TO: ABALONE COVE TECHNICAL PANEL

VOLUME I OF II

SUBJECT: TRIAL 3-DIMENSIONAL STABILITY CALCULATION

MARCH 16, 1992

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Geotechnical Engineering | *Engineering Geology*

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March 16, 1992
Job No. 82-025-F

TO: Abalone Cove Technical Panel
FROM: R. T. Frankian

SUBJECT: Trial 3-Dimensional Stability Calculation

Attached to this memorandum is the printout of the three dimensional slope stability program CLARA applied to the approximate parameters of the active Abalone Cove landslide. Also attached is a summary of each calculation series, and a summary of the trial data.

It should be noted that what is presented is not a final analysis, since approximate values were used for the shear strength, and we have not tested the sensitivity of the safety factors to the shear strength. It is not intended that the analysis presented represent accurately the safety factors present in the past or what they could be in the future.

The purpose of this exercise was to determine if CLARA would be an appropriate program to use to model the slide. The conclusion is that it may be the best commercial program available today, but it has a number of drawbacks, some of which are serious. The only other available 3-D analysis known to the writer is TSLOPE3 which should be compared with the results herein obtained before a final selection of program is made.

The advantage of using a 3-D program is that where there are side effects, external forces, and significant variations in the subsurface sections, the interactions can be determined without relying on a weighted averaging procedure. The variation of the safety factors, based on a 2-D analysis, depending upon where the cross-section is cut, is shown on the contour map of the sliding surface used in the analyses.

CLARA is capable of handling external loads, such as the push from the Portuguese landslide, according to the manual. We have not had time to try it to verify this. CLARA requires that all points of the mass move in the same direction, and only analyzes one direction at a time. All points of the Abalone Cove slide are not moving in the same direction. Every time a new direction is selected, the problem has to be set up all over, which takes about 40 hours.

Without major modification, CLARA does not appear capable of handling separate units within the slide, which in the actual slide are each moving at a different rate and probably direction. Only a finite element program would have that capability. A 3-D finite element program is not yet available, but has been estimated to cost $50,000 and about 6 months time to develop.

The total number of definable points per specified boundary is 17. For each boundary (ground surface, piezometric surface, slide surface) the specified boundary line must start and end with a point beyond the limits of the analaysis. This means that each boundary within each of the 2800 foot long cross sections can only have 15 points of definition. This does not provide adequate detail for the critical areas of the analysis, such as the toe area.

The software will only accept a defined grid of less than 1600 total columns. Using the largest number of columns available, our analysis generates columns of 100 feet wide and 50 feet long. The number of grid columns is based upon the system memory of up to 640 k. The software programmer indicated that a system upgrade that will use system expanded or extended memory above 640k is under development but will not be available in the near future.

CLARA will interpolate the points used in the analysis from the set of 2 dimensional cross section input points. The interpolated points will be set within the defined grid. These points may or may not be set to match the input set of points and thus contribute to geometry errors. This is evident in the final plots of the analysis. The slope geometry indicated on the final plots have discrepancies with the input set of points.

We would like the opportunity to test the TSLOPE3 program, and to see if CLARA or TSLOPE3 can be made to fit closer to the actual slide conditions so that a more accurate model will be available for the present and future analyses. We estimate that the proposed work would cost $15,000.

Respectfully Submitted,

R. T. FRANKIAN & ASSOCIATES

by Scott David Rudd
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SUMMARY OF EACH SERIES

The Preliminary Stability Analysis for the Abalone Cove Landslide was performed using a number of slope stability software programs. They included CLARA, in both two and three dimensional configurations, TSLOPE and PCSTABL5. Prior to beginning the analysis the geometry for subsurface conditions concerning Abalone Cove and the landslide had to be plotted in both topographic and two dimensional views. All surfaces for each element of the analysis had to be defined. This included ground surfaces, material surfaces, piezometric surfaces and sliding surfaces.

The analysis was performed by a series of trial runs, each with a specific objective. The following is a summary of each series of trials.

Series One:

Series One was performed using CLARA in the three dimensional configuration. Within this analysis the topographic surface from the Abalone Cove Topo Map dated December 21, 1984 was used as the basis for the ground surfaces. The piezometric surface was set to elevations approximately 20 feet higher than the slide plane as plotted on the attached plan. In general, the bottom of the slide was assumed to have strength values with a Phi of 7 degrees and Cohesion of 0 psf. The sides and rear of the sliding surface were defined as having a Phi of 20 degrees and Cohesion of 100 psf.

The objective for this series was to establish a "base line" value for the Factor of Safety. Trial Number 1 was used within this series.

The resulting values of the analysis were 1.149 when using Bishop's Method of Analysis and 1.142 when using the Janbu Method.

Series Two:

This series was also performed using CLARA in the three dimensional configuration. The subsurface geometry for this analysis remained the same as in Series One with the exception of raising the piezometric surface to the levels indicated as "High" levels on Cross Sections "A" and "C". The strength values were also left the same.

The objective for this series was to determine the affects of raising the water table to the "High" water level. Trial Number 2 was used within this series.

The resulting values were 1.035 when using Bishop's Method and 1.030 when using the Janbu Method.

Series Three:

This series was performed using CLARA in the three dimensional configuration. The subsurface geometry for this analysis remained the same as in Series' One and Two with the exception of modifying the piezometric surface to the levels indicated on the November-

December Water Level Map. The strength values were also left the same.

The objective for this series was to determine the affects of current water table conditions. It also aided in the evaluation of both the software and the subsurface geometry being used. Trial Number 25 was used within this series.

The resulting values were 1.124 when using Bishop's Method and 1.118 when using the Janbu Method.

Series Four:

This series was performed using CLARA in the three dimensional configuration as well. The subsurface geometry for this analysis remained the same as in Series One but the proposed toeberm as shown on Cross Sections "A" and "C" was added. The strength values were left the same with the exception of adding an additional value for the compacted fill. This value was a Phi of 30 degrees and a Cohesion of 400 psf.

The objective for this series was to determine the affects of adding the toeberm. Trial Number 26 was used within this series.

The resulting values were 1.270 when using Bishop's Method and 1.259 when using the Janbu Method.

Series Five:

This series was also performed using CLARA in the three dimensional configuration. The subsurface geometry for this analysis remained the same as in Series Four but the piezometric surface was modified using the November-December water levels. The strength values were left the same as in Series Four.

The objective for this series was to determine the affects of adding the toeberm with the current water levels. Trial Number 26 was used within this series.

The resulting values were 1.237 when using Bishop's Method and 1.227 when using the Janbu Method.

Series Six:

The first part of this series was performed using all three methods of analysis and focused on 2 dimensional Cross Section X=400' with the proposed toeberm. The geometry was identical to those in Trial Number 26.

The objective of this series was to compare the results of CLARA to other software of known performance. Within the CLARA trial it was found that the output file representing the slope geometry used in analysis differed from the input geometry. For further comparison Trial Number 28 was performed based on the CLARA output.

The results of the trials were as follows:

CLARA Trial 5C - 1.119
TSLOPE Trial 14C - 1.360
PCSTABL5 Trial 17A - 1.356
TSLOPE Trial 28 - 1.322

The second part of this series was performed using CLARA and TSLOPE methods of analysis and focused on 2 dimensional Cross Section X=400' without the proposed toeberm. The geometry was identical to those in Trial Number 1.

The objective of this series was to compare the results of CLARA to other software of known performance.

The results of the trials were as follows:

CLARA Trial 9 - 1.028
TSLOPE Trial 15 - 1.217

Series Seven:

The objective of this series was to compare the results of CLARA to other software of known performance based on Cross Section X=200. This series used CLARA and TSLOPE methods of analysis. The proposed toeberm was used in the first part of the series and the geometry was identical to those in Trial Number 26. For the second part of the series the toeberm was omitted and the geometry was identical to those in Trial Number 1.

The results of the trials with the toeberm were as follows:

CLARA Trial 4A - 4.039
TSLOPE Trial 12A - 1.764

The results of the trials without the toeberm were as follows:

CLARA Trial 8A - 3.009
TSLOPE Trial 13 - 1.353

Series Eight:

The objective of this series was to compare the results of CLARA to other software of known performance based on Cross Section X=700. This series used CLARA and TSLOPE methods of analysis. The proposed toeberm was used in the first part of the series and the geometry was identical to those in Trial Number 26. For the second part of the series the toeberm was omitted and the geometry was identical to those in Trial Number 1.

The results of the trials with the toeberm were as follows:

CLARA Trial 6A - 1.018
TSLOPE Trial 20 - 1.226

The results of the trials without the toeberm were as follows:

CLARA Trial 10 - 0.871
TSLOPE Trial 19 - 0.940

Series Nine:

The objective of this series was to compare the results of CLARA to other software of known performance based on Cross Section X=1000. This series used CLARA and TSLOPE methods of analysis. The proposed toeberm was used in the first part of the series and the geometry was identical to those in Trial Number 26. For the second part of the series the toeberm was omitted and the geometry

was identical to those in Trial Number 1.

The results of the trials with the toeberm were as follows:

CLARA Trial 7A - 0.922
TSLOPE Trial 22 - 0.706

The results of the trials without the toeberm were as follows:

CLARA Trial 11 - 0.880
TSLOPE Trial 21 - 0.745

Series Ten:

The objective of this series was to compare the results of CLARA to other software of known performance based on Cross Section X=1300. This series used CLARA and TSLOPE methods of analysis. The proposed toeberm was used in the first part of the series and the geometry was identical to those in Trial Number 26. For the second part of the series the toeberm was omitted and the geometry was identical to those in Trial Number 1.

The results of the trials with the toeberm were as follows:

CLARA Trial 29 - 1.056
TSLOPE Trial 30 - 0.851

The results of the trials without the toeberm were as follows:

CLARA Trial 31 - 1.040
TSLOPE Trial 32 - 0.784

SUMMARY OF TRIAL DATA

TRIAL 1

PROGRAM:	CLARA 3d		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
RESULTS:	Bishop's 1.149	Janbu 1.142	

REMARKS:
Original set-up of slide geometry. A series of 2d sections at X=0, 100, 200, 300, 400, 700, 1000, 1300, 1400, 1600, 1700 and 1800 were drawn from available topo maps to create the 3d file for CLARA. The water level was assumed to be 20 feet above the sliding surface plotted on each 2d cross section. Where the sliding surface was not present the water level was set to a common grid.

TRIAL 2

PROGRAM:	CLARA 3d		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Used "High Level" from X-Sects A-A' and C-C'		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
RESULTS:	Bishop's 1.035	Janbu 1.030	

REMARKS: This trial was based on Trial Number 1 with revisions to the water levels based upon Cross Sections "A" and "C" High Level.

TRIAL 3

PROGRAM:	CLARA 3d		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Added (see remarks below)		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 1.305	Janbu 1.294	

REMARKS:
The 3d model of the toeberm was made from the 2d sections on Cross Sections A-A' and C-C' from the 12-17-84 report. The two sections were transferred onto the CLARA "X" section map. The toeberm sections were connected and the areas to the sides of the sections were drawn and daylighted along the length of the slide. Personal knowledge of earthwork and grading design were used as the basis for the design. In our opinion it represents a potential possible design. The failure surface was placed to break along the lower portion of the toeberm.

TRIAL 4

PROGRAM:	CLARA 2d (X=200)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 3.379	Janbu 3.374	

REMARKS: This 2d section was run to compare CLARA 2d results with those of other stability software. The failure surface was set to break in the lower portion of the toeberm.

TRIAL 4A

PROGRAM:	CLARA 2d (X=200)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 4.039	Janbu 4.034	

REMARKS: The failure surface was revised to break at an approximate 60 degree angle through the toeberm.

TRIAL 5

PROGRAM:	CLARA 2d (X=400)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 1.130	Janbu 1.126	

REMARKS: The sliding surface was set to break in the lower portion of the toeberm.

TRIAL 5A

PROGRAM:	CLARA 2d (X=400)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 1.318	Janbu 1.307	

REMARKS: This trial was run with a modified slide plane geometry through the toeberm area for comparison to TSLOPE trials.

TRIAL 5B

PROGRAM:	CLARA 2d (X=400)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 1.332	Janbu 1.320	

REMARKS: Additional modifications to the toeberm and sliding surface geometry for TSLOPE comparisons.

TRIAL 5C

PROGRAM:	CLARA 2d (X=400)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 1.119	Janbu 1.107	

REMARKS: Final CLARA trial run on this 2d section for comparison to TSLOPE trials. In this run the slope surface geometry and sliding surface geometry was revised in the area of the toeberm.

TRIAL 6

PROGRAM:	CLARA 2d (X=700)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 0.974	Janbu 0.963	

REMARKS: The sliding surface was set to break in the lower portion of the toeberm.

TRIAL 6A

PROGRAM:	CLARA 2d (X=700)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 1.018	Janbu 1.002	

REMARKS: Sliding surface geometry was revised to break at an approximate 60 degree angle through the toeberm.

TRIAL 7

PROGRAM:	CLARA 2d (X=1000)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 0.915	Janbu 0.914	

REMARKS: The sliding surface was set to break in the lower portion of the toeberm material.

TRIAL 7A

PROGRAM:	CLARA 2d (X=1000)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 0.922	Janbu 0.920	

REMARKS: The sliding surface was revised to break at an approximate 60 degree angle through the toeberm.

TRIAL 8

PROGRAM:	CLARA 2d (X=200)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	No		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
RESULTS:	Bishop's 3.009	Janbu 3.009	

REMARKS: This trial was run for continuing comparisons with other trials. Sliding surface was set the same as in trial one.

TRIAL 9

PROGRAM:	CLARA 2d (X=400)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	No		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
RESULTS:	Bishop's 1.028	Janbu 1.022	

REMARKS: This trial was run for continuing comparisons with other trials. Sliding surface was set the same as in trial one.

TRIAL 10

PROGRAM:	CLARA 2d (X=700)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	No		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
RESULTS:	Bishop's 0.871	Janbu 0.861	

REMARKS: This trial was run for continuing comparisons with other trials. Sliding surface was set the same as in trial one.

TRIAL 11

PROGRAM:	CLARA 2d (X=1000)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	No		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
RESULTS:	Bishop's 0.880	Janbu 0.879	

REMARKS: This trial was run for continuing comparisons with other trials. Sliding surface was set the same as in trial one.

TRIAL 12A

PROGRAM:	TSLOPE 2d (X=200)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	1.764		

REMARKS: This trial was performed for comparison of CLARA to TSLOPE.

TRIAL 13

PROGRAM:	TSLOPE 2d (X=200)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	No		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
RESULTS:	1.353		

REMARKS: This trial was performed for comparison of CLARA to TSLOPE.

TRIAL 14A

PROGRAM:	TSLOPE 2d (X=400)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	1.547		

REMARKS: This trial was performed for comparison of CLARA to TSLOPE.

TRIAL 14B

PROGRAM:	TSLOPE 2d (X=400)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	1.346		

REMARKS: In this trial the slope and sliding surface was modified for use as comparison between CLARA and TSLOPE.

TRIAL 14C

PROGRAM:	TSLOPE 2d (X=400)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	1.360		

REMARKS: Sliding surface geometry was revised in this trial for the final comparison in this series.

TRIAL 15

PROGRAM:	TSLOPE 2d (X=400)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	No		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
RESULTS:	1.217		

REMARKS: This trial was performed for comparison of CLARA and TSLOPE.

TRIAL 16

PROGRAM:	CLARA 2d (X=400)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 1.337 Janbu 1.324		

REMARKS: Break at toe was forced through toeberm based upon CLARA Trial 5c output. The angle was set to an approximate 60 degrees up through the toe berm.

TRIAL 17A

PROGRAM:	PCSTABL5 2d (X=400)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
	Rock (before slide)	C= 600 psf	Phi= 37 deg
RESULTS:	1.356		

REMARKS: This was ran to search for the critical failure surface. The descending portion of the RTF&A slide contour was continued downward with a random search box to find the critical plane. As anticipated the critical plane broke out at the toe of the toeberm slightly higher than the previously used sliding surface. Rock strengths below and in front of the RTF&A slide contours.

TRIAL 19

PROGRAM:	TSLOPE 2d (X=700)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	No		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
RESULTS:	0.940		

REMARKS: This trial was performed for comparison of CLARA to TSLOPE.

TRIAL 20

PROGRAM:	TSLOPE 2d (X=700)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg

RESULTS: 1.226

REMARKS: This trial was performed for comparison of CLARA to TSLOPE.

TRIAL 21

PROGRAM:	TSLOPE 2d (X=1000)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	No		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg

RESULTS: 0.745 ?

REMARKS: This trial was performed for comparison of CLARA to TSLOPE.

TRIAL 22

PROGRAM:	TSLOPE 2d (X=1000)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg

RESULTS: 0.706 ?

REMARKS: This trial was performed for the comparison of CLARA to TSLOPE.

TRIAL 23

PROGRAM:	CLARA 3d		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 1.260 Janbu 1.250		

REMARKS: This 3d run was performed using a modified version of the toeberm design based on Cross Sections "A" and "C". The toe of slope was placed to more closely resemble the shoreline contours.

TRIAL 24

PROGRAM:	CLARA 3d		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Nov/Dec water levels		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 1.228 Janbu 1.219		

REMARKS: This trial was performed with Nov/Dec Water levels for comparison with the toeberm.

TRIAL 25

PROGRAM:	CLARA 3d		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Nov/Dec water level data		
TOEBERM:	No		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
RESULTS:	Bishop's 1.124 Janbu 1.118		

REMARKS: This run was revised to use Nov/Dec water levels for comparison without the toeberm.

TRIAL 26

PROGRAM:	CLARA 3d		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 1.270 Janbu 1.259		

REMARKS: This trial was run based on Trial 3 with revisions to the angle of break within the toeberm material. The break was made at an approximate 60 degree angle through the toeberm.

TRIAL 27

PROGRAM:	CLARA 3d		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Nov/Dec Water level data		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 1.237 Janbu 1.227		

REMARKS: This run was based on Trial 3 with revisions to the angle of break within the toeberm material and the addition of the Nov/Dec water level data.

TRIAL 28

PROGRAM:	TSLOPE 2d (X=400)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	1.322		

REMARKS: This run was made based on the CLARA trial 5c output file. The slope surface generated in trial 5c was used for comparison.

TRIAL 29

PROGRAM:	CLARA 2d (X=1300)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	Bishop's 1.056 Janbu 1.053		

REMARKS: This trial was performed for CLARA to TSLOPE comparison.

TRIAL 30

PROGRAM:	TSLOPE 2d (X=1300)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	Yes		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
	Toeberm	C= 400 psf	Phi= 30 deg
RESULTS:	0.851		

REMARKS: This trial was run to compare CLARA Trial number 29 to TSLOPE.

TRIAL 31

PROGRAM:	CLARA 2d (X=1300)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	No		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg
RESULTS:	Bishop's 1.040 Janbu 1.037		

REMARKS: This run was used for comparison of CLARA to TSLOPE. No toeberm was used.

TRIAL 32

PROGRAM:	TSLOPE 2d (X=1300)		
SURFACE DATA:	From 12/21/84 Topo Map		
SLIDE DATA:	From RTF&A generated contour map		
PIEZO SURFACE:	Assumed 20 feet above slide surface		
TOEBERM:	No		
MATERIAL(S):	Sides of Slide	C= 100 psf	Phi= 20 deg
	Bottom of Slide	C= 0 psf	Phi= 7 deg

RESULTS: 0.784

REMARKS: This trial was performed for comparison of CLARA to TSLOPE.

R. T. Frankian & Associates Inc., Burbank, CA

CLARA - SLOPE STABILITY ANALYSIS, BISHOP'S SIMPLIFIED AND JANBU METHODS

Project: Abalone Cove
Data File: 82025(B).CLA Analysis by: SDR Date: 01-05-92
Data Set: SN1 - Water 20' above slide surface

RUN IDENTIFICATION LABEL: SN1 - Water 20' above Slide Plane

Number of Active Columns	563	Axis of Rotation Y-coordinate	762.19
Max. No. Columns in Y-dir.	23	Axis of Rotation Z-coordinate	4151.59
Slide Volume	2.84E+08	Total Water Trust Force	0.00E+00
Weight of Slide Mass ...	3.69E+10	Unbalanced Transverse Force .	1.82E+09
Sliding Surface Area ...	3.04E+06	Z-coord. of unbalanced force	399.03
Earthquake Acceleration	0.00	Negative Norm. Forces 0.00 % OF WEIGHT	

!! NUMBER OF WARNINGS ISSUED CONCERNING THE PRESENT SOLUTION: ... 0

FACTOR OF SAFETY: Bishop's ... 1.091
Janbu ..... 1.083 (uncorrected)

SUMMARY OF MATERIAL AND DISCONTINUITY PROPERTIES

NO.	LABEL	UNIT WEIGHT	COHESION HOR.	COHESION VERT.	FRICTION HOR.	FRICTION VERT.	PORE-PRESS. RATIO*	PORE-PRESS. B-BAR
A/ MATERIALS:								
1	Side Materia	130.00	100.0	100.0	20.0	20.0	-1.00	0.00
2	Bottom Mater	130.00	0.0	0.0	7.0	7.0	-1.00	0.00

NOTES:
Material layers are numbered from bottom up
* Negative integer signifies the applicable piezometric surface number

. T. Frankian & Associates Inc., Burbank, CA
SLOPE STABILITY ANALYSIS - DATA FILE SUMMARY
PROJECT - Abalone Cove
DATA FILE - 82025(B).CLA
DATA SET - SN1 - Water 20' above slide surface
ANALYSIS BY SDR
DATE: 01-05-92

UNIT WEIGHT OF WATER = 62.4

CONTROL VARIABLES

COLUMN LENGTH (Y-DIRECTION)	100
MESH START Y-COORDINATE	10
MESH END Y-COORDINATE	2790
ROW WIDTH	50
TRANSVERSE MESH WIDTH	1800
NUMBER OF MATERIALS	2
NUMBER OF DISCONTINUITIES	0
NUMBER OF PIEZOMETRIC SURFACES	1

SUMMARY OF MATERIAL AND DISCONTINUITY PROPERTIES

NO.	LABEL	UNIT WEIGHT	COHESION HOR.	COHESION VERT.	FRICTION HOR.	FRICTION VERT.	PORE-PRESS. RATIO*	PORE-PRESS. B-BAR
A/ MATERIALS:								
1	Side Materia	130.00	100.0	100.0	20.0	20.0	-1.00	0.00
2	Bottom Mater	130.00	0.0	0.0	7.0	7.0	-1.00	0.00

NOTES:
Material layers are numbered from bottom up
* Negative integer signifies the applicable piezometric surface number

CROSS-SECTION NUMBER 1 X = 0

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
200.00	201.00
300.00	212.00
350.00	245.00
500.00	295.00
700.00	330.00
900.00	356.00
1050.00	380.00
1100.00	380.00
1150.00	393.00
1400.00	470.00
1600.00	503.00
1800.00	480.00
2000.00	440.00
2350.00	505.00
2600.00	548.00
2800.00	548.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
200.00	201.00
300.00	212.00
350.00	245.00
500.00	295.00
700.00	330.00
900.00	356.00
1050.00	380.00
1100.00	380.00
1150.00	393.00
1400.00	470.00
1600.00	503.00
1800.00	480.00
2000.00	440.00
2350.00	505.00
2600.00	548.00
2800.00	548.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
1000.00	200.00
2000.00	300.00
2800.00	400.00

CROSS-SECTION NUMBER 2 X = 100

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
240.00	200.00
350.00	220.00
400.00	260.00
550.00	270.00
900.00	336.00
1000.00	350.00
1070.00	366.00
1300.00	370.00
1650.00	480.00
1810.00	430.00
2000.00	410.00
2250.00	430.00
2380.00	490.00
2500.00	540.00
2700.00	540.00
2800.00	540.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
240.00	200.00
350.00	220.00
400.00	260.00
550.00	270.00

900.00	336.00
1000.00	350.00
1070.00	366.00
1300.00	370.00
1650.00	480.00
1810.00	430.00
2000.00	410.00
2250.00	430.00
2380.00	490.00
2500.00	540.00
2700.00	540.00
2800.00	540.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
1000.00	200.00
2000.00	300.00
2800.00	400.00

CROSS-SECTION NUMBER 3 X = 200

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
290.00	200.00
390.00	220.00
430.00	280.00
460.00	270.00
720.00	270.00
930.00	340.00
1100.00	360.00
1560.00	370.00
1650.00	410.00
1700.00	380.00
1800.00	395.00
1950.00	435.00
2020.00	415.00
2360.00	440.00
2500.00	510.00
2800.00	518.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
290.00	200.00
390.00	220.00
430.00	280.00
460.00	270.00
720.00	270.00
920.00	340.00
1100.00	360.00
1560.00	370.00
1650.00	410.00
1700.00	380.00
1800.00	395.00
1950.00	435.00

2020.00	415.00
2360.00	440.00
2500.00	510.00
2800.00	518.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
1000.00	200.00
2000.00	300.00
2800.00	400.00

CROSS-SECTION NUMBER 4 X = 300

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
1270.00	100.00
1570.00	370.00
1710.00	390.00
1850.00	452.00
1960.00	453.00
2000.00	438.00
2200.00	460.00
2600.00	460.00
2800.00	500.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
300.00	200.00
390.00	220.00
430.00	270.00
650.00	280.00
790.00	320.00
940.00	342.00
1230.00	340.00
1310.00	351.00
1570.00	370.00
1710.00	390.00
1850.00	452.00
1960.00	453.00
2000.00	438.00
2200.00	460.00
2600.00	460.00
2800.00	500.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
740.00	200.00
920.00	280.00
2000.00	300.00
2800.00	400.00

CROSS-SECTION NUMBER 5 X = 400

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
1500.00	100.00
1800.00	430.00
2050.00	452.00
2150.00	477.00
2350.00	480.00
2400.00	500.00
2700.00	500.00
2800.00	480.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
300.00	200.00
450.00	270.00
500.00	272.00
600.00	262.00
650.00	286.00
800.00	342.00
1200.00	356.00
1300.00	372.00
1650.00	378.00
1800.00	430.00
2050.00	452.00
2150.00	477.00
2350.00	480.00
2400.00	500.00
2700.00	500.00
2800.00	480.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
820.00	200.00
900.00	230.00
1070.00	260.00
1760.00	280.00
2000.00	300.00
2800.00	400.00

CROSS-SECTION NUMBER 6 X = 700

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
2100.00	100.00
2350.00	508.00
2450.00	550.00
2800.00	565.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE

0.00	200.00
300.00	200.00
400.00	220.00
450.00	270.00
650.00	285.00
750.00	265.00
800.00	310.00
900.00	340.00
1200.00	353.00
1600.00	380.00
1700.00	368.00
2050.00	478.00
2250.00	500.00
2350.00	508.00
2450.00	550.00
2800.00	565.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
954.00	200.00
1698.00	242.00
2250.00	360.00
2800.00	400.00

CROSS-SECTION NUMBER 7 X = 1000

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
1965.00	100.00
2500.00	568.00
2800.00	582.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
200.00	200.00
250.00	202.00
350.00	236.00
500.00	240.00
650.00	270.00
700.00	298.00
1150.00	358.00
1400.00	402.00
1550.00	420.00
1750.00	406.00
1900.00	482.00
2150.00	492.00
2500.00	568.00
2800.00	582.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
750.00	210.00

1400.00	298.00
1650.00	320.00
2200.00	388.00
2300.00	400.00
2800.00	400.00

CROSS-SECTION NUMBER 8 X = 1300

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
2000.00	100.00
2160.00	540.00
2425.00	564.00
2500.00	593.00
2800.00	600.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
190.00	200.00
280.00	210.00
490.00	250.00
770.00	320.00
900.00	324.00
1000.00	358.00
1230.00	380.00
1500.00	450.00
1620.00	450.00
1800.00	500.00
1940.00	500.00
2160.00	540.00
2425.00	564.00
2500.00	593.00
2800.00	600.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
190.00	200.00
280.00	210.00
570.00	240.00
800.00	280.00
920.00	300.00
1220.00	320.00
1780.00	360.00
2180.00	400.00
2800.00	400.00

CROSS-SECTION NUMBER 9 X = 1400

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
1500.00	100.00
1690.00	510.00

1840.00	510.00
1950.00	523.00
2250.00	550.00
2380.00	576.00
2800.00	604.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
170.00	200.00
250.00	206.00
280.00	218.00
400.00	220.00
590.00	270.00
930.00	358.00
1070.00	360.00
1300.00	430.00
1400.00	430.00
1510.00	460.00
1690.00	510.00
1840.00	510.00
1950.00	523.00
2250.00	550.00
2380.00	576.00
2800.00	604.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
400.00	200.00
1150.00	320.00
2030.00	400.00
2800.00	400.00

CROSS-SECTION NUMBER 10 X = 1600

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	200.00
210.00	210.00
235.00	218.00
330.00	220.00
640.00	356.00
870.00	366.00
960.00	406.00
1175.00	411.00
1370.00	486.00
1570.00	500.00
1630.00	520.00
1870.00	540.00
2070.00	570.00
2300.00	560.00
2360.00	578.00
2800.00	600.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	200.00
210.00	210.00
235.00	218.00
330.00	220.00
640.00	356.00
870.00	366.00
960.00	406.00
1175.00	411.00
1370.00	486.00
1570.00	500.00
1630.00	520.00
1870.00	540.00
2070.00	570.00
2300.00	560.00
2360.00	578.00
2800.00	600.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
1000.00	200.00
2000.00	300.00
2800.00	400.00

CROSS-SECTION NUMBER 11 X = 1800

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	205.00
200.00	214.00
250.00	230.00
500.00	348.00
650.00	360.00
700.00	370.00
800.00	370.00
1200.00	420.00
1250.00	450.00
1300.00	470.00
1500.00	490.00
1750.00	552.00
1800.00	563.00
2050.00	585.00
2250.00	572.00
2800.00	600.00

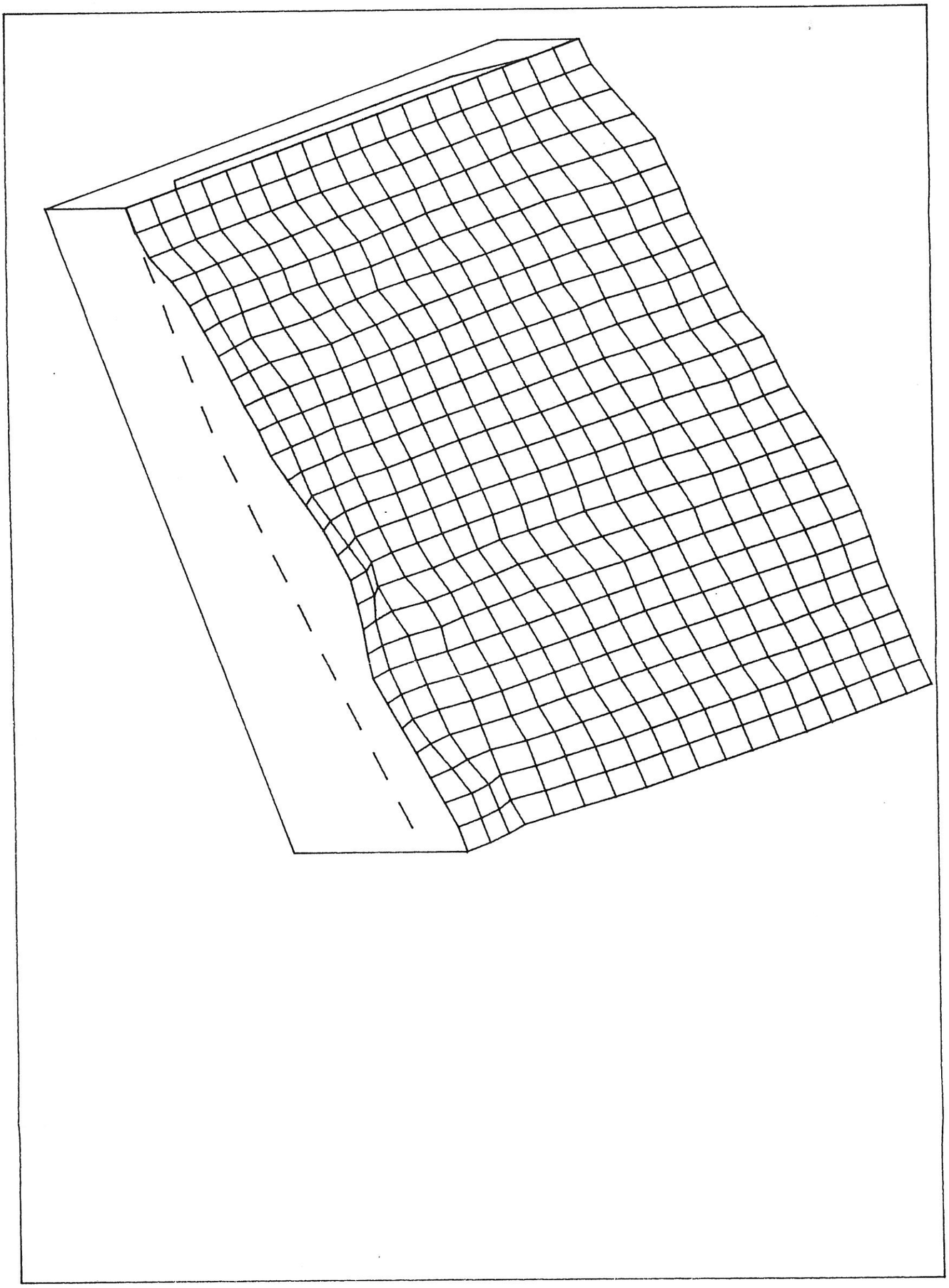
MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	205.00
200.00	214.00
250.00	230.00
500.00	348.00
650.00	360.00

700.00	370.00
800.00	370.00
1200.00	420.00
1250.00	450.00
1300.00	470.00
1500.00	490.00
1750.00	552.00
1800.00	563.00
2050.00	585.00
2250.00	572.00
2800.00	600.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
1000.00	200.00
2000.00	300.00
2800.00	400.00

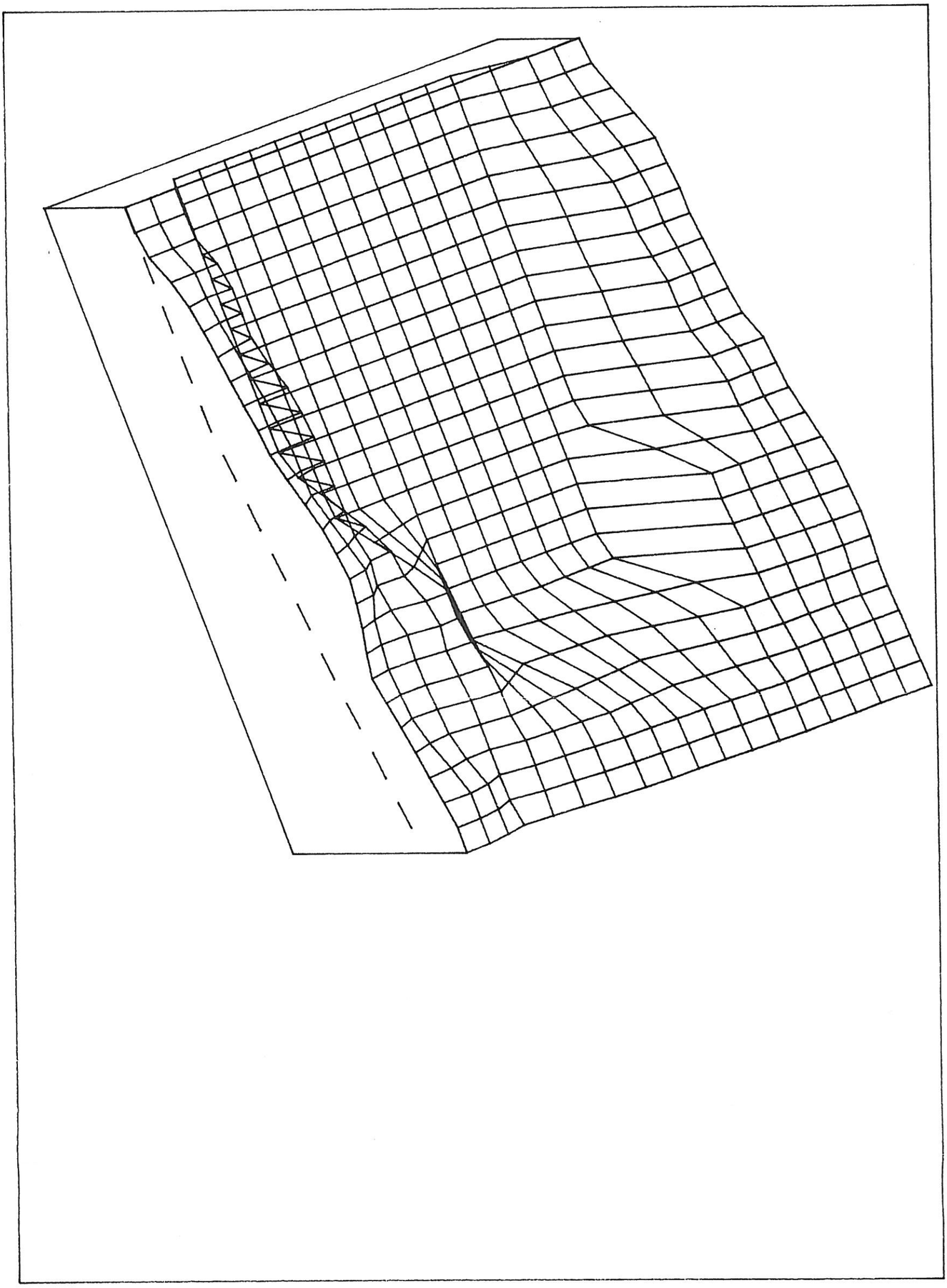


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***
GROUND SURFACE

R.T. FRANKIAN & ASSOCIATES

DATE:	SCALE:	PLATE:
03-02-92		1-12

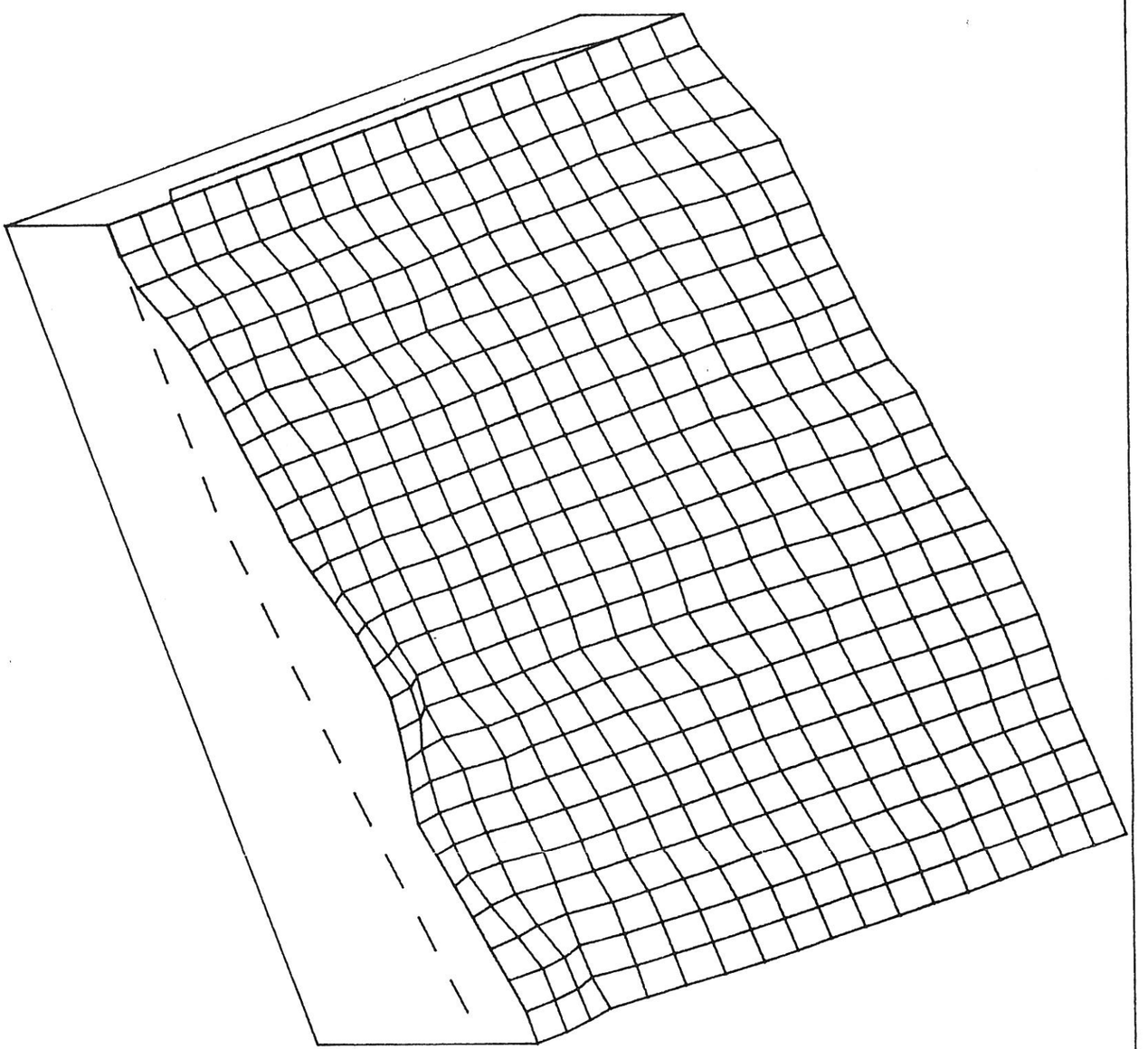


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***
MATERIAL ONE

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 SCALE: PLATE: 1-13

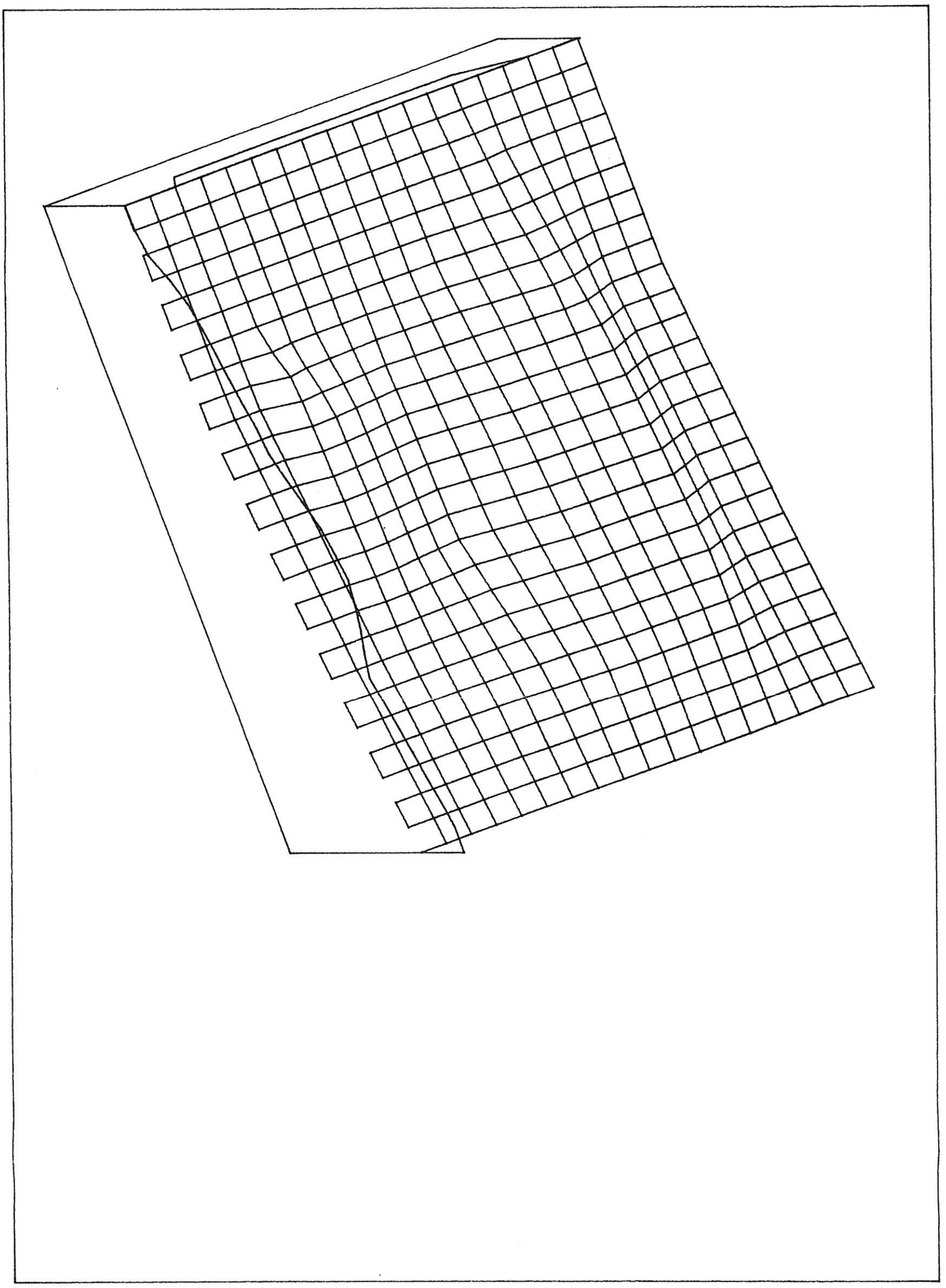


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***
MATERIAL TWO

R.T. FRANKIAN & ASSOCIATES

DATE:	SCALE:	PLATE:
03-02-92		1-14



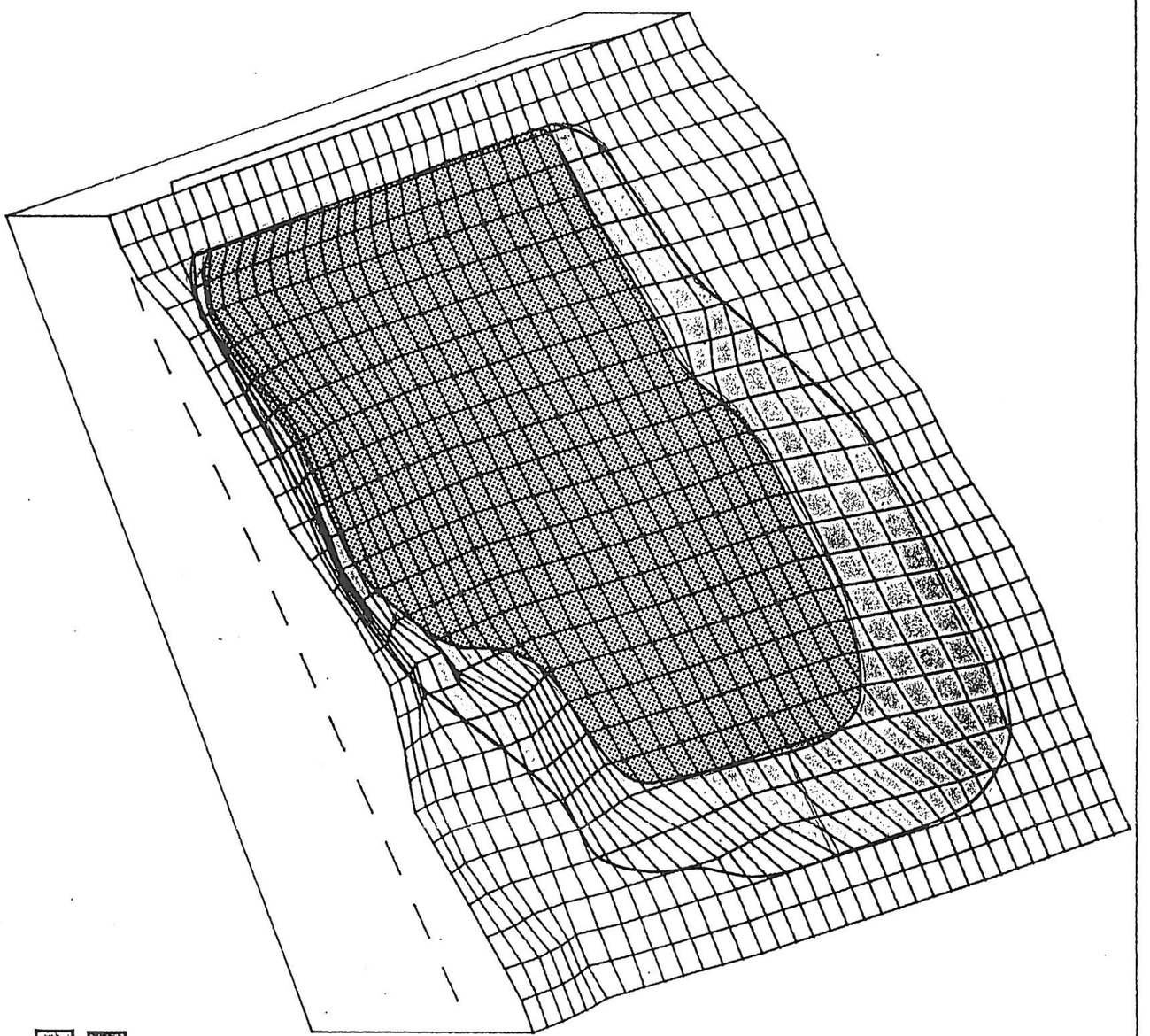
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***

PIEZOMETRIC SURFACE

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 *SCALE:* *PLATE:* 1-15



SIDE SURFACES - Phi= 20 degrees C= 100 psf

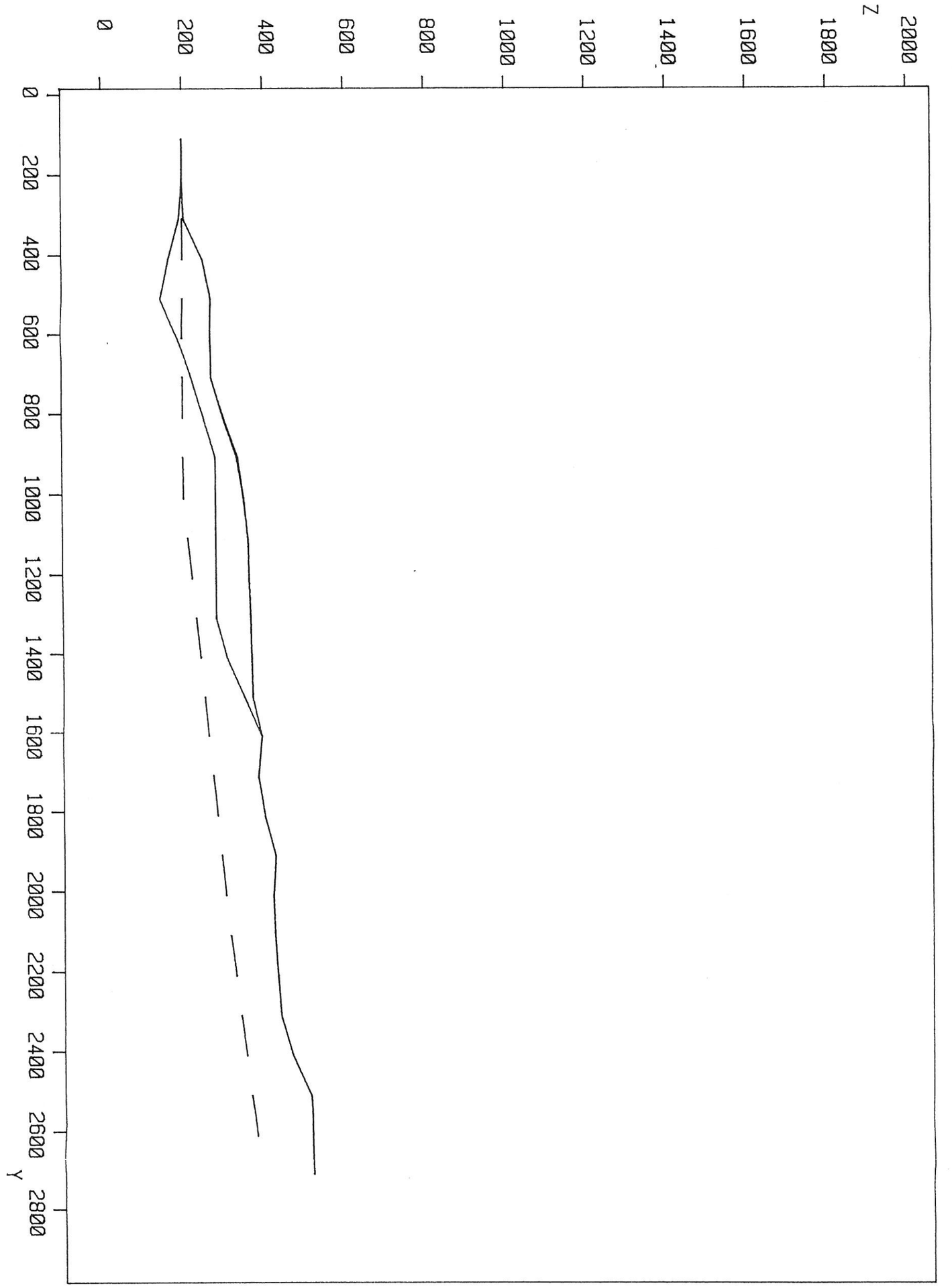
SLIDE SURFACE - Phi= 7 degrees C= 0 psf

RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with Trial No. SN-1
SLIDING SURFACE

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 SCALE: PLATE: 1-16



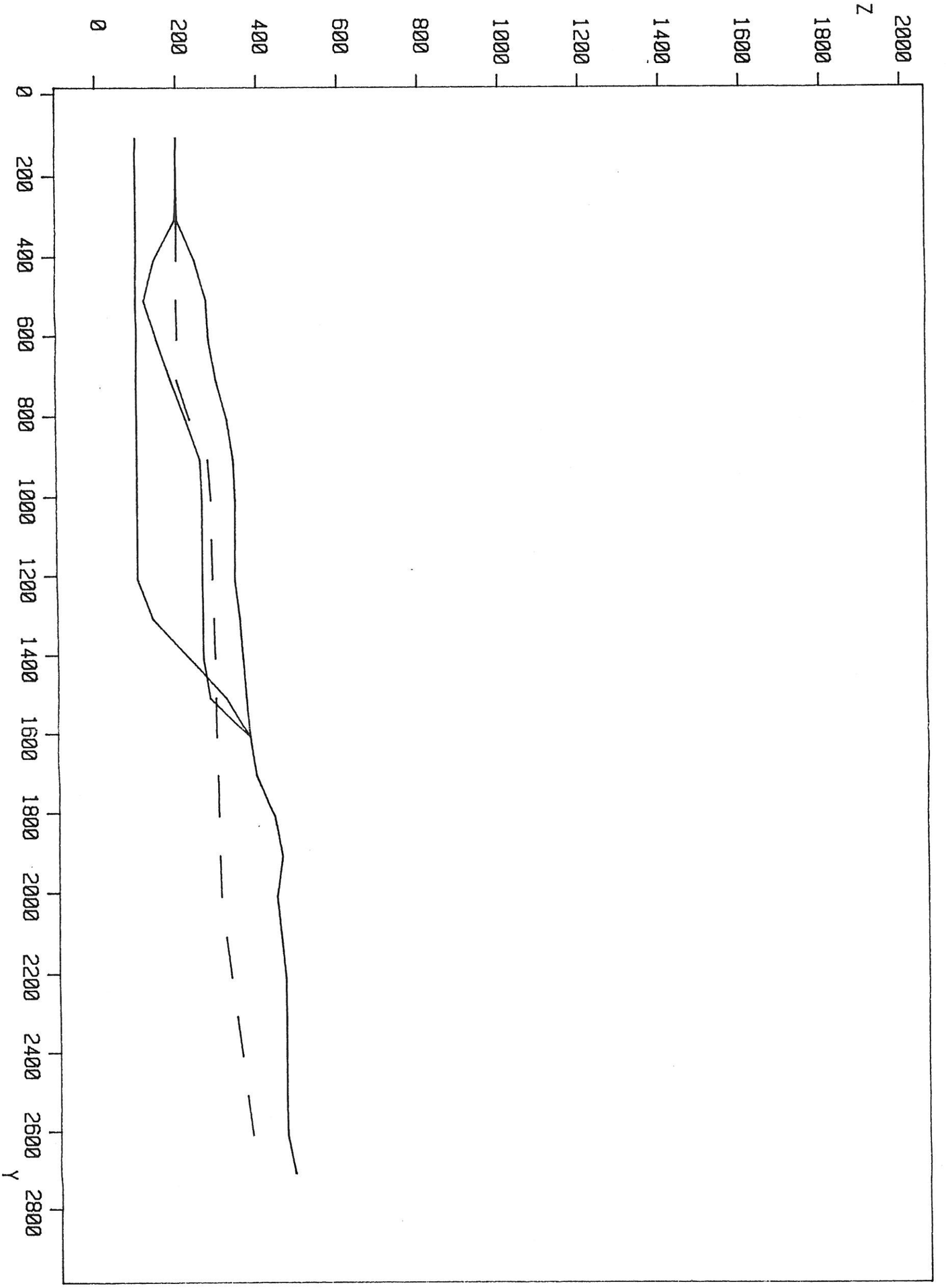
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***

X = 200

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 *SCALE:* *PLATE:* 1-17

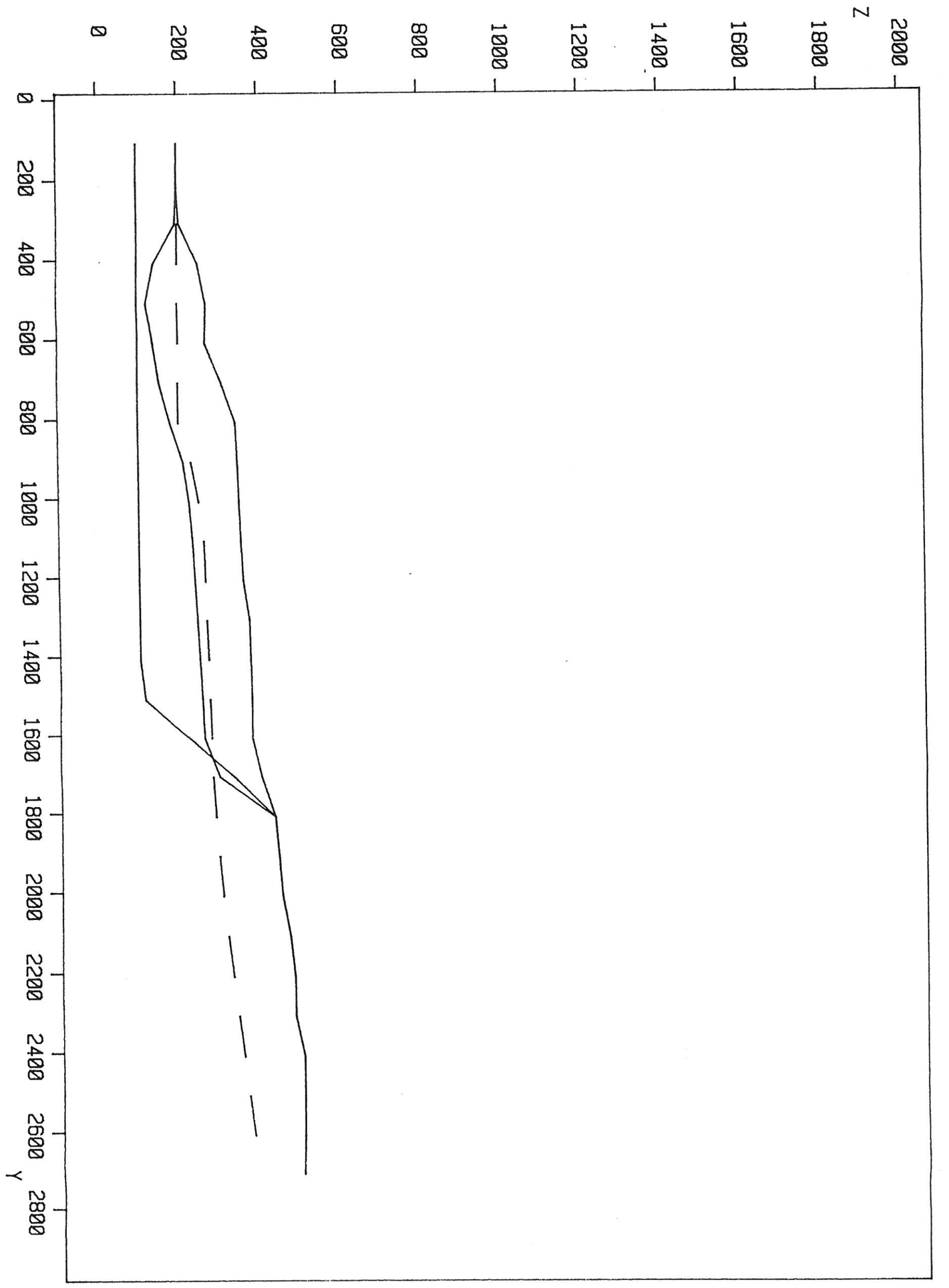


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***
x = 300

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 SCALE: PLATE: 1-18



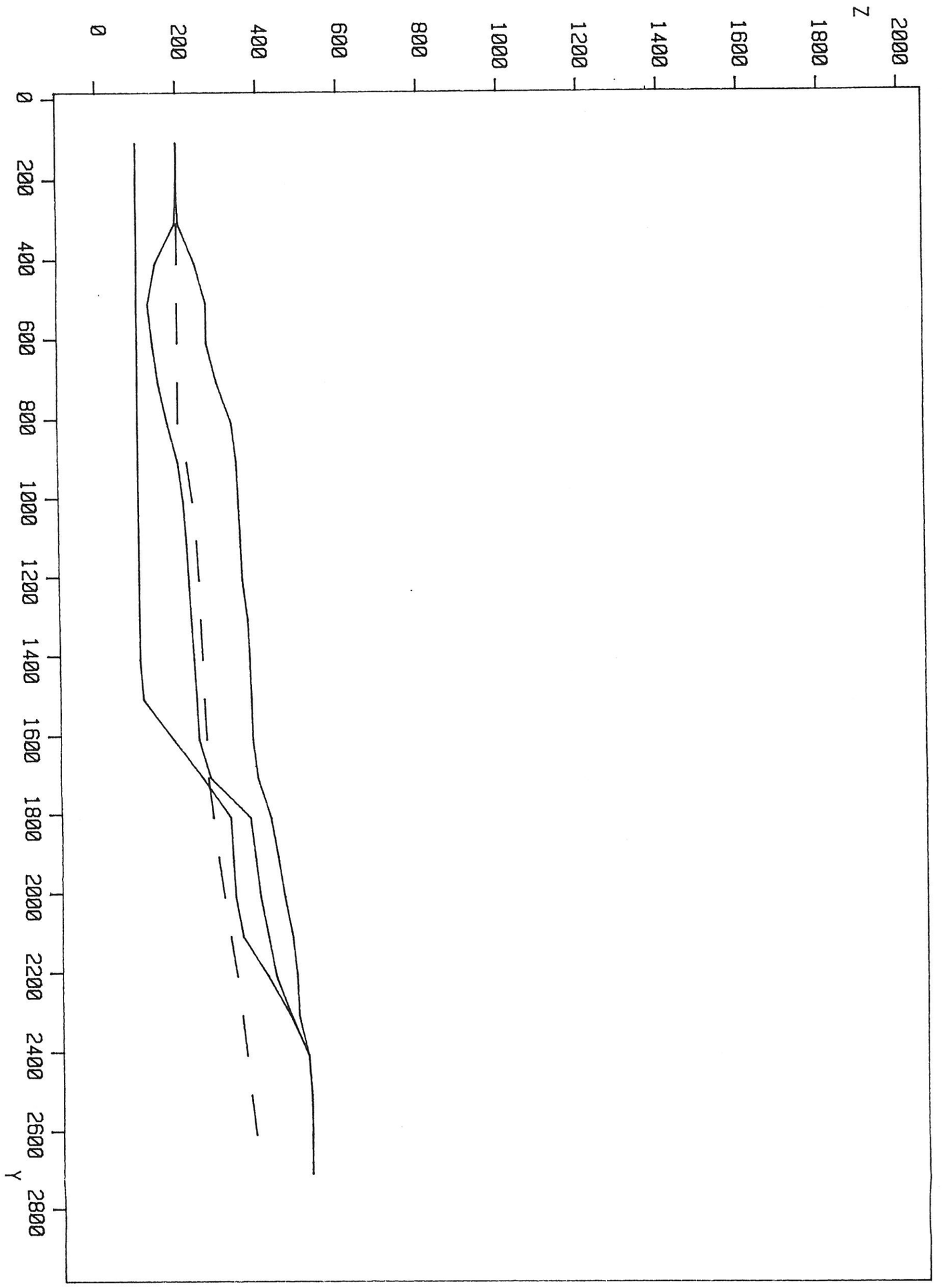
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***

X = 400

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 *SCALE:* *PLATE:* 1-19

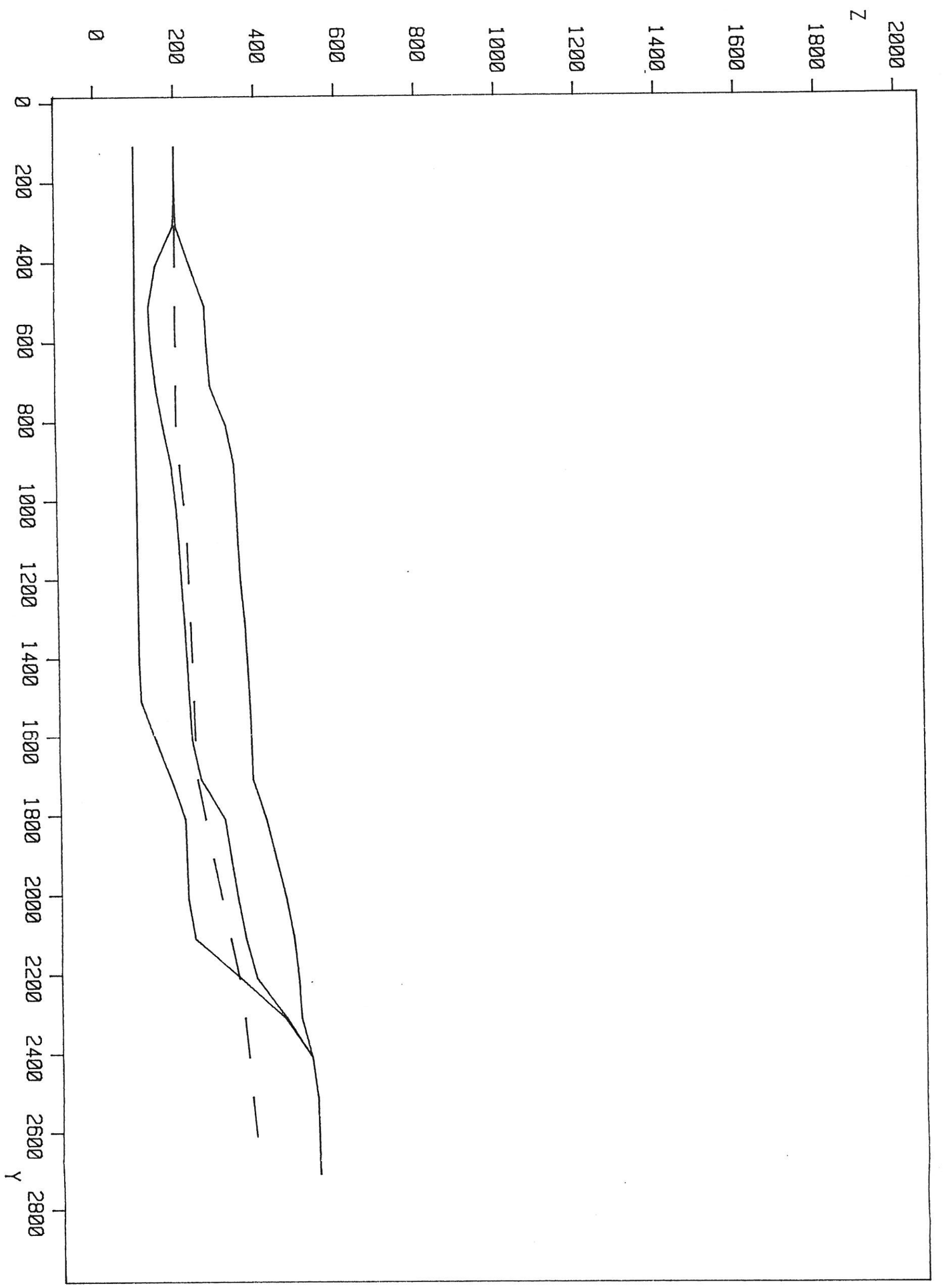


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***
X = 500

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 SCALE: PLATE: 1-20



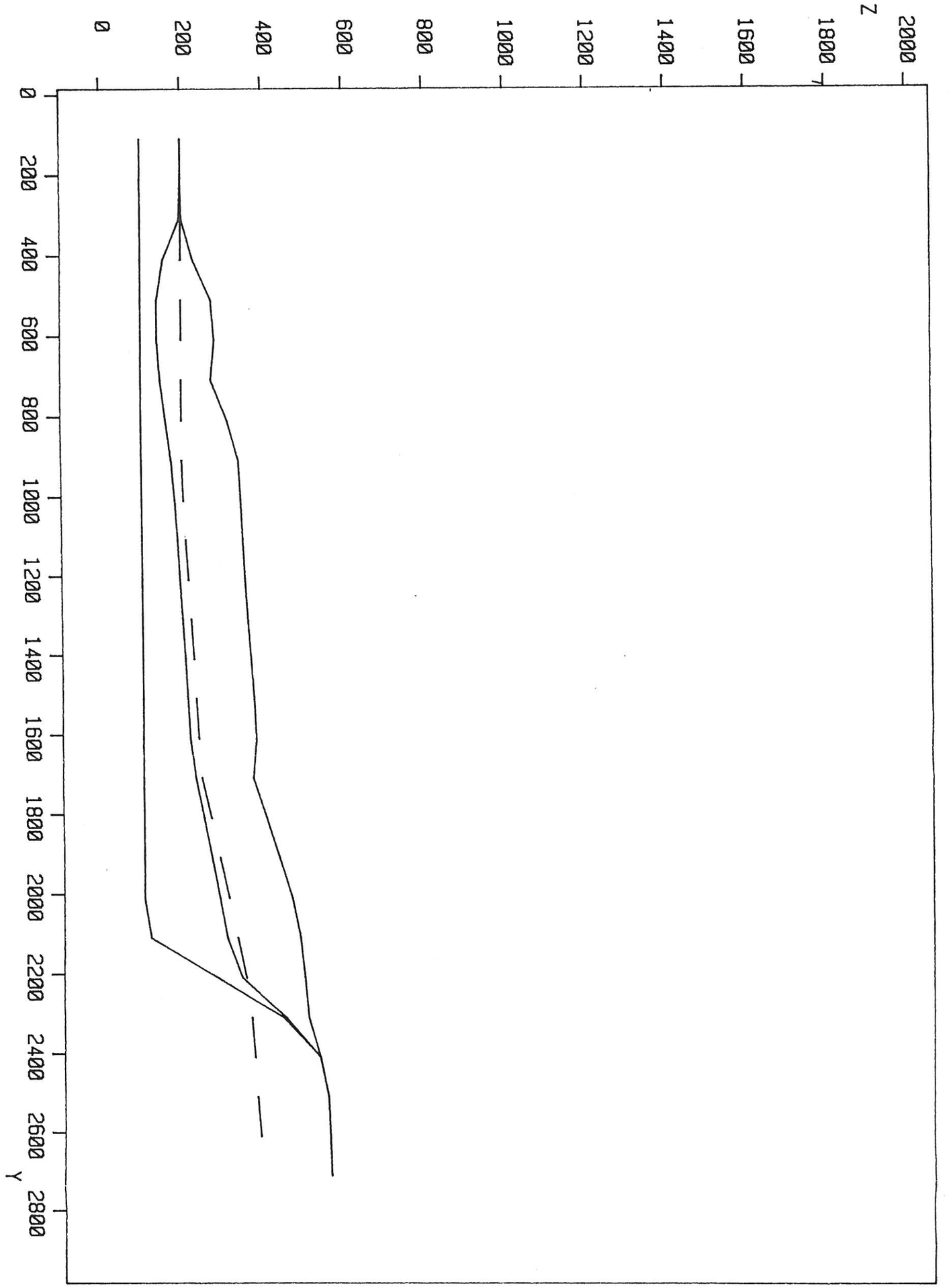
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***

X = 600

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 SCALE: PLATE: 1-21

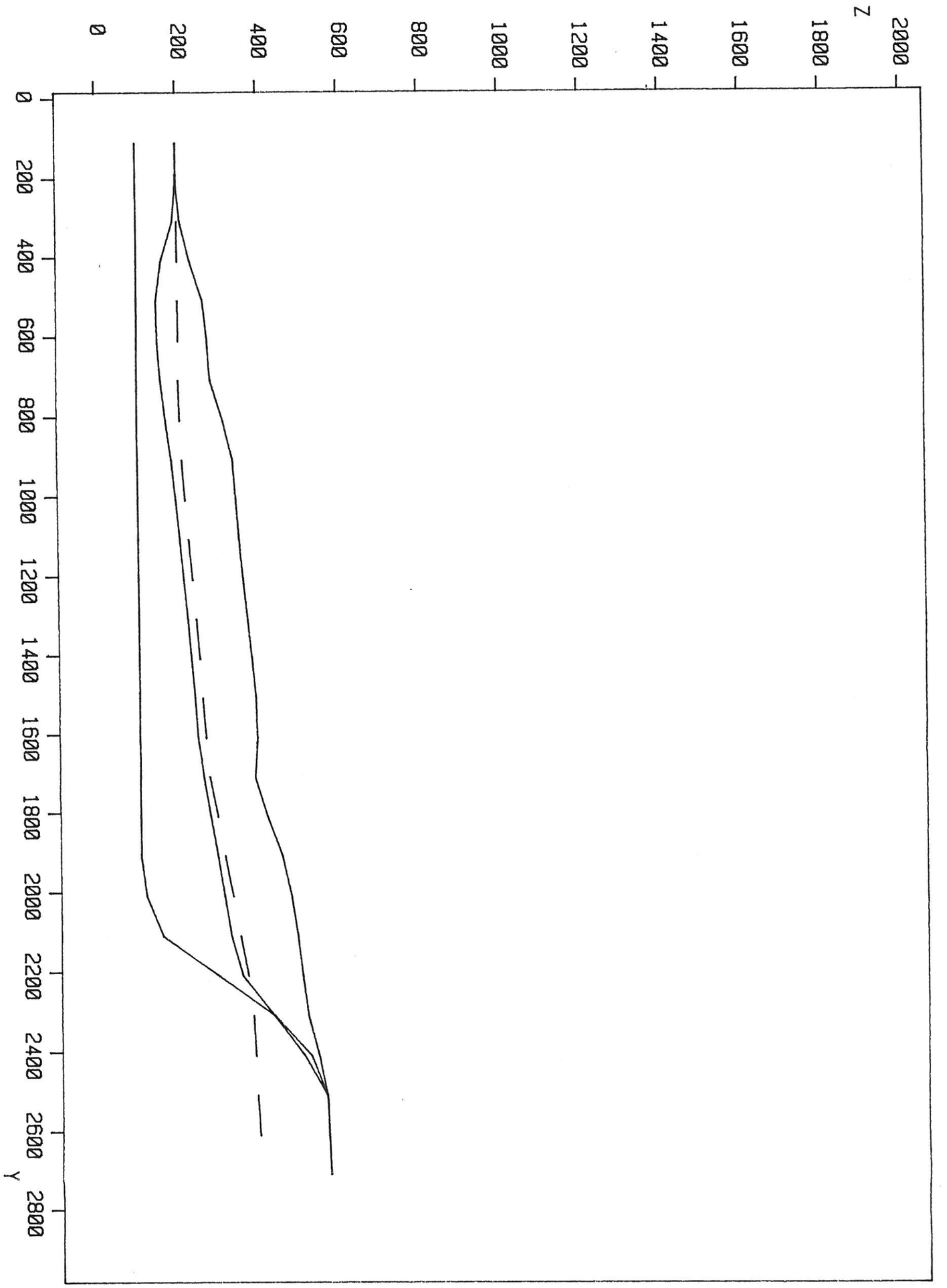


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-1
X = 700

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 SCALE: PLATE: 1-22

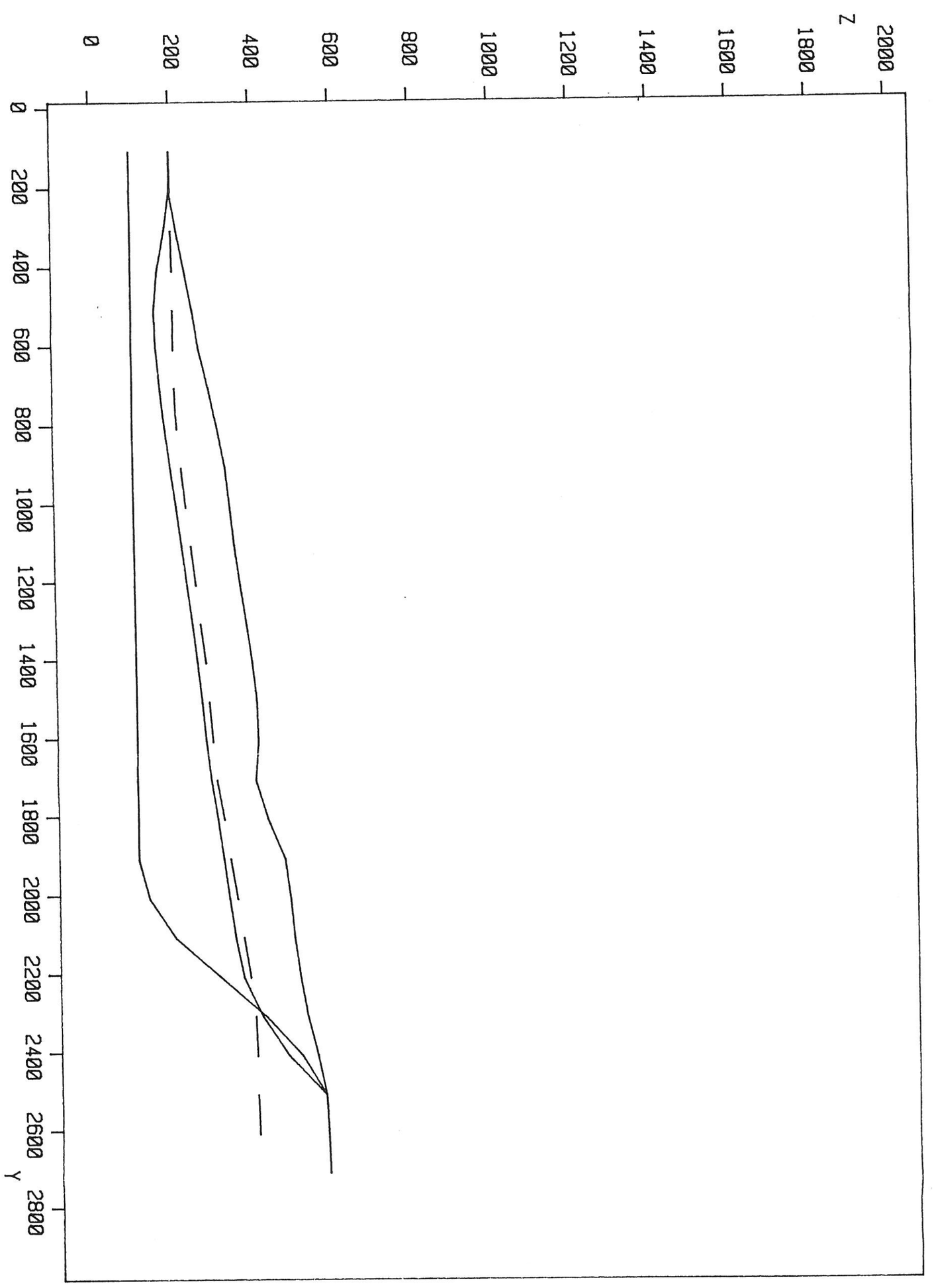


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-1
X = 800

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 SCALE: PLATE: 1-23



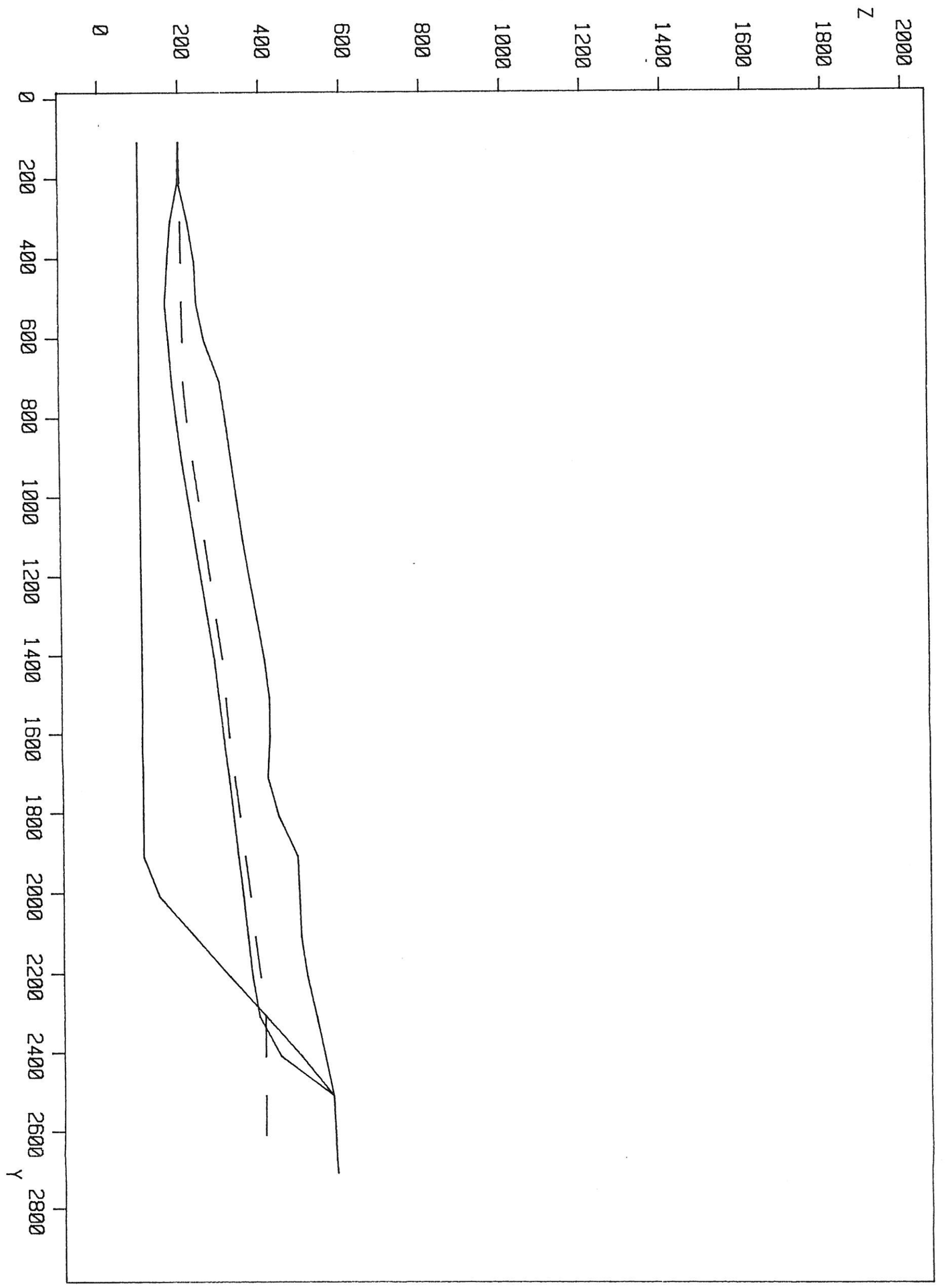
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***

X = 900

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 SCALE: PLATE: 1-24

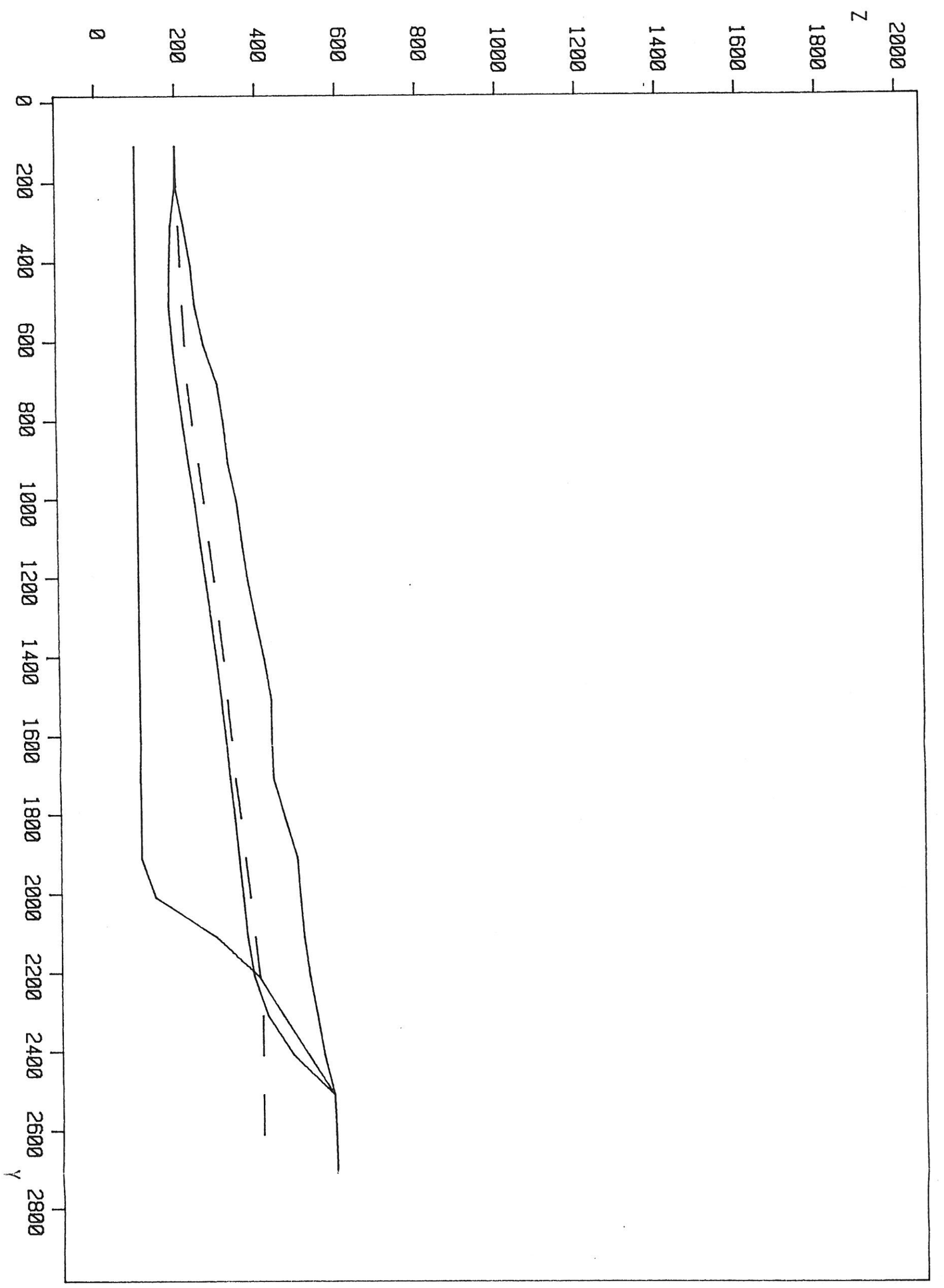


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-1
X = 1000

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 SCALE: PLATE: 1-25

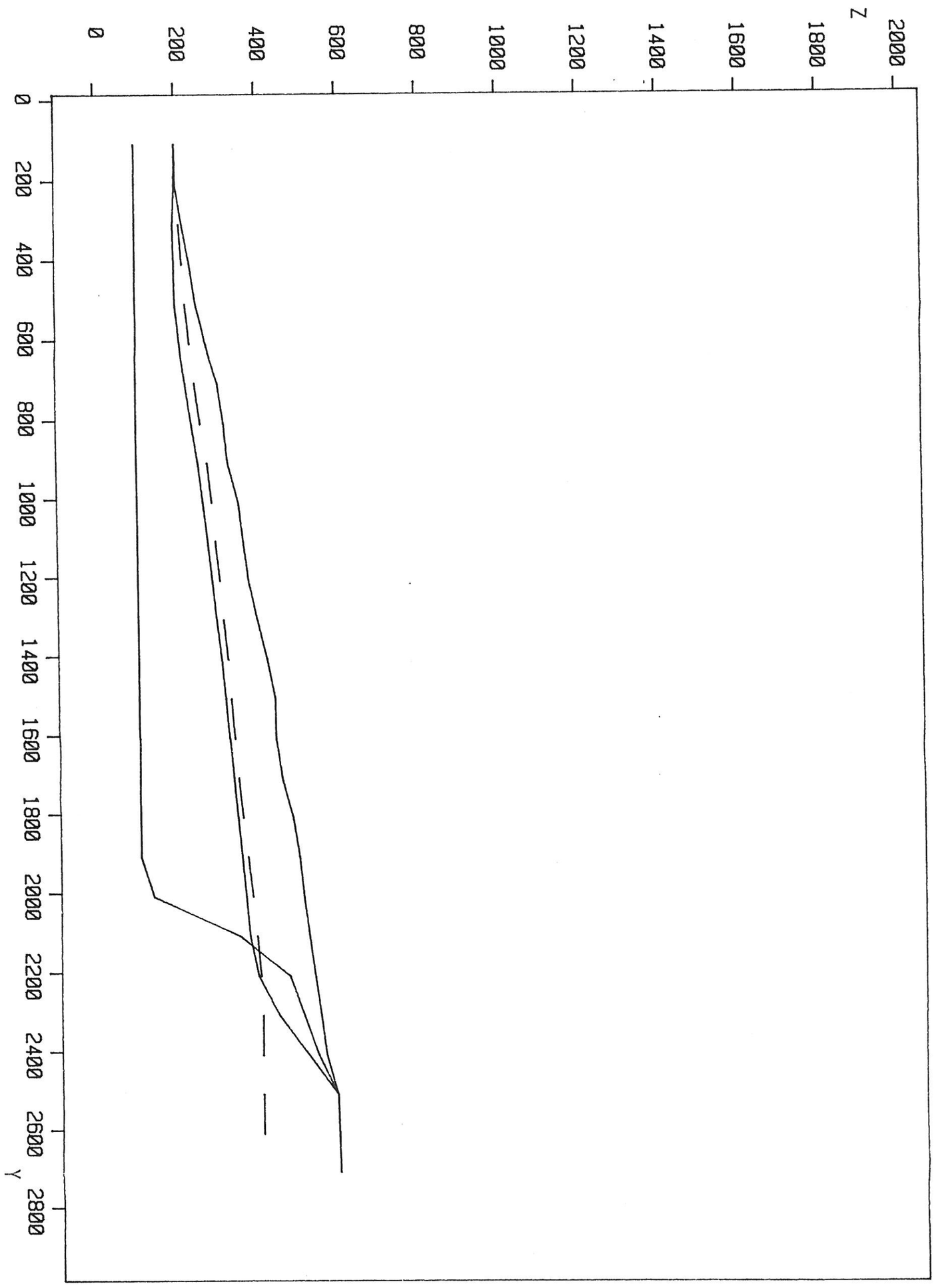


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***
X = 1100

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 SCALE: PLATE: 1-26



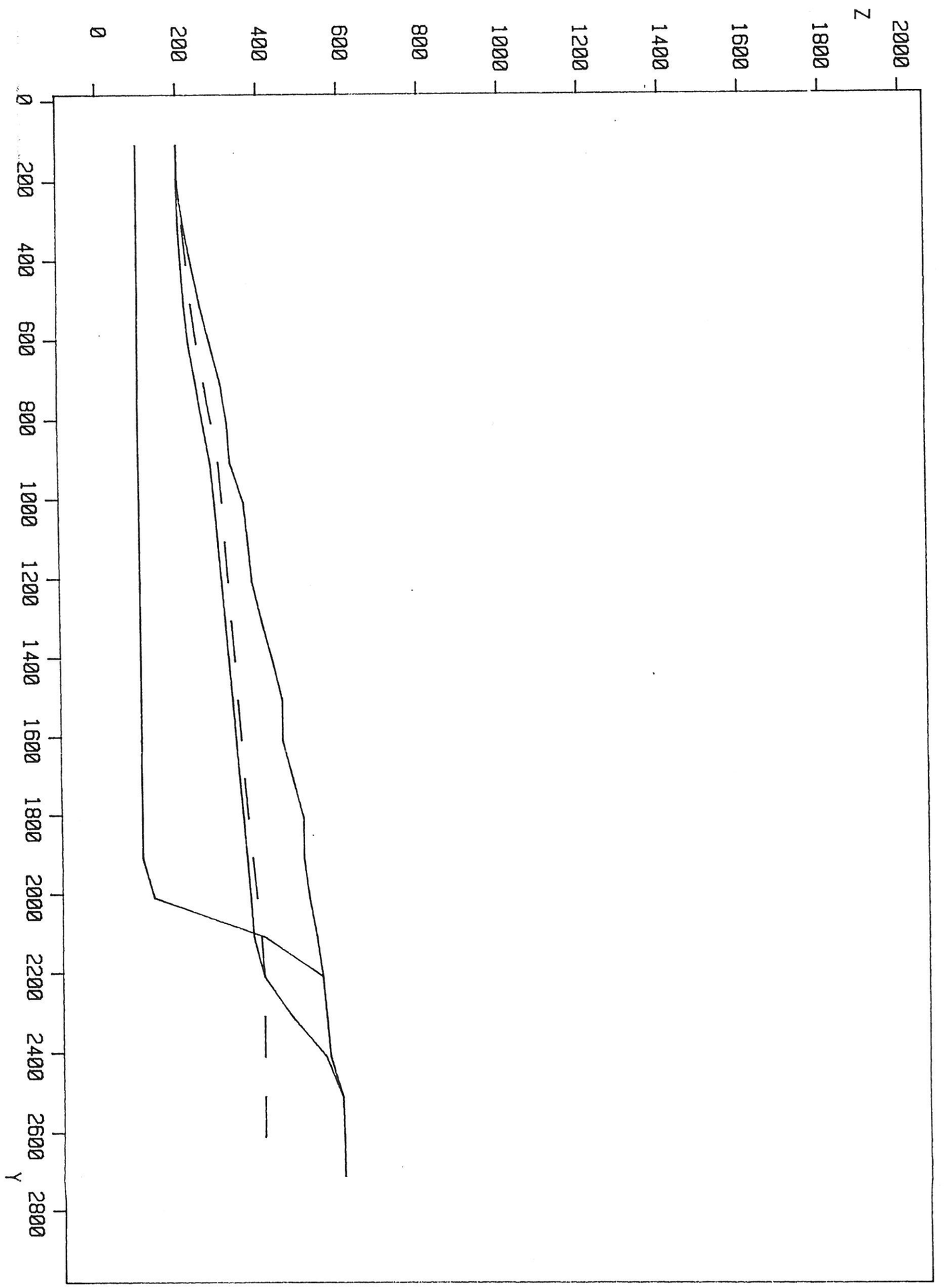
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***

X = 1200

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 SCALE: PLATE: 1-27

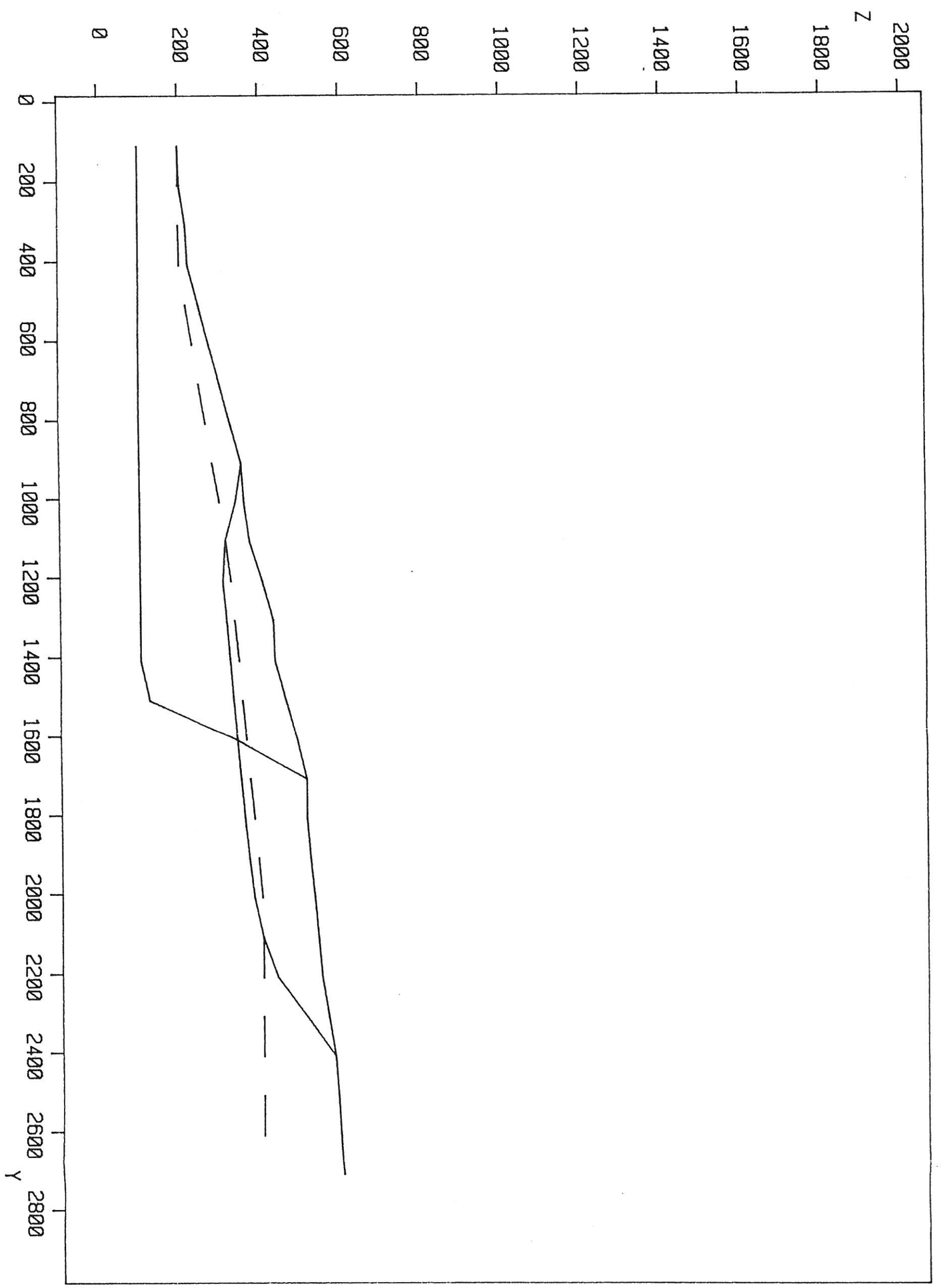


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***
X = 1300

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 SCALE: PLATE: 1-28



RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-1***
X = 1400

R.T. FRANKIAN & ASSOCIATES

DATE: 03-02-92 *SCALE:* *PLATE:* 1-29

R. T. Frankian & Associates Inc., Burbank, CA

CLARA - SLOPE STABILITY ANALYSIS, BISHOP'S SIMPLIFIED AND JANBU METHODS

Project: Abalone Cove
Data File: 82025(C).CLA Analysis by: SDR Date: 01-06-92
Data Set: Run 2 - X-Sect A & C "High" Water Level

RUN IDENTIFICATION LABEL: Run 2 - X-Sect A & C "High" Water Level

Number of Active Columns	563	Axis of Rotation Y-coordinate	762.19
Max. No. Columns in Y-dir.	23	Axis of Rotation Z-coordinate	4151.59
Slide Volume	2.84E+08	Total Water Trust Force	0.00E+00
Weight of Slide Mass ...	3.69E+10	Unbalanced Transverse Force .	1.82E+09
Sliding Surface Area ...	3.04E+06	Z-coord. of unbalanced force	398.46
Earthquake Acceleration	0.00	Negative Norm. Forces 0.00 % OF WEIGHT	

!! NUMBER OF WARNINGS ISSUED CONCERNING THE PRESENT SOLUTION: ... 0

FACTOR OF SAFETY: Bishop's ... 0.990
Janbu ..... 0.987 (uncorrected)

SUMMARY OF MATERIAL AND DISCONTINUITY PROPERTIES

NO.	LABEL	UNIT WEIGHT	COHESION HOR.	COHESION VERT.	FRICTION HOR.	FRICTION VERT.	PORE-PRESS. RATIO*	PORE-PRESS. B-BAR
A/ MATERIALS:								
1	Side Materia	130.00	100.0	100.0	20.0	20.0	-1.00	0.00
2	Bottom Mater	130.00	0.0	0.0	7.0	7.0	-1.00	0.00

NOTES:
Material layers are numbered from bottom up
* Negative integer signifies the applicable piezometric surface number

R. T. Frankian & Associates Inc., Burbank, CA
SLOPE STABILITY ANALYSIS - DATA FILE SUMMARY
PROJECT - Abalone Cove
DATA FILE - 82025(C).CLA
DATA SET - Run 2 - X-Sect A & C "High" Water Level
ANALYSIS BY SDR
DATE: 01-06-92

UNIT WEIGHT OF WATER = 62.4

CONTROL VARIABLES

COLUMN LENGTH (Y-DIRECTION)	100
MESH START Y-COORDINATE	10
MESH END Y-COORDINATE	2790
ROW WIDTH	50
TRANSVERSE MESH WIDTH	1800
NUMBER OF MATERIALS	2
NUMBER OF DISCONTINUITIES	0
NUMBER OF PIEZOMETRIC SURFACES	1

SUMMARY OF MATERIAL AND DISCONTINUITY PROPERTIES

NO.	LABEL	UNIT WEIGHT	COHESION HOR.	COHESION VERT.	FRICTION HOR.	FRICTION VERT.	PORE-PRESS. RATIO*	PORE-PRESS. B-BAR
A/ MATERIALS:								
1	Side Materia	130.00	100.0	100.0	20.0	20.0	-1.00	0.00
2	Bottom Mater	130.00	0.0	0.0	7.0	7.0	-1.00	0.00

NOTES:
Material layers are numbered from bottom up
* Negative integer signifies the applicable piezometric surface number

CROSS-SECTION NUMBER 1 X = 0

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
200.00	201.00
300.00	212.00
350.00	245.00
500.00	295.00
700.00	330.00
900.00	356.00
1050.00	380.00
1100.00	380.00
1150.00	393.00
1400.00	470.00
1600.00	503.00
1800.00	480.00
2000.00	440.00
2350.00	505.00
2600.00	548.00
2800.00	548.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
200.00	201.00
300.00	212.00
350.00	245.00
500.00	295.00
700.00	330.00
900.00	356.00
1050.00	380.00
1100.00	380.00
1150.00	393.00
1400.00	470.00
1600.00	503.00
1800.00	480.00
2000.00	440.00
2350.00	505.00
2600.00	548.00
2800.00	548.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
520.00	200.00
1200.00	260.00
1550.00	280.00
2600.00	360.00
2800.00	380.00

CROSS-SECTION NUMBER 2 X = 100

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
240.00	200.00
350.00	220.00
400.00	260.00
550.00	270.00
900.00	336.00
1000.00	350.00
1070.00	366.00
1300.00	370.00
1650.00	480.00
1810.00	430.00
2000.00	410.00
2250.00	430.00
2380.00	490.00
2500.00	540.00
2700.00	540.00
2800.00	540.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
240.00	200.00
350.00	220.00

400.00	260.00
550.00	270.00
900.00	336.00
1000.00	350.00
1070.00	366.00
1300.00	370.00
1650.00	480.00
1810.00	430.00
2000.00	410.00
2250.00	430.00
2380.00	490.00
2500.00	540.00
2700.00	540.00
2800.00	540.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
510.00	200.00
1180.00	260.00
1500.00	280.00
1840.00	300.00
2800.00	380.00

CROSS-SECTION NUMBER 3 X = 200

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
290.00	200.00
390.00	220.00
430.00	280.00
460.00	270.00
720.00	270.00
930.00	340.00
1100.00	360.00
1560.00	370.00
1650.00	410.00
1700.00	380.00
1800.00	395.00
1950.00	435.00
2020.00	415.00
2360.00	440.00
2500.00	510.00
2800.00	518.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
290.00	200.00
390.00	220.00
430.00	280.00
460.00	270.00
720.00	270.00
920.00	340.00
1100.00	360.00
1560.00	370.00

1650.00	410.00
1700.00	380.00
1800.00	395.00
1950.00	435.00
2020.00	415.00
2360.00	440.00
2500.00	510.00
2800.00	518.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
500.00	200.00
1160.00	260.00
1460.00	280.00
1790.00	300.00
2200.00	340.00
2800.00	386.00

CROSS-SECTION NUMBER 4 X = 300

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
1270.00	100.00
1570.00	370.00
1710.00	390.00
1850.00	452.00
1960.00	453.00
2000.00	438.00
2200.00	460.00
2600.00	460.00
2800.00	500.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
300.00	200.00
390.00	220.00
430.00	270.00
650.00	280.00
790.00	320.00
940.00	342.00
1230.00	340.00
1310.00	351.00
1570.00	370.00
1710.00	390.00
1850.00	452.00
1960.00	453.00
2000.00	438.00
2200.00	460.00
2600.00	460.00
2800.00	500.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE

0.00	200.00
480.00	200.00
1130.00	260.00
1420.00	280.00
1730.00	300.00
2800.00	400.00

CROSS-SECTION NUMBER 5 X = 400

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
1500.00	100.00
1800.00	430.00
2050.00	452.00
2150.00	477.00
2350.00	480.00
2400.00	500.00
2700.00	500.00
2800.00	480.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
300.00	200.00
450.00	270.00
500.00	272.00
600.00	262.00
650.00	286.00
800.00	342.00
1200.00	356.00
1300.00	372.00
1650.00	378.00
1800.00	430.00
2050.00	452.00
2150.00	477.00
2350.00	480.00
2400.00	500.00
2700.00	500.00
2800.00	480.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
470.00	200.00
1110.00	260.00
1360.00	280.00
1660.00	300.00
2800.00	408.00

CROSS-SECTION NUMBER 6 X = 700

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
2100.00	100.00

2350.00	508.00
2450.00	550.00
2800.00	565.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
300.00	200.00
400.00	220.00
450.00	270.00
650.00	285.00
750.00	265.00
800.00	310.00
900.00	340.00
1200.00	353.00
1600.00	380.00
1700.00	368.00
2050.00	478.00
2250.00	500.00
2350.00	508.00
2450.00	550.00
2800.00	565.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
400.00	200.00
1020.00	260.00
1430.00	300.00
2000.00	360.00
2800.00	436.00

CROSS-SECTION NUMBER 7 X = 1000

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
1965.00	100.00
2500.00	568.00
2800.00	582.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
200.00	200.00
250.00	202.00
350.00	236.00
500.00	240.00
650.00	270.00
700.00	298.00
1150.00	358.00
1400.00	402.00
1550.00	420.00
1750.00	406.00
1900.00	482.00
2150.00	492.00

2500.00	568.00
2800.00	582.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
280.00	200.00
890.00	260.00
1200.00	300.00
2200.00	400.00
2800.00	462.00

CROSS-SECTION NUMBER 8 X = 1300

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
2000.00	100.00
2160.00	540.00
2425.00	564.00
2500.00	593.00
2800.00	600.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
190.00	200.00
280.00	210.00
490.00	250.00
770.00	320.00
900.00	324.00
1000.00	358.00
1230.00	380.00
1500.00	450.00
1620.00	450.00
1800.00	500.00
1940.00	500.00
2160.00	540.00
2425.00	564.00
2500.00	593.00
2800.00	600.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
130.00	200.00
330.00	220.00
920.00	300.00
1940.00	420.00
2800.00	487.00

CROSS-SECTION NUMBER 9 X = 1400

MATERIAL NO. 1

Y-COORDINATE Z-COORDINATE

0.00	100.00
1500.00	100.00
1690.00	510.00
1840.00	510.00
1950.00	523.00
2250.00	550.00
2380.00	576.00
2800.00	604.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
170.00	200.00
250.00	206.00
280.00	218.00
400.00	220.00
590.00	270.00
930.00	358.00
1070.00	360.00
1300.00	430.00
1400.00	430.00
1510.00	460.00
1690.00	510.00
1840.00	510.00
1950.00	523.00
2250.00	550.00
2380.00	576.00
2800.00	604.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	200.00
880.00	300.00
1530.00	400.00
2800.00	500.00

CROSS-SECTION NUMBER 10 X = 1600

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	200.00
210.00	210.00
235.00	218.00
330.00	220.00
640.00	356.00
870.00	366.00
960.00	406.00
1175.00	411.00
1370.00	486.00
1570.00	500.00
1630.00	520.00
1870.00	540.00
2070.00	570.00
2300.00	560.00
2360.00	578.00

2800.00	600.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	200.00
210.00	210.00
235.00	218.00
330.00	220.00
640.00	356.00
870.00	366.00
960.00	406.00
1175.00	411.00
1370.00	486.00
1570.00	500.00
1630.00	520.00
1870.00	540.00
2070.00	570.00
2300.00	560.00
2360.00	578.00
2800.00	600.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	200.00
670.00	300.00
1250.00	400.00
2800.00	515.00

CROSS-SECTION NUMBER 11 X = 1800

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	205.00
200.00	214.00
250.00	230.00
500.00	348.00
650.00	360.00
700.00	370.00
800.00	370.00
1200.00	420.00
1250.00	450.00
1300.00	470.00
1500.00	490.00
1750.00	552.00
1800.00	563.00
2050.00	585.00
2250.00	572.00
2800.00	600.00

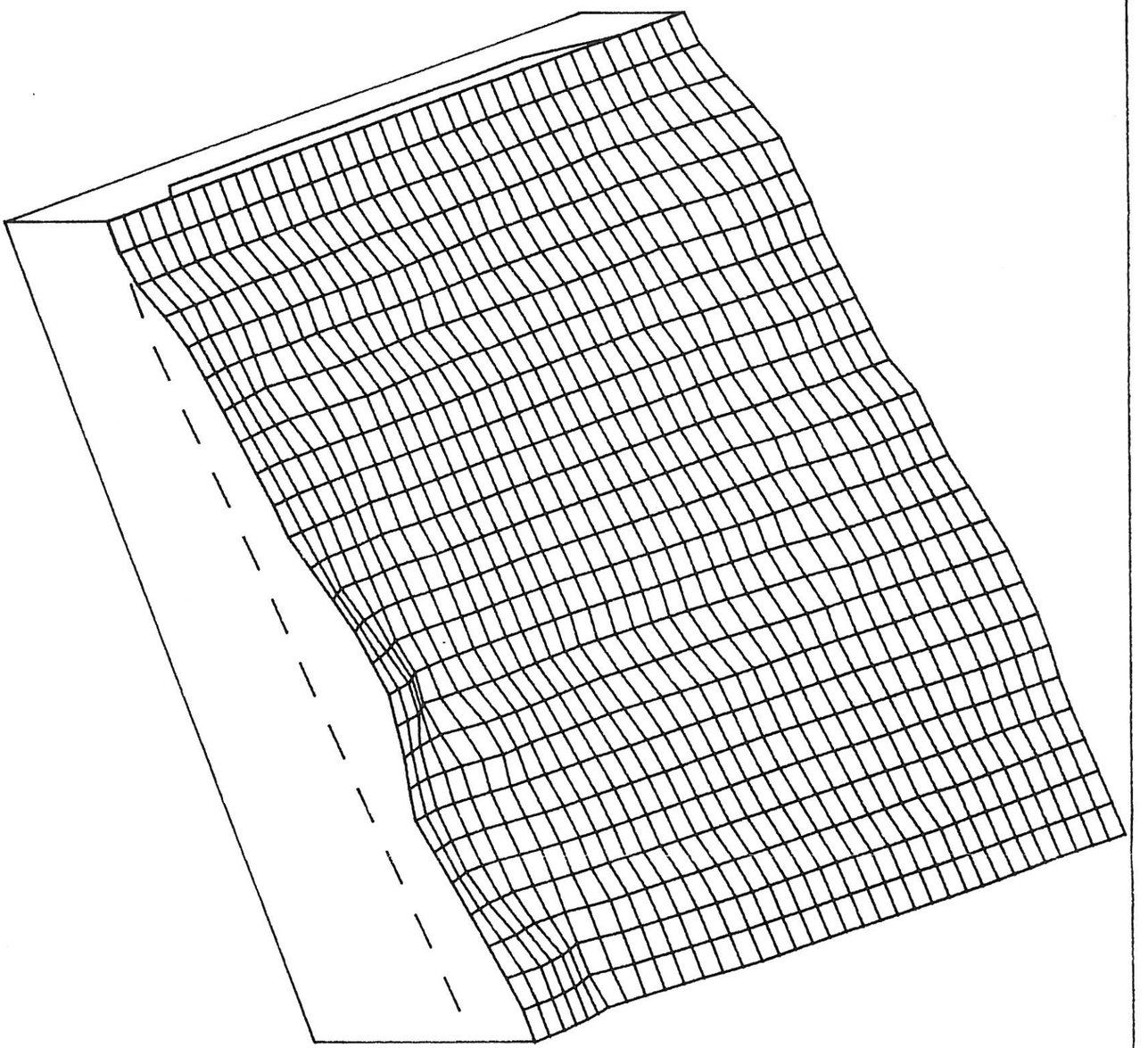
MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	205.00

200.00	214.00
250.00	230.00
500.00	348.00
650.00	360.00
700.00	370.00
800.00	370.00
1200.00	420.00
1250.00	450.00
1300.00	470.00
1500.00	490.00
1750.00	552.00
1800.00	563.00
2050.00	585.00
2250.00	572.00
2800.00	600.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	200.00
560.00	300.00
1080.00	400.00
2800.00	520.00

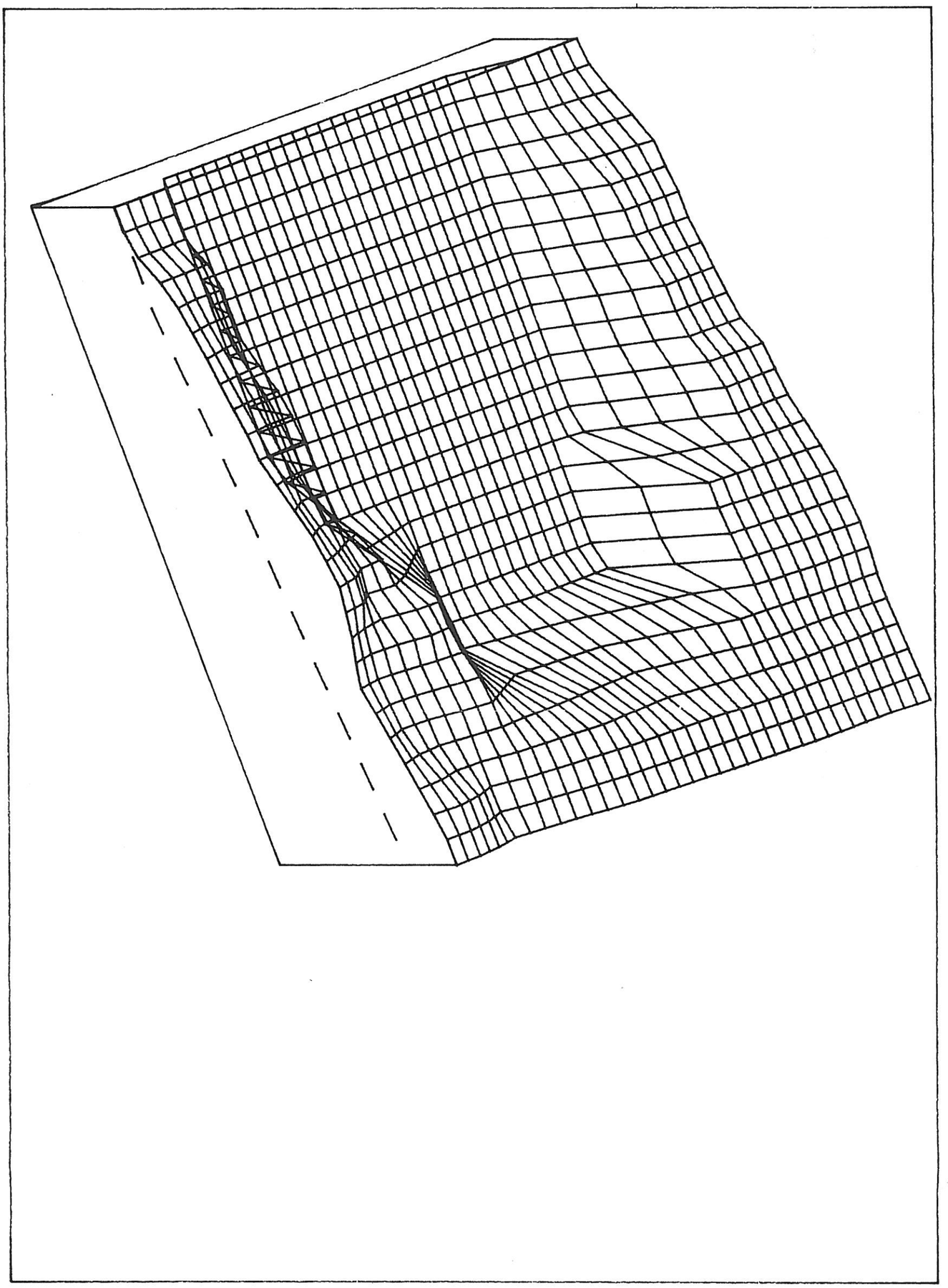


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-2
GROUND SURFACE

R.T. FRANKIAN & ASSOCIATES

DATE:	SCALE:	PLATE:
03-03-92		2-12



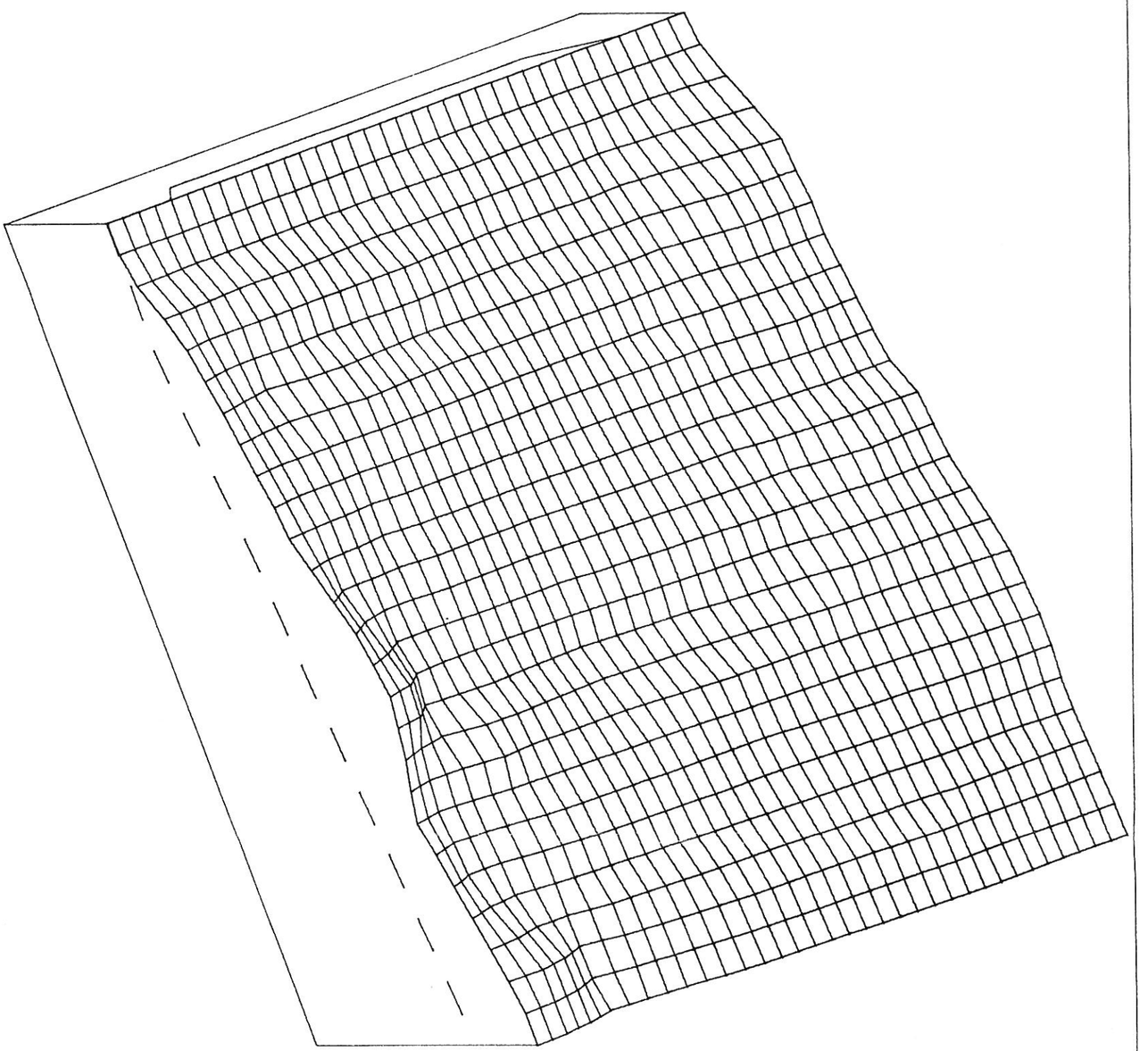
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***

MATERIAL ONE

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 *SCALE:* *PLATE:* 2-13

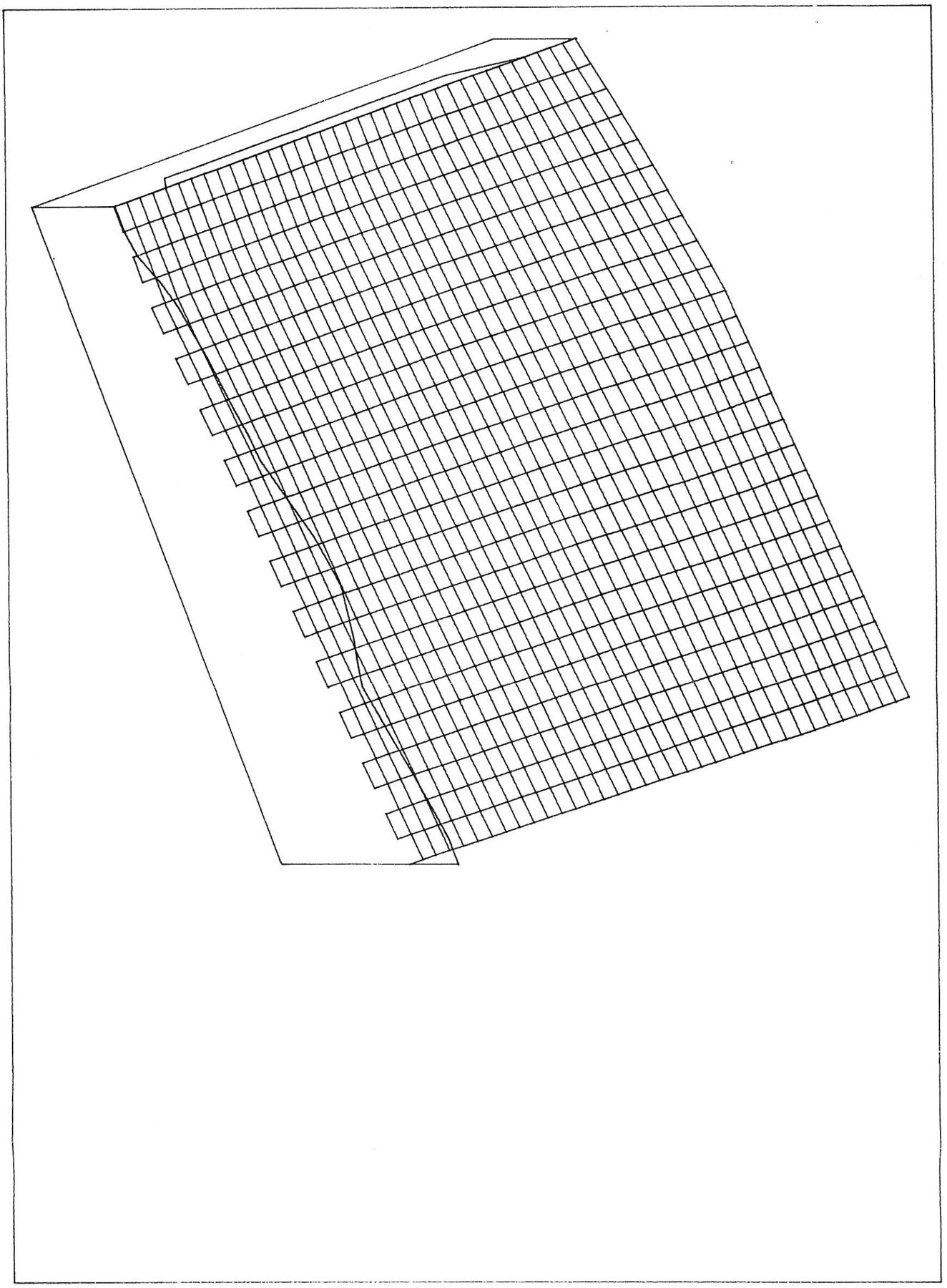


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-2
MATERIAL TWO

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 ***SCALE:*** ***PLATE:*** 2-14

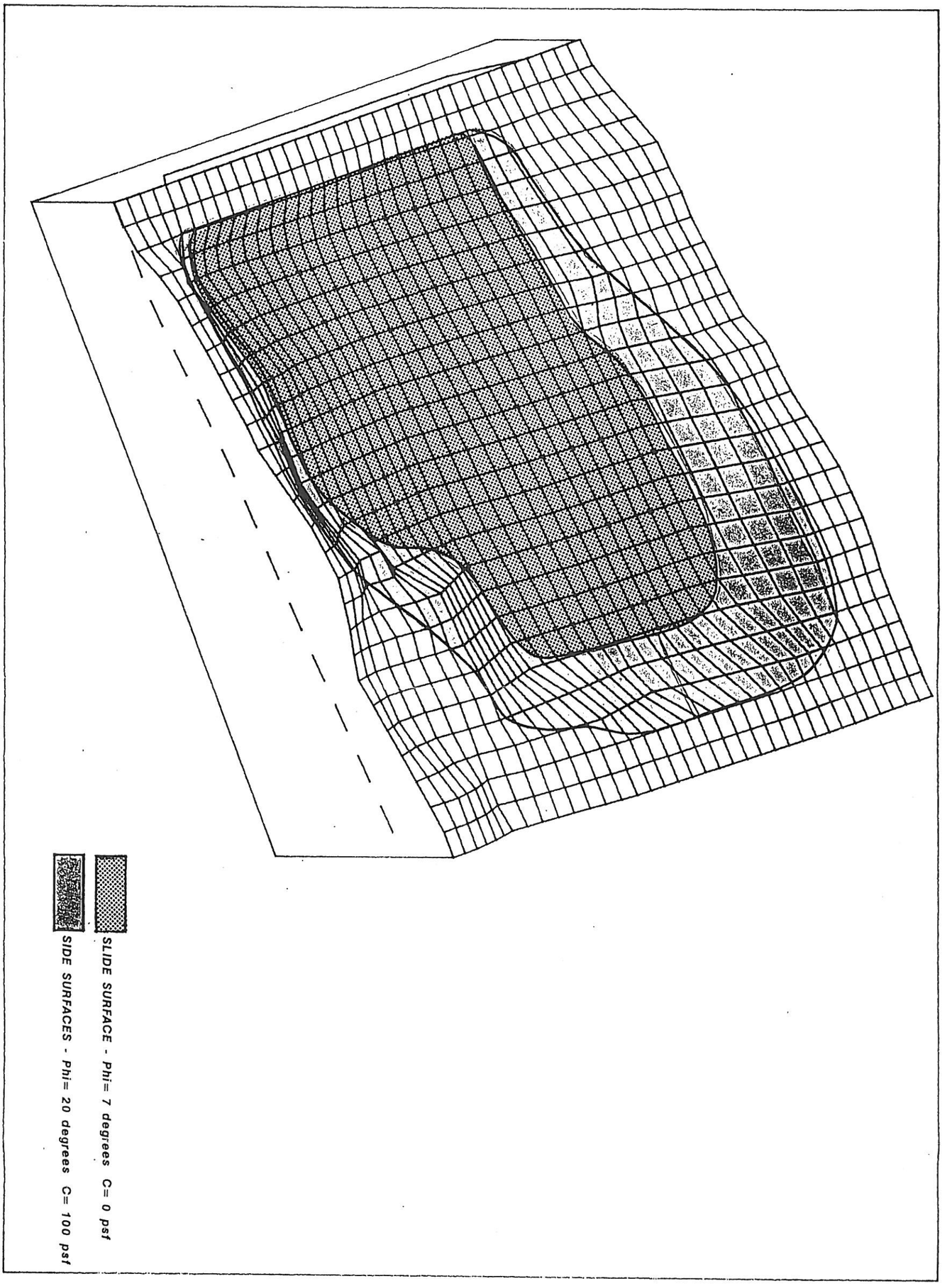


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-2
PIEZOMETRIC SURFACE

R.T. FRANKIAN & ASSOCIATES

DATE:	SCALE:	PLATE:
03-03-92		2-15

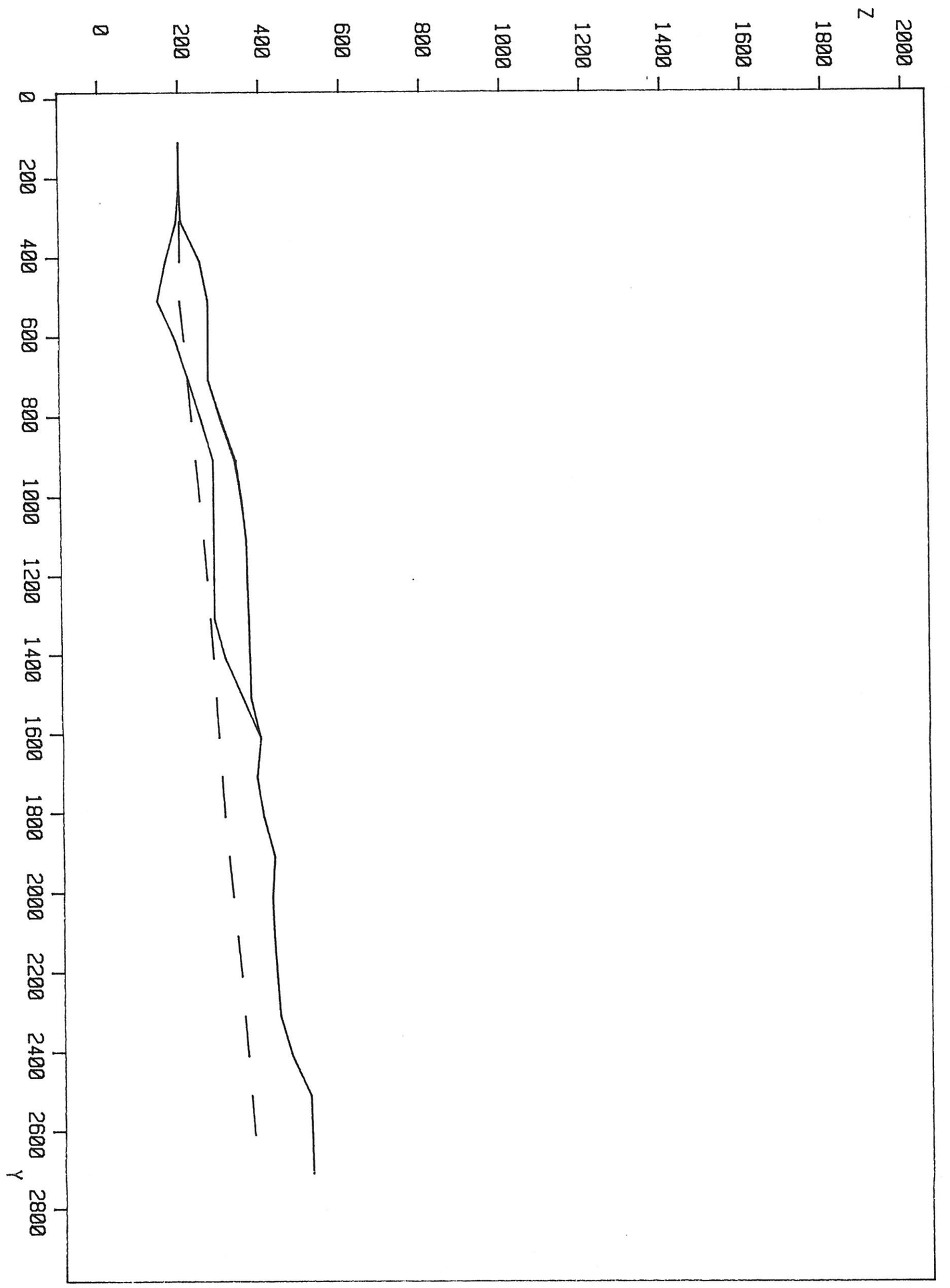


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with Trial No. SN-2
SLIDING SURFACE

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 SCALE: PLATE: 2-16

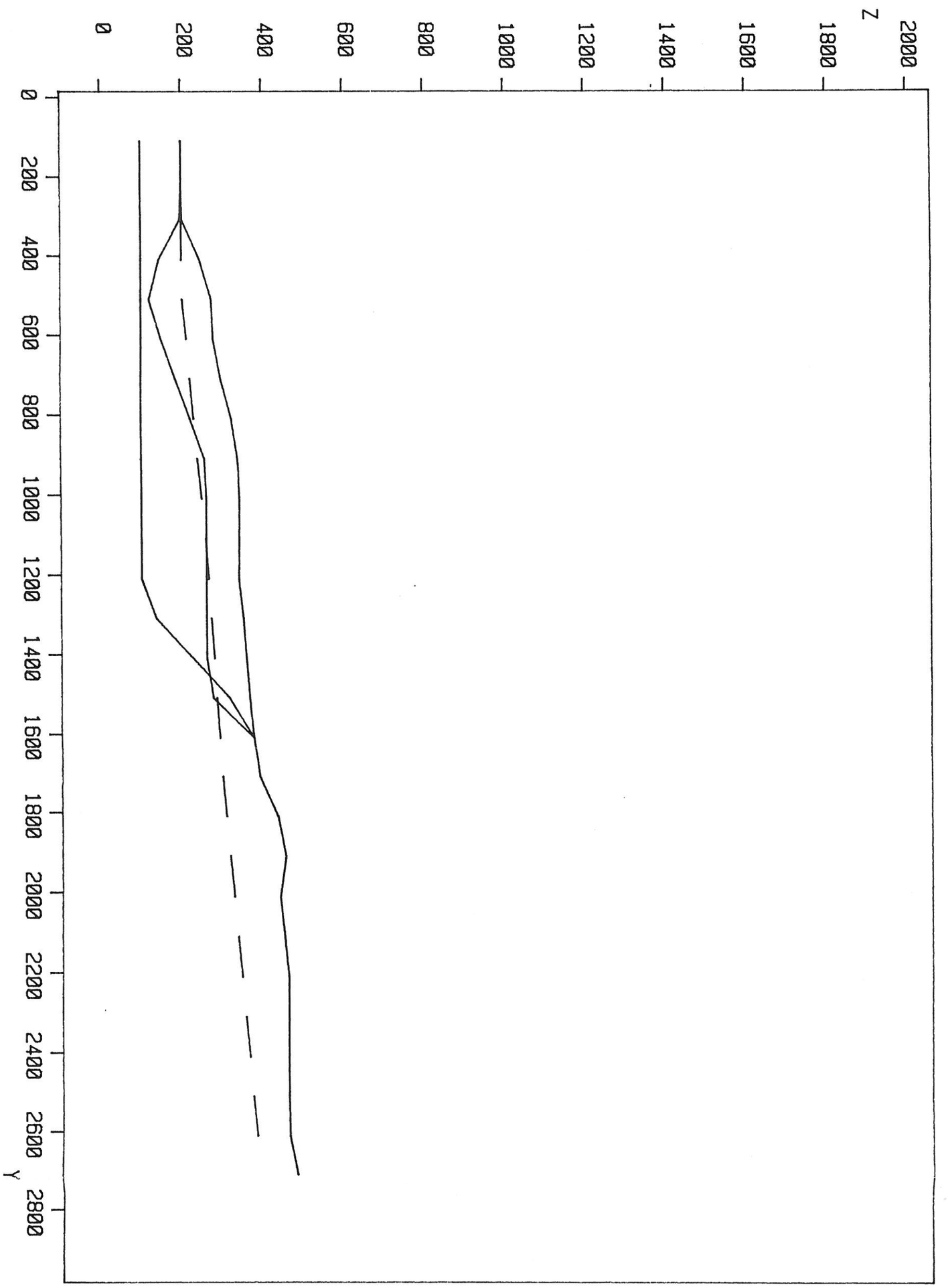


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-2
X = 200

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 SCALE: PLATE: 2-17

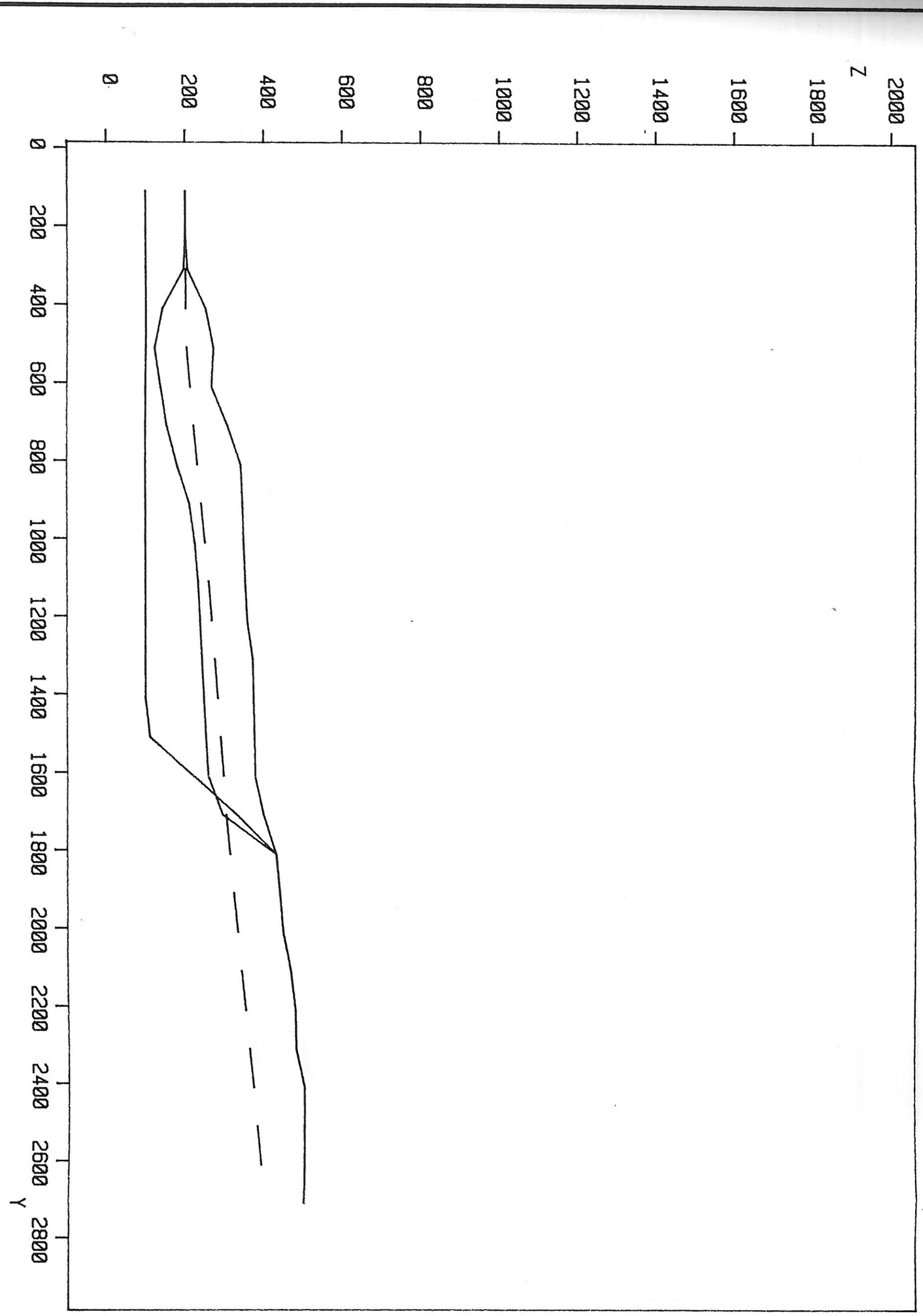


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***
X = 300

R.T. FRANKIAN & ASSOCIATES

DATE:	SCALE:	PLATE:
03-03-92		2-18

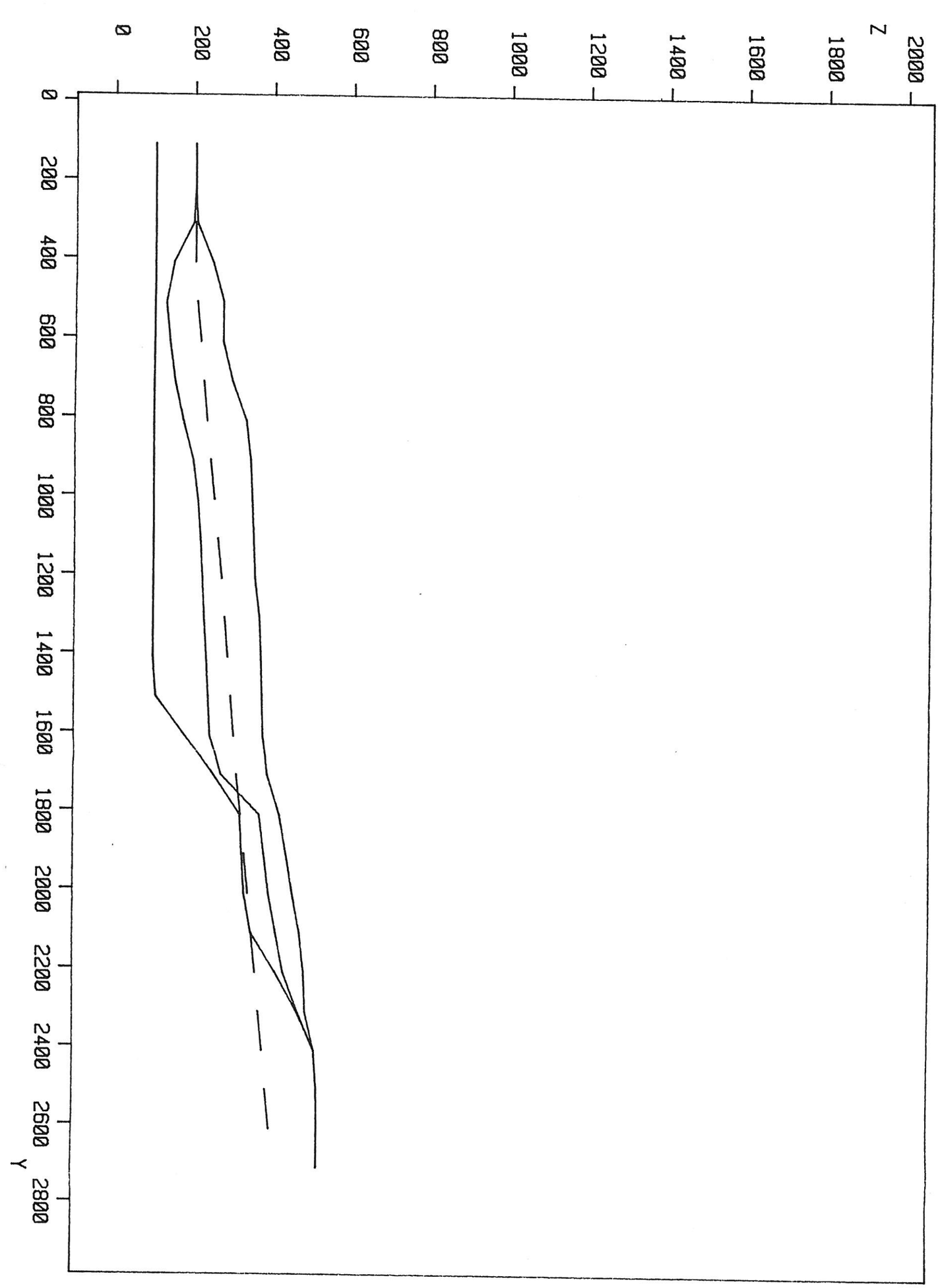


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***
X = 400

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 *SCALE:* *PLATE:* 2-19

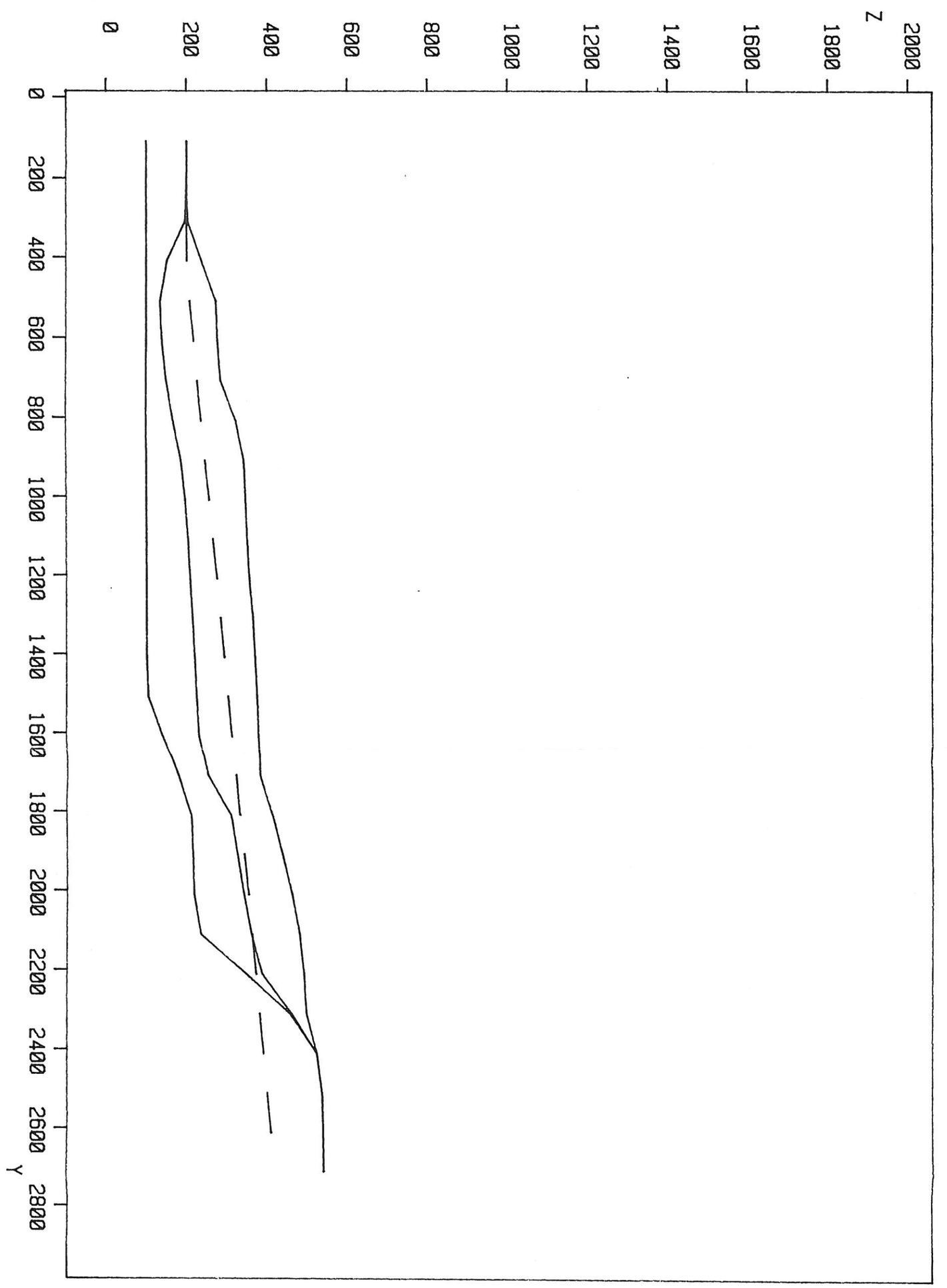


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-2
X = 500

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 ***SCALE:*** ***PLATE:*** 2-20

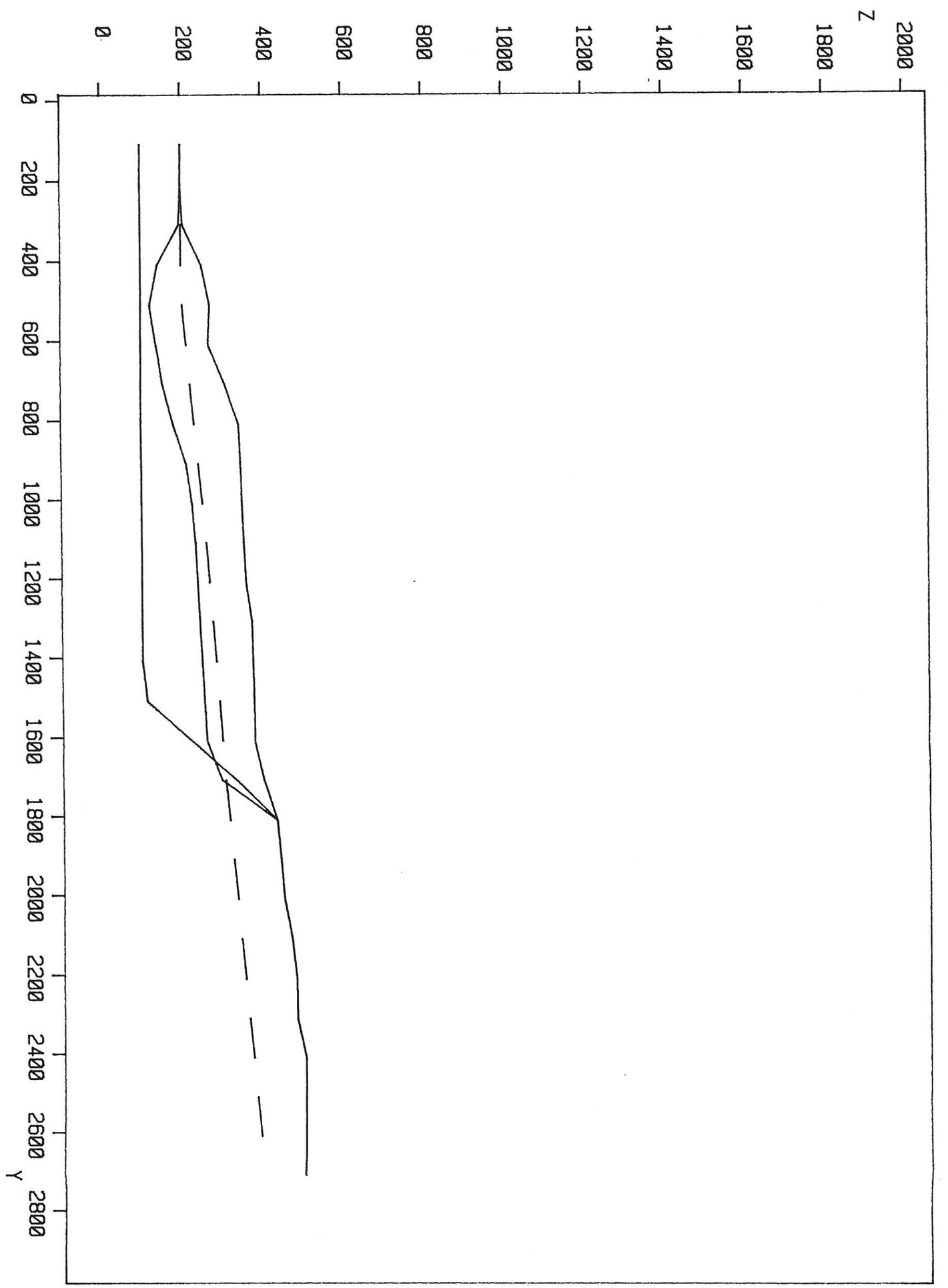


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-2
X = 600

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 ***SCALE:*** ***PLATE:*** 2-21

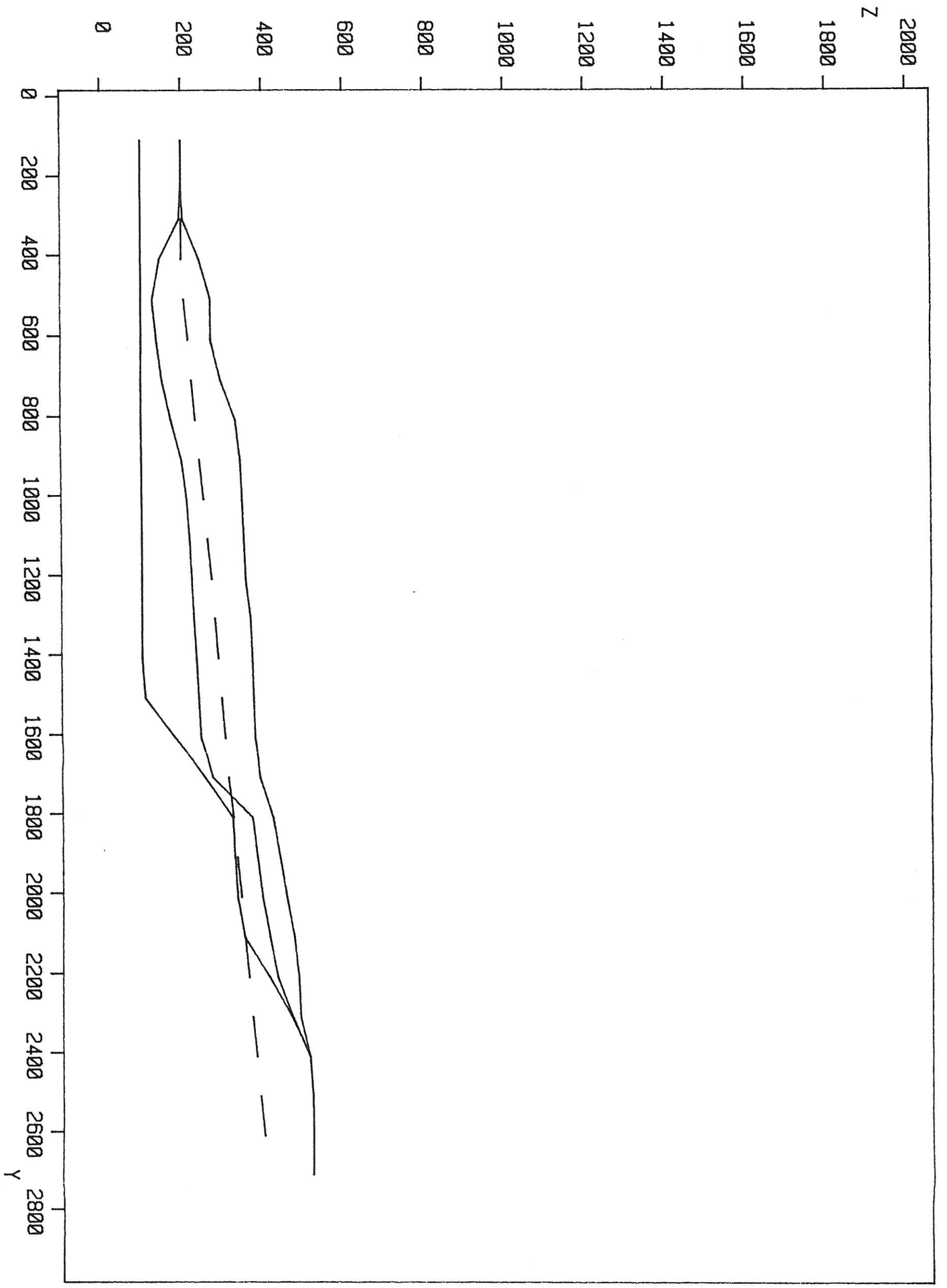


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***
X = 400

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 *SCALE:* *PLATE:* 2-19

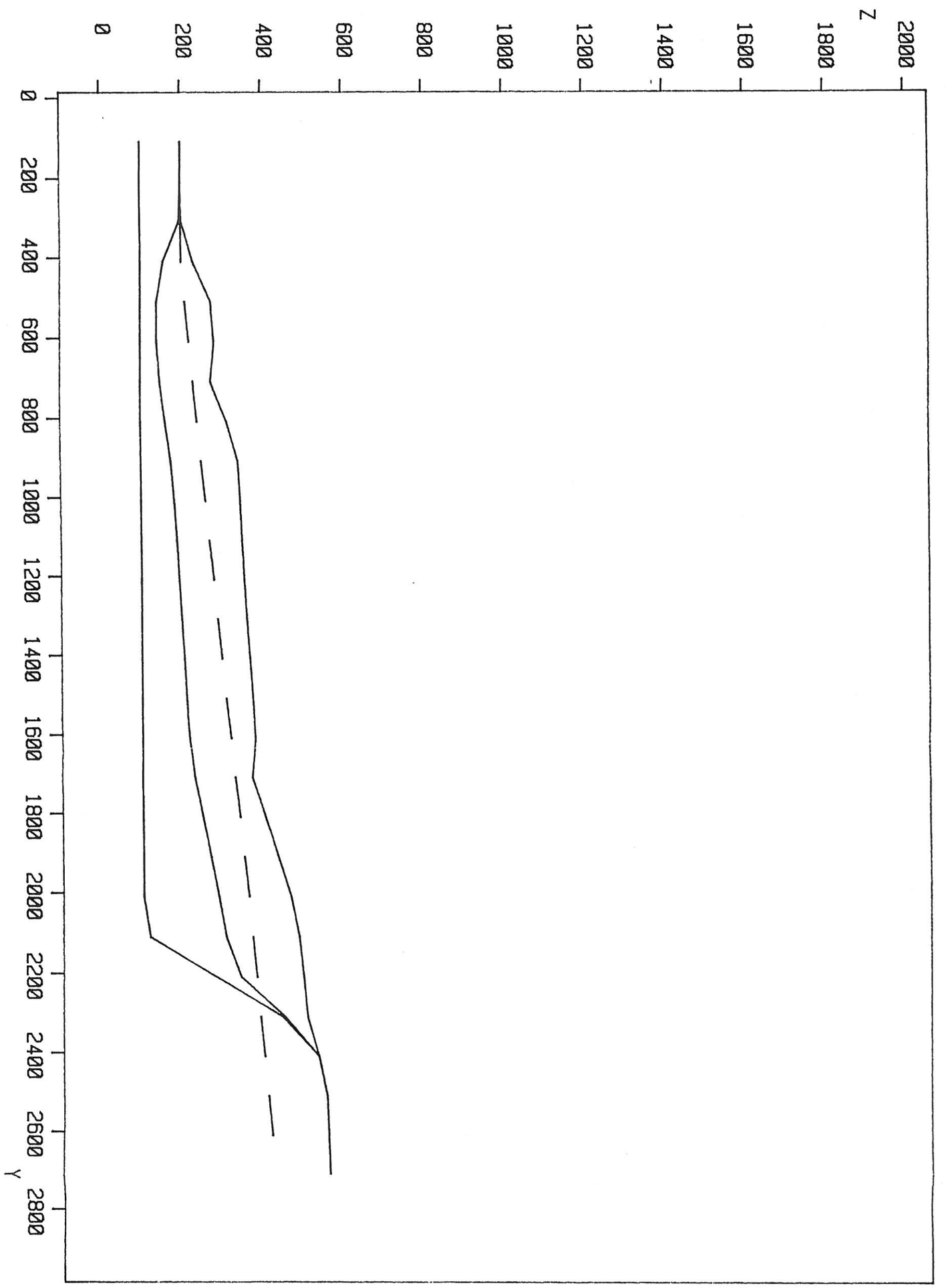


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***
X = 500

R.T. FRANKIAN & ASSOCIATES

DATE:	SCALE:	PLATE:
03-03-92		2-20

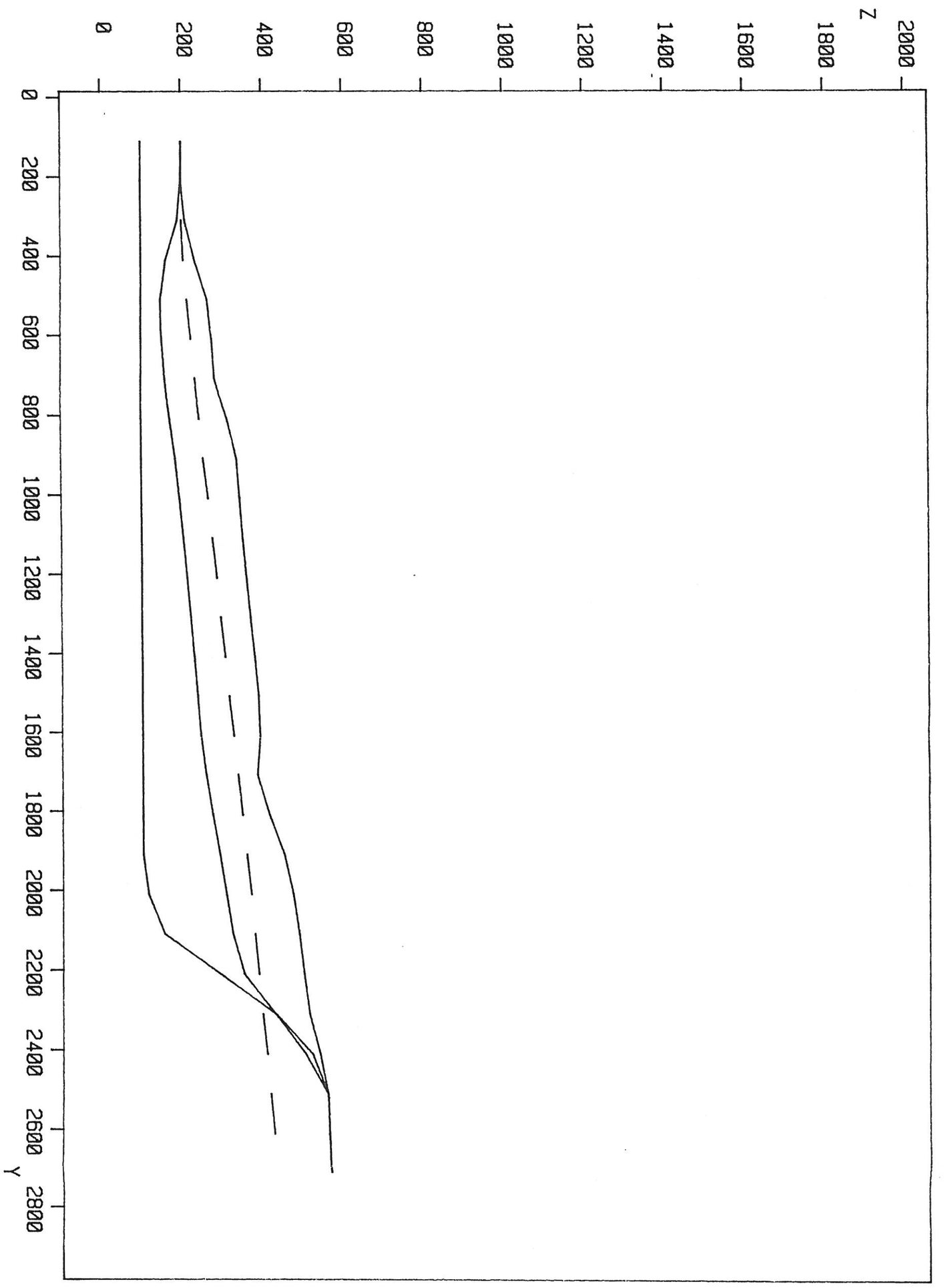


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***
X = 700

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 *SCALE:* *PLATE:* 2-22



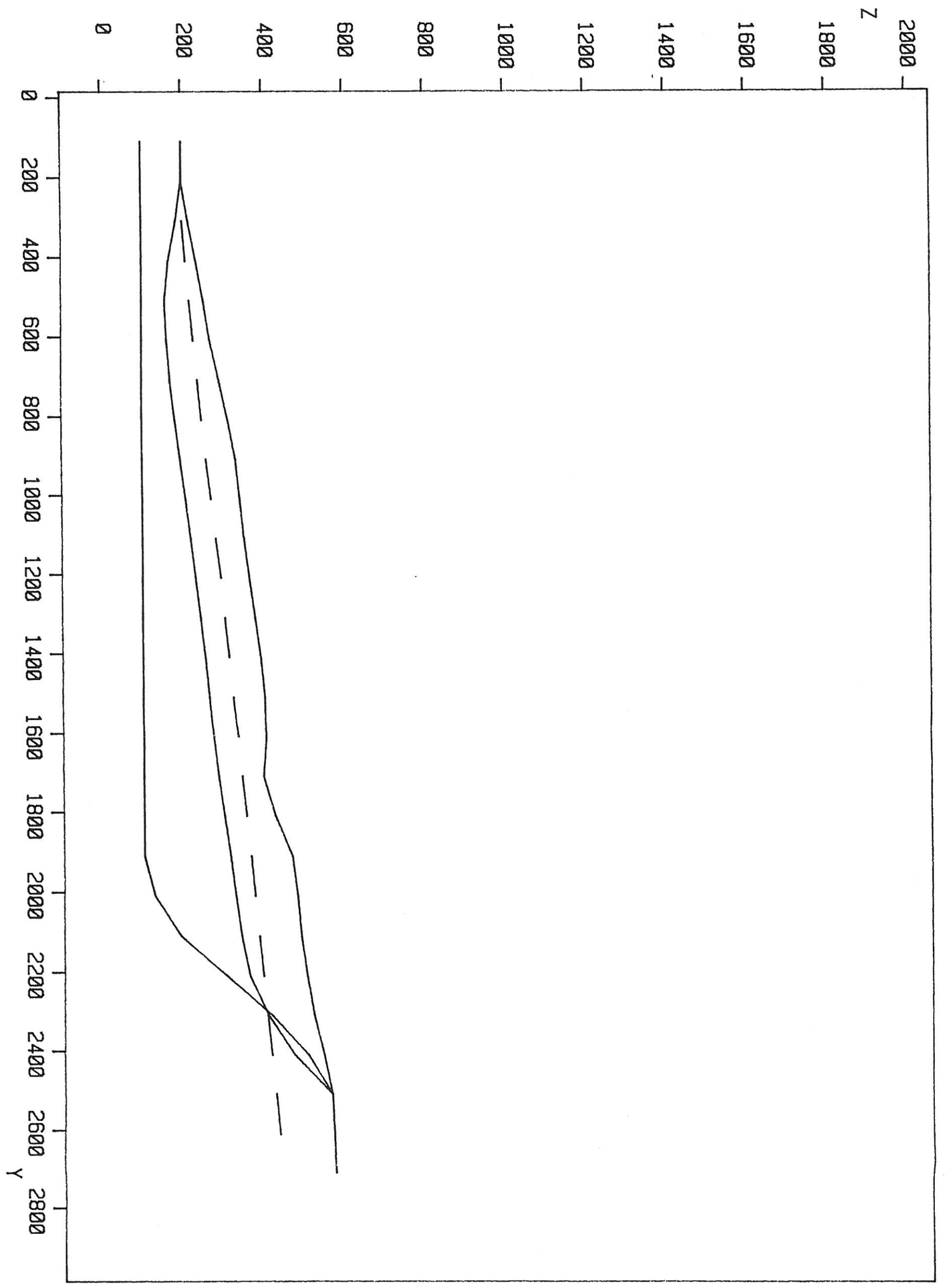
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***

X = 800

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 *SCALE:* *PLATE:* 2-23

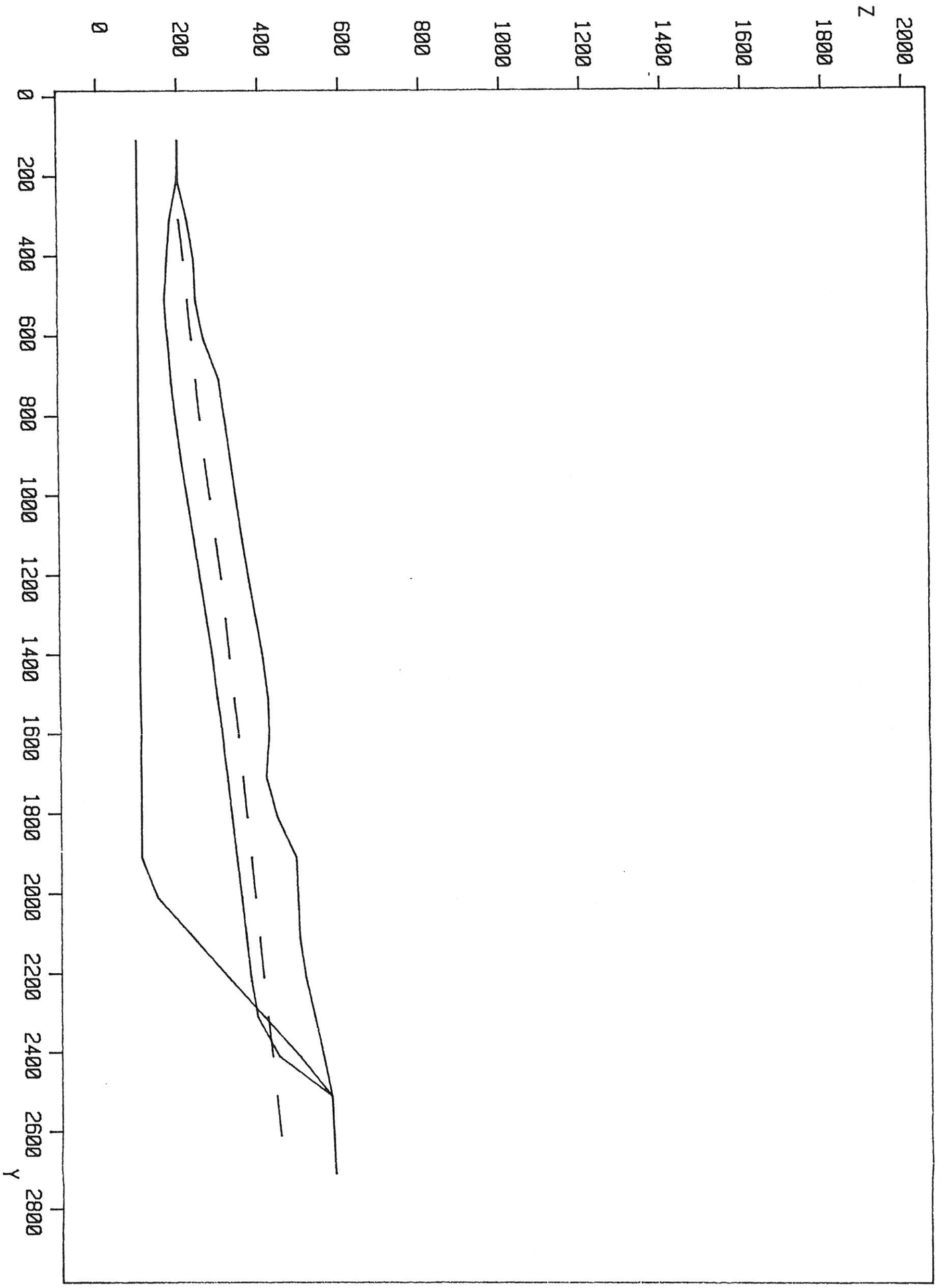


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***
X = 900

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 *SCALE:* *PLATE:* 2-24

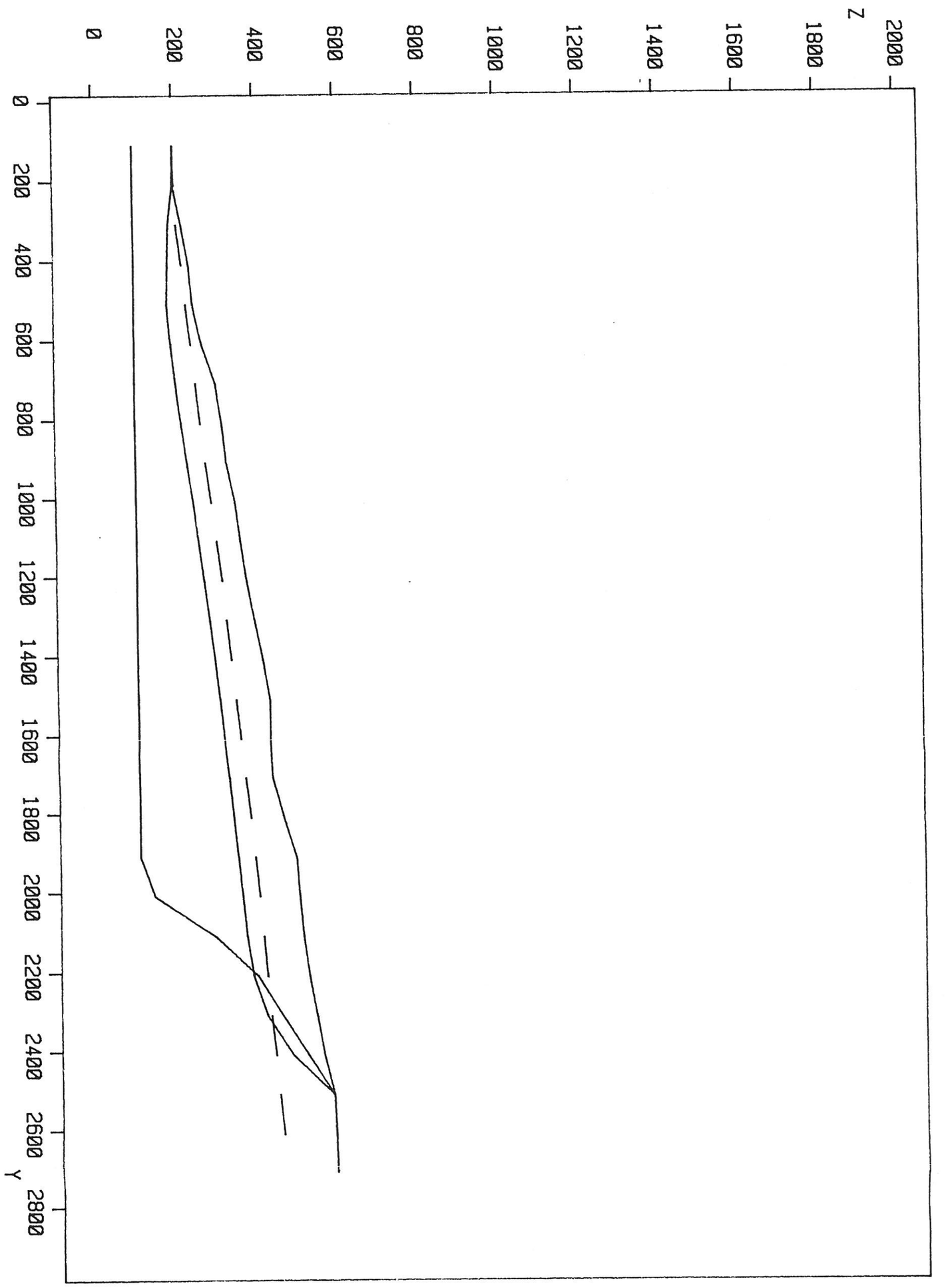


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***
X = 1000

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 *SCALE:* *PLATE:* 2-25



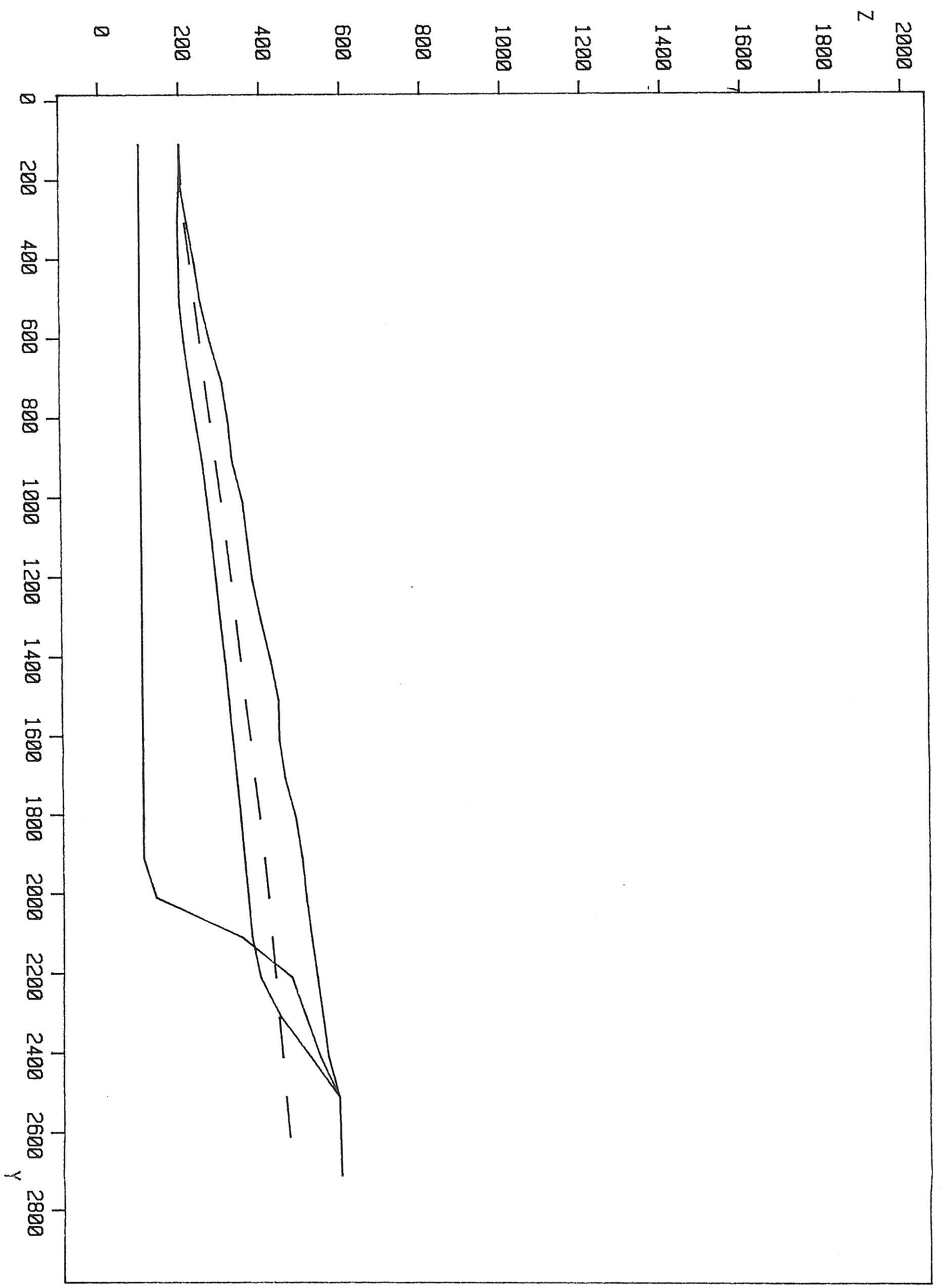
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***

X = 1100

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 *SCALE:* *PLATE:* 2-26

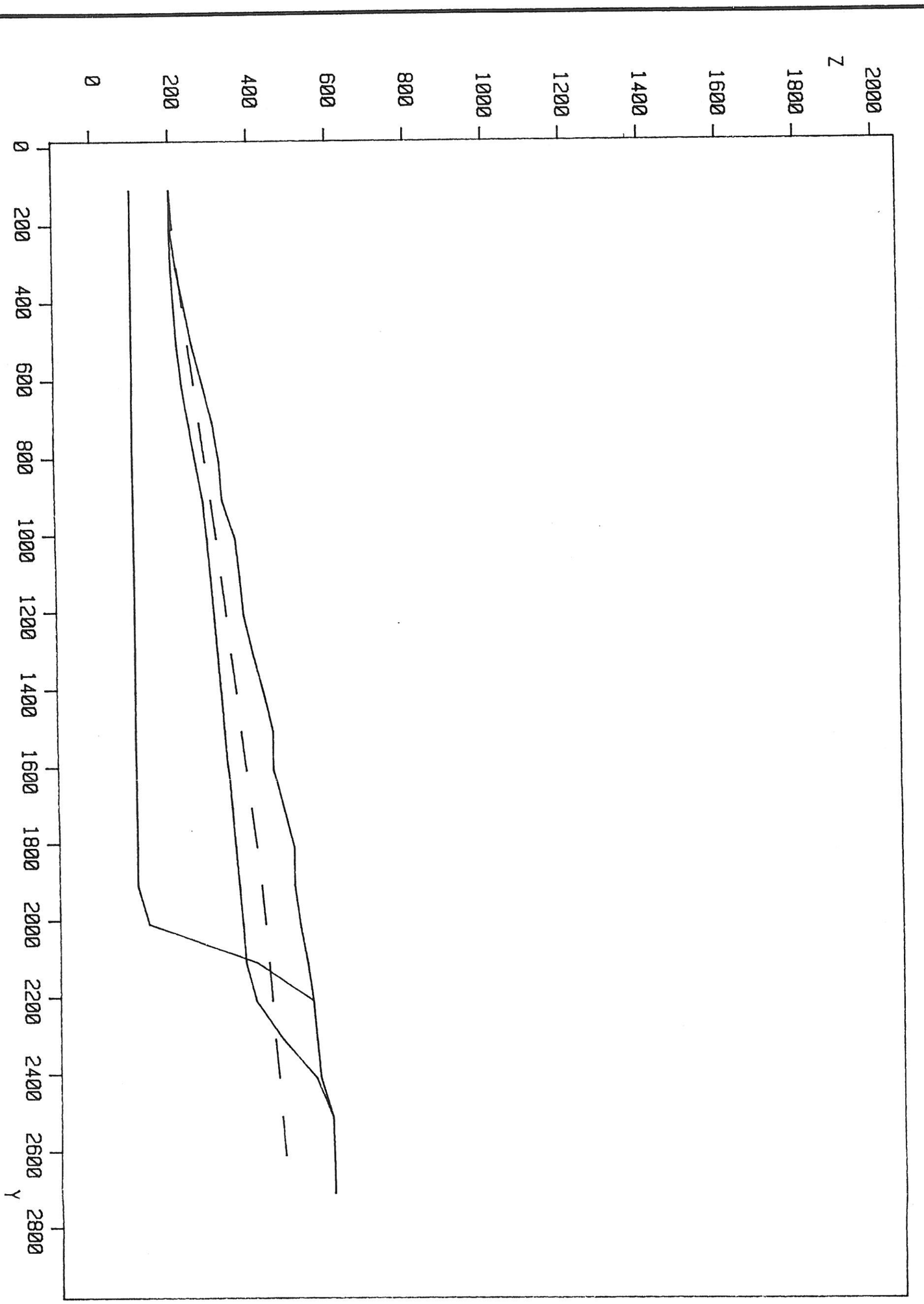


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***
X = 1200

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 *SCALE:* *PLATE:* 2-27



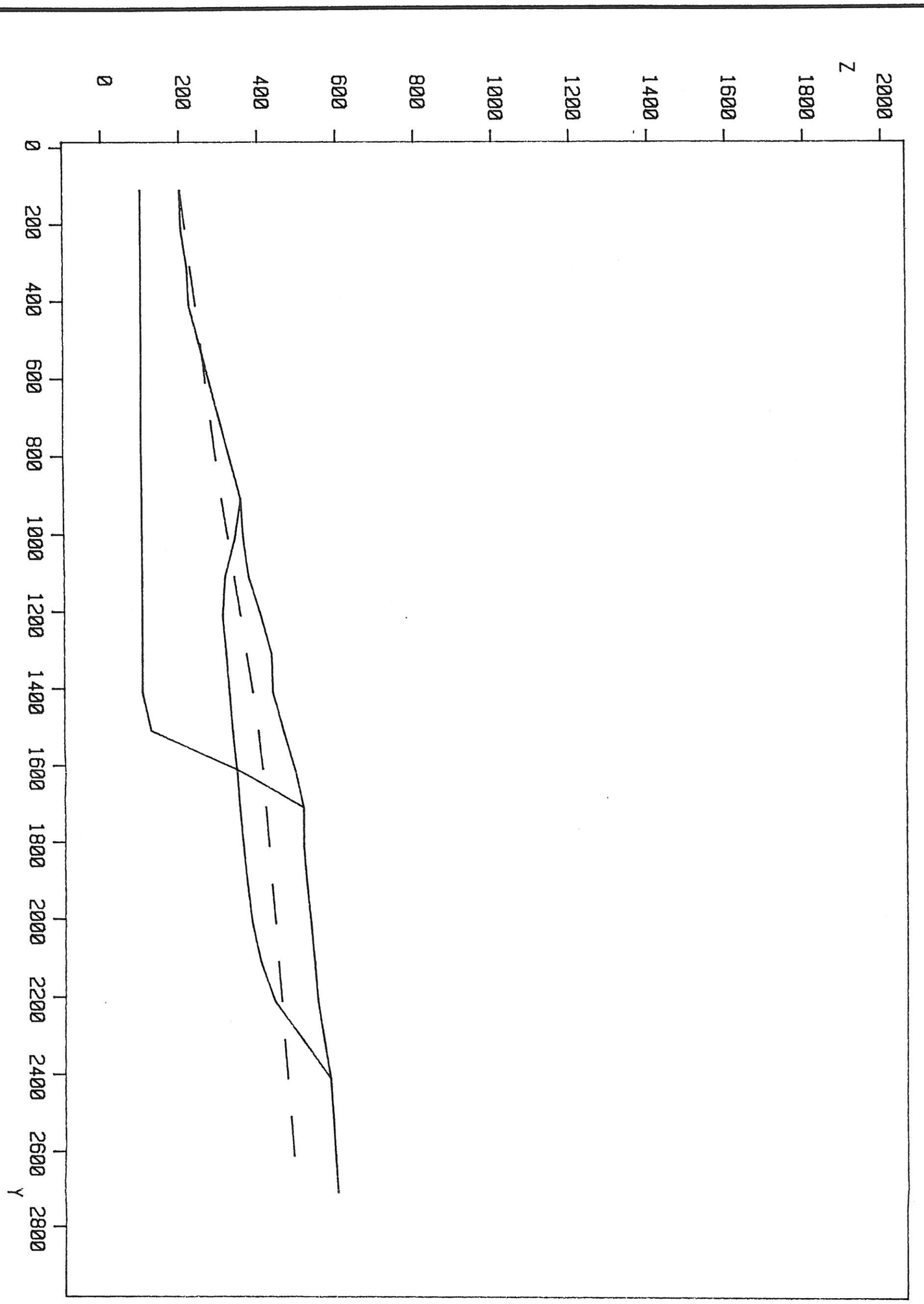
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***

X = 1300

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 *SCALE:* *PLATE:* 2-28



RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-2***
X = 1400

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 *SCALE:* *PLATE:* 2-29

R. T. Frankian & Associates Inc., Burbank, CA

CLARA - SLOPE STABILITY ANALYSIS, BISHOP'S SIMPLIFIED AND JANBU METHODS

Project: Abalone Cove
Data File: 82025(U).CLA Analysis by: SDR Date: 03-05-92
Data Set: TN23 w/ Nov Dec Water Levels

RUN IDENTIFICATION LABEL: TN25 - TN1 w/ Nov-Dec Water Levels

Number of Active Columns	552	Axis of Rotation Y-coordinate	753.58
Max. No. Columns in Y-dir.	23	Axis of Rotation Z-coordinate	4367.43
Slide Volume	2.80E+08	Total Water Trust Force	0.00E+00
Weight of Slide Mass ...	3.63E+10	Unbalanced Transverse Force .	1.83E+09
Sliding Surface Area ...	2.99E+06	Z-coord. of unbalanced force	402.81
Earthquake Acceleration	0.00	Negative Norm. Forces	0.00 % OF WEIGHT

!! NUMBER OF WARNINGS ISSUED CONCERNING THE PRESENT SOLUTION: ... 0

FACTOR OF SAFETY: Bishop's ... 1.070
Janbu ..... 1.063 (uncorrected)

SUMMARY OF MATERIAL AND DISCONTINUITY PROPERTIES

NO.	LABEL	UNIT WEIGHT	COHESION HOR.	COHESION VERT.	FRICTION HOR.	FRICTION VERT.	PORE-PRESS. RATIO*	PORE-PRESS. B-BAR
A/ MATERIALS:								
1	Side Materia	130.00	100.0	100.0	20.0	20.0	-1.00	0.00
2	Bottom Mater	130.00	0.0	0.0	7.0	7.0	-1.00	0.00

NOTES:
Material layers are numbered from bottom up
* Negative integer signifies the applicable piezometric surface number

R. T. Frankian & Associates Inc., Burbank, CA
SLOPE STABILITY ANALYSIS - DATA FILE SUMMARY
PROJECT - Abalone Cove
DATA FILE - 82025(U).CLA
DATA SET - TN23 w/ Nov Dec Water Levels
ANALYSIS BY SDR
DATE: 03-05-92

UNIT WEIGHT OF WATER = 62.4

CONTROL VARIABLES

COLUMN LENGTH (Y-DIRECTION)	100
MESH START Y-COORDINATE	10
MESH END Y-COORDINATE	2790
ROW WIDTH	50
TRANSVERSE MESH WIDTH	1800
NUMBER OF MATERIALS	2
NUMBER OF DISCONTINUITIES	0
NUMBER OF PIEZOMETRIC SURFACES	1

SUMMARY OF MATERIAL AND DISCONTINUITY PROPERTIES

NO.	LABEL	UNIT WEIGHT	COHESION HOR.	COHESION VERT.	FRICTION HOR.	FRICTION VERT.	PORE-PRESS. RATIO*	PORE-PRESS. B-BAR
A/ MATERIALS:								
1	Side Materia	130.00	100.0	100.0	20.0	20.0	-1.00	0.00
2	Bottom Mater	130.00	0.0	0.0	7.0	7.0	-1.00	0.00

NOTES:
Material layers are numbered from bottom up
* Negative integer signifies the applicable piezometric surface number

CROSS-SECTION NUMBER 1 X = 0

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
200.00	201.00
300.00	212.00
350.00	245.00
435.00	270.00
500.00	295.00
900.00	356.00
1050.00	380.00
1100.00	380.00
1600.00	503.00
2000.00	440.00
2600.00	548.00
2800.00	548.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00

200.00	201.00
300.00	212.00
350.00	245.00
435.00	270.00
500.00	295.00
900.00	356.00
1050.00	380.00
1100.00	380.00
1600.00	503.00
2000.00	440.00
2600.00	548.00
2800.00	548.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
200.00	200.00
500.00	220.00
950.00	240.00
1330.00	260.00
1665.00	280.00
2000.00	340.00
2350.00	360.00
2800.00	385.00

CROSS-SECTION NUMBER 2 X = 100

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	185.00
209.00	185.00
240.00	200.00
350.00	220.00
400.00	260.00
530.00	268.00
550.00	270.00
600.00	282.00
1050.00	360.00
1070.00	366.00
1300.00	370.00
1650.00	480.00
2000.00	410.00
2250.00	430.00
2500.00	540.00
2800.00	540.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	185.00
209.00	185.00
240.00	200.00
350.00	220.00
400.00	260.00
530.00	268.00
550.00	270.00
600.00	282.00
1050.00	360.00

1070.00	366.00
1300.00	370.00
1650.00	480.00
2000.00	410.00
2250.00	430.00
2500.00	540.00
2800.00	540.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
240.00	200.00
550.00	220.00
1000.00	240.00
1700.00	280.00
1960.00	340.00
2330.00	360.00
2800.00	390.00

CROSS-SECTION NUMBER 3 X = 200

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	185.00
140.00	185.00
290.00	200.00
390.00	220.00
460.00	270.00
720.00	270.00
750.00	287.00
1100.00	360.00
1560.00	370.00
1650.00	410.00
1700.00	380.00
1950.00	435.00
2020.00	415.00
2360.00	440.00
2500.00	510.00
2800.00	518.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	185.00
140.00	185.00
290.00	200.00
390.00	220.00
460.00	270.00
720.00	270.00
750.00	287.00
1100.00	360.00
1560.00	370.00
1650.00	410.00
1700.00	380.00
1950.00	435.00
2020.00	415.00
2360.00	440.00
2500.00	510.00

2800.00	518.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
290.00	200.00
550.00	220.00
1000.00	240.00
1420.00	260.00
1700.00	280.00
1950.00	340.00
2800.00	390.00

CROSS-SECTION NUMBER 4 X = 300

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
1270.00	100.00
1570.00	370.00
1710.00	390.00
1850.00	452.00
1960.00	453.00
2000.00	438.00
2600.00	460.00
2800.00	500.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	185.00
275.00	185.00
300.00	200.00
390.00	220.00
430.00	270.00
670.00	285.00
940.00	342.00
1230.00	340.00
1570.00	370.00
1710.00	390.00
1850.00	452.00
1960.00	453.00
2000.00	438.00
2600.00	460.00
2800.00	500.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
300.00	200.00
550.00	220.00
1000.00	240.00
1450.00	260.00
1750.00	280.00
1960.00	340.00
2250.00	360.00
2650.00	380.00

2800.00	390.00

CROSS-SECTION NUMBER 5 X = 400

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
1500.00	100.00
1800.00	430.00
2050.00	452.00
2350.00	480.00
2400.00	500.00
2700.00	500.00
2800.00	480.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	185.00
260.00	185.00
300.00	200.00
450.00	270.00
500.00	272.00
600.00	262.00
650.00	286.00
800.00	342.00
1200.00	350.00
1300.00	372.00
1650.00	378.00
1800.00	430.00
2050.00	452.00
2350.00	480.00
2400.00	500.00
2700.00	500.00
2800.00	480.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
320.00	200.00
550.00	220.00
1000.00	240.00
1450.00	260.00
1780.00	280.00
1970.00	340.00
2230.00	360.00
2680.00	380.00
2800.00	390.00

CROSS-SECTION NUMBER 6 X = 700

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
2100.00	100.00
2350.00	508.00
2800.00	565.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	185.00
275.00	185.00
300.00	200.00
400.00	220.00
450.00	270.00
650.00	285.00
750.00	265.00
780.00	286.00
1200.00	353.00
1250.00	386.00
1600.00	380.00
1700.00	368.00
2050.00	478.00
2250.00	500.00
2350.00	508.00
2800.00	565.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
310.00	200.00
600.00	220.00
970.00	240.00
1380.00	260.00
1800.00	280.00
2060.00	340.00
2430.00	380.00
2800.00	415.00

CROSS-SECTION NUMBER 7 X = 1000

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
1965.00	100.00
2500.00	568.00
2800.00	582.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	185.00
185.00	185.00
200.00	200.00
250.00	202.00
350.00	236.00
510.00	246.00
1000.00	324.00
1150.00	358.00
1400.00	402.00
1550.00	420.00
1750.00	406.00
1900.00	482.00
2150.00	492.00

2500.00	568.00
2800.00	582.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
230.00	200.00
850.00	240.00
1170.00	260.00
1560.00	280.00
1920.00	340.00
2150.00	380.00
2370.00	400.00
2570.00	460.00
2800.00	485.00

CROSS-SECTION NUMBER 8 X = 1300

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
2000.00	100.00
2160.00	540.00
2425.00	564.00
2500.00	593.00
2800.00	600.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	185.00
190.00	195.00
225.00	195.00
230.00	205.00
280.00	210.00
410.00	242.00
490.00	250.00
900.00	324.00
1230.00	380.00
1500.00	450.00
1620.00	450.00
1940.00	500.00
2160.00	540.00
2425.00	564.00
2500.00	593.00
2800.00	600.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
200.00	200.00
420.00	220.00
1040.00	300.00
1530.00	340.00
1900.00	380.00
2150.00	400.00
2510.00	500.00

2800.00	500.00

CROSS-SECTION NUMBER 9 X = 1400

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	100.00
1500.00	100.00
1690.00	510.00
1840.00	510.00
1950.00	523.00
2330.00	560.00
2380.00	576.00
2800.00	604.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	185.00
160.00	185.00
170.00	200.00
265.00	200.00
310.00	220.00
400.00	220.00
480.00	242.00
930.00	358.00
1070.00	360.00
1300.00	430.00
1400.00	430.00
1690.00	510.00
1840.00	510.00
2330.00	568.00
2380.00	576.00
2800.00	604.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
170.00	200.00
300.00	220.00
880.00	300.00
1600.00	360.00
2060.00	400.00
2350.00	480.00
2530.00	500.00
2800.00	515.00

CROSS-SECTION NUMBER 10 X = 1600

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	200.00
210.00	210.00
235.00	218.00
330.00	220.00
640.00	356.00

870.00	366.00
960.00	406.00
1175.00	411.00
1370.00	486.00
1570.00	500.00
1630.00	520.00
1870.00	540.00
2070.00	570.00
2300.00	560.00
2360.00	578.00
2800.00	600.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	200.00
210.00	210.00
235.00	218.00
330.00	220.00
640.00	356.00
870.00	366.00
960.00	406.00
1175.00	411.00
1370.00	486.00
1570.00	500.00
1630.00	520.00
1870.00	540.00
2070.00	570.00
2300.00	560.00
2360.00	578.00
2800.00	600.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
120.00	200.00
240.00	220.00
570.00	300.00
950.00	360.00
1740.00	400.00
2110.00	480.00
2620.00	500.00
2800.00	510.00

CROSS-SECTION NUMBER 11 X = 1800

MATERIAL NO. 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	205.00
200.00	214.00
250.00	230.00
500.00	348.00
650.00	360.00
700.00	370.00
800.00	370.00
1200.00	420.00

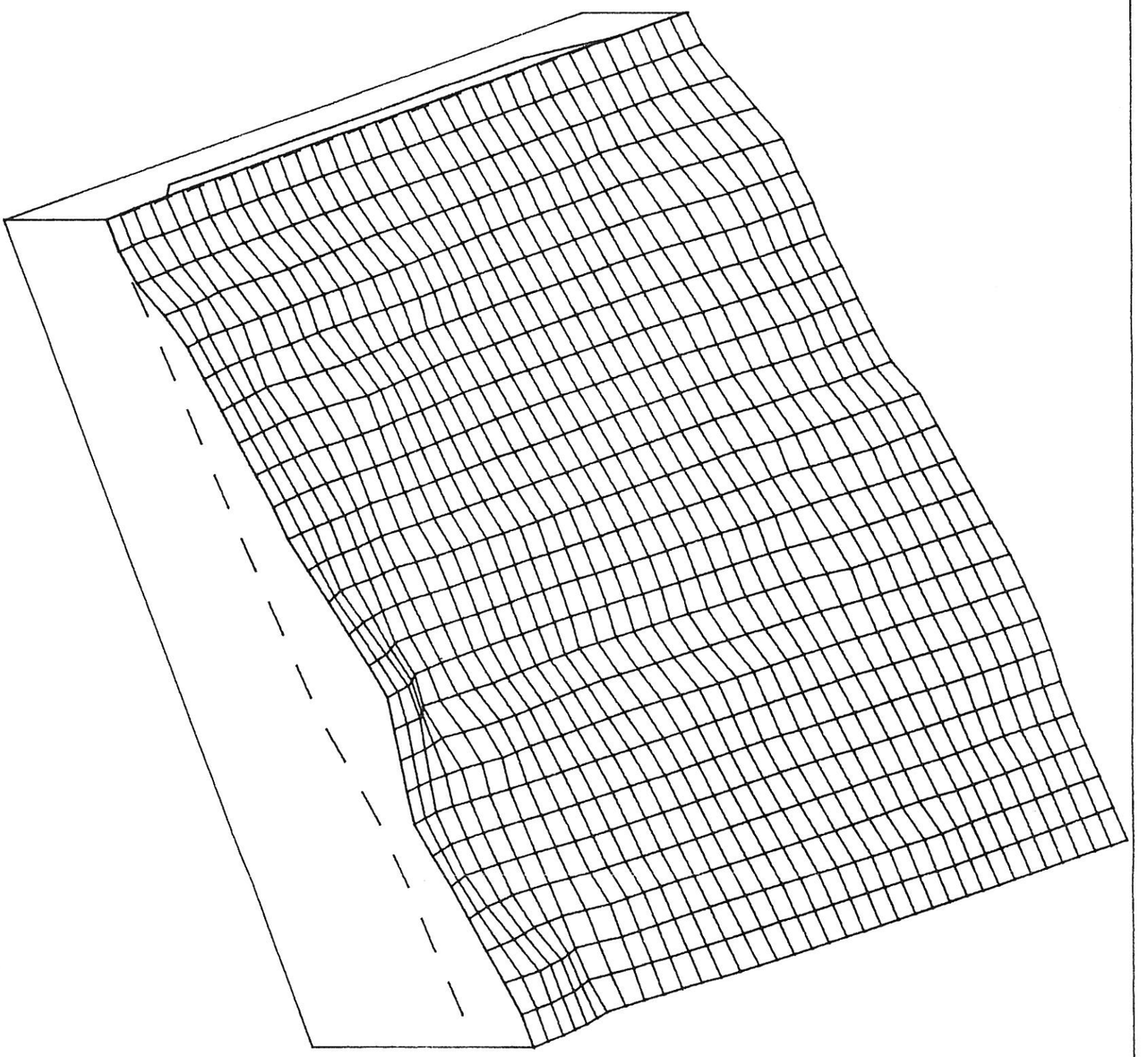
1250.00	450.00
1300.00	470.00
1500.00	490.00
1750.00	552.00
1800.00	563.00
2050.00	585.00
2250.00	572.00
2800.00	600.00

MATERIAL NO. 2

Y-COORDINATE	Z-COORDINATE
0.00	200.00
100.00	205.00
200.00	214.00
250.00	230.00
500.00	348.00
650.00	360.00
700.00	370.00
800.00	370.00
1200.00	420.00
1250.00	450.00
1300.00	470.00
1750.00	552.00
1800.00	563.00
2050.00	585.00
2250.00	572.00
2800.00	600.00

PIEZO SURFACE NO 1

Y-COORDINATE	Z-COORDINATE
0.00	200.00
80.00	200.00
130.00	220.00
350.00	300.00
1660.00	360.00
1800.00	480.00
2720.00	500.00
2800.00	505.00



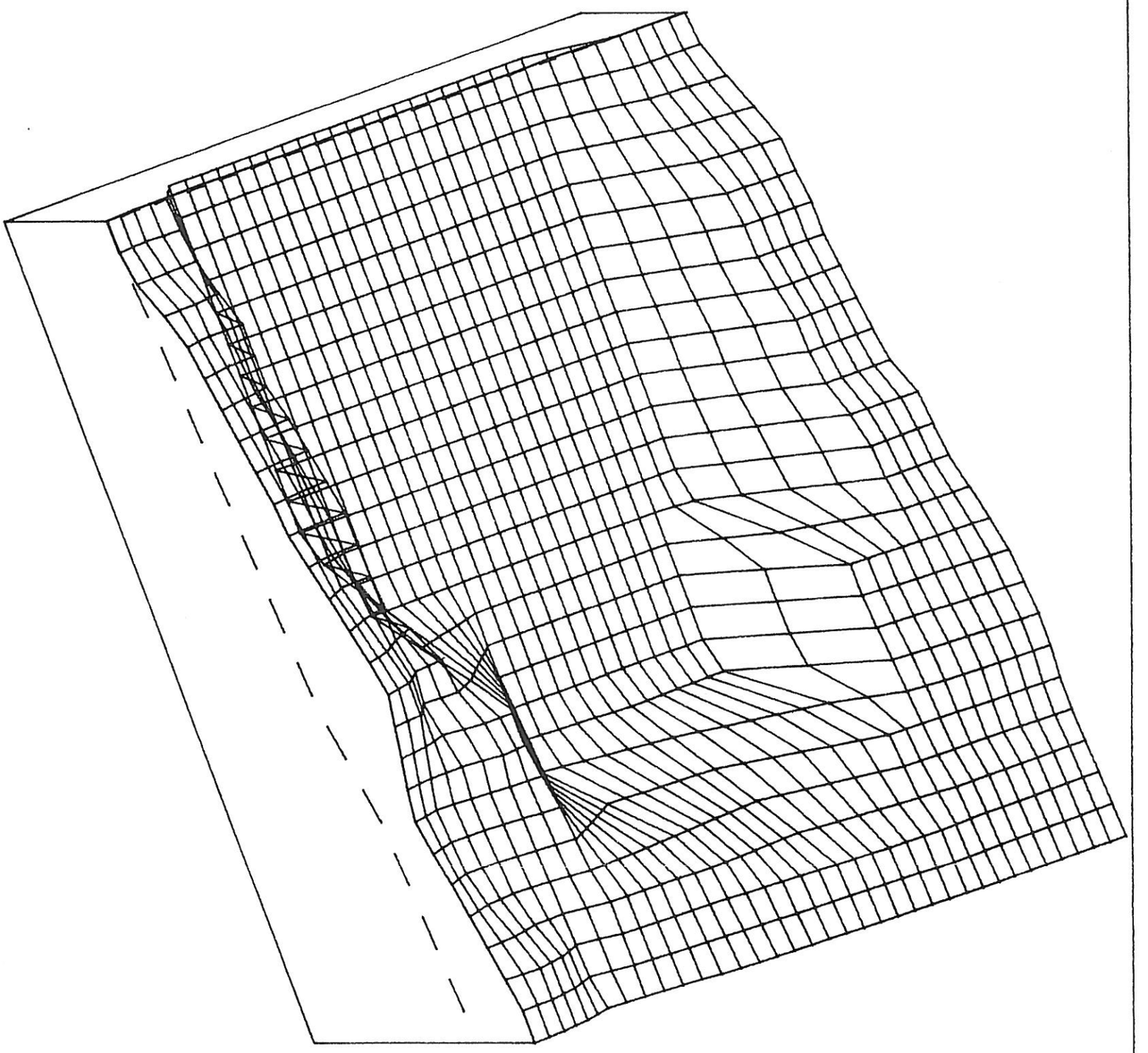
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-3***

GROUND SURFACE

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 *SCALE:* *PLATE:* 3-12

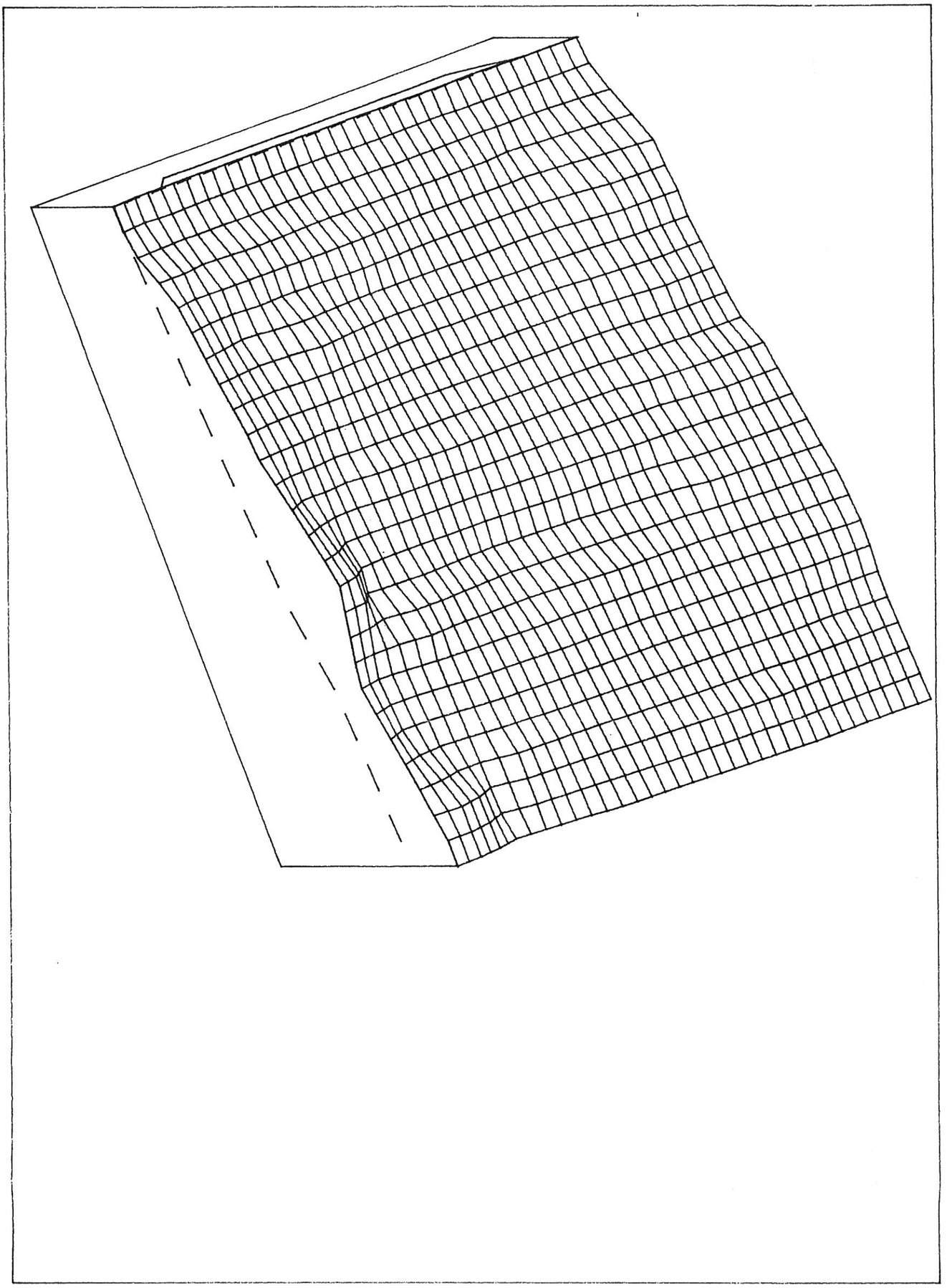


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-3***
MATERIAL ONE

R.T. FRANKIAN & ASSOCIATES

DATE: 03-04-92 *SCALE:* *PLATE:* 3-13

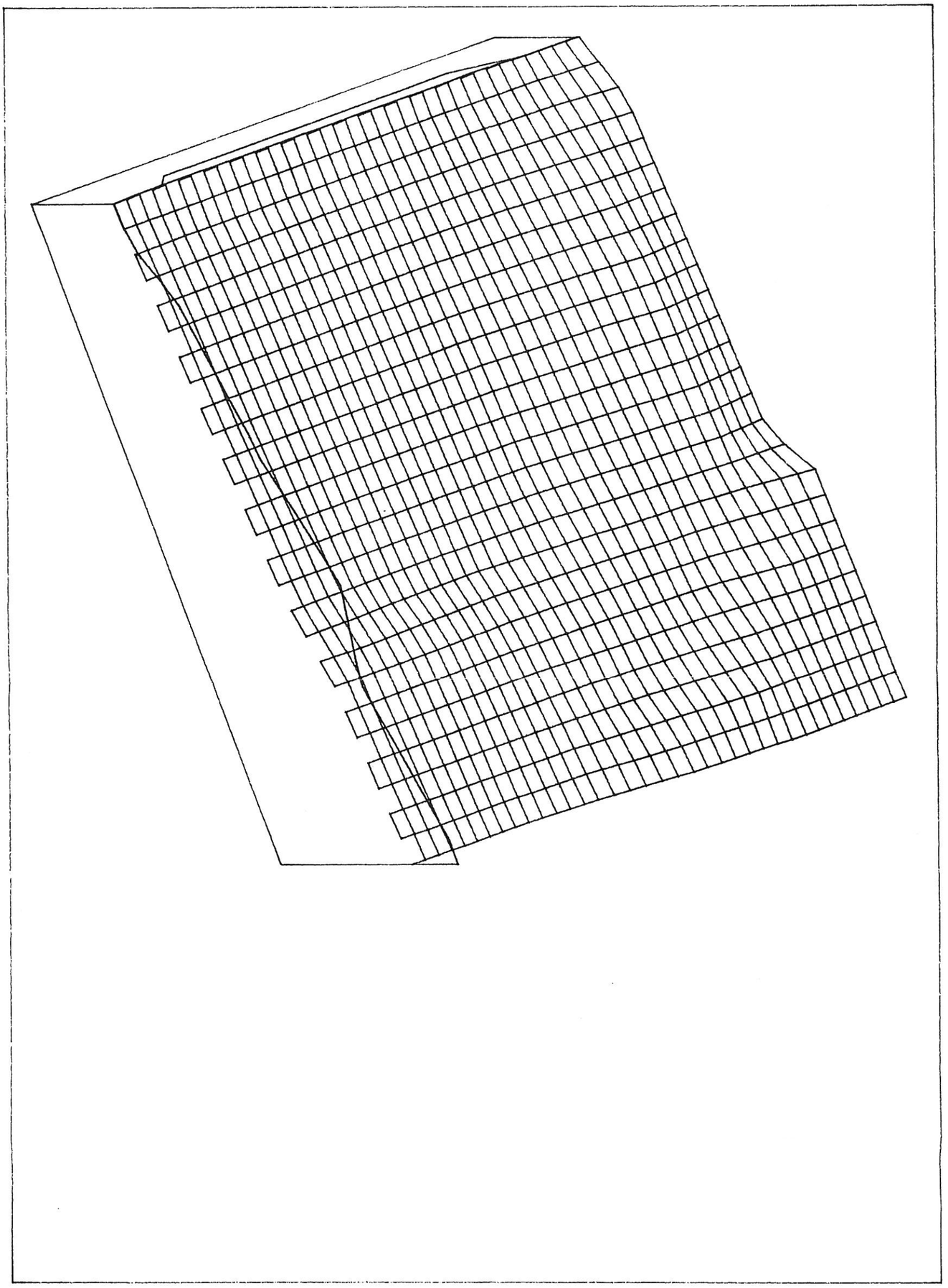


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-3
MATERIAL TWO

R.T. FRANKIAN & ASSOCIATES

DATE: 03-04-92 ***SCALE:*** ***PLATE:*** 3-14



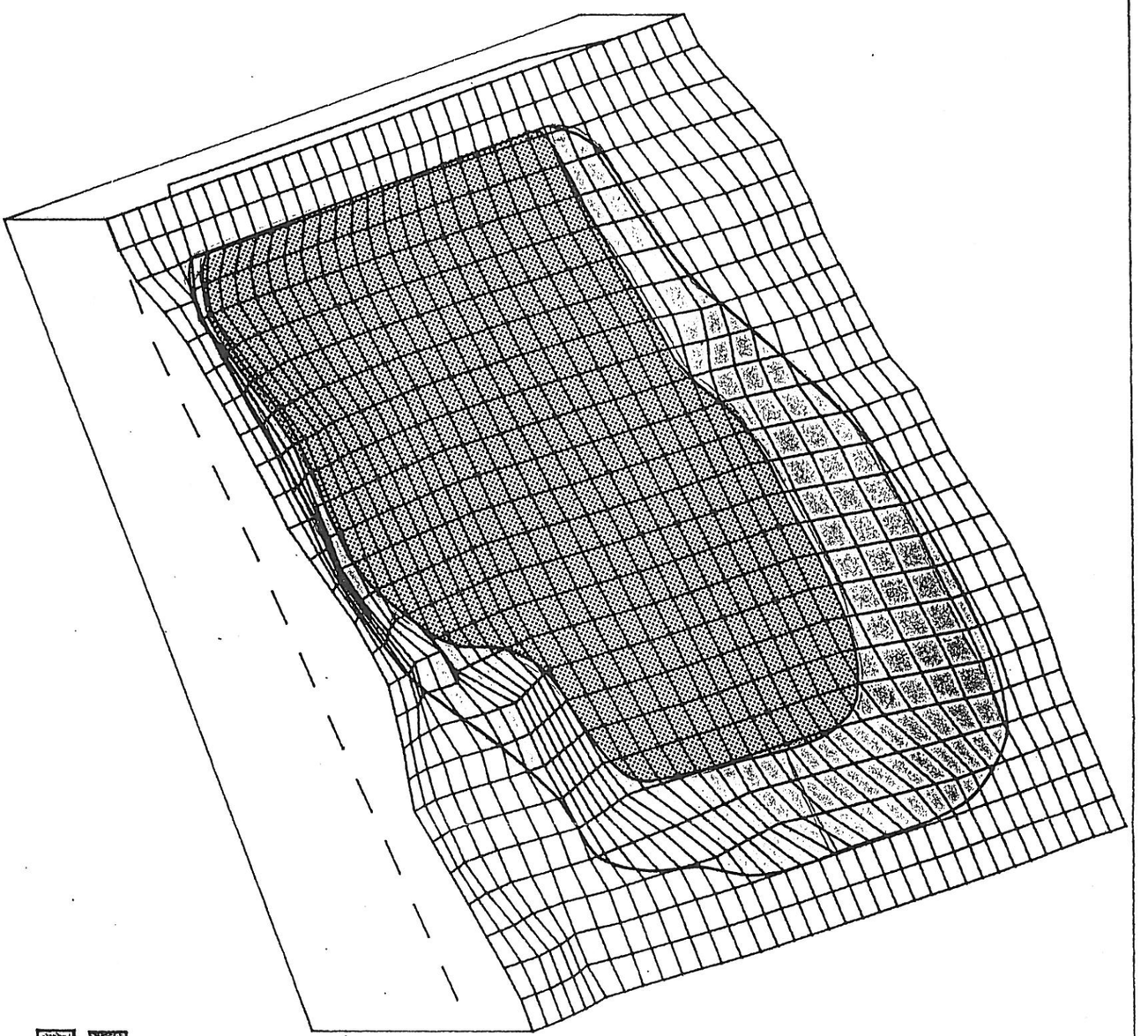
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-3***

PIEZOMETRIC SURFACE

R.T. FRANKIAN & ASSOCIATES

DATE: 03-04-92 *SCALE:* *PLATE:* 3-15



SIDE SURFACES - Phi= 20 degrees C= 100 psf

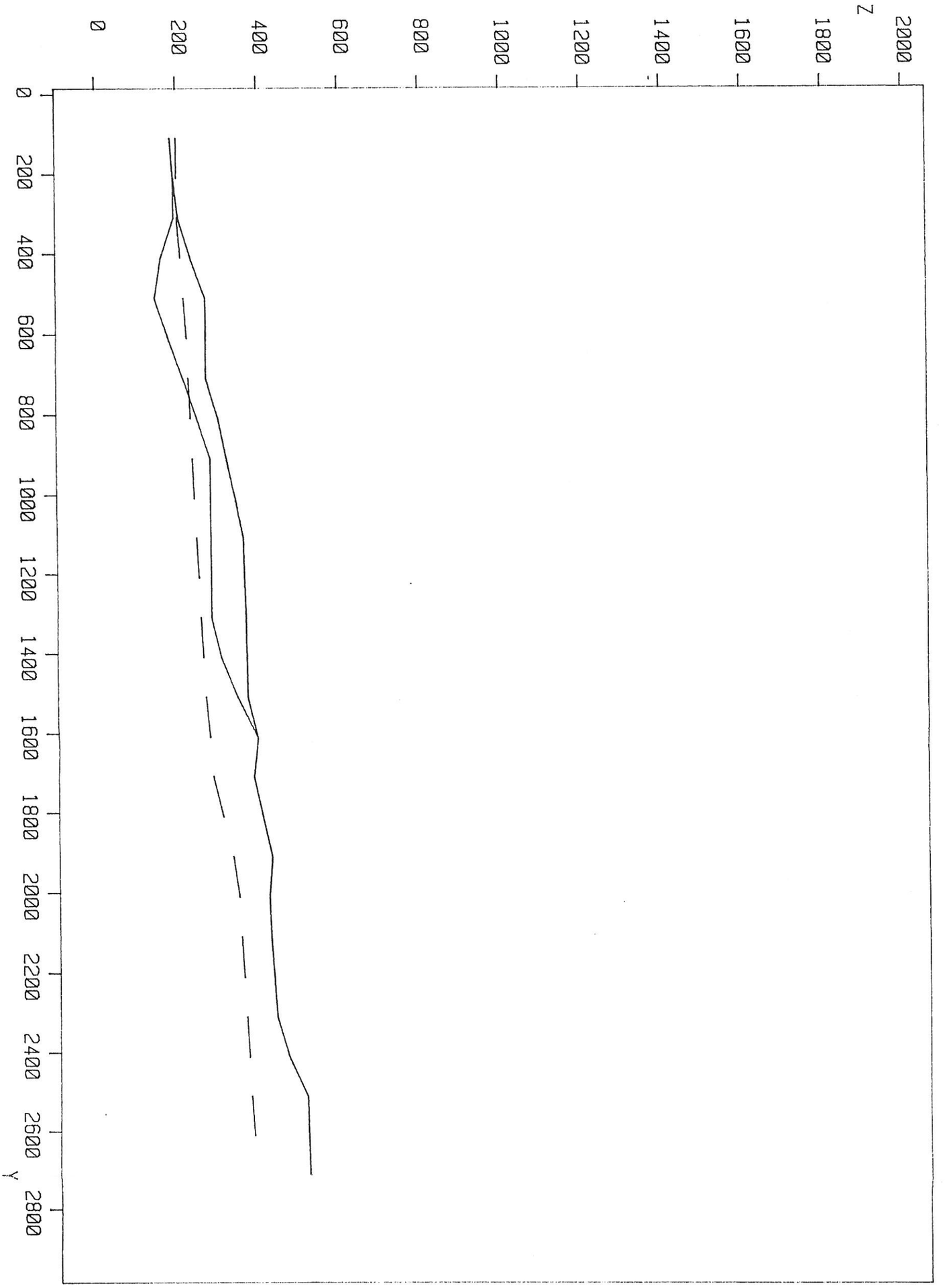
SLIDE SURFACE - Phi= 7 degrees C= 0 psf

RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with Trial No. SN-3
SLIDING SURFACE

R.T. FRANKIAN & ASSOCIATES

DATE: 03-03-92 SCALE: PLATE: 3-16

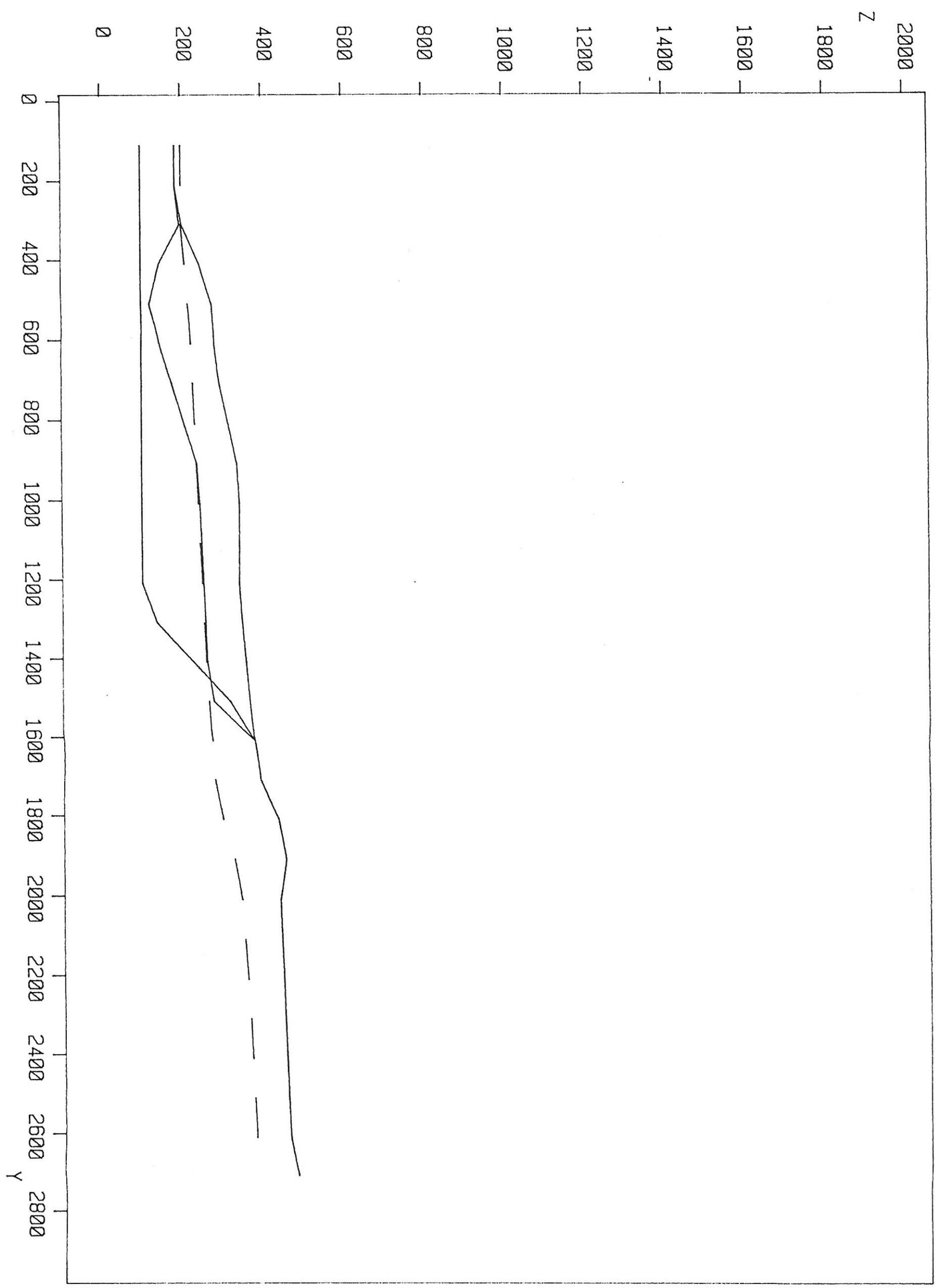


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-3
X = 200

R.T. FRANKIAN & ASSOCIATES

DATE: 03-04-92 SCALE: PLATE: 3-17

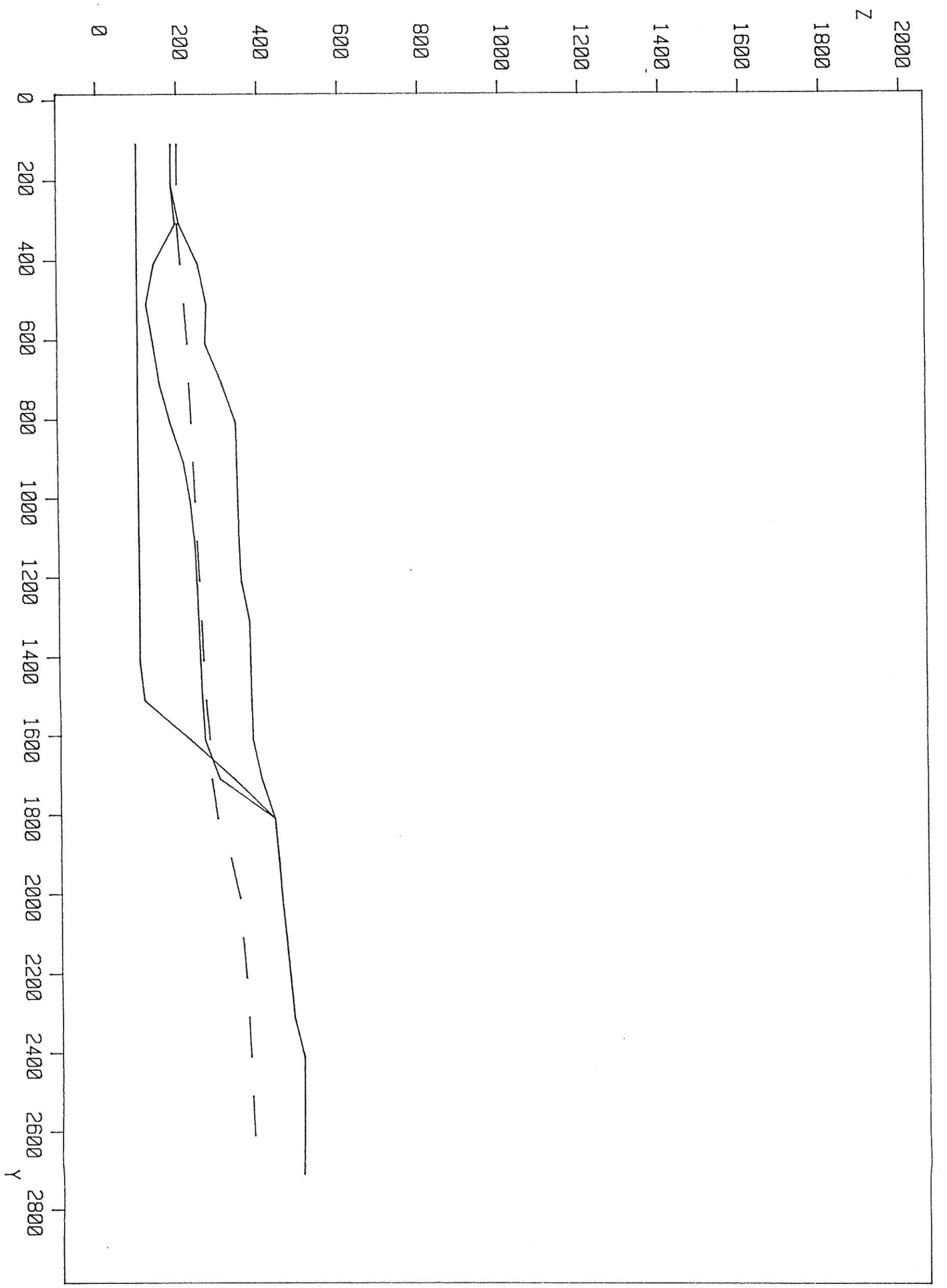


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-3
X = 300

R.T. FRANKIAN & ASSOCIATES

DATE:	SCALE:	PLATE:
03-04-92		3-18

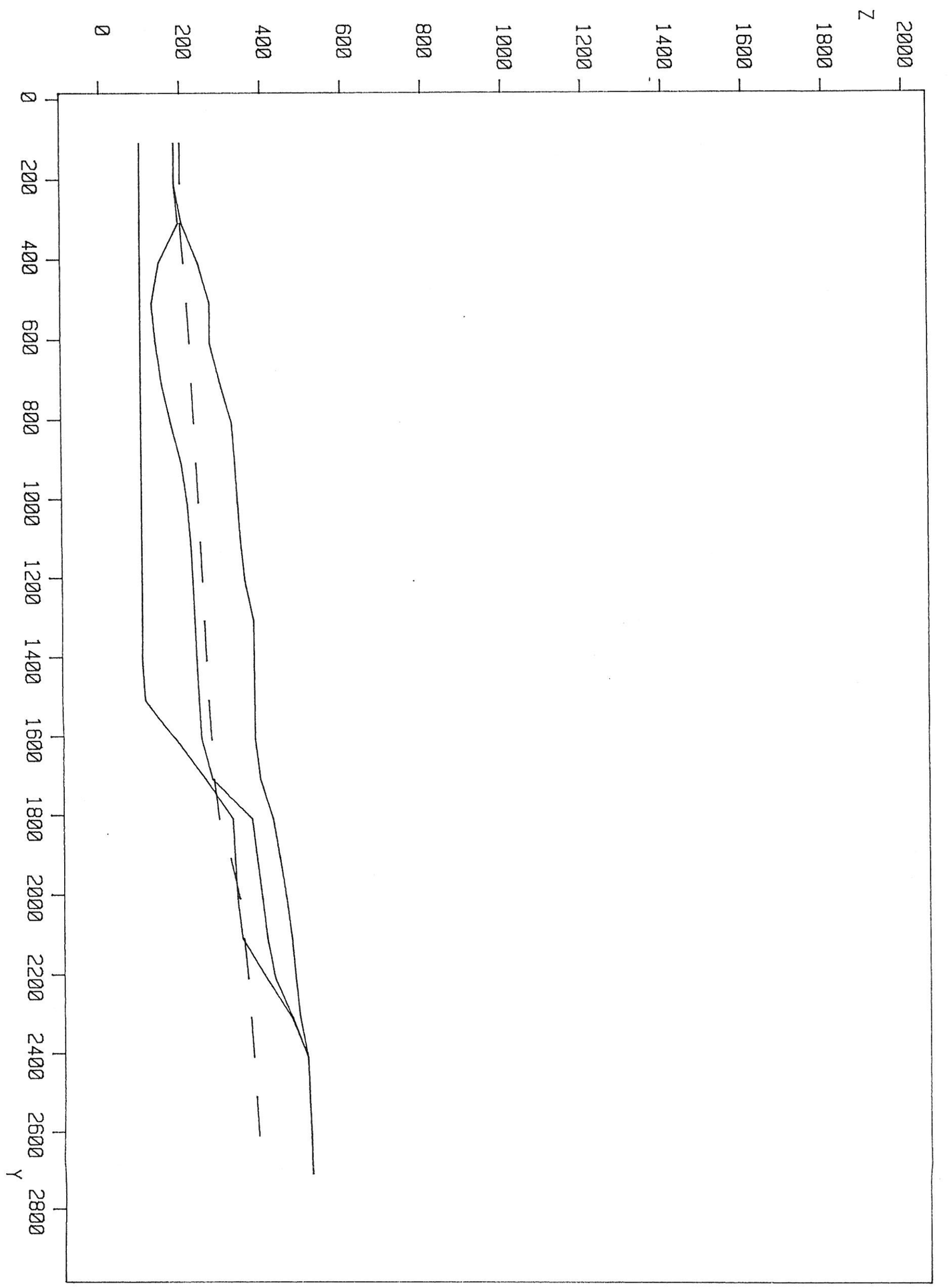


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-3
X = 400

R.T. FRANKIAN & ASSOCIATES

DATE:	SCALE:	PLATE:
03-04-92		3-19

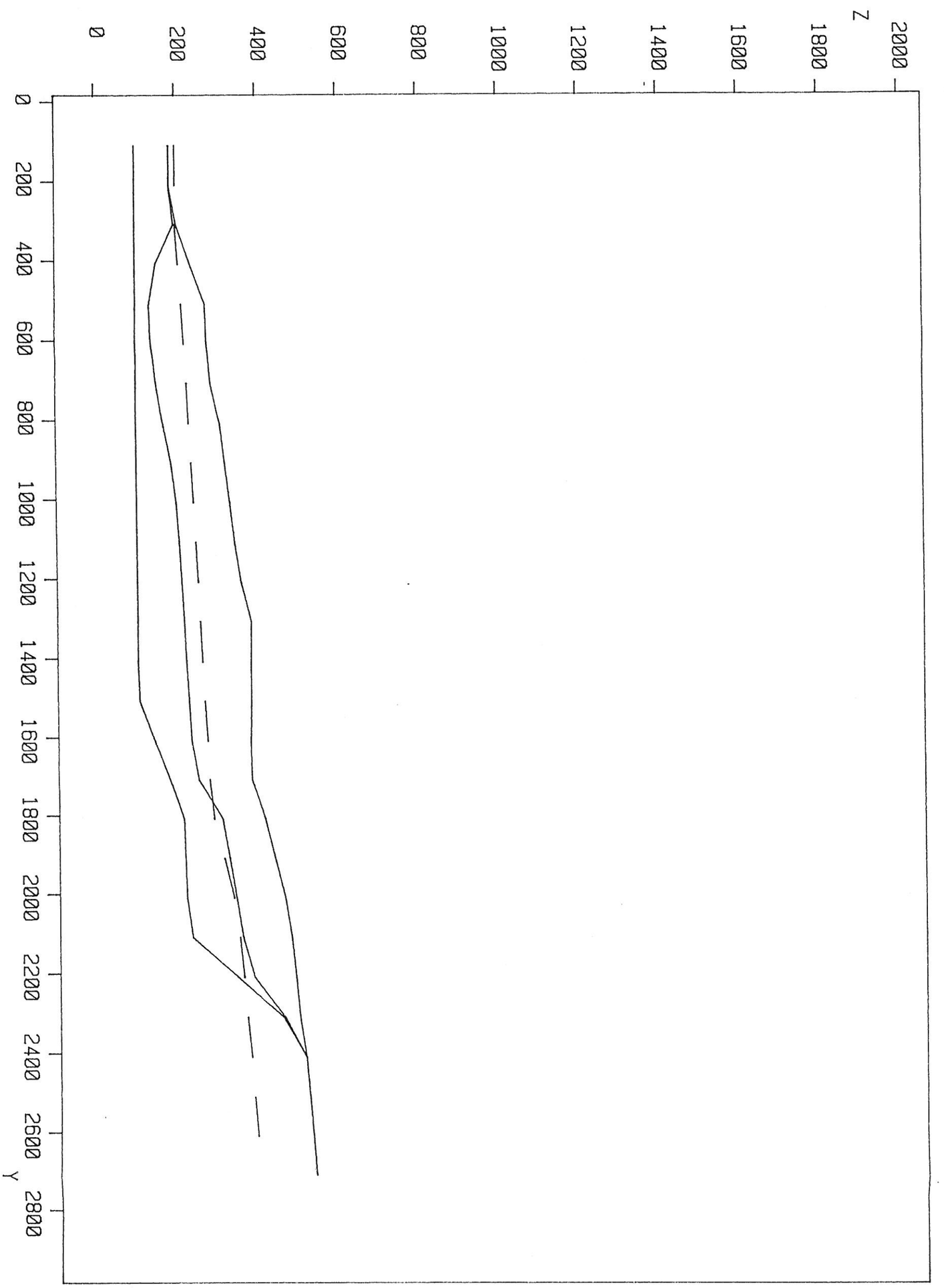


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-3***
X = 500

R.T. FRANKIAN & ASSOCIATES

DATE:	SCALE:	PLATE:
03-04-92		3-20



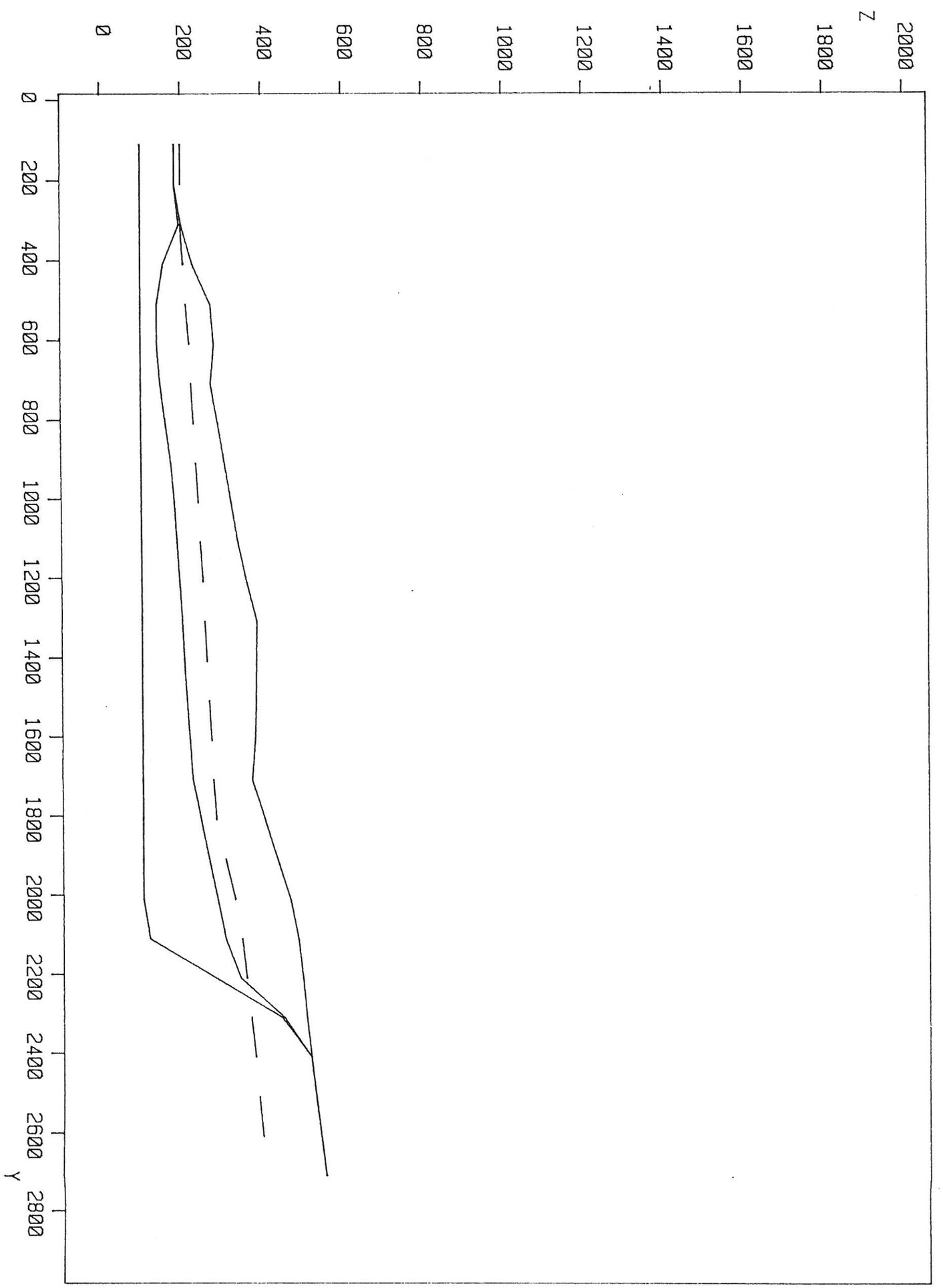
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-3***

X = 600

R.T. FRANKIAN & ASSOCIATES

DATE: 03-04-92 SCALE: PLATE: 3-21

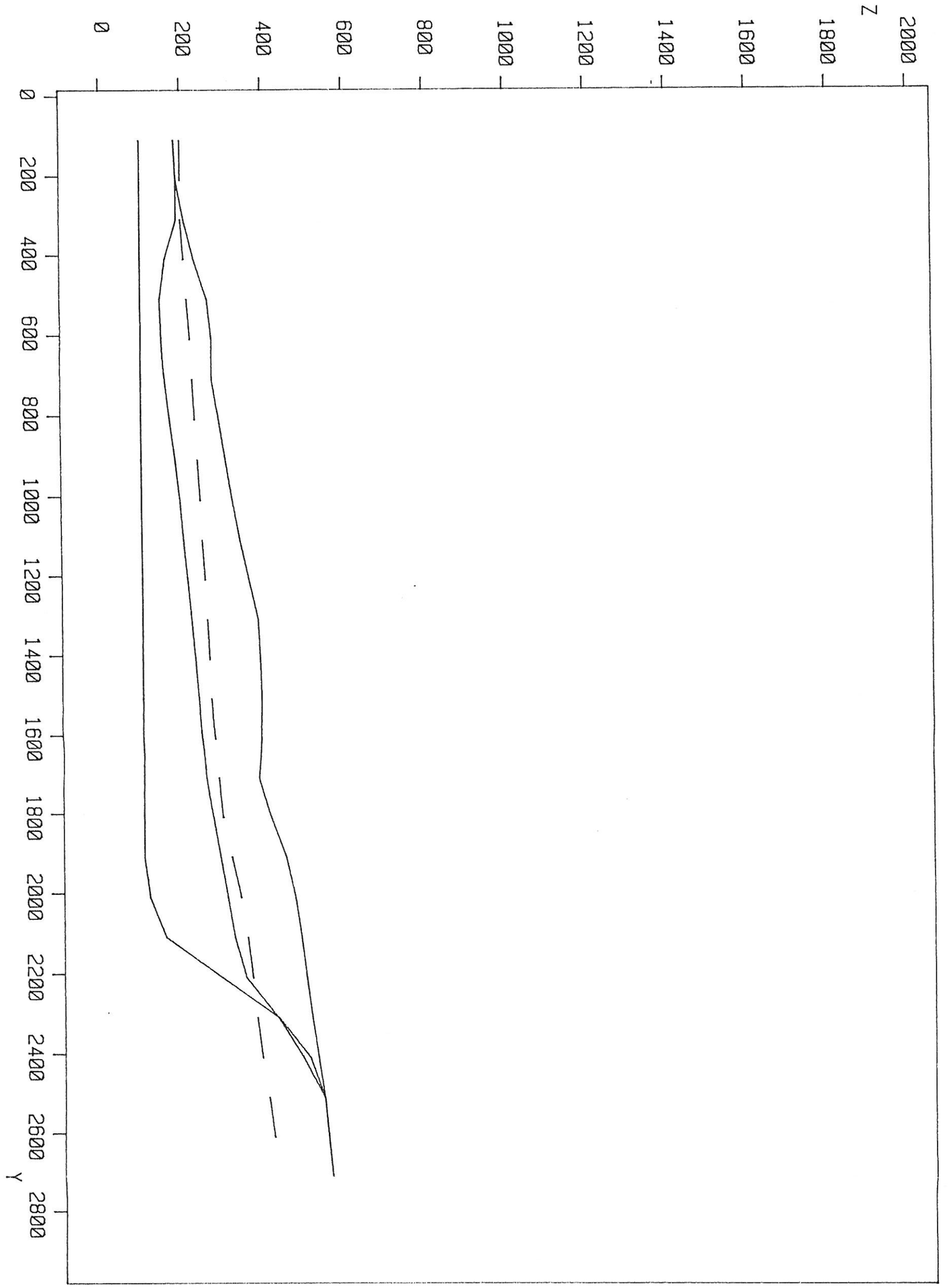


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-3
X = 700

R.T. FRANKIAN & ASSOCIATES

DATE: 03-04-92 SCALE: PLATE: 3-22



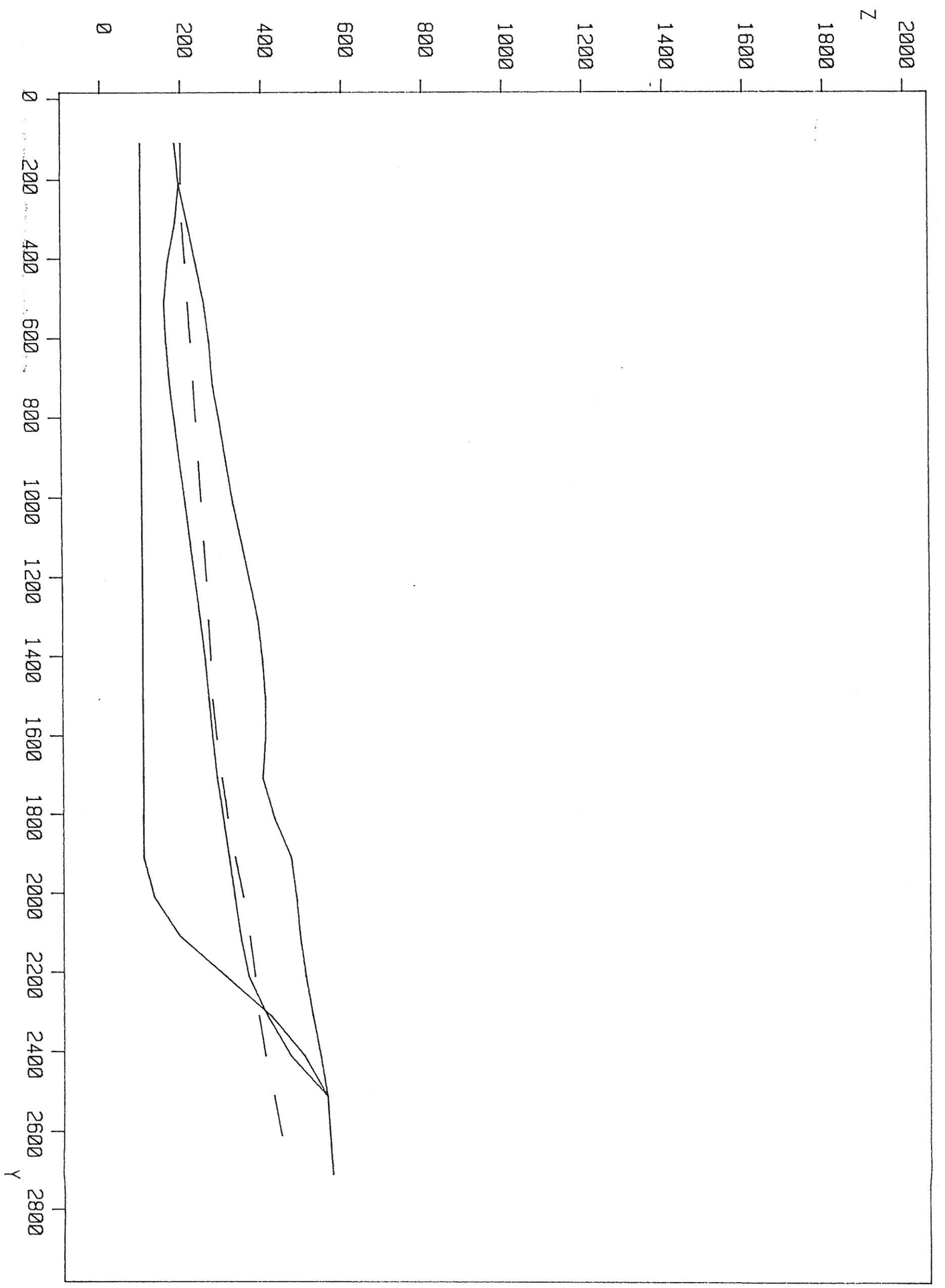
RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-3***

X = 800

R.T. FRANKIAN & ASSOCIATES

DATE: 03-04-92 SCALE: PLATE: 3-23

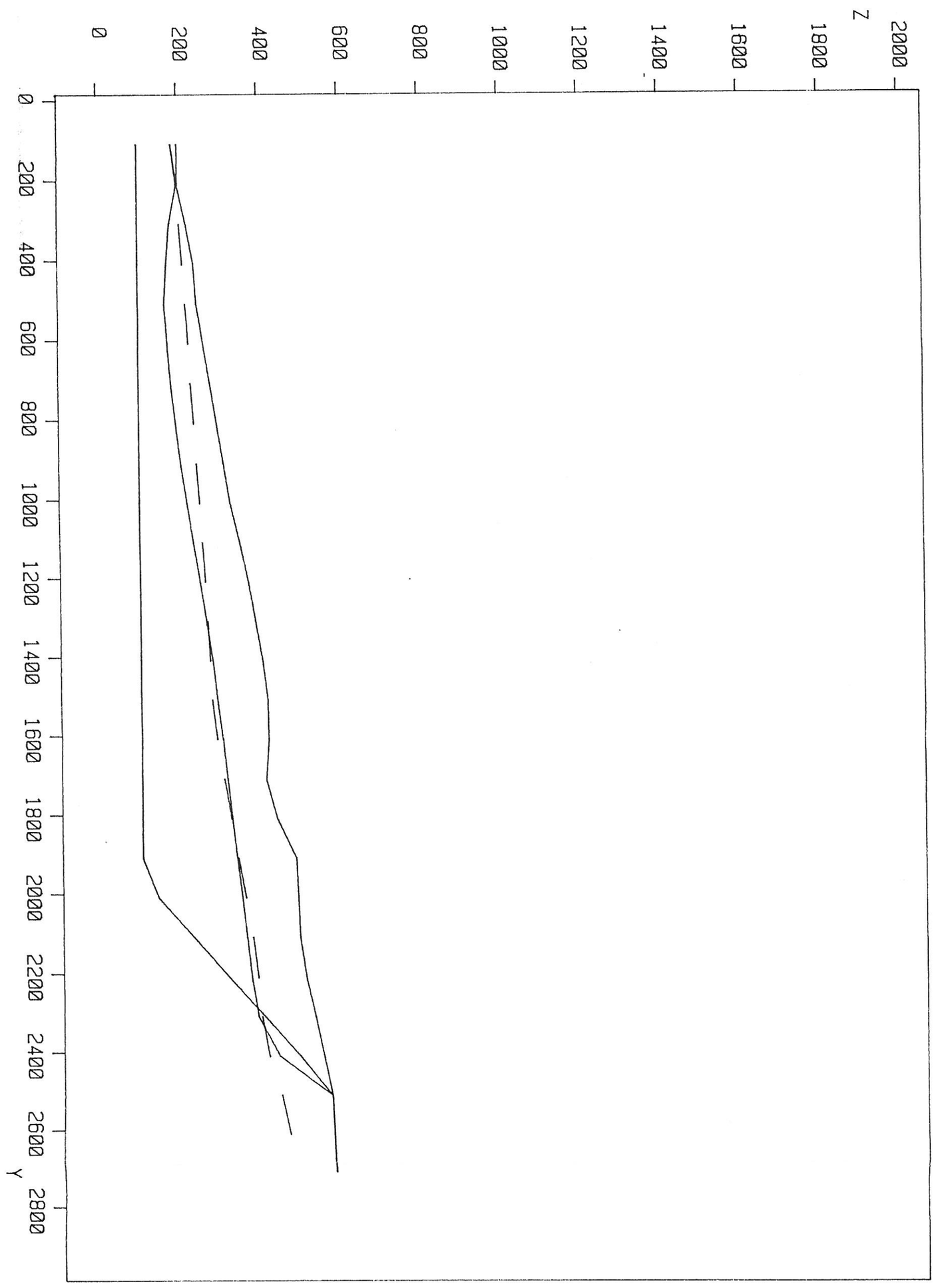


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-3
X = 900

R.T. FRANKIAN & ASSOCIATES

DATE: 03-04-92 SCALE: PLATE: 3-24

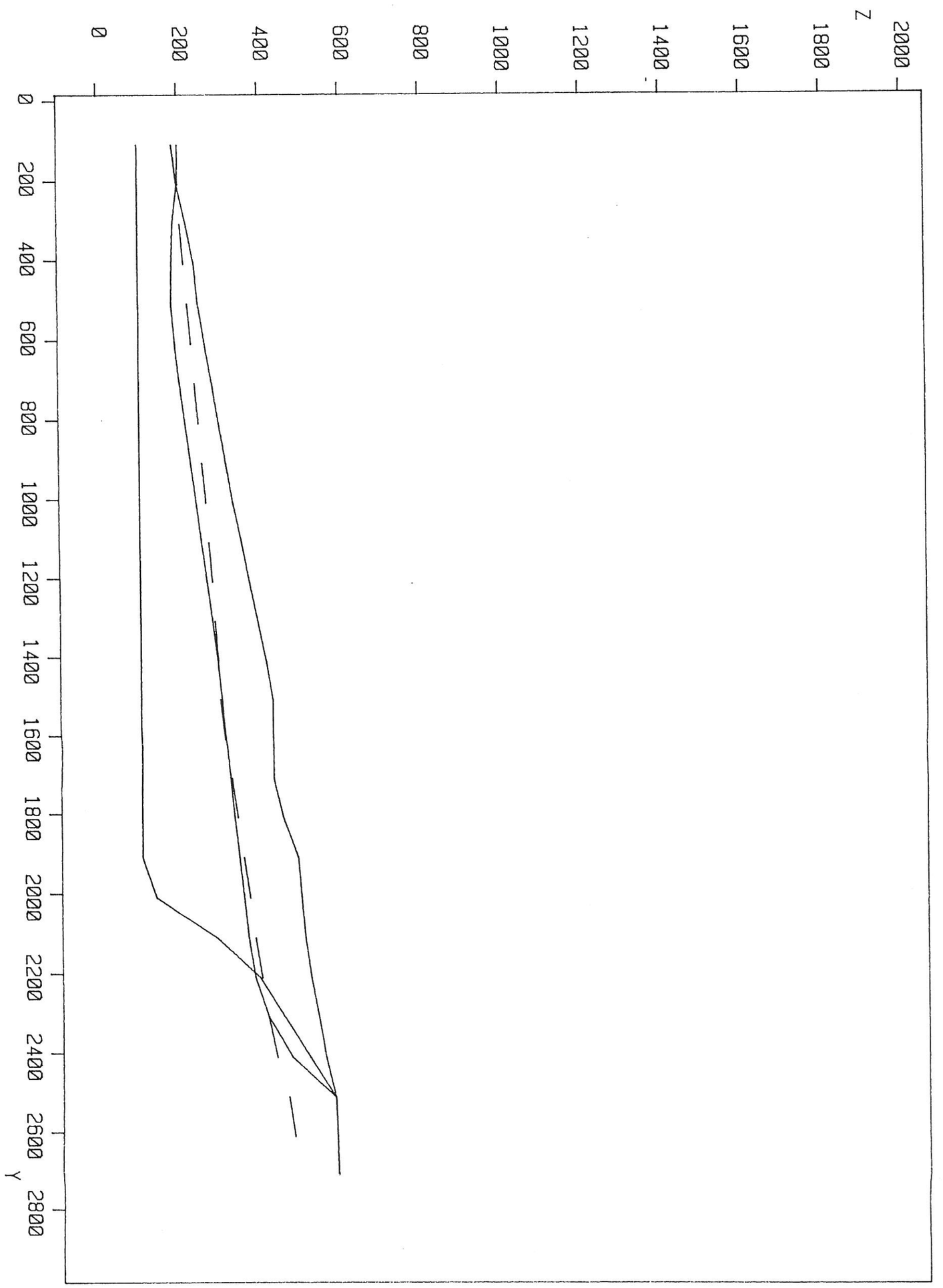


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-3***
X = 1000

R.T. FRANKIAN & ASSOCIATES

DATE:	SCALE:	PLATE:
03-04-92		3-25

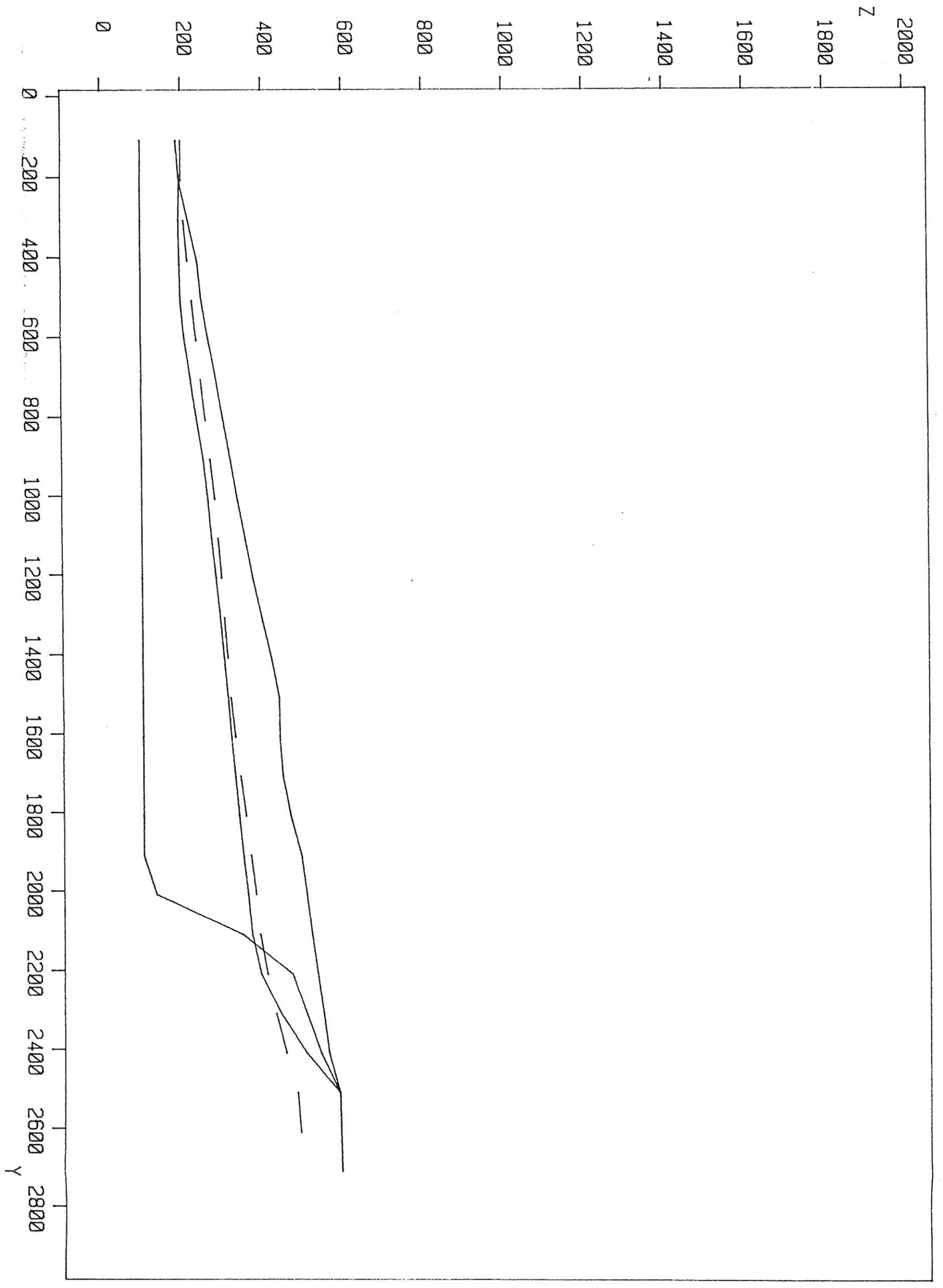


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. SN-3
X = 1100

R.T. FRANKIAN & ASSOCIATES

DATE: 03-04-92 SCALE: PLATE: 3-26

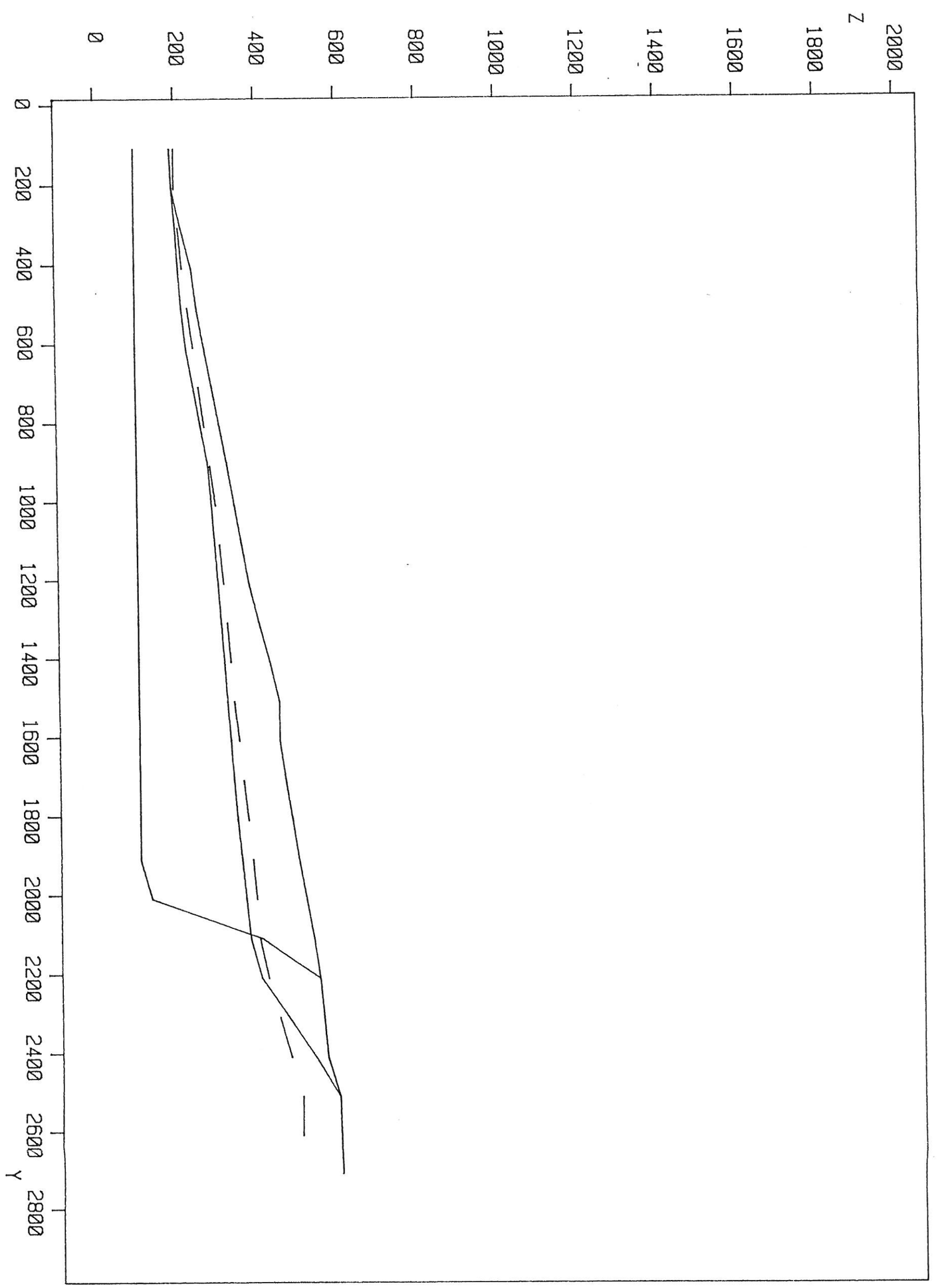


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-3***
X = 1200

R.T. FRANKIAN & ASSOCIATES

DATE: 03-04-92 *SCALE:* *PLATE:* 3-27

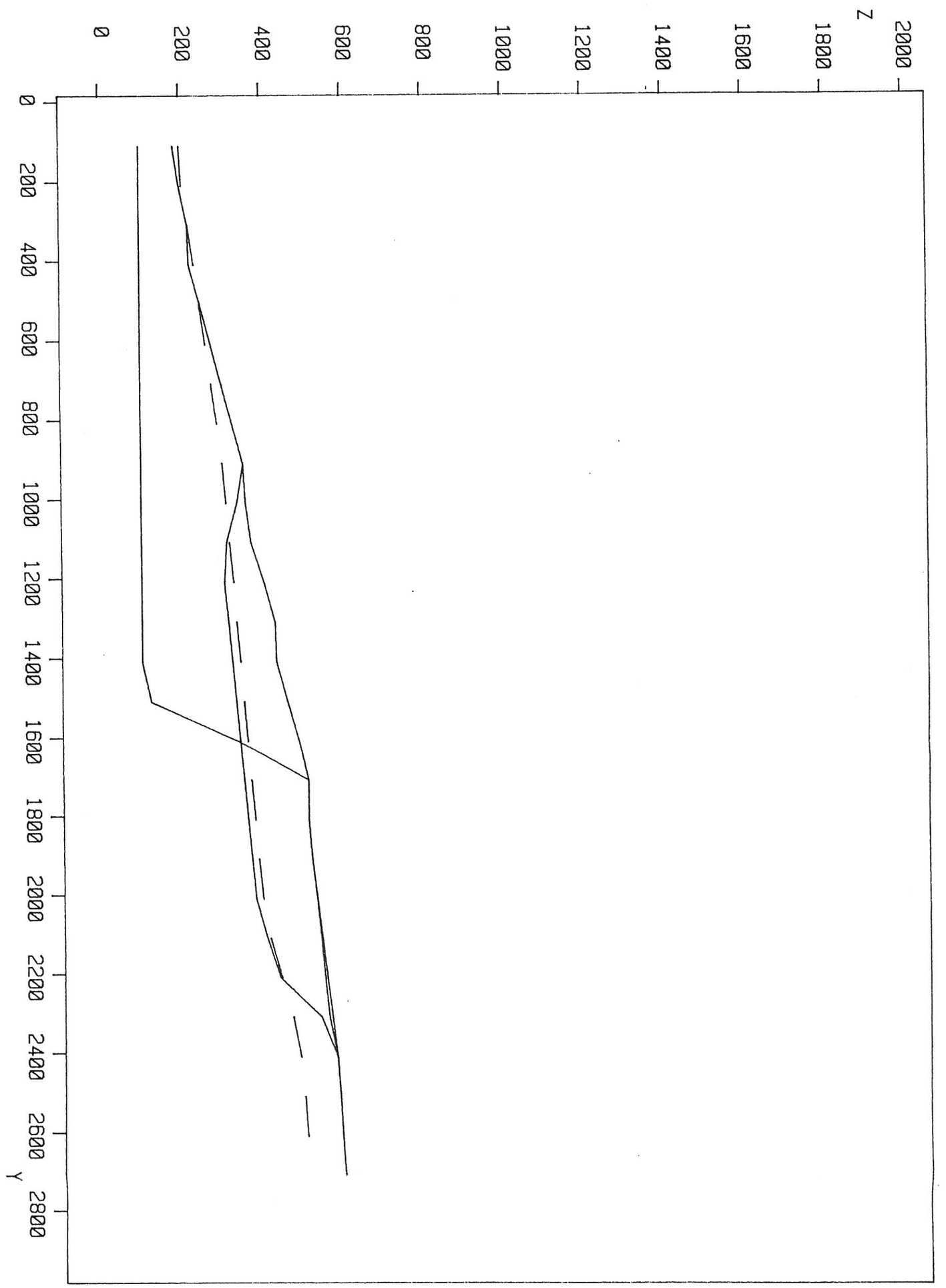


RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-3***
X = 1300

R.T. FRANKIAN & ASSOCIATES

DATE:	SCALE:	PLATE:
03-04-92		3-28



RANCHO PALOS VERDES
ABALONE COVE LANDSLIDE
PRELIMINARY STABILITY ANALYSIS
JOB NO. 82-025-F

Use with TRIAL NO. ***SN-3***
X = 1400

R.T. FRANKIAN & ASSOCIATES

DATE:	SCALE:	PLATE:
03-04-92		3-29