TERRA ASSOCIATES, Inc.
Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

November 10, 2015
Project No. T-7248

Mr. Greg Nelson
William Buchan Homes
2630 – 116th Avenue NE, #100
Bellevue, Washington 98004

Subject: Slope Stability
MacDonald Plat
12702 and 12704 – 72nd Avenue NE
Kirkland, Washington

References:
1. Geotechnical Slope Evaluation, MacDonald Plat, 12702 and 12704 – 72nd Avenue NE, Kirkland, Washington, prepared by Terra Associates, dated June 26, 2015
2. Report of Geotechnical Investigation, Proposed Subdivision Joan MacDonald Estates, King County, Washington, Project No. 538, prepared by S&EE, dated May 1, 2006

Dear Mr. Nelson:

As requested, we have reviewed public comments received by the City of Kirkland regarding slope stability concerns for the subject project. Two comments were received. The following outlines the comments and our response.

The first comment was from George Ploudre who resides at 7171 NE 126th Street. Mr. Ploudre indicated that two historic landslides occurred that affected the property that were not discussed in our referenced June 26 report. One slide impacted the Denny Creek channel which is located at the toe of the slope east of the MacDonald property. The second slide occurred in 1991 and was caused by runoff. Mr. Ploudre indicated this slide affected some of his property and a large portion of the county road and parkland.

During our reconnaissance of the property and slopes, we saw no evidence of sliding that has affected the subject property. We observed indications of numerous shallow ground movements on the steep ravine slopes throughout the Denny Creek drainage corridor, including areas adjacent to the eastern and southern sides of the MacDonald property. However, this is a natural geomorphologic process that typically occurs on steep slopes in Western Washington, and is not an indication of mass instability.

Based on information provided by the current land owner, the 1991 landslide Mr. Ploudre discussed occurred at the very end of 72nd Avenue NE approximately 400 feet south of the subject property. As indicated by Mr. Ploudre that slide was caused by runoff from a failed county storm drain. This was a manmade erosional event as opposed to being caused by unstable geology. Development of the site with properly designed, constructed and maintained storm drainage facilities will actually improve this condition and reduce the risk of future erosion impacts.

The second comment was from Kathleen Redmond who resides at 12805 Holiday Drive NE. Ms. Redmond mentioned a small but significant slide occurred approximately 12 years ago behind the existing pool house on the MacDonald property. Based on information from the current property owner this slide occurred sometime before 1997. The slide debris was composed waste material from horses including wet straw and manure that was placed in a pile near the slope crest. This pile eventually slid down the ravine slope and impacted the native vegetation and trees on the ravine slope face.

We observed remnant conditions of these surficial ground movements within a natural drainage/erosional feature on the slope located east-southeast of the existing barn in the northeastern portion of the site. These include indications of soil and/or other materials being pushed over the crest of the slope, deposits of loose, organic-rich soils containing scattered wood debris and brush, and minor amounts of residential debris in the upper to mid portions of the natural drainage/erosional feature, and an accumulation of soil, wood debris, and minor residential debris, including an automobile tire, at the toe of the slope. The lobe of material at the base of the slope appears to have extended into the Denny Creek channel altering its course of flow to the east by several feet. The conditions we observed on the slope are consistent with the current property owners description of the slide discussed above.

We did not observe any indications of deep seated instability, persistent wet soil conditions, or groundwater seepage on the slope. Additionally, we did not observe indications of any recent ground movements within the natural drainage/erosional feature, where the vast majority of the native forest and understory appears to have has recovered completely. The lobe extension into Denny Creek is currently stable and there are no indications of additional erosion. Based on our observations, it is our opinion that this occurrence resulted from ill-advised human activity at the top of the steep slope, and is not related to unstable geologic conditions.

In our referenced June 26, 2015 letter, based on our geologic reconnaissance of the property and information contained in the referenced May 1, 2006 report by S&EE, we recommended maintaining a minimum buffer distance of 10 feet from the steep slope crests to mitigate potential impacts to the steep slope stability from development activity. In their review, the City of Kirkland noted the previous S&EE report recommended a 25-foot buffer setback. Also in her comment letter to the city, Ms. Redmond noted that prior to annexation King County required a 100-foot buffer from the crest of the steep slopes. We would note that in the King County Code the required buffer from a landslide hazard area or steep slope hazard area is a minimum of 50 feet if a critical area report supporting a reduced buffer is not submitted (KCC 21A.24.280 and 21A.24.310). The 100-foot distance is for the building setback that the county may impose if the landslide hazard area has a vertical rise of 200 feet.

As requested by the city, the following provides additional information and analysis supporting our recommended buffer and building setback.

Supplemental Slope Stability Evaluation

In our June 26, 2015 letter, we referenced the USGS Geologic Map of the Kirkland Quadrangle which maps the area geology and provides an indication of soil conditions underlying the property and slopes. Equally important on these map publications is evidence or signs of unstable geology with mapped landslides. Figure 1 is a portion of this referenced USGS map showing the area geology with the approximate limits of the subject site. The mapped geology on the property was confirmed by the previous soil test pits and our recent subsurface explorations to consist of glacial sediments composed primarily of dense to very dense till and till-like silty sand with gravel (Qvt) overlying advance glacial outwash (Qva). The vast majority of the soils observed in our hand-excavated test holes on the mid to lower portions of the slope face are sand consistent with Qva.

These glacial sediments originated from melt water streams and were deposited in advance of the glacier and were subsequently over-ridden by the glacial ice sheet. Consequently they are highly consolidated and exhibit high shear strength characteristics. Note that the geologic mapping shows no areas of unstable ground or evidence of historic landslide events pre 1983 the year the map was published.

Recent advances in Lidar imagery also provide valuable data in identifying unstable slope areas. Attached figure 2 is a Lidar image of the site and surrounding properties. The imagery clearly shows the ravine slopes. Lacking are morphologic characteristics used to map landslides such as head scarps, hummocky topography, convex and concave slope areas, and midslope terraces. Our visual reconnaissance of the slopes confirms the absence of these landslide features. This is also consistent with our review of historic stereographic aerial photographs of the slope areas adjacent to the site.

To confirm the deeper subsurface soil/geologic conditions we investigated subsurface conditions on the steep slopes by drilling two 50-foot deep test borings at the top of the slope in the northeastern and southeastern portions of the site using a track-mounted drill rig and by hand excavating several shallow test holes on the slope face. The boring locations are shown on Figures 3 and 4. The soils observed in the borings are glacial deposits consisting of about 13 feet of medium dense to dense, till-like silty sand with gravel overlying dense to very dense silt and fine sand and very dense fine to medium sand. The very dense fine to medium sand observed below a depth of about 28 feet in both borings is interpreted to be Vashon advance outwash. The overlying soils in Boring B-1 are interpreted to be till or till-like deposits intermediate between till and outwash. The upper approximately 18 feet in Boring B-2 are interpreted to be ice contact deposits. We did not observe soil conditions in the borings that would be indicative of instability.

We observed wet soils in Boring B-1 between depths of about 30 feet and 40.5 feet; however, we did not observe groundwater seepage or indications of persistently wet soils on the slope face below Boring B-1. We did not observe groundwater or wet soils in Boring B-2.

Detailed descriptions of the soil conditions observed in the borings are presented on the attached Boring Logs.

Stability Analysis

We performed stability analyses of the steep slope areas bordering the proposed building areas using the computer program WinStabl. The soil parameters used for our analyses are based on field data and our past experience with similar soils. These parameters are shown on the attached WinStabl output text. Analyses were performed on section lines identified as Section A-A' and Section B-B' on Figures 3 and 4, respectively, for both static and pseudostatic (seismic) conditions for the existing slope conditions.

The pseudostatic analysis used a horizontal earthquake coefficient value of 0.2g to model ground motions expected from a severe earthquake. The USGS seismic hazard maps for a seismic event having a 10 percent probability of exceedance in a 50-year period indicates the subject site is located within an area where the peak horizontal ground acceleration for this return period is expected to range between 0.25g and 0.3g. Our analysis considered a horizontal acceleration exceeding one-half the maximum value of this range. The lowest safety factors determined by our analyses are given below:

Section Analyzed	Minimum Safety Factors	
	Static	Pseudostatic
A-A'	2.24	1.37
A-A' Upper Slope	1.88	1.26
B-B'	1.74	1.17
B-B' Upper Slope	1.73	1.20

The results of the stability analyses indicate that the slope areas are stable with respect to deep-seated failure under static and pseudostatic conditions. The safety factors listed above are all higher than the minimum safety factors considered acceptable for stable slopes by local geotechnical engineering practice.

Conclusions

Based on our supplemental study and analysis the eastern and southern slopes are comprised of stable geologic conditions and only fall into a high landslide hazard category as defined by the Kirkland Municipal Code because the slope inclination is 40 percent or greater. As indicated in our referenced letter current impacts to the slope areas are due to erosion from uncontrolled runoff. In our opinion, development of the property will largely mitigate this process with design and construction of stormwater facilities that will collect, detain, and direct discharge to approved points of controlled discharge.

Based on our supplemental study, it is our opinion that along with these improved site drainage measures, a native vegetated buffer zone of ten feet from the slope crest, along with a building setback distance of ten feet from this buffer, would adequately mitigate the steep slope hazard. Vegetation in the buffer zone and on the slopes themselves should remain undisturbed.

We trust the information presented is sufficient for your current needs. If you have any questions or require additional information, please call.

Sincerely yours,
TERRA ASSOCIATES, INC.

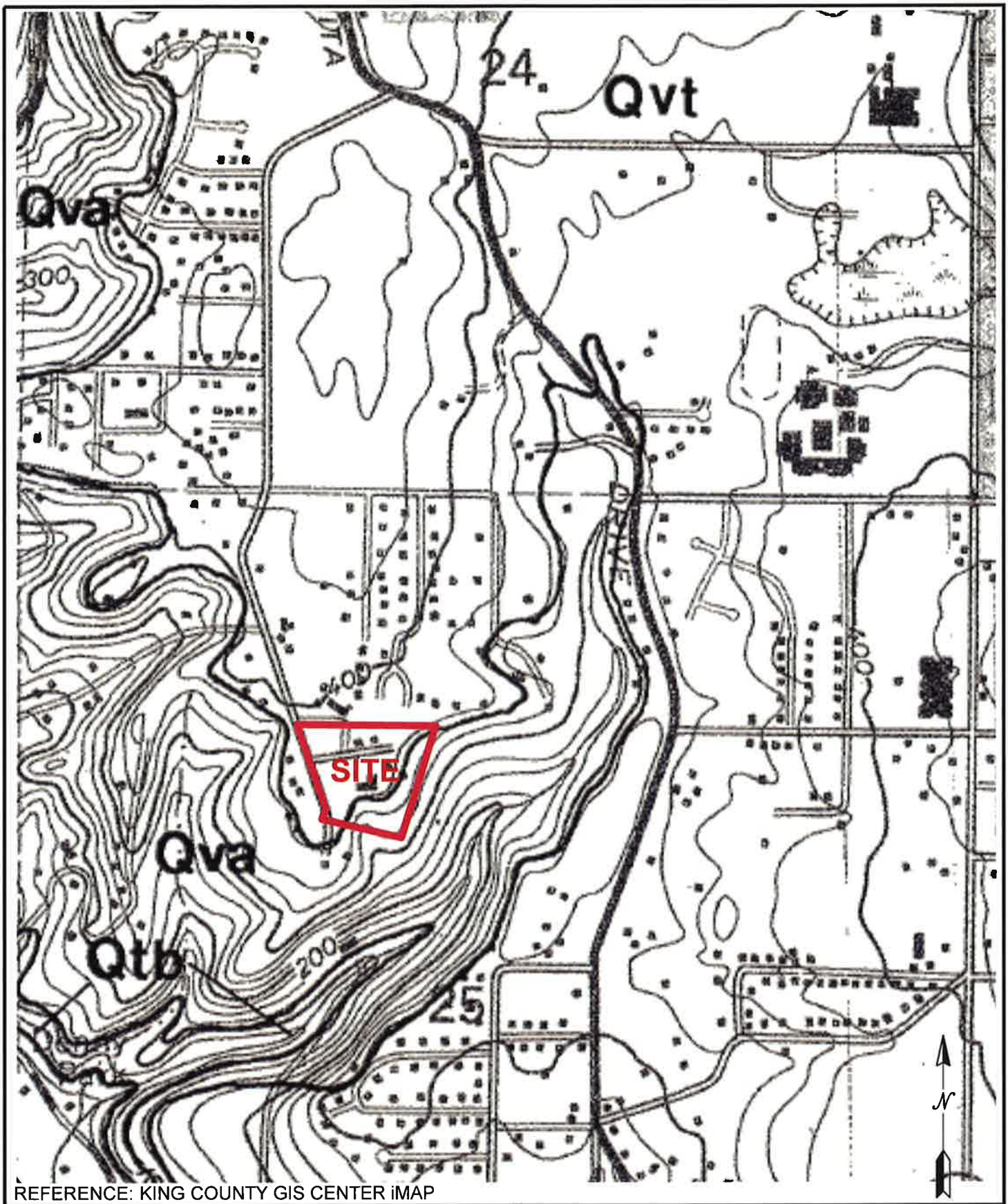
John C. Sadler, L.E.G., L.H.G.
Engineering Geologist

11-10-15

Theodore Schepper, P.E.
President

Attachments: Figure 1 – Geologic Map
Figure 2 – Site Map with Lidar Imagery
Figures 3 and 4 – Geologic Sections A-A' and B-B'
Figure 5 – Unified Soils Classification System
Figures 6 and 7 – Boring Logs
WinStabl Output Data

cc: Moira Haughian, Blueline Group



REFERENCE: KING COUNTY GIS CENTER iMAP

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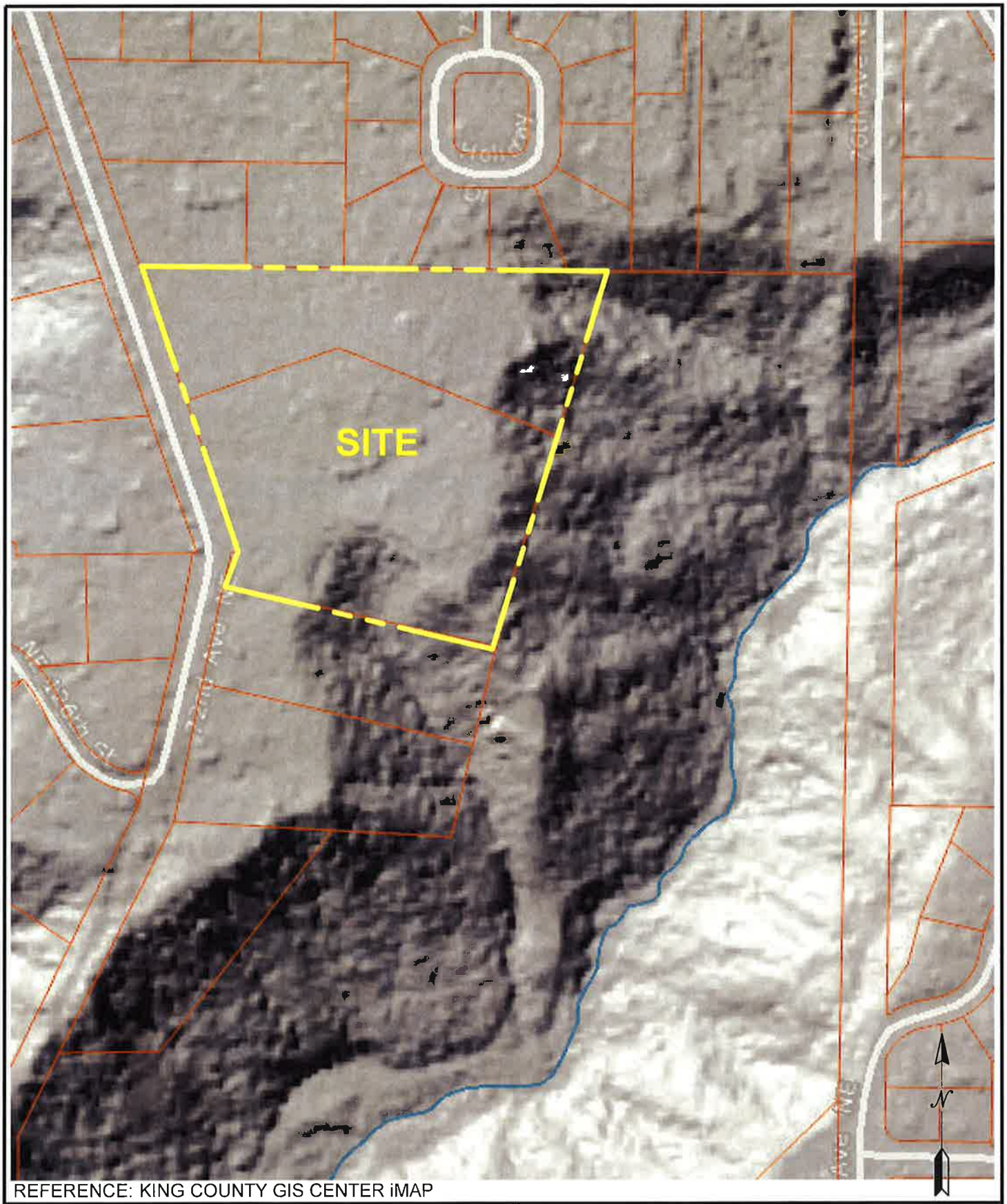
GEOLOGIC MAP
MACDONALD PLAT
KIRKLAND, WASHINGTON

Proj. No.T-7248	Date NOV 2015	Figure 1



REFERENCE: KING COUNTY GIS CENTER iMAP

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LIDAR IMAGERY
MACDONALD PLAT
KIRKLAND, WASHINGTON

Proj. No.T-7248	Date NOV 2015	Figure 2

BARN

A'

B-1

GARAGE

POOL HOUSE

SITE

HOUSE

DENNY CREEK

A

NOTE:

THIS SITE PLAN IS SCHEMATIC. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE. IT IS INTENDED FOR REFERENCE ONLY AND SHOULD NOT BE USED FOR DESIGN OR CONSTRUCTION PURPOSES.

REFERENCE:

KING COUNTY iMAP

LEGEND:

APPROXIMATE BORING LOCATION

0 60 120

APPROXIMATE SCALE IN FEET

N

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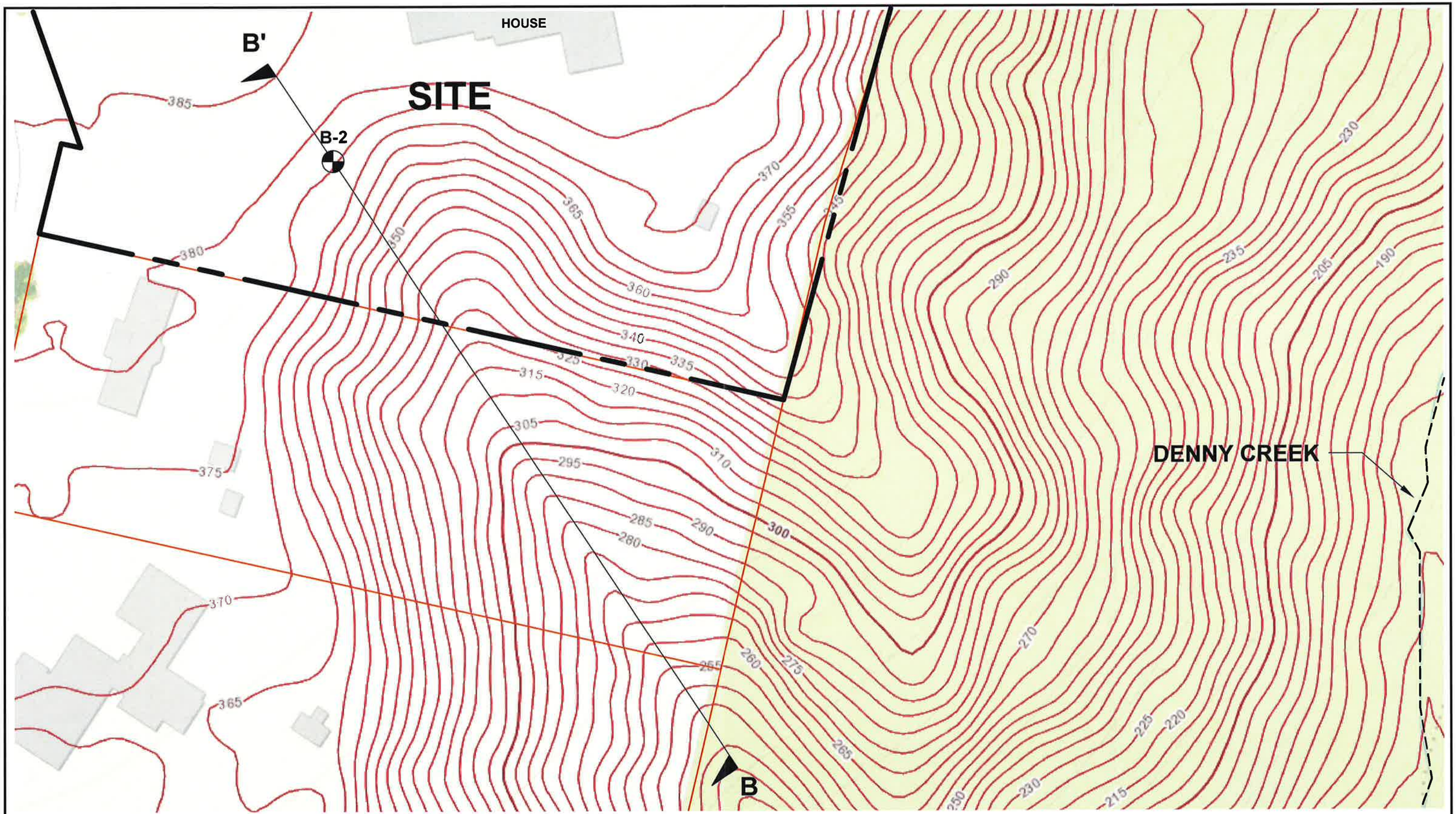
GEOLOGIC SECTION A-A'
MACDONALD PLAT
KIRKLAND, WASHINGTON

Proj. No.T-7248	Date NOV 2015	Figure 3



NOTE:

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REFERENCE:

KING COUNTY iMAP

LEGEND:

APPROXIMATE BORING LOCATION

0 50 100

APPROXIMATE SCALE IN FEET

N

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GEOLOGIC SECTION B-B'
MACDONALD PLAT
KIRKLAND, WASHINGTON

Proj. No. T-7248	Date NOV 2015	Figure 4

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS More than 50% material larger than No. 200 sieve size	**GRAVELS** More than 50% of coarse fraction is larger than No. 4 sieve	Clean Gravels (less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS More than 50% of coarse fraction is smaller than No. 4 sieve	Clean Sands (less than 5% fines)	SW	Well-graded sands, sands with gravel, little or no fines.
			SP	Poorly-graded sands, sands with gravel, little or no fines.
		Sands with fines	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS More than 50% material smaller than No. 200 sieve size	**SILTS AND CLAYS** Liquid Limit is less than 50%		ML	Inorganic silts, rock flour, clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity. (Lean clay)
			OL	Organic silts and organic clays of low plasticity.
	SILTS AND CLAYS Liquid Limit is greater than 50%		MH	Inorganic silts, elastic.
			CH	Inorganic clays of high plasticity. (Fat clay)
			OH	Organic clays of high plasticity.
HIGHLY ORGANIC SOILS			PT	Peat.

DEFINITION OF TERMS AND SYMBOLS

COHESIONLESS

Density	Standard Penetration Resistance in Blows/Foot
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	>50

COHESIVE

Consistancy	Standard Penetration Resistance in Blows/Foot
Very Soft	0-2
Soft	2-4
Medium Stiff	4-8
Stiff	8-16
Very Stiff	16-32
Hard	>32

I	2" OUTSIDE DIAMETER SPILT SPOON SAMPLER
II	2.4" INSIDE DIAMETER RING SAMPLER OR SHELBY TUBE SAMPLER
▼	WATER LEVEL (Date)
Tr	TORVANE READINGS, tsf
Pp	PENETROMETER READING, tsf
DD	DRY DENSITY, pounds per cubic foot
LL	LIQUID LIMIT, percent
PI	PLASTIC INDEX
N	STANDARD PENETRATION, blows per foot

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UNIFIED SOIL CLASSIFICATION SYSTEM
MACDONALD PLAT
KIRKLAND, WASHINGTON

Proj. No.T-7248	Date NOV 2015	Figure 5

LOG OF BORING NO. 1

Figure No. 6

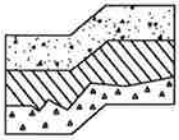
Project: MacDonald Plat **Project No:** T-7248 **Date Drilled:** October 30, 2015

Client: William Buchan Homes **Driller:** BORETEC **Logged By:** JCS

Location: Kirkland, Washington **Approx. Elev:** 389 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Pocket Penetrometer TSF / SPT (N) Blows/ft	Moisture Content % Wp |-----x-----| Wl
1–4		Gray silty SAND with gravel, moist, trace of mottling. (SM) (Weathered till)	Medium Dense	23	
5–6					
7–8					
9–10		Gray silty SAND with gravel, moist. (SM) (Till-like)	Dense	47	
11–13					
14–15		Gray-brown fine sandy SILT to silty fine SAND, moist, scattered to numerous stratified gray silt and fine sand partings and seams. (ML/SM)	Very Dense	69	
16–20					
21		- Scattered coarse sand between 21 and 21.4 feet.		84/11"	
22–25					
26–28				80/10"	
29–30		Gray-brown fine to medium SAND with gravel, wet, trace to scattered silty fine sand partings, seams, and layers. (SP) *Continued on Next Page		69	

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site.



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LOG OF BORING NO. 1

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Location: Kirkland, Washington **Approx. Elev:** 389 Feet

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Pocket Penetrometer △ TSF △ 1 2 3 4 / SPT (N) • Blows/ft • 10 20 30 40	Moisture Content % Wp |-----x-----| Wl 10 20 30 40
31–39		Gray-brown fine to medium SAND with gravel, wet, trace to scattered silty fine sand partings, seams, and layers. (SP)	Very Dense	69; 50/4"; 50/5"	
40–50		Gray-brown fine to medium SAND to fine to medium SAND with gravel, moist to wet. (SP)		74; 50/6"	
51		Boring terminated at 51 feet. Wet soils encountered below about 30 feet.			

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site.

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LOG OF BORING NO. 2

Figure No. 7

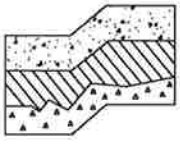
Project: MacDonald Plat **Project No:** T-7248 **Date Drilled:** October 30, 2015

Client: William Buchan Homes **Driller:** Boretec **Logged By:** JCS

Location: Kirkland, Washington **Approx. Elev:** 380

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Pocket Penetrometer △ TSF △ 1 2 3 4 / SPT (N) • Blows/ft • 10 20 30 40	Moisture Content % Wp |-----x-----| Wl 10 20 30 40
1–4					
4			Very Dense		
5				50/6"	
6		Gray-brown to gray silty SAND with gravel, moist. (SM)			
7–9					
10				37	
10–11		- Mottled. Appears reworked.			
12			Dense		
13					
14				34	
15–16		Gray-brown SILT to fine sandy SILT, moist, scattered fine sand seams and light gray silt partings, significant iron-oxide staining, appears reworked. (ML)			
17–18					
19					
20		Gray to gray-brown silty GRAVEL with sand, moist, subrounded to subangular gravel. (GM)		50/6"	
21–23					
24			Very Dense		
25		Gray-brown silty fine to medium SAND to fine to medium SAND with silt, trace of gravel, moist, grading cleaner with depth. (SM/SP-SM)		63	
26–28					
29		Gray-brown fine to medium SAND to fine to medium SAND with silt, trace to scattered gravel, moist. (SP/SP-SM)			
30		*Continued on Next Page		50/6"	

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site.



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LOG OF BORING NO. 2

Figure No. 7

Project: MacDonald Plat **Project No:** T-7248 **Date Drilled:** October 30, 2015

Client: William Buchan Homes **Driller:** Boretec **Logged By:** JCS

Location: Kirkland, Washington **Approx. Elev:** 380

Depth (ft)	Sample Interval	Soil Description	Consistency/ Relative Density	Pocket Penetrometer △ TSF △ 1 2 3 4 / SPT (N) • Blows/ft • 10 20 30 40	Moisture Content % Wp |-----x-----| Wl 10 20 30 40
31–48		Gray-brown fine to medium SAND to fine to medium SAND with silt, trace to scattered gravel, moist. (SP/SP-SM)	Very Dense	50/6" at 31; 50/4" Bouncing at 35; 90 at 40	
48–51		Gray-brown fine to coarse SAND, trace of fine gravel, moist. (SP)		50/5" at 45; 88 at 50	
52–60		Boring terminated at 51.5 feet. No groundwater or wet soils observed.			

Note: This borehole log has been prepared for geotechnical purposes. This information pertains only to this boring location and should not be interpeted as being indicative of other areas of the site.

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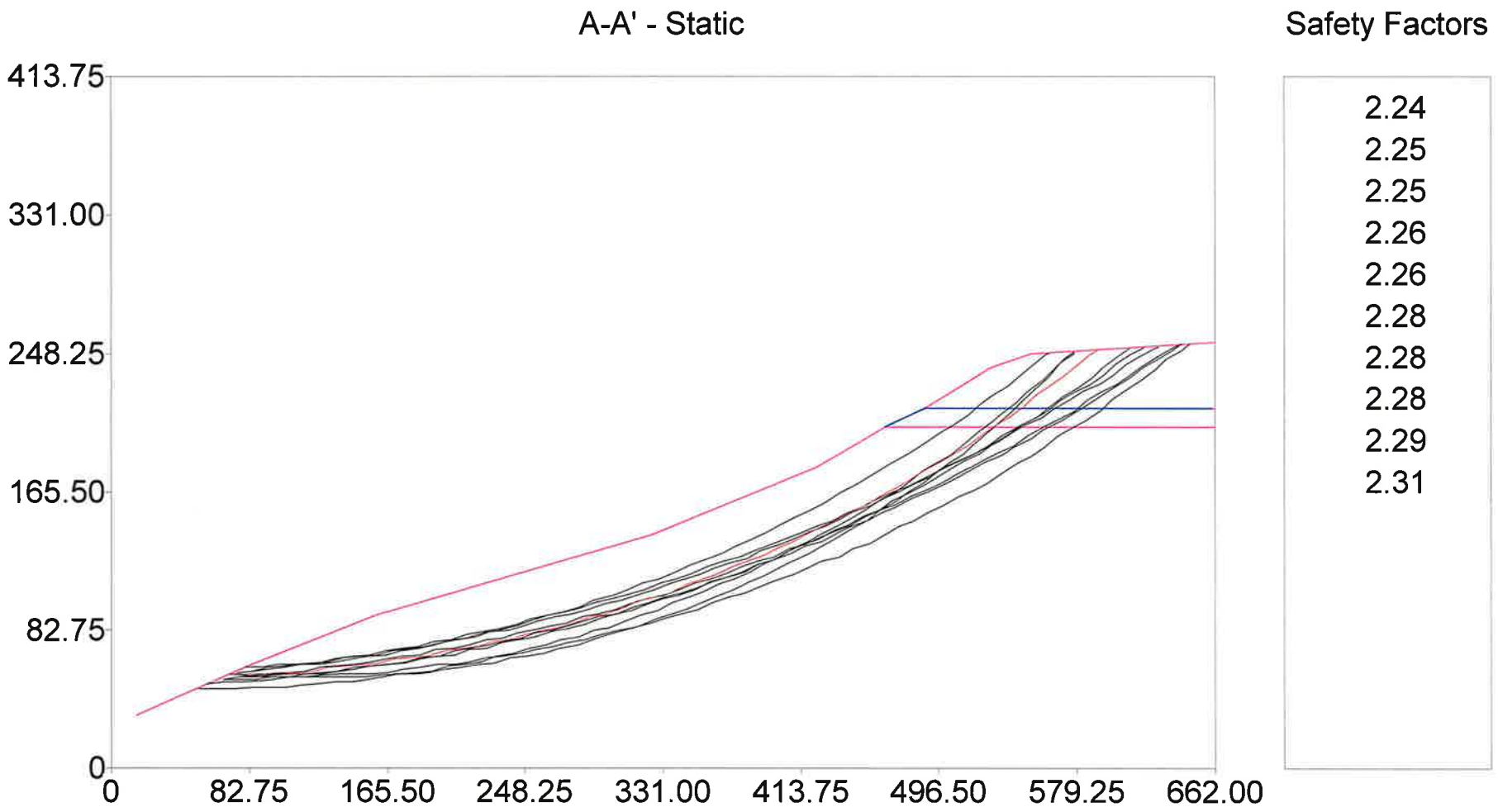

A-A' - Static
Safety Factors
413.75
331.00
248.25
165.50
82.75
0
0
82.75
165.50
248.25
331.00
413.75
496.50
579.25
662.00
2.24
2.25
2.25
2.26
2.26
2.28
2.28
2.28
2.29
2.31

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

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

PROBLEM DESCRIPTION **MacDonald Plat A-A' - Static**

BOUNDARY COORDINATES

9 Top Boundaries
11 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	16.00	32.00	80.00	60.00	3
2	80.00	60.00	160.00	92.00	3
3	160.00	92.00	324.00	140.00	3
4	324.00	140.00	424.00	180.00	3
5	424.00	180.00	464.00	204.00	3
6	464.00	204.00	488.00	216.00	2
7	488.00	216.00	528.00	240.00	1
8	528.00	240.00	552.00	248.00	1
9	552.00	248.00	662.00	256.00	1
10	488.00	216.00	662.00	216.00	2
11	464.00	204.00	662.00	204.00	3

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	500.0	40.0	0.00	0.0	0
2	125.0	135.0	100.0	38.0	0.00	0.0	1
3	125.0	125.0	100.0	38.0	0.00	0.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 3 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	464.00	204.00
2	488.00	216.00
3	660.00	216.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular 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 = 40.00 ft.
and X = 80.00 ft.

Each Surface Terminates Between X = 552.00 ft.
and X = 660.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 2.00 ft.

10.00 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 Bishop Method *
*

Failure Surface Specified By 58 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.11	56.11
2	81.10	56.49
3	91.09	56.98
4	101.07	57.59
5	111.05	58.31
6	121.01	59.15
7	130.97	60.10
8	140.91	61.17
9	150.84	62.35
10	160.76	63.64
11	170.66	65.06
12	180.54	66.58
13	190.40	68.22
14	200.25	69.97
15	210.07	71.84
16	219.88	73.82
17	229.65	75.91

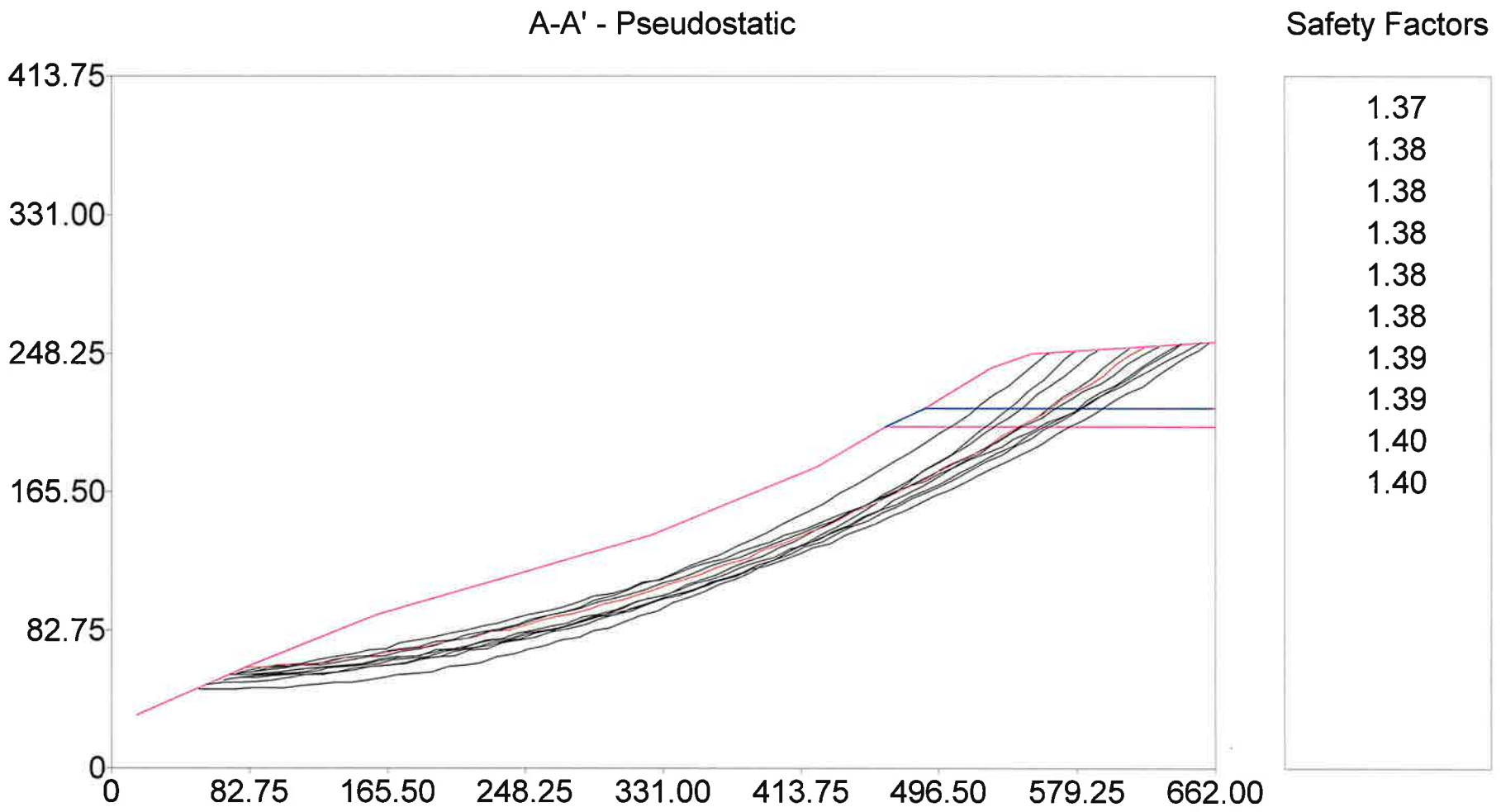
18	239.41	78.11
19	249.14	80.43
20	258.84	82.86
21	268.51	85.40
22	278.15	88.05
23	287.76	90.81
24	297.34	93.69
25	306.88	96.67
26	316.39	99.77
27	325.87	102.97
28	335.30	106.28
29	344.70	109.71
30	354.05	113.24
31	363.37	116.87
32	372.64	120.62
33	381.87	124.47
34	391.05	128.43
35	400.19	132.49
36	409.28	136.66
37	418.32	140.93
38	427.31	145.31
39	436.25	149.79
40	445.14	154.37
41	453.97	159.06
42	462.75	163.84
43	471.48	168.73
44	480.15	173.72
45	488.75	178.81
46	497.30	184.00
47	505.79	189.28
48	514.22	194.66
49	522.59	200.14
50	530.89	205.72
51	539.12	211.39
52	547.29	217.16
53	555.40	223.02
54	563.43	228.97
55	571.40	235.02
56	579.29	241.15
57	587.12	247.38
58	591.39	250.86

Circle Center At X = 43.5 ; Y = 922.4 and Radius, 866.7

*** 2.236 ***

Failure Surface Specified By 60 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	66.67	54.17
2	76.66	54.53


A-A' - Pseudostatic
Safety Factors
413.75
331.00
248.25
165.50
82.75
0
0
82.75
165.50
248.25
331.00
413.75
496.50
579.25
662.00
1.37
1.38
1.38
1.38
1.38
1.38
1.39
1.39
1.40
1.40

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

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

PROBLEM DESCRIPTION **MacDonald Plat A-A' - Pseudostatic**

BOUNDARY COORDINATES

9 Top Boundaries
11 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	16.00	32.00	80.00	60.00	3
2	80.00	60.00	160.00	92.00	3
3	160.00	92.00	324.00	140.00	3
4	324.00	140.00	424.00	180.00	3
5	424.00	180.00	464.00	204.00	3
6	464.00	204.00	488.00	216.00	2
7	488.00	216.00	528.00	240.00	1
8	528.00	240.00	552.00	248.00	1
9	552.00	248.00	662.00	256.00	1
10	488.00	216.00	662.00	216.00	2
11	464.00	204.00	662.00	204.00	3

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	500.0	40.0	0.00	0.0	0
2	125.0	135.0	100.0	38.0	0.00	0.0	1
3	125.0	125.0	100.0	38.0	0.00	0.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 3 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	464.00	204.00
2	488.00	216.00
3	660.00	216.00

A Horizontal Earthquake Loading Coefficient
Of0.200 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 psf

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular 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 = 40.00 ft.
and X = 80.00 ft.

Each Surface Terminates Between X = 552.00 ft.
and X = 660.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 2.00 ft.

10.00 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 Bishop Method * *

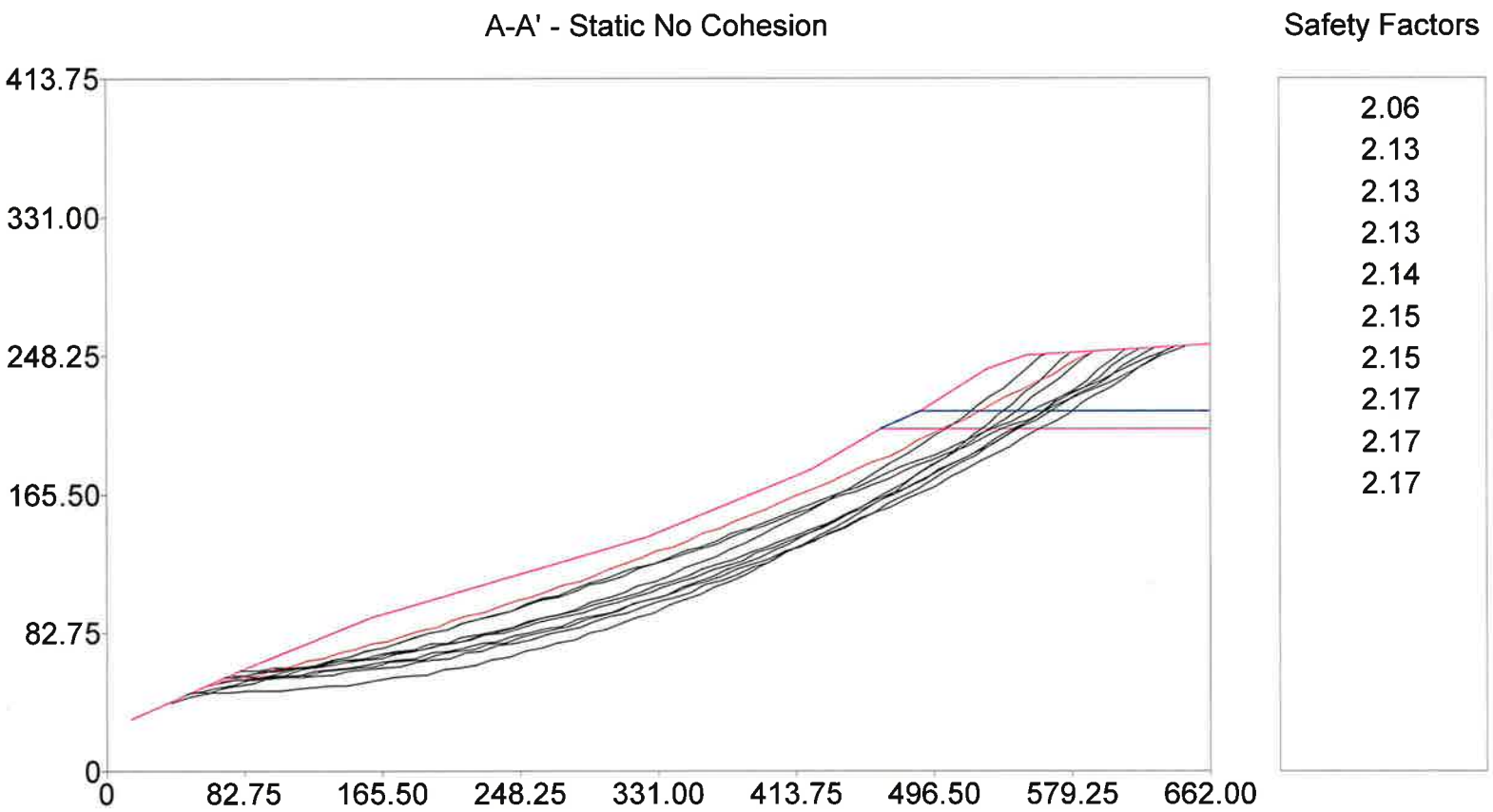
Failure Surface Specified By 60 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.00	60.00
2	89.97	60.79
3	99.93	61.68
4	109.88	62.66
5	119.82	63.73
6	129.76	64.89
7	139.68	66.14
8	149.59	67.48
9	159.48	68.92
10	169.37	70.45
11	179.23	72.07

12	189.09	73.78
13	198.92	75.58
14	208.74	77.47
15	218.54	79.46
16	228.33	81.53
17	238.09	83.70
18	247.83	85.95
19	257.55	88.29
20	267.25	90.73
21	276.93	93.25
22	286.58	95.87
23	296.21	98.57
24	305.81	101.36
25	315.39	104.24
26	324.94	107.21
27	334.46	110.27
28	343.95	113.41
29	353.41	116.65
30	362.85	119.97
31	372.25	123.37
32	381.62	126.87
33	390.95	130.45
34	400.26	134.12
35	409.53	137.87
36	418.76	141.71
37	427.96	145.63
38	437.12	149.64
39	446.24	153.73
40	455.33	157.91
41	464.37	162.17
42	473.38	166.52
43	482.35	170.95
44	491.27	175.46
45	500.16	180.05
46	508.99	184.73
47	517.79	189.48
48	526.54	194.32
49	535.25	199.24
50	543.91	204.24
51	552.52	209.32
52	561.09	214.48
53	569.61	219.71
54	578.08	225.03
55	586.50	230.43
56	594.87	235.90
57	603.19	241.45
58	611.46	247.07
59	619.67	252.78
60	619.90	252.94

Circle Center At X = -0.7 ; Y = 1137.8 and Radius, 1080.8

*** 1.374 ***


A-A' - Static No Cohesion
Safety Factors
413.75
331.00
248.25
165.50
82.75
0
0
82.75
165.50
248.25
331.00
413.75
496.50
579.25
662.00
2.06
2.13
2.13
2.13
2.14
2.15
2.15
2.17
2.17
2.17

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

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

PROBLEM DESCRIPTION **MacDonald Plat**
A-A' - Static No Cohesion

BOUNDARY COORDINATES

9 Top Boundaries
11 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	16.00	32.00	80.00	60.00	3
2	80.00	60.00	160.00	92.00	3
3	160.00	92.00	324.00	140.00	3
4	324.00	140.00	424.00	180.00	3
5	424.00	180.00	464.00	204.00	3
6	464.00	204.00	488.00	216.00	2
7	488.00	216.00	528.00	240.00	1
8	528.00	240.00	552.00	248.00	1
9	552.00	248.00	662.00	256.00	1
10	488.00	216.00	662.00	216.00	2
11	464.00	204.00	662.00	204.00	3

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	0.0	40.0	0.00	0.0	0
2	125.0	135.0	0.0	38.0	0.00	0.0	1
3	125.0	125.0	0.0	38.0	0.00	0.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 3 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	464.00	204.00
2	488.00	216.00
3	660.00	216.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular 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 = 40.00 ft.
and X = 80.00 ft.

Each Surface Terminates Between X = 552.00 ft.
and X = 660.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 2.00 ft.

10.00 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 Bishop Method * *

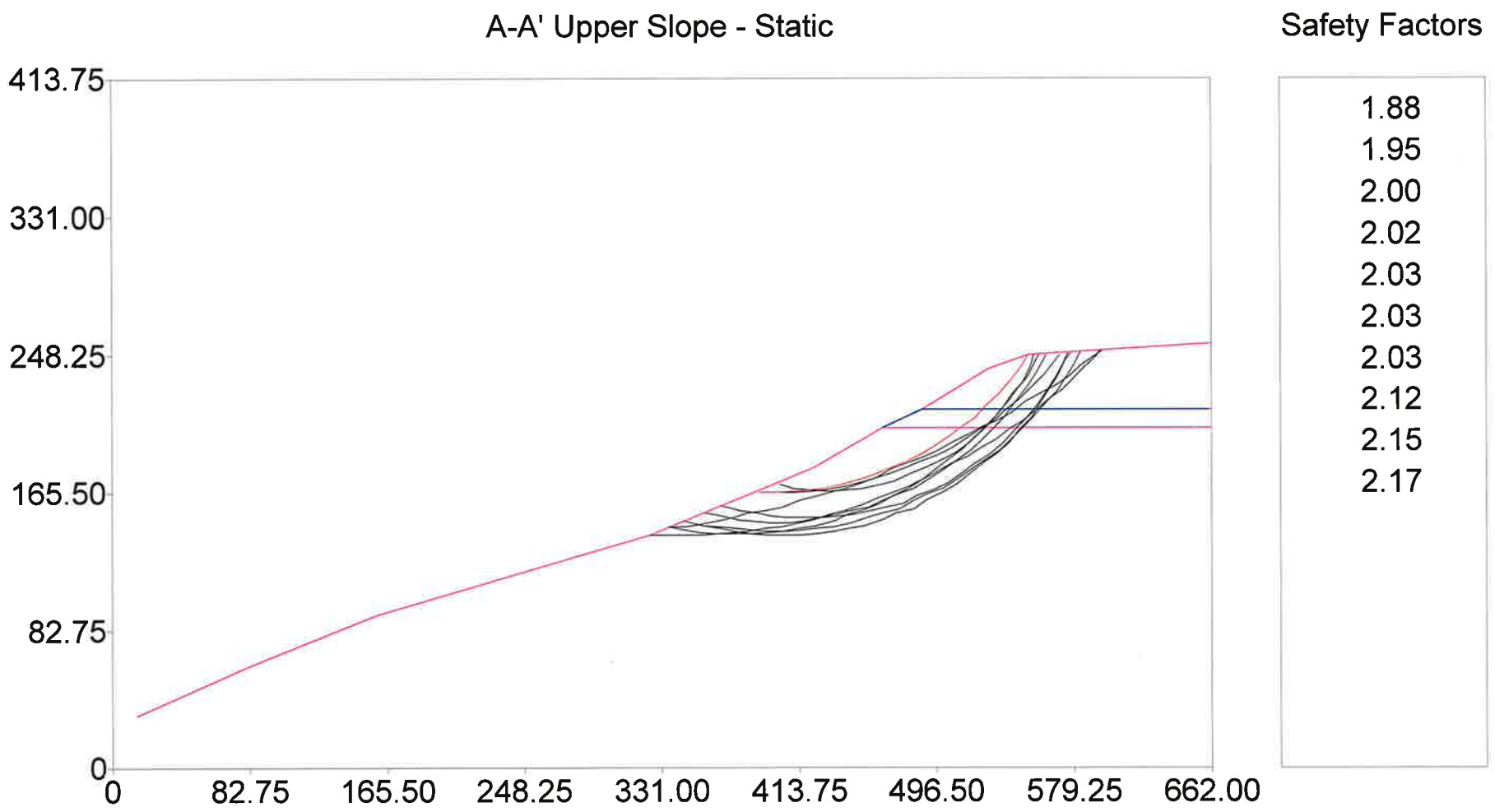
Failure Surface Specified By 58 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.22	52.22
2	71.98	54.39
3	81.73	56.61
4	91.47	58.88
5	101.20	61.20
6	110.92	63.56
7	120.62	65.98
8	130.31	68.44
9	139.99	70.95
10	149.66	73.52
11	159.31	76.13
12	168.95	78.78

13	178.58	81.49
14	188.19	84.25
15	197.79	87.05
16	207.38	89.90
17	216.95	92.80
18	226.50	95.75
19	236.04	98.74
20	245.57	101.79
21	255.08	104.88
22	264.57	108.02
23	274.05	111.21
24	283.51	114.44
25	292.96	117.72
26	302.39	121.05
27	311.80	124.43
28	321.20	127.85
29	330.58	131.32
30	339.94	134.84
31	349.28	138.41
32	358.60	142.02
33	367.91	145.68
34	377.20	149.39
35	386.47	153.14
36	395.72	156.94
37	404.95	160.78
38	414.16	164.68
39	423.35	168.62
40	432.52	172.60
41	441.68	176.63
42	450.81	180.71
43	459.92	184.83
44	469.01	189.00
45	478.08	193.21
46	487.12	197.47
47	496.15	201.78
48	505.15	206.13
49	514.14	210.52
50	523.10	214.96
51	532.03	219.45
52	540.95	223.98
53	549.84	228.55
54	558.71	233.17
55	567.55	237.84
56	576.38	242.55
57	585.17	247.30
58	591.74	250.89

Circle Center At X = -364.5 ; Y = 1994.6 and Radius, 1988.7

*** 2.063 ***


A-A' Upper Slope - Static
Safety Factors
1.88
1.95
2.00
2.02
2.03
2.03
2.03
2.12
2.15
2.17
413.75
331.00
248.25
165.50
82.75
0
0
82.75
165.50
248.25
331.00
413.75
496.50
579.25
662.00

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

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

PROBLEM DESCRIPTION **MacDonald Plat A-A' Upper Slope - Static**

BOUNDARY COORDINATES

9 Top Boundaries
11 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	16.00	32.00	80.00	60.00	3
2	80.00	60.00	160.00	92.00	3
3	160.00	92.00	324.00	140.00	3
4	324.00	140.00	424.00	180.00	3
5	424.00	180.00	464.00	204.00	3
6	464.00	204.00	488.00	216.00	2
7	488.00	216.00	528.00	240.00	1
8	528.00	240.00	552.00	248.00	1
9	552.00	248.00	662.00	256.00	1
10	488.00	216.00	662.00	216.00	2
11	464.00	204.00	662.00	204.00	3

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	500.0	40.0	0.00	0.0	0
2	125.0	135.0	100.0	38.0	0.00	0.0	1
3	125.0	125.0	100.0	38.0	0.00	0.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 3 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	464.00	204.00
2	488.00	216.00
3	660.00	216.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular 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 = 324.00 ft.
and X = 424.00 ft.

Each Surface Terminates Between X = 552.00 ft.
and X = 660.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 2.00 ft.

10.00 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 Bishop Method * *

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.67	166.67
2	400.67	166.49
3	410.66	166.84
4	420.62	167.74
5	430.52	169.16
6	440.32	171.12
7	450.01	173.59
8	459.55	176.59
9	468.92	180.09
10	478.09	184.09
11	487.02	188.57
12	495.71	193.53
13	504.11	198.95
14	512.22	204.81
15	519.99	211.09

16	527.42	217.79
17	534.48	224.87
18	541.15	232.32
19	547.41	240.12
20	553.12	248.08

Circle Center At X = 399.0 ; Y = 352.8 and Radius, 186.3

*** 1.876 ***

Failure Surface Specified By 22 Coordinate Points

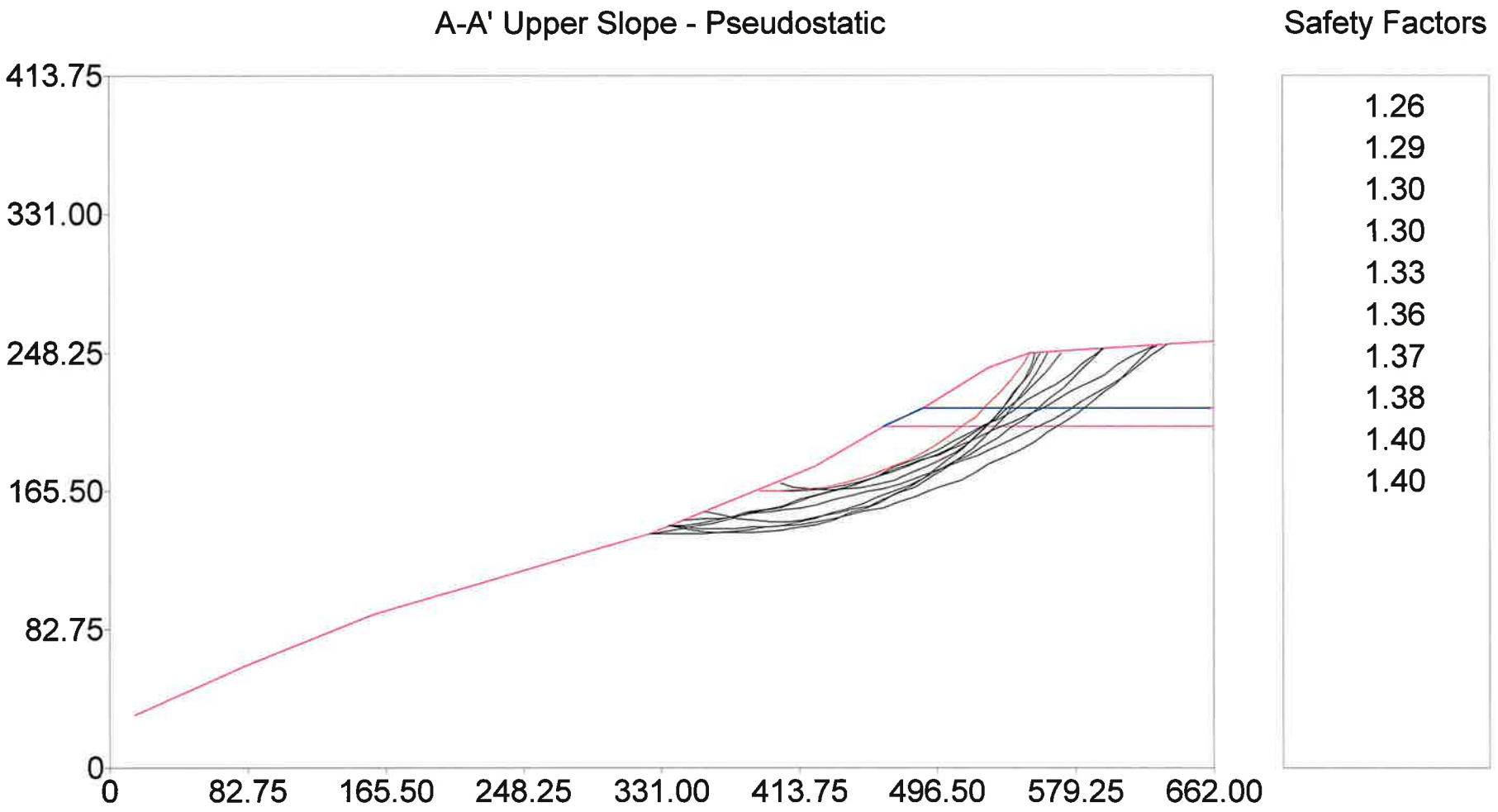
Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.67	166.67
2	400.66	166.36
3	410.66	166.52
4	420.64	167.14
5	430.58	168.23
6	440.46	169.78
7	450.26	171.78
8	459.95	174.24
9	469.52	177.15
10	478.94	180.51
11	488.19	184.29
12	497.26	188.51
13	506.13	193.14
14	514.76	198.18
15	523.16	203.61
16	531.29	209.44
17	539.14	215.63
18	546.69	222.18
19	553.93	229.08
20	560.85	236.31
21	567.41	243.85
22	571.85	249.44

Circle Center At X = 402.3 ; Y = 381.0 and Radius, 214.7

*** 1.951 ***

Failure Surface Specified By 28 Coordinate Points

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


A-A' Upper Slope - Pseudostatic
Safety Factors
1.26
1.29
1.30
1.30
1.33
1.36
1.37
1.38
1.40
1.40
413.75
331.00
248.25
165.50
82.75
0
0
82.75
165.50
248.25
331.00
413.75
496.50
579.25
662.00

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

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

PROBLEM DESCRIPTION **MacDonald Plat**
A-A' Upper Slope - Pseudostatic

BOUNDARY COORDINATES

9 Top Boundaries
11 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	16.00	32.00	80.00	60.00	3
2	80.00	60.00	160.00	92.00	3
3	160.00	92.00	324.00	140.00	3
4	324.00	140.00	424.00	180.00	3
5	424.00	180.00	464.00	204.00	3
6	464.00	204.00	488.00	216.00	2
7	488.00	216.00	528.00	240.00	1
8	528.00	240.00	552.00	248.00	1
9	552.00	248.00	662.00	256.00	1
10	488.00	216.00	662.00	216.00	2
11	464.00	204.00	662.00	204.00	3

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	500.0	40.0	0.00	0.0	0
2	125.0	135.0	100.0	38.0	0.00	0.0	1
3	125.0	125.0	100.0	38.0	0.00	0.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 3 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	464.00	204.00
2	488.00	216.00
3	660.00	216.00

A Horizontal Earthquake Loading Coefficient
Of0.200 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 psf

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular 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 = 324.00 ft.
and X = 424.00 ft.

Each Surface Terminates Between X = 552.00 ft.
and X = 660.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 2.00 ft.

10.00 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 Bishop Method * *

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.67	166.67
2	400.67	166.49
3	410.66	166.84
4	420.62	167.74
5	430.52	169.16
6	440.32	171.12
7	450.01	173.59

8	459.55	176.59
9	468.92	180.09
10	478.09	184.09
11	487.02	188.57
12	495.71	193.53
13	504.11	198.95
14	512.22	204.81
15	519.99	211.09
16	527.42	217.79
17	534.48	224.87
18	541.15	232.32
19	547.41	240.12
20	553.12	248.08

Circle Center At X = 399.0 ; Y = 352.8 and Radius, 186.3

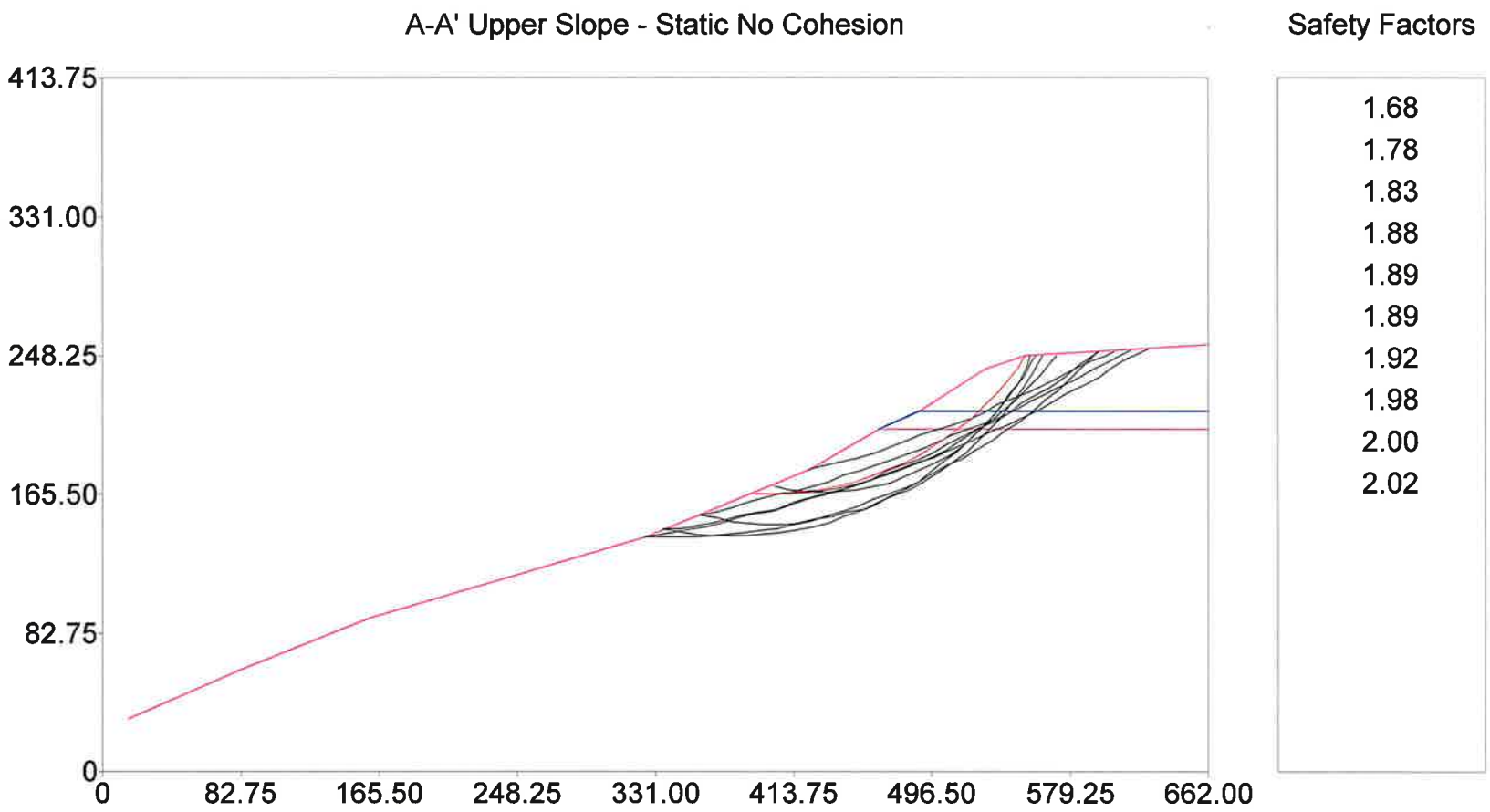
*** 1.260 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.67	166.67
2	400.66	166.36
3	410.66	166.52
4	420.64	167.14
5	430.58	168.23
6	440.46	169.78
7	450.26	171.78
8	459.95	174.24
9	469.52	177.15
10	478.94	180.51
11	488.19	184.29
12	497.26	188.51
13	506.13	193.14
14	514.76	198.18
15	523.16	203.61
16	531.29	209.44
17	539.14	215.63
18	546.69	222.18
19	553.93	229.08
20	560.85	236.31
21	567.41	243.85
22	571.85	249.44

Circle Center At X = 402.3 ; Y = 381.0 and Radius, 214.7

*** 1.292 ***


A-A' Upper Slope - Static No Cohesion
Safety Factors
1.68
1.78
1.83
1.88
1.89
1.89
1.92
1.98
2.00
2.02
413.75
331.00
248.25
165.50
82.75
0
0
82.75
165.50
248.25
331.00
413.75
496.50
579.25
662.00

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

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

PROBLEM DESCRIPTION **MacDonald Plat**
A-A' Upper Slope - Static No Cohesion

BOUNDARY COORDINATES

9 Top Boundaries
11 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	16.00	32.00	80.00	60.00	3
2	80.00	60.00	160.00	92.00	3
3	160.00	92.00	324.00	140.00	3
4	324.00	140.00	424.00	180.00	3
5	424.00	180.00	464.00	204.00	3
6	464.00	204.00	488.00	216.00	2
7	488.00	216.00	528.00	240.00	1
8	528.00	240.00	552.00	248.00	1
9	552.00	248.00	662.00	256.00	1
10	488.00	216.00	662.00	216.00	2
11	464.00	204.00	662.00	204.00	3

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	0.0	40.0	0.00	0.0	0
2	125.0	135.0	0.0	38.0	0.00	0.0	1
3	125.0	125.0	0.0	38.0	0.00	0.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 3 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	464.00	204.00
2	488.00	216.00
3	660.00	216.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular 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 = 324.00 ft.
and X = 424.00 ft.

Each Surface Terminates Between X = 552.00 ft.
and X = 660.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 2.00 ft.

10.00 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 Bishop Method * *

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.67	166.67
2	400.67	166.49
3	410.66	166.84
4	420.62	167.74
5	430.52	169.16
6	440.32	171.12
7	450.01	173.59
8	459.55	176.59
9	468.92	180.09
10	478.09	184.09
11	487.02	188.57
12	495.71	193.53
13	504.11	198.95

14	512.22	204.81
15	519.99	211.09
16	527.42	217.79
17	534.48	224.87
18	541.15	232.32
19	547.41	240.12
20	553.12	248.08

Circle Center At X = 399.0 ; Y = 352.8 and Radius, 186.3

*** 1.679 ***

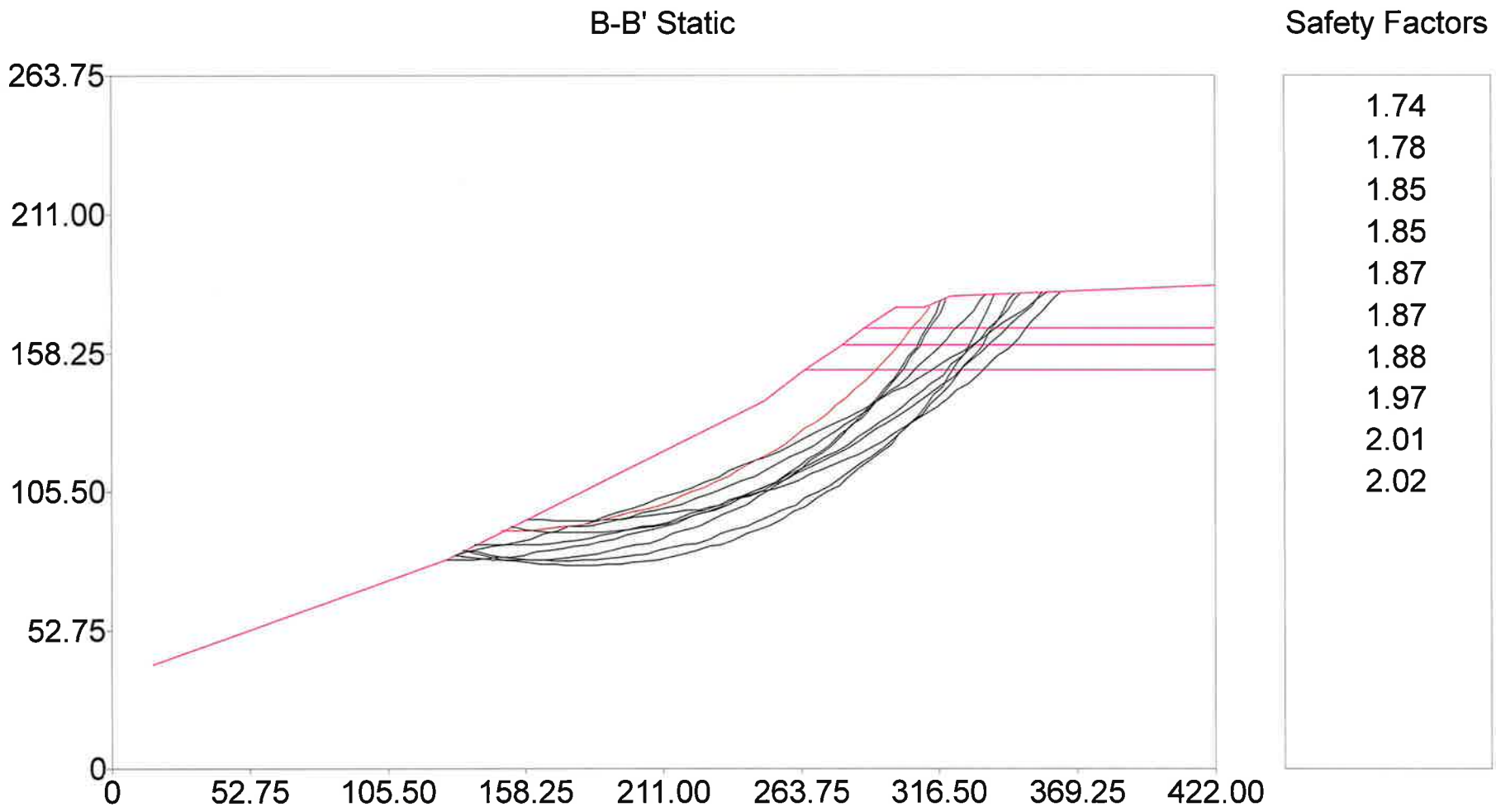
Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.67	166.67
2	400.66	166.36
3	410.66	166.52
4	420.64	167.14
5	430.58	168.23
6	440.46	169.78
7	450.26	171.78
8	459.95	174.24
9	469.52	177.15
10	478.94	180.51
11	488.19	184.29
12	497.26	188.51
13	506.13	193.14
14	514.76	198.18
15	523.16	203.61
16	531.29	209.44
17	539.14	215.63
18	546.69	222.18
19	553.93	229.08
20	560.85	236.31
21	567.41	243.85
22	571.85	249.44

Circle Center At X = 402.3 ; Y = 381.0 and Radius, 214.7

*** 1.780 ***

Failure Surface Specified By 30 Coordinate Points


B-B' Static
Safety Factors
263.75
211.00
158.25
105.50
52.75
0
0
52.75
105.50
158.25
211.00
263.75
316.50
369.25
422.00
1.74
1.78
1.85
1.85
1.87
1.87
1.88
1.97
2.01
2.02

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

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

PROBLEM DESCRIPTION **MacDonald Plat B-B' Static**

BOUNDARY COORDINATES

9 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	16.00	40.00	128.00	80.00	4
2	128.00	80.00	250.00	140.00	4
3	250.00	140.00	266.00	152.00	4
4	266.00	152.00	280.00	162.00	3
5	280.00	162.00	288.00	168.00	2
6	288.00	168.00	300.00	176.00	1
7	300.00	176.00	312.00	176.00	1
8	312.00	176.00	322.00	180.00	1
9	322.00	180.00	422.00	184.00	1
10	288.00	168.00	422.00	168.00	2
11	280.00	162.00	422.00	162.00	3
12	266.00	152.00	422.00	152.00	4

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	500.0	36.0	0.00	0.0	0
2	120.0	120.0	500.0	36.0	0.00	0.0	0
3	130.0	130.0	200.0	38.0	0.00	0.0	0
4	125.0	125.0	100.0	38.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular 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 = 128.00 ft.
and X = 160.00 ft.

Each Surface Terminates Between X = 312.00 ft.
and X = 422.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 20.00 ft.

5.00 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 Bishop Method * *

Failure Surface Specified By 40 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	149.33	90.49
2	154.33	90.67
3	159.32	90.98
4	164.30	91.40
5	169.27	91.94
6	174.23	92.59
7	179.17	93.37
8	184.09	94.26
9	188.99	95.27
10	193.86	96.40
11	198.70	97.65
12	203.51	99.00
13	208.29	100.48
14	213.03	102.06
15	217.73	103.76
16	222.39	105.57
17	227.01	107.50
18	231.58	109.53
19	236.10	111.67
20	240.56	113.92
21	244.98	116.27
22	249.33	118.73
23	253.62	121.29
24	257.86	123.95
25	262.02	126.72
26	266.12	129.58
27	270.15	132.54
28	274.11	135.59

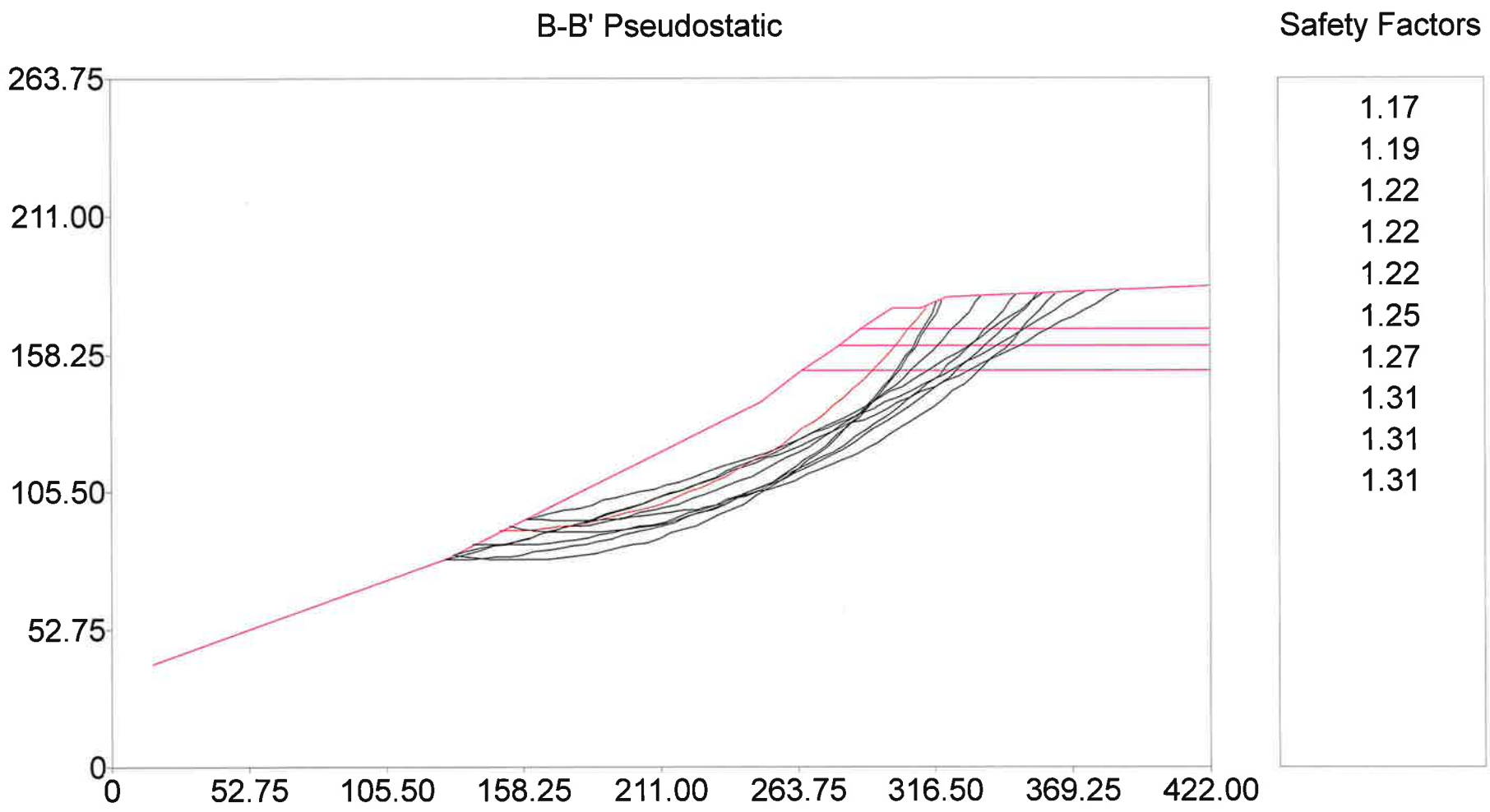
29	278.00	138.74
30	281.80	141.98
31	285.53	145.31
32	289.18	148.73
33	292.75	152.23
34	296.23	155.82
35	299.63	159.49
36	302.93	163.24
37	306.15	167.07
38	309.28	170.97
39	312.31	174.95
40	313.50	176.60

Circle Center At X = 144.2 ; Y = 299.9 and Radius, 209.4

*** 1.735 ***

Failure Surface Specified By 44 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	149.33	90.49
2	154.33	90.61
3	159.33	90.82
4	164.32	91.14
5	169.30	91.57
6	174.27	92.09
7	179.23	92.72
8	184.18	93.45
9	189.11	94.28
10	194.02	95.22
11	198.91	96.26
12	203.78	97.39
13	208.63	98.63
14	213.44	99.97
15	218.23	101.40
16	222.99	102.94
17	227.72	104.57
18	232.41	106.30
19	237.06	108.13
20	241.68	110.05
21	246.25	112.07
22	250.78	114.18
23	255.27	116.39
24	259.71	118.69
25	264.10	121.08
26	268.45	123.55
27	272.74	126.12
28	276.97	128.78


B-B' Pseudostatic
Safety Factors
263.75
211.00
158.25
105.50
52.75
0
0
52.75
105.50
158.25
211.00
263.75
316.50
369.25
422.00
1.17
1.19
1.22
1.22
1.22
1.25
1.27
1.31
1.31
1.31

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

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

PROBLEM DESCRIPTION **MacDonald Plat B-B' Pseudostatic**

BOUNDARY COORDINATES

9 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	16.00	40.00	128.00	80.00	4
2	128.00	80.00	250.00	140.00	4
3	250.00	140.00	266.00	152.00	4
4	266.00	152.00	280.00	162.00	3
5	280.00	162.00	288.00	168.00	2
6	288.00	168.00	300.00	176.00	1
7	300.00	176.00	312.00	176.00	1
8	312.00	176.00	322.00	180.00	1
9	322.00	180.00	422.00	184.00	1
10	288.00	168.00	422.00	168.00	2
11	280.00	162.00	422.00	162.00	3
12	266.00	152.00	422.00	152.00	4

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	500.0	36.0	0.00	0.0	0
2	120.0	120.0	500.0	36.0	0.00	0.0	0
3	130.0	130.0	200.0	38.0	0.00	0.0	0
4	125.0	125.0	100.0	38.0	0.00	0.0	0

A Horizontal Earthquake Loading Coefficient
Of0.200 Has Been Assigned

A Vertical Earthquake Loading Coefficient

Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 psf

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular 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 = 128.00 ft.
and X = 160.00 ft.

Each Surface Terminates Between X = 312.00 ft.
and X = 422.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 20.00 ft.

5.00 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 Bishop Method * *

Failure Surface Specified By 40 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	149.33	90.49
2	154.33	90.67
3	159.32	90.98
4	164.30	91.40
5	169.27	91.94
6	174.23	92.59
7	179.17	93.37
8	184.09	94.26
9	188.99	95.27
10	193.86	96.40
11	198.70	97.65
12	203.51	99.00
13	208.29	100.48
14	213.03	102.06
15	217.73	103.76
16	222.39	105.57
17	227.01	107.50
18	231.58	109.53
19	236.10	111.67

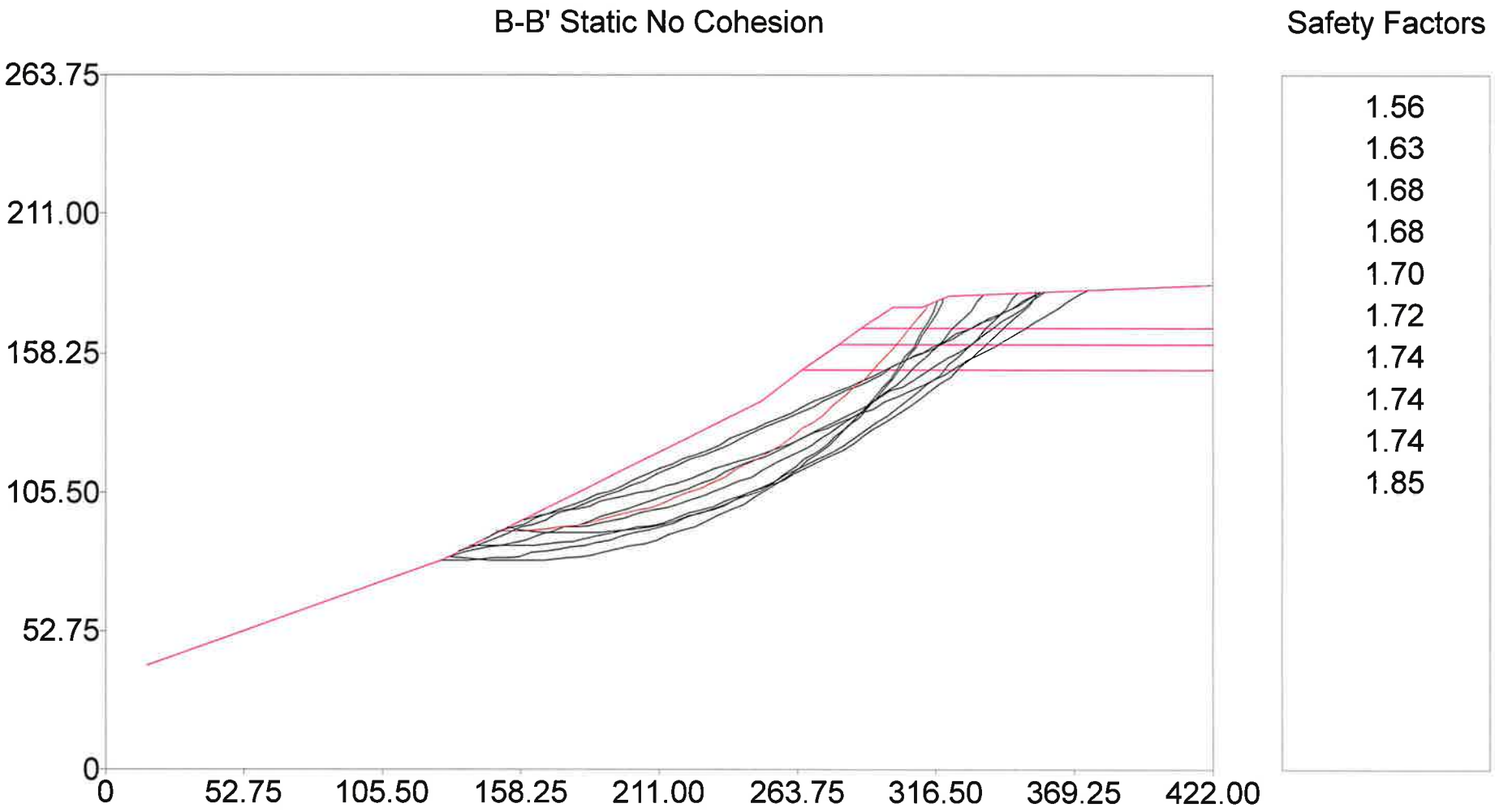
20	240.56	113.92
21	244.98	116.27
22	249.33	118.73
23	253.62	121.29
24	257.86	123.95
25	262.02	126.72
26	266.12	129.58
27	270.15	132.54
28	274.11	135.59
29	278.00	138.74
30	281.80	141.98
31	285.53	145.31
32	289.18	148.73
33	292.75	152.23
34	296.23	155.82
35	299.63	159.49
36	302.93	163.24
37	306.15	167.07
38	309.28	170.97
39	312.31	174.95
40	313.50	176.60

Circle Center At X = 144.2 ; Y = 299.9 and Radius, 209.4

*** 1.169 ***

Failure Surface Specified By 44 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	149.33	90.49
2	154.33	90.61
3	159.33	90.82
4	164.32	91.14
5	169.30	91.57
6	174.27	92.09
7	179.23	92.72
8	184.18	93.45
9	189.11	94.28
10	194.02	95.22
11	198.91	96.26
12	203.78	97.39
13	208.63	98.63
14	213.44	99.97
15	218.23	101.40
16	222.99	102.94
17	227.72	104.57
18	232.41	106.30
19	237.06	108.13


B-B' Static No Cohesion
Safety Factors
1.56
1.63
1.68
1.68
1.70
1.72
1.74
1.74
1.74
1.85
263.75
211.00
158.25
105.50
52.75
0
0
52.75
105.50
158.25
211.00
263.75
316.50
369.25
422.00

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

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

PROBLEM DESCRIPTION **MacDonald Plat B-B' Static No Cohesion**

BOUNDARY COORDINATES

9 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	16.00	40.00	128.00	80.00	4
2	128.00	80.00	250.00	140.00	4
3	250.00	140.00	266.00	152.00	4
4	266.00	152.00	280.00	162.00	3
5	280.00	162.00	288.00	168.00	2
6	288.00	168.00	300.00	176.00	1
7	300.00	176.00	312.00	176.00	1
8	312.00	176.00	322.00	180.00	1
9	322.00	180.00	422.00	184.00	1
10	288.00	168.00	422.00	168.00	2
11	280.00	162.00	422.00	162.00	3
12	266.00	152.00	422.00	152.00	4

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	0.0	36.0	0.00	0.0	0
2	120.0	120.0	0.0	36.0	0.00	0.0	0
3	130.0	130.0	0.0	38.0	0.00	0.0	0
4	125.0	125.0	0.0	38.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular 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 = 128.00 ft.
and X = 160.00 ft.

Each Surface Terminates Between X = 312.00 ft.
and X = 422.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 20.00 ft.

5.00 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 Bishop Method * *

Failure Surface Specified By 40 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	149.33	90.49
2	154.33	90.67
3	159.32	90.98
4	164.30	91.40
5	169.27	91.94
6	174.23	92.59
7	179.17	93.37
8	184.09	94.26
9	188.99	95.27
10	193.86	96.40
11	198.70	97.65
12	203.51	99.00
13	208.29	100.48
14	213.03	102.06
15	217.73	103.76
16	222.39	105.57
17	227.01	107.50
18	231.58	109.53
19	236.10	111.67
20	240.56	113.92
21	244.98	116.27
22	249.33	118.73
23	253.62	121.29
24	257.86	123.95
25	262.02	126.72
26	266.12	129.58

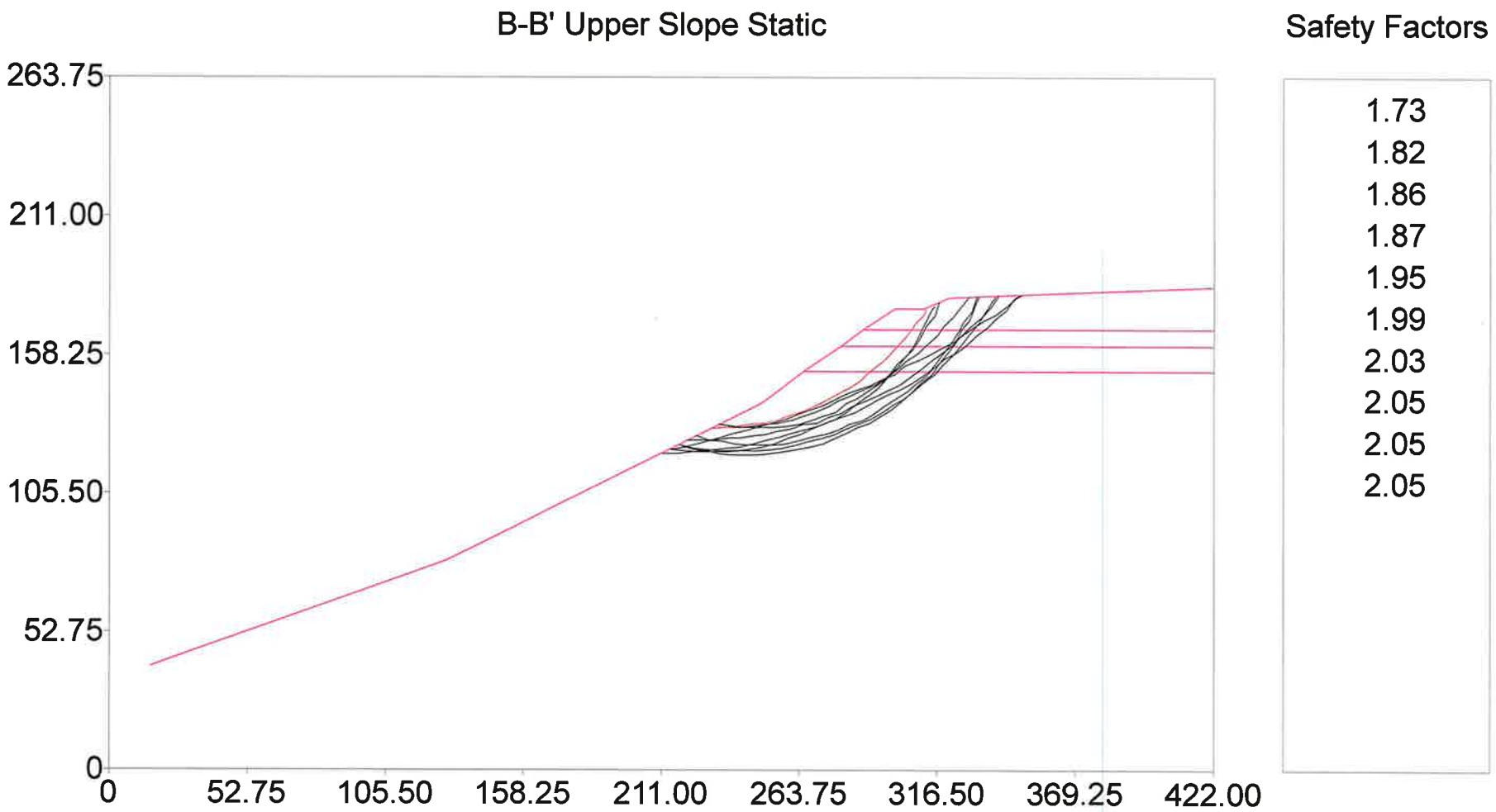
27	270.15	132.54
28	274.11	135.59
29	278.00	138.74
30	281.80	141.98
31	285.53	145.31
32	289.18	148.73
33	292.75	152.23
34	296.23	155.82
35	299.63	159.49
36	302.93	163.24
37	306.15	167.07
38	309.28	170.97
39	312.31	174.95
40	313.50	176.60

Circle Center At X = 144.2 ; Y = 299.9 and Radius, 209.4

*** 1.562 ***

Failure Surface Specified By 44 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	149.33	90.49
2	154.33	90.61
3	159.33	90.82
4	164.32	91.14
5	169.30	91.57
6	174.27	92.09
7	179.23	92.72
8	184.18	93.45
9	189.11	94.28
10	194.02	95.22
11	198.91	96.26
12	203.78	97.39
13	208.63	98.63
14	213.44	99.97
15	218.23	101.40
16	222.99	102.94
17	227.72	104.57
18	232.41	106.30
19	237.06	108.13
20	241.68	110.05
21	246.25	112.07
22	250.78	114.18
23	255.27	116.39
24	259.71	118.69
25	264.10	121.08
26	268.45	123.55


B-B' Upper Slope Static
Safety Factors
1.73
1.82
1.86
1.87
1.95
1.99
2.03
2.05
2.05
2.05
263.75
211.00
158.25
105.50
52.75
0
0
52.75
105.50
158.25
211.00
263.75
316.50
369.25
422.00

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

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

PROBLEM DESCRIPTION **MacDonald Plat B-B' Upper Slope Static**

BOUNDARY COORDINATES

9 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	16.00	40.00	128.00	80.00	4
2	128.00	80.00	250.00	140.00	4
3	250.00	140.00	266.00	152.00	4
4	266.00	152.00	280.00	162.00	3
5	280.00	162.00	288.00	168.00	2
6	288.00	168.00	300.00	176.00	1
7	300.00	176.00	312.00	176.00	1
8	312.00	176.00	322.00	180.00	1
9	322.00	180.00	422.00	184.00	1
10	288.00	168.00	422.00	168.00	2
11	280.00	162.00	422.00	162.00	3
12	266.00	152.00	422.00	152.00	4

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	500.0	36.0	0.00	0.0	0
2	120.0	120.0	500.0	36.0	0.00	0.0	0
3	130.0	130.0	200.0	38.0	0.00	0.0	0
4	125.0	125.0	100.0	38.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular 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 = 212.00 ft.
and X = 240.00 ft.

Each Surface Terminates Between X = 312.00 ft.
and X = 422.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 20.00 ft.

5.00 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 Bishop Method
* *

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	230.67	130.49
2	235.66	130.67
3	240.64	131.11
4	245.60	131.80
5	250.51	132.73
6	255.37	133.92
7	260.16	135.34
8	264.87	137.01
9	269.49	138.92
10	274.01	141.06
11	278.42	143.42
12	282.70	146.00
13	286.85	148.80
14	290.85	151.80
15	294.69	155.00
16	298.36	158.39
17	301.86	161.97
18	305.17	165.71
19	308.29	169.62
20	311.20	173.68
21	312.94	176.38

Circle Center At X = 229.6 ; Y = 229.2 and Radius, 98.7

*** 1.725 ***

Failure Surface Specified By 26 Coordinate Points

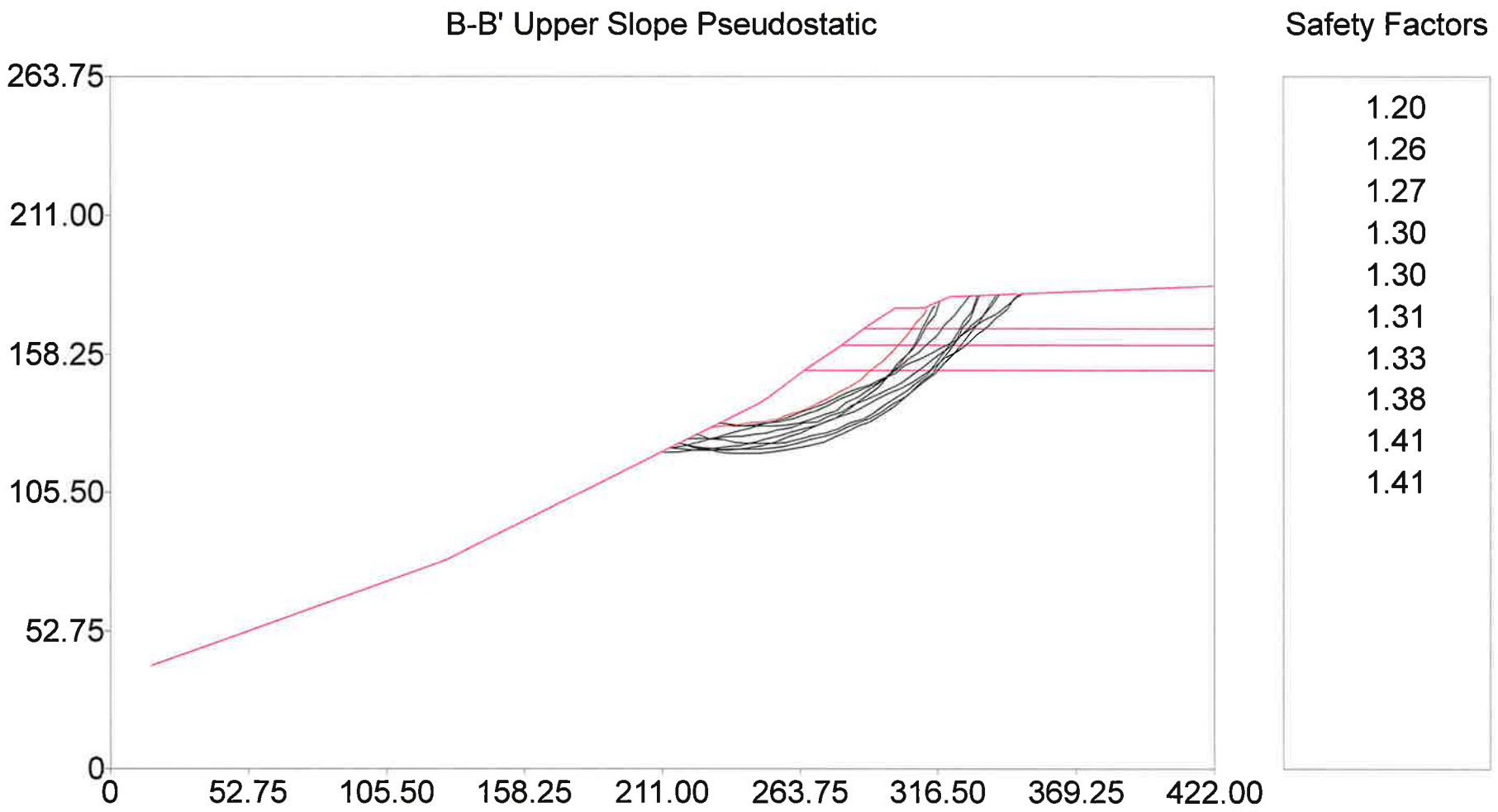
Point No.	X-Surf (ft)	Y-Surf (ft)
1	215.11	122.84
2	220.07	122.21
3	225.06	121.84
4	230.06	121.73
5	235.05	121.88
6	240.04	122.28
7	244.99	122.95
8	249.91	123.87
9	254.77	125.04
10	259.56	126.47
11	264.27	128.14
12	268.89	130.05
13	273.41	132.20
14	277.81	134.58
15	282.07	137.18
16	286.20	140.01
17	290.18	143.04
18	293.99	146.27
19	297.63	149.70
20	301.09	153.31
21	304.35	157.10
22	307.42	161.05
23	310.27	165.15
24	312.91	169.40
25	315.33	173.78
26	317.47	178.19

Circle Center At X = 229.7 ; Y = 218.2 and Radius, 96.4

*** 1.818 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	230.67	130.49
2	235.67	130.61
3	240.66	130.92
4	245.63	131.45
5	250.58	132.17


B-B' Upper Slope Pseudostatic
Safety Factors
1.20
1.26
1.27
1.30
1.30
1.31
1.33
1.38
1.41
1.41
263.75
211.00
158.25
105.50
52.75
0
0
52.75
105.50
158.25
211.00
263.75
316.50
369.25
422.00

** PCSTABL6 **

by
Purdue University

modified by
Peter J. Bosscher
University of Wisconsin-Madison

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

PROBLEM DESCRIPTION **MacDonald Plat**
B-B' Upper Slope Pseudostatic

BOUNDARY COORDINATES

9 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	16.00	40.00	128.00	80.00	4
2	128.00	80.00	250.00	140.00	4
3	250.00	140.00	266.00	152.00	4
4	266.00	152.00	280.00	162.00	3
5	280.00	162.00	288.00	168.00	2
6	288.00	168.00	300.00	176.00	1
7	300.00	176.00	312.00	176.00	1
8	312.00	176.00	322.00	180.00	1
9	322.00	180.00	422.00	184.00	1
10	288.00	168.00	422.00	168.00	2
11	280.00	162.00	422.00	162.00	3
12	266.00	152.00	422.00	152.00	4

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	500.0	36.0	0.00	0.0	0
2	120.0	120.0	500.0	36.0	0.00	0.0	0
3	130.0	130.0	200.0	38.0	0.00	0.0	0
4	125.0	125.0	100.0	38.0	0.00	0.0	0

A Horizontal Earthquake Loading Coefficient
Of0.200 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 psf

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular 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 = 212.00 ft.
and X = 240.00 ft.

Each Surface Terminates Between X = 312.00 ft.
and X = 422.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 20.00 ft.

5.00 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 Bishop Method * *

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	230.67	130.49
2	235.66	130.67
3	240.64	131.11
4	245.60	131.80
5	250.51	132.73
6	255.37	133.92
7	260.16	135.34
8	264.87	137.01
9	269.49	138.92
10	274.01	141.06
11	278.42	143.42
12	282.70	146.00
13	286.85	148.80
14	290.85	151.80
15	294.69	155.00
16	298.36	158.39
17	301.86	161.97

18	305.17	165.71
19	308.29	169.62
20	311.20	173.68
21	312.94	176.38

Circle Center At X = 229.6 ; Y = 229.2 and Radius, 98.7

*** 1.201 ***

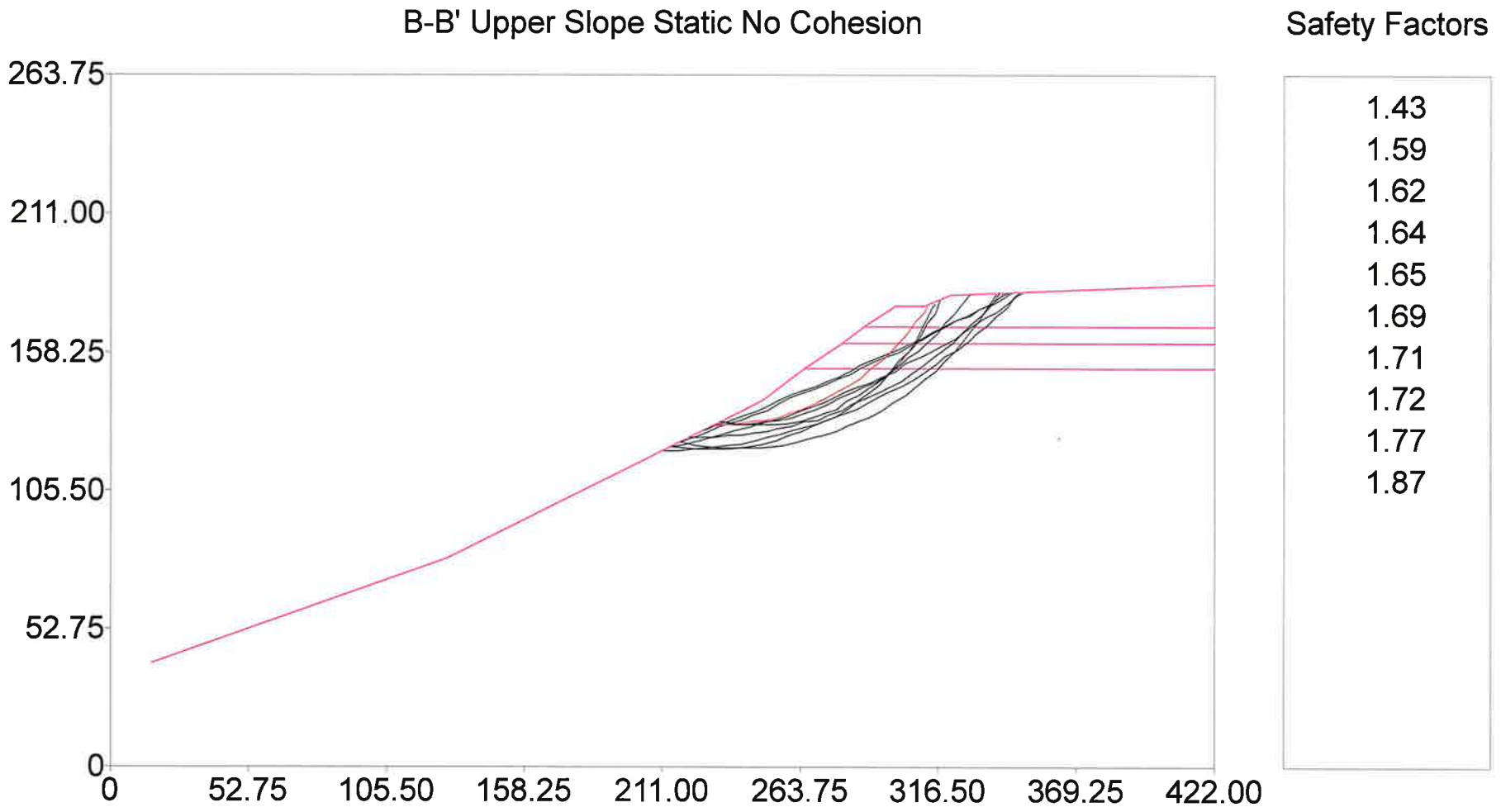
Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	215.11	122.84
2	220.07	122.21
3	225.06	121.84
4	230.06	121.73
5	235.05	121.88
6	240.04	122.28
7	244.99	122.95
8	249.91	123.87
9	254.77	125.04
10	259.56	126.47
11	264.27	128.14
12	268.89	130.05
13	273.41	132.20
14	277.81	134.58
15	282.07	137.18
16	286.20	140.01
17	290.18	143.04
18	293.99	146.27
19	297.63	149.70
20	301.09	153.31
21	304.35	157.10
22	307.42	161.05
23	310.27	165.15
24	312.91	169.40
25	315.33	173.78
26	317.47	178.19

Circle Center At X = 229.7 ; Y = 218.2 and Radius, 96.4

*** 1.263 ***

Failure Surface Specified By 24 Coordinate Points


B-B' Upper Slope Static No Cohesion
Safety Factors
1.43
1.59
1.62
1.64
1.65
1.69
1.71
1.72
1.77
1.87
263.75
211.00
158.25
105.50
52.75
0
0
52.75
105.50
158.25
211.00
263.75
316.50
369.25
422.00

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--Slope Stability Analysis--
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PROBLEM DESCRIPTION **MacDonald Plat**
B-B' Upper Slope Static No Cohesion

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9 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
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6	288.00	168.00	300.00	176.00	1
7	300.00	176.00	312.00	176.00	1
8	312.00	176.00	322.00	180.00	1
9	322.00	180.00	422.00	184.00	1
10	288.00	168.00	422.00	168.00	2
11	280.00	162.00	422.00	162.00	3
12	266.00	152.00	422.00	152.00	4

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	0.0	36.0	0.00	0.0	0
2	120.0	120.0	0.0	36.0	0.00	0.0	0
3	130.0	130.0	0.0	38.0	0.00	0.0	0
4	125.0	125.0	0.0	38.0	0.00	0.0	0

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

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

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	230.67	130.49
2	235.66	130.67
3	240.64	131.11
4	245.60	131.80
5	250.51	132.73
6	255.37	133.92
7	260.16	135.34
8	264.87	137.01
9	269.49	138.92
10	274.01	141.06
11	278.42	143.42
12	282.70	146.00
13	286.85	148.80
14	290.85	151.80
15	294.69	155.00
16	298.36	158.39
17	301.86	161.97
18	305.17	165.71
19	308.29	169.62
20	311.20	173.68
21	312.94	176.38

Circle Center At X = 229.6 ; Y = 229.2 and Radius, 98.7

*** 1.432 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	230.67	130.49
2	235.67	130.61
3	240.66	130.92
4	245.63	131.45
5	250.58	132.17
6	255.49	133.10
7	260.36	134.23
8	265.18	135.56
9	269.94	137.08
10	274.64	138.80
11	279.26	140.71
12	283.80	142.80
13	288.25	145.09
14	292.60	147.55
15	296.85	150.18
16	300.98	152.99
17	305.00	155.97
18	308.89	159.11
19	312.65	162.41
20	316.27	165.85
21	319.75	169.45
22	323.08	173.18
23	326.25	177.04
24	328.68	180.27

Circle Center At X = 230.4 ; Y = 252.5 and Radius, 122.0

*** 1.586 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	215.11	122.84
2	220.07	122.21
3	225.06	121.84
4	230.06	121.73
5	235.05	121.88
6	240.04	122.28
7	244.99	122.95
8	249.91	123.87
9	254.77	125.04
10	259.56	126.47