



September 18, 2019

G-4149-1

Mr. John Leong  
9216 – 132<sup>nd</sup> Avenue NE  
Redmond, Washington 98052

**Subject:** Response to City of Mercer Island Comments Regarding Slope Stabilization Measures Letter Dated August 21, 2019, 9400 SE 47<sup>th</sup> Street, Mercer Island, Washington.

**References:** Geotechnical Evaluation of Slope Stabilization Measures, 9400 SE 47<sup>th</sup> Street, Mercer Island, Washington 98040. GEO Group Northwest, Inc., January 25, 2017.

Update to Geotechnical Evaluation of Slope Stabilization Measures, 9400 SE 47<sup>th</sup> Street, Mercer Island, Washington 98040. GEO Group Northwest, Inc., May 9, 2019.

Response to City of Mercer Island Comments Regarding Slope Stabilization Measures, 9400 SE 47<sup>th</sup> Street, Mercer Island, Washington. GEO Group Northwest, Inc., August 21, 2019.

Dear Mr. Leong:

GEO Group Northwest, Inc. has prepared this revised response letter following comments received from the City of Mercer Island on September 10, 2019, regarding our above-referenced comments response letter dated August 21, 2019, for the project. The September 10 comments were received in the form of notes appended to an electronic file of the August 21 letter. Our responses to these comments, relating to the lateral acceleration parameter used in the slope stability analyses, are provided below.

Supplemental slope stability analyses were performed for the slope condition prior to the occurrence of the December 2015 landslide and subsequent repair activities, per the request of the City. These analyses use a pseudo-static lateral acceleration value of 0.28g. This value is equal to one-half of the calculated peak lateral acceleration value of 0.56g for a design seismic event having a 2,475-year return period, as established in the 2015 IBC.

The analysis results for the slope configuration prior to the December 2015 landslide present a safety factor of 2.01 for the static scenario and 1.26 for the modeled seismic scenario.

The updated analysis results for the slope condition after the completion of the slope repair activities present a safety factor of 2.05 for the static scenario and 1.24 for the modeled seismic scenario.

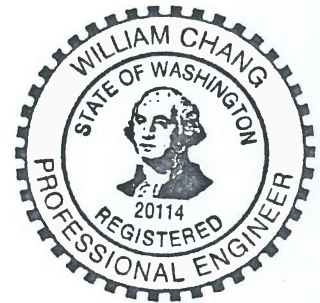
Based on our observations, findings, and evaluations during the course of the project, and the slope stability analysis results presented with this letter, we conclude that the landslide hazard area has been modified so that the risk to the site and adjacent property is mitigated such that the site is determined to be safe.

Sincerely,

GEO GROUP NORTHWEST, INC.

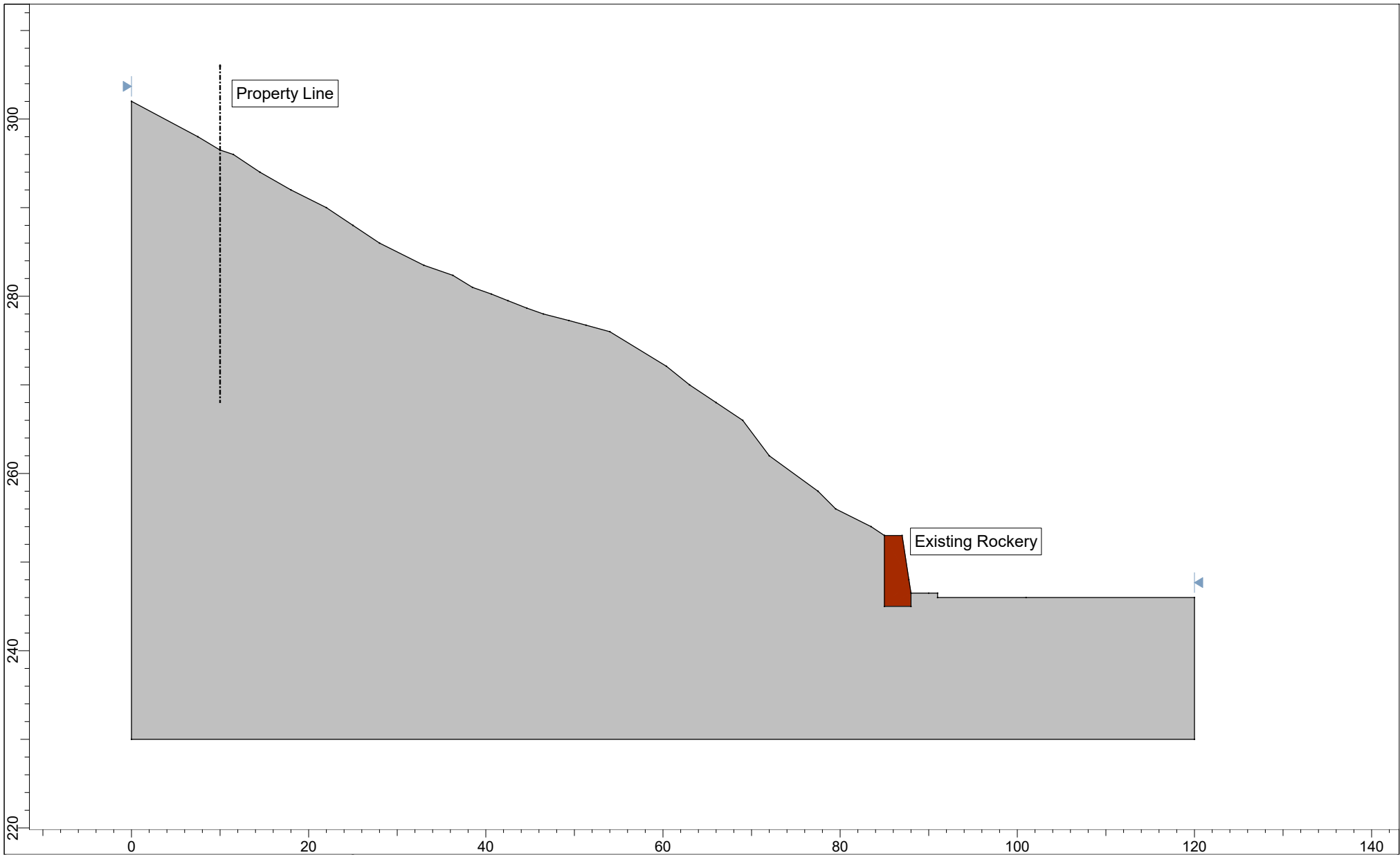



Keith Johnson  
Project Geologist

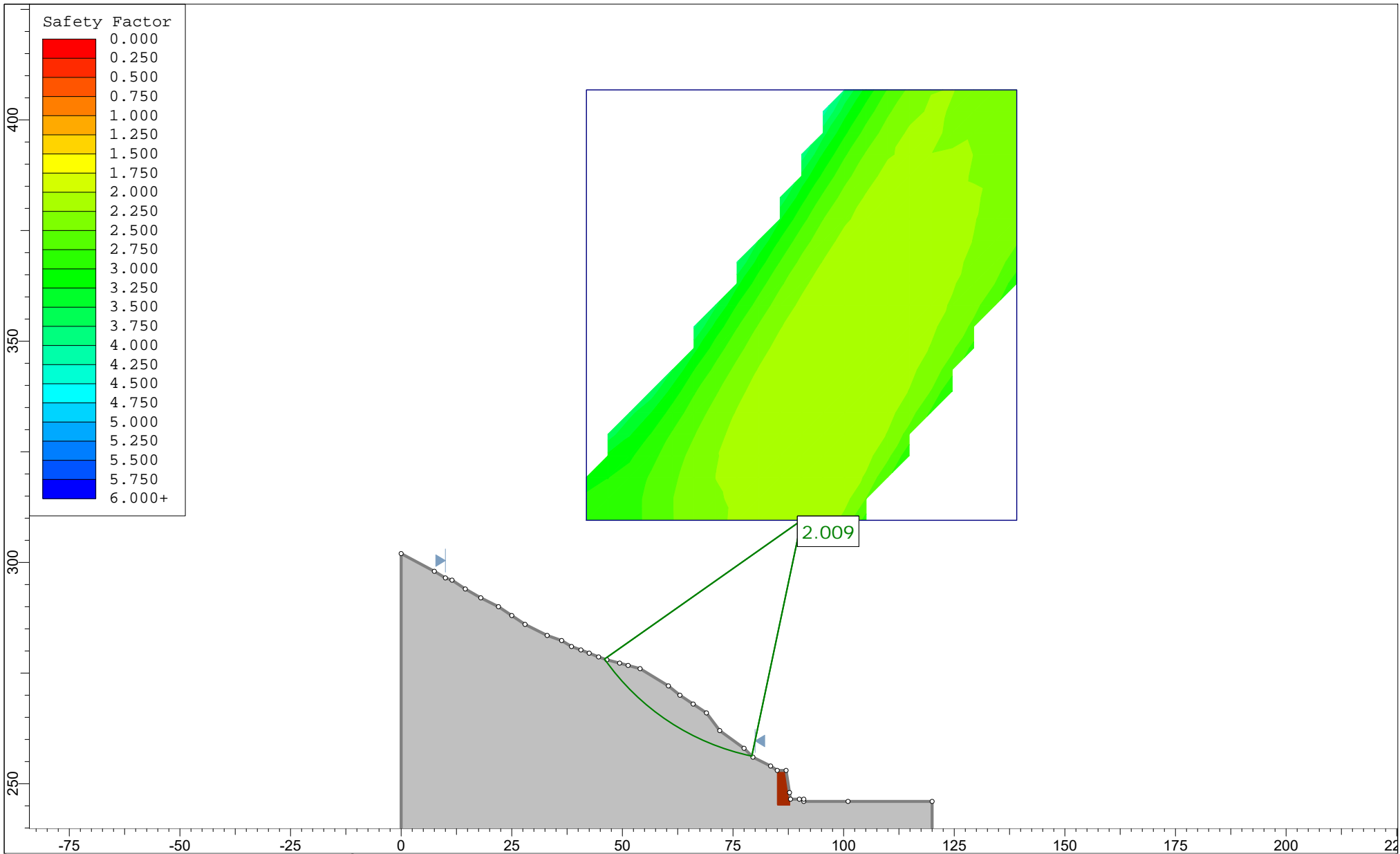



William Chang, P.E.  
Principal

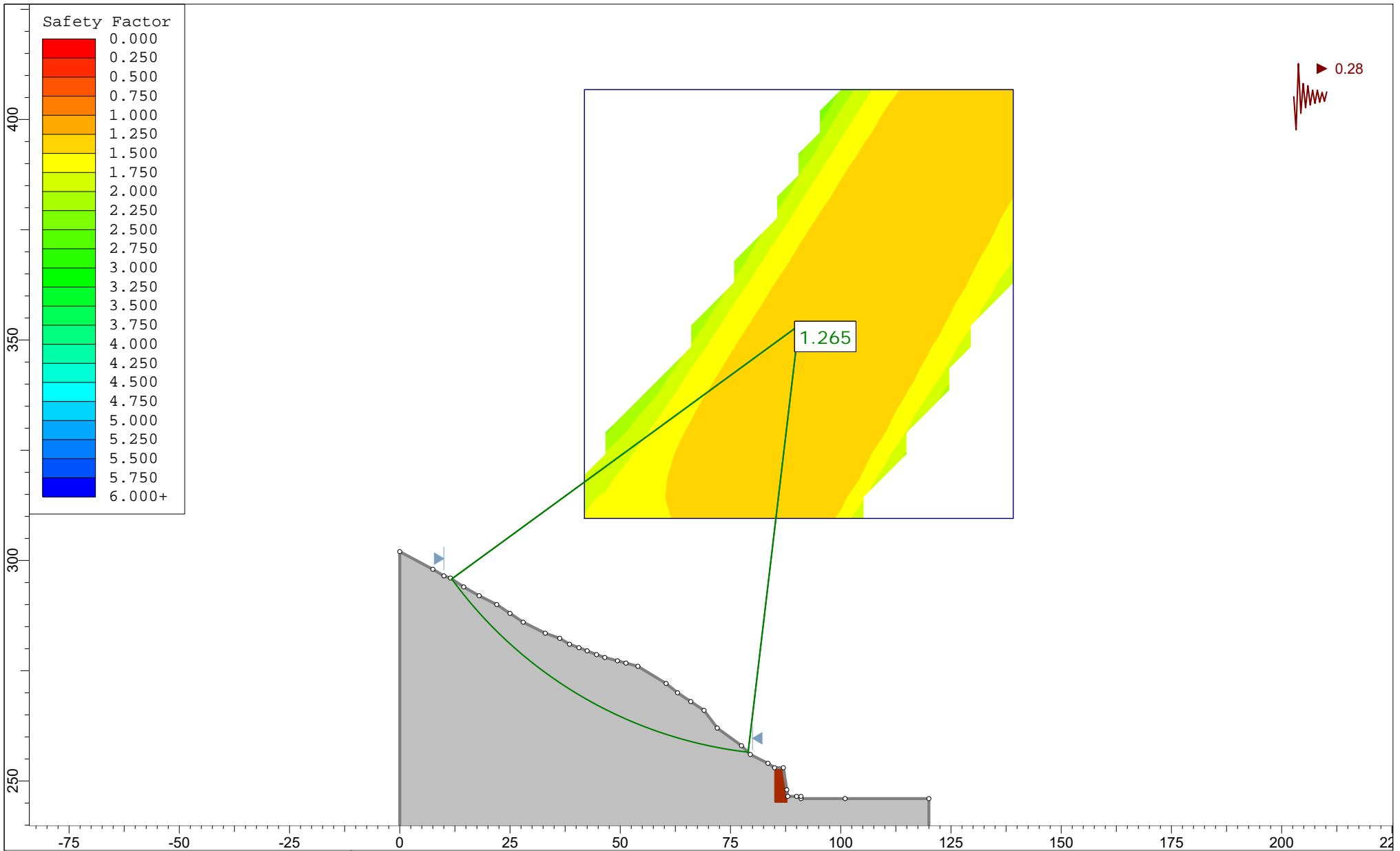
Enclosure: Supplemental Slope Stability Analysis Results




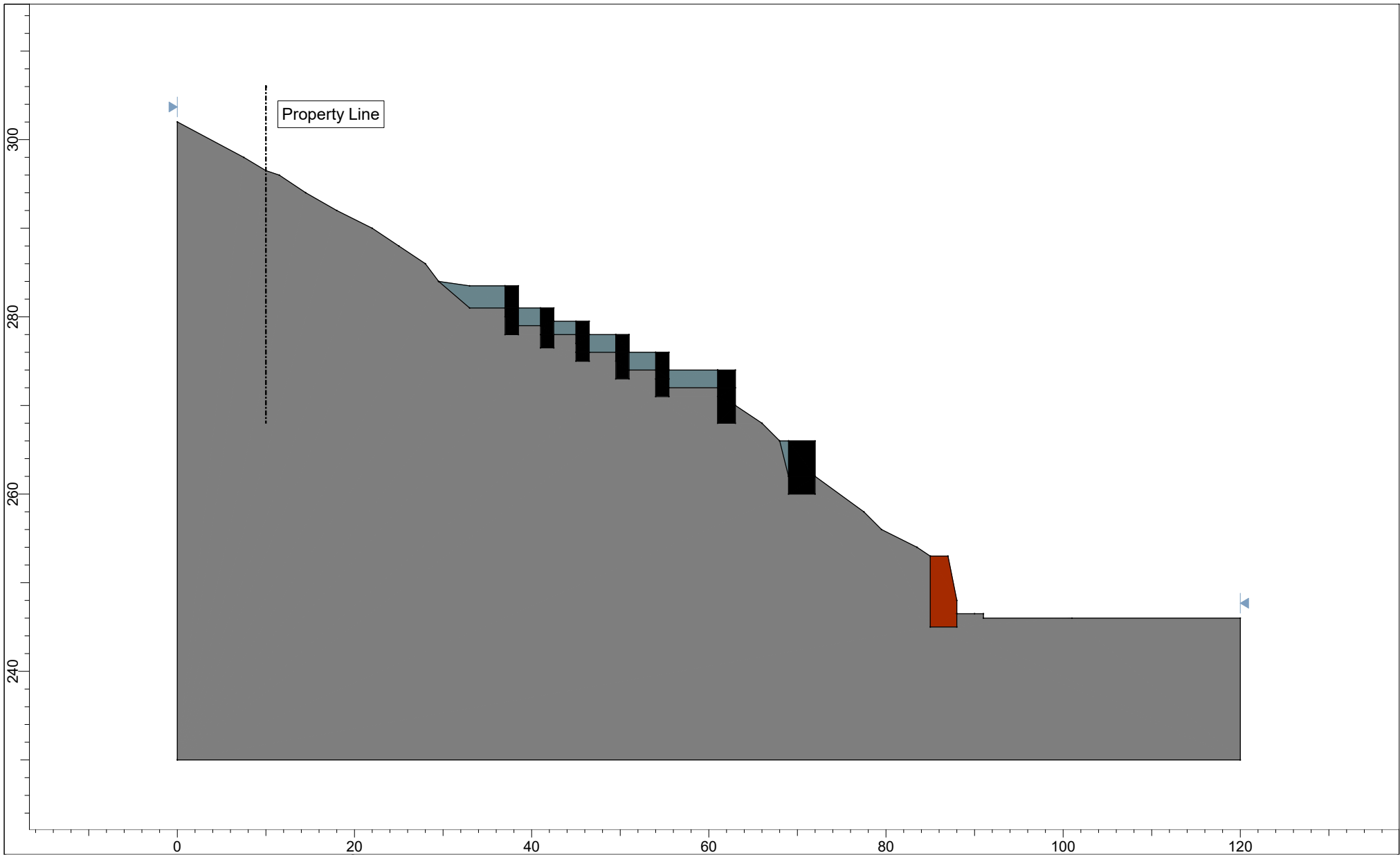
	<i>Project</i> Leong Residence Slope Stabilization			
	<i>Analysis Description</i>			
	<i>Drawn By</i> KJ	<i>Scale</i> 1:180	<i>Company</i> GEO Group Northwest, Inc.	
	<i>Date</i> 9/18/2019, 11:35:02 AM	<i>File Name</i> Leong slope profile original config.slim		



	<i>Project</i> <b>Leong Residence Slope Stabilization</b>				
	<i>Analysis Description</i>				
	<i>Drawn By</i> KJ	<i>Scale</i> 1:360	<i>Company</i> GEO Group Northwest, Inc.		
	<i>Date</i> 09/18/2019, 11:35:02 AM	<i>File Name</i> Leong slope profile original config stat.slim			

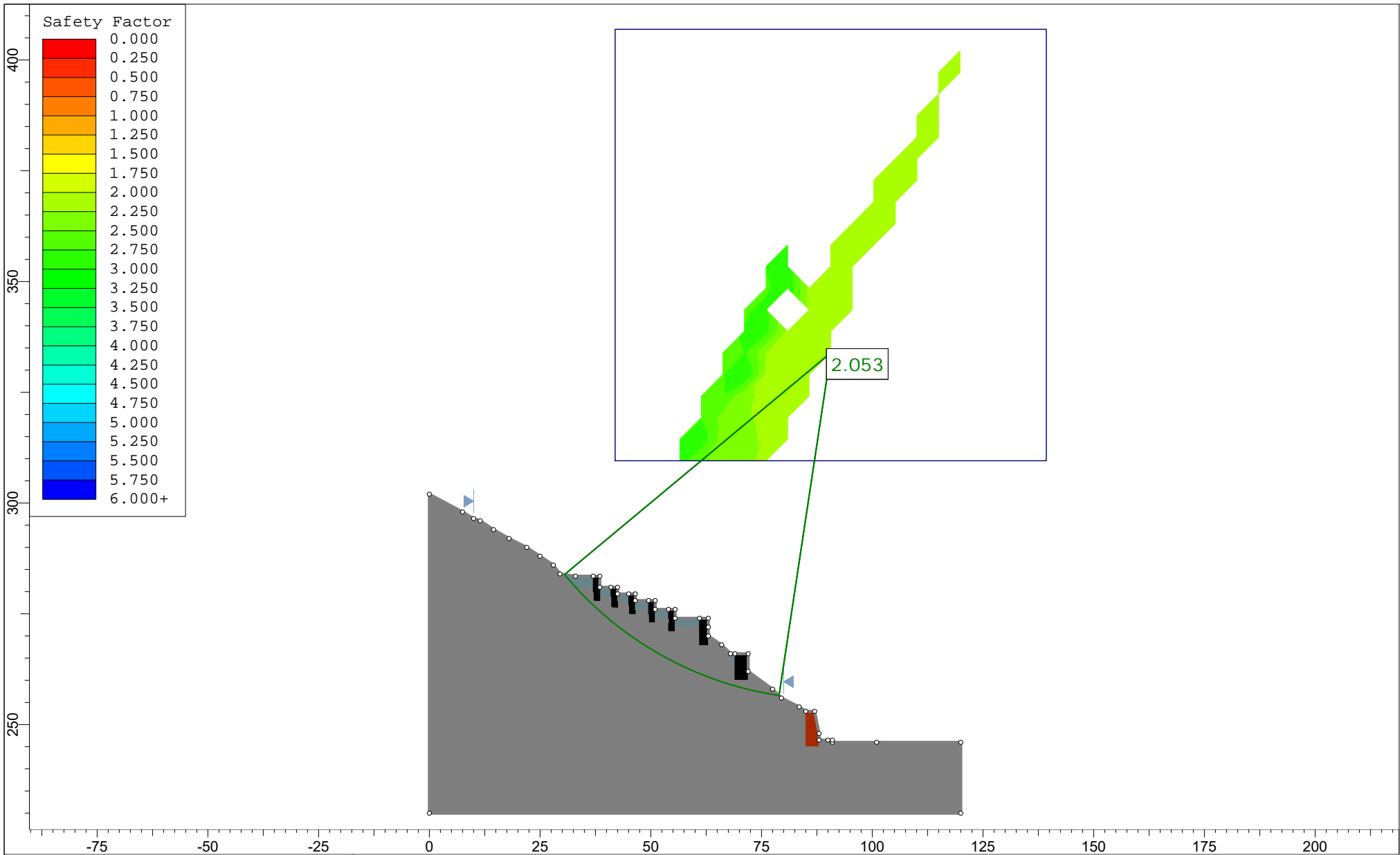


	<i>Project</i> <b>Leong Residence Slope Stabilization</b>			
	<i>Analysis Description</i>			
	<i>Drawn By</i> KJ	<i>Scale</i> 1:360	<i>Company</i> GEO Group Northwest, Inc.	
	<i>Date</i> 09/18/2019, 11:35:02 AM	<i>File Name</i> Leong slope profile original config seis 28.slim		



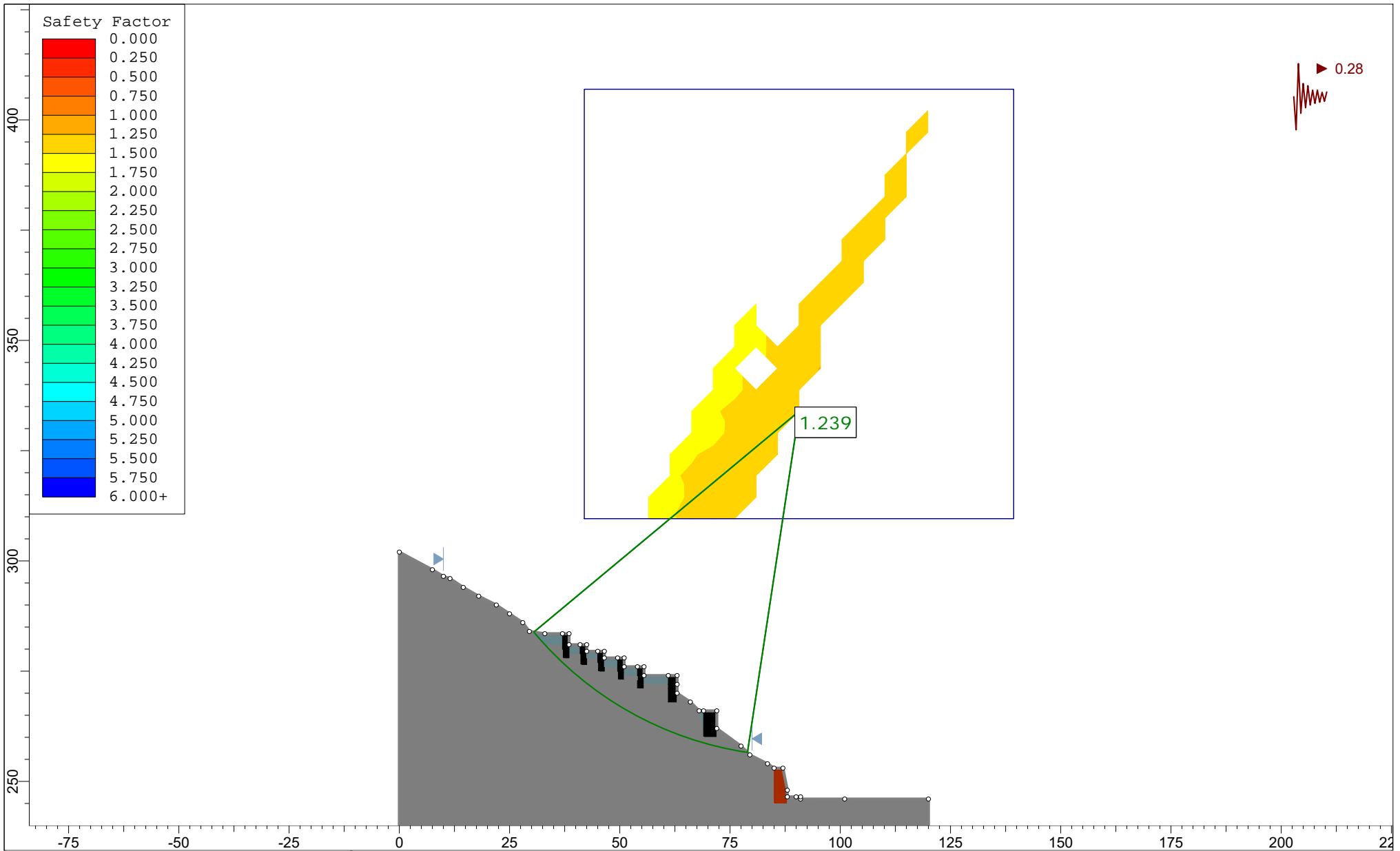
SLIDE 7.037


<i>Project</i>			
Leong Residence Slope Stabilization			
<i>Analysis Description</i>			
<i>Drawn By</i>	KJ	<i>Scale</i>	1:180
<i>Company</i>	GEO Group Northwest, Inc.		
<i>Date</i>	09/18/2019, 11:35:02 AM		<i>File Name</i>
	Leong slope profile c.slim		



SLIDEINTERPRET 7.037

<i>Project</i>			
Leong Residence Slope Stabilization			
<i>Analysis Description</i>			
<i>Drawn By</i>	KJ	<i>Scale</i>	1:360
<i>Company</i>	GEO Group Northwest, Inc.		
<i>Date</i>	09/18/2019, 11:35:02 AM		<i>File Name</i>
	Leong slope profile c stat.slim		



	<i>Project</i> <b>Leong Residence Slope Stabilization</b>		
	<i>Analysis Description</i>		
	<i>Drawn By</i> KJ	<i>Scale</i> 1:360	<i>Company</i> GEO Group Northwest, Inc.
	<i>Date</i> 09/18/2019, 11:35:02 AM	<i>File Name</i> Leong slope profile c seis 28.slim	



# *Slide Analysis Information*

## *Leong Residence Slope Stabilization*

### *Project Summary*

---

File Name: Leong slope profile original config stat  
 Last saved with Slide version: 7.037  
 Project Title: Leong Residence Slope Stabilization  
 Author: KJ  
 Company: GEO Group Northwest, Inc.  
 Date Created: 09/18/2019, 11:35:02 AM

### *General Settings*

---

Units of Measurement: Imperial Units  
 Time Units: days  
 Permeability Units: feet/second  
 Failure Direction: Left to Right  
 Data Output: Standard  
 Maximum Material Properties: 20  
 Maximum Support Properties: 20

### *Analysis Options*

---

Slices Type: Vertical

**Analysis Methods Used**

Bishop simplified  
 Janbu simplified

Number of slices: 50  
 Tolerance: 0.005  
 Maximum number of iterations: 75  
 Check malpha < 0.2: Yes  
 Create Interslice boundaries at intersections with water tables and piezos: Yes  
 Initial trial value of FS: 1  
 Steffensen Iteration: Yes

### *Groundwater Analysis*

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Groundwater Method: Water Surfaces  
 Pore Fluid Unit Weight [lbs/ft3]: 62.4  
 Use negative pore pressure cutoff: Yes  
 Maximum negative pore pressure [psf]: 0  
 Advanced Groundwater Method: None

### Random Numbers

---

Pseudo-random Seed: 10116  
 Random Number Generation Method: Park and Miller v.3

### Surface Options

---

Surface Type: Circular  
 Search Method: Grid Search  
 Radius Increment: 10  
 Composite Surfaces: Disabled  
 Reverse Curvature: Invalid Surfaces  
 Minimum Elevation: Not Defined  
 Minimum Depth [ft]: 3  
 Minimum Area: Not Defined  
 Minimum Weight: Not Defined



### Seismic

---

Advanced seismic analysis: No  
 Staged pseudostatic analysis: No

### Material Properties

---

Property	Native SM-ML	Rockery
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	120	160
Cohesion [psf]	200	0
Friction Angle [deg]	38	75
Water Surface	None	None
Ru Value	0	0

### List Of Coordinates

---

#### External Boundary



X	Y
0	230
120	230
120	246
101	246
91	246
91	246.5
90	246.5
88	246.5
87.7692	248
87	253
85	253
83.5	254
79.5	256
77.5	258
72	262
69	266
66	268
63	270
60.393	272.098
54	276
51.312	276.728
49.378	277.256
46.5	278
44.632	278.662
42.5	279.5
40.633	280.244
38.5	281
36.272	282.36
33	283.5
28	286
25	288
22	290
18	292
14.5	294
11.5	296
10	296.5
7.5	298
0	302

**Material Boundary**

X	Y
85	253
85	245
88	245
88	246.5

# Slide Analysis Information

## Leong Residence Slope Stabilization

### Project Summary

---

File Name: Leong slope profile original config seis 28  
 Last saved with Slide version: 7.037  
 Project Title: Leong Residence Slope Stabilization  
 Author: KJ  
 Company: GEO Group Northwest, Inc.  
 Date Created: 09/18/2019, 11:35:02 AM

### General Settings

---

Units of Measurement: Imperial Units  
 Time Units: days  
 Permeability Units: feet/second  
 Failure Direction: Left to Right  
 Data Output: Standard  
 Maximum Material Properties: 20  
 Maximum Support Properties: 20

### Analysis Options

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 Steffensen Iteration: Yes

### Groundwater Analysis

---

Groundwater Method: Water Surfaces  
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 Maximum negative pore pressure [psf]: 0  
 Advanced Groundwater Method: None

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 Reverse Curvature: Invalid Surfaces  
 Minimum Elevation: Not Defined  
 Minimum Depth [ft]: 3  
 Minimum Area: Not Defined  
 Minimum Weight: Not Defined

### Seismic

---

Advanced seismic analysis: No  
 Staged pseudostatic analysis: No



### Loading

---

Seismic Load Coefficient (Horizontal): 0.28

### Material Properties

---

Property	Native SM-ML	Rockery
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	120	160
Cohesion [psf]	200	0
Friction Angle [deg]	38	75
Water Surface	None	None
Ru Value	0	0

### List Of Coordinates

---

**External Boundary**

X	Y
0	230
120	230
120	246
101	246
91	246
91	246.5
90	246.5
88	246.5
87.7692	248
87	253
85	253
83.5	254
79.5	256
77.5	258
72	262
69	266
66	268
63	270
60.393	272.098
54	276
51.312	276.728
49.378	277.256
46.5	278
44.632	278.662
42.5	279.5
40.633	280.244
38.5	281
36.272	282.36
33	283.5
28	286
25	288
22	290
18	292
14.5	294
11.5	296
10	296.5
7.5	298
0	302

**Material Boundary**

X	Y
85	253
85	245
88	245
88	246.5

# *Slide Analysis Information*

## *Leong Residence Slope Stabilization*

### *Project Summary*

---

File Name: Leong slope profile c stat  
 Last saved with Slide version: 7.037  
 Project Title: Leong Residence Slope Stabilization  
 Author: KJ  
 Company: GEO Group Northwest, Inc.  
 Date Created: 08/13/2019, 11:35:02 AM

### *General Settings*

---

Units of Measurement: Imperial Units  
 Time Units: days  
 Permeability Units: feet/second  
 Failure Direction: Left to Right  
 Data Output: Standard  
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 Maximum Support Properties: 20

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 Pore Fluid Unit Weight [lbs/ft3]: 62.4  
 Use negative pore pressure cutoff: Yes  
 Maximum negative pore pressure [psf]: 0  
 Advanced Groundwater Method: None

### Random Numbers

Pseudo-random Seed: 10116  
 Random Number Generation Method: Park and Miller v.3





### Surface Options

Surface Type: Circular  
 Search Method: Grid Search  
 Radius Increment: 10  
 Composite Surfaces: Disabled  
 Reverse Curvature: Invalid Surfaces  
 Minimum Elevation: Not Defined  
 Minimum Depth [ft]: 2  
 Minimum Area: Not Defined  
 Minimum Weight: Not Defined

### Seismic

Advanced seismic analysis: No  
 Staged pseudostatic analysis: No

### Material Properties

Property	Native SM-ML	Soil Fill	Sand Bags	Rockery
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Infinite strength	Mohr-Coulomb
Unit Weight [lbs/ft3]	118	115	120	160
Cohesion [psf]	150	0		0
Friction Angle [deg]	38	33		75
Water Surface	None	None	None	None
Ru Value	0	0	0	0

### List Of Coordinates

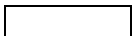
#### External Boundary





X	Y
0	230
120	230
120	246
101	246
91	246
91	246.5
90	246.5
88	246.5
87.9993	248
87	253
85	253
83.5	254
79.5	256
77.5	258
72	262
72	266
69	266
68	266
66	268
63	270
63	272
63	274
61	274
55.5	274
55.5	276
54	276
51	276
51	278
49.5	278
46.5	278
46.5	279.5
45	279.5
42.5	279.5
42.5	281
41	281
38.5	281
38.5	283.5
37	283.5
33	283.5
29.5	284
28	286
25	288
22	290
18	292
14.5	294
11.5	296
10	296.5
7.5	298
0	302

**Material Boundary**



X	Y
85	253
85	245
88	245
88	246.5

**Material Boundary**

X	Y
69	266
69	262
69	260
72	260
72	262

**Material Boundary**

X	Y
37	283.5
37	281
37	280
37	278
38.5	278
38.5	279
38.5	281

**Material Boundary**

X	Y
61	274
61	272
61	271
61	268
63	268
63	270

**Material Boundary**

X	Y
41	281
41	279
41	278
41	276.5
42.5	276.5
42.5	278
42.5	279.5

**Material Boundary**

--	--

X	Y
45	279.5
45	278
45	277
45	276
45	275
46.5	275
46.5	276
46.5	278

**Material Boundary**

X	Y
54	276
54	274
54	273
54	271
55.5	271
55.5	272
55.5	273
55.5	274

**Material Boundary**

X	Y
49.5	278
49.5	276
49.5	275
49.5	273
51	273
51	274
51	276

**Material Boundary**

X	Y
29.5	284
33	281
37	281

**Material Boundary**

X	Y
38.5	279
41	279

**Material Boundary**

X	Y
46.5	276
49.5	276

**Material Boundary**

X	Y
51	274
54	274

**Material Boundary**

X	Y
55.5	272
61	272

**Material Boundary**

X	Y
68	266
69	262

**Material Boundary**

X	Y
42.5	278
45	278

# *Slide Analysis Information*

## *Leong Residence Slope Stabilization*

### *Project Summary*

---

File Name: Leong slope profile c seis 28  
 Last saved with Slide version: 7.037  
 Project Title: Leong Residence Slope Stabilization  
 Author: KJ  
 Company: GEO Group Northwest, Inc.  
 Date Created: 09/18/2019, 11:35:02 AM

### *General Settings*

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Units of Measurement: Imperial Units  
 Time Units: days  
 Permeability Units: feet/second  
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 Maximum Support Properties: 20

### *Analysis Options*

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 Use negative pore pressure cutoff: Yes  
 Maximum negative pore pressure [psf]: 0  
 Advanced Groundwater Method: None

### Random Numbers

Pseudo-random Seed: 10116  
 Random Number Generation Method: Park and Miller v.3

### Surface Options

Surface Type: Circular  
 Search Method: Grid Search  
 Radius Increment: 10  
 Composite Surfaces: Disabled  
 Reverse Curvature: Invalid Surfaces  
 Minimum Elevation: Not Defined  
 Minimum Depth [ft]: 2  
 Minimum Area: Not Defined  
 Minimum Weight: Not Defined





### Seismic

Advanced seismic analysis: No  
 Staged pseudostatic analysis: No

### Loading

Seismic Load Coefficient (Horizontal): 0.28

### Material Properties

Property	Native SM-ML	Soil Fill	Sand Bags	Rockery
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Infinite strength	Mohr-Coulomb
Unit Weight [lbs/ft3]	120	115	120	160
Cohesion [psf]	200	0		0
Friction Angle [deg]	38	32		75
Water Surface	None	None	None	None
Ru Value	0	0	0	0

### List Of Coordinates

**External Boundary**

X	Y
0	230
120	230
120	246
101	246
91	246
91	246.5
90	246.5
88	246.5
87.9993	248
87	253
85	253
83.5	254
79.5	256
77.5	258
72	262
72	266
69	266
68	266
66	268
63	270
63	272
63	274
61	274
55.5	274
55.5	276
54	276
51	276
51	278
49.5	278
46.5	278
46.5	279.5
45	279.5
42.5	279.5
42.5	281
41	281
38.5	281
38.5	283.5
37	283.5
33	283.5
29.5	284
28	286
25	288
22	290
18	292
14.5	294
11.5	296
10	296.5
7.5	298
0	302

**Material Boundary**

X	Y
85	253
85	245
88	245
88	246.5

**Material Boundary**

X	Y
69	266
69	262
69	260
72	260
72	262

**Material Boundary**

X	Y
37	283.5
37	281
37	280
37	278
38.5	278
38.5	279
38.5	281

**Material Boundary**

X	Y
61	274
61	272
61	271
61	268
63	268
63	270

**Material Boundary**

X	Y
41	281
41	279
41	278
41	276.5
42.5	276.5
42.5	278
42.5	279.5

**Material Boundary**

--



X	Y
45	279.5
45	278
45	277
45	276
45	275
46.5	275
46.5	276
46.5	278

**Material Boundary**

X	Y
54	276
54	274
54	273
54	271
55.5	271
55.5	272
55.5	273
55.5	274

**Material Boundary**

X	Y
49.5	278
49.5	276
49.5	275
49.5	273
51	273
51	274
51	276

**Material Boundary**

X	Y
29.5	284
33	281
37	281

**Material Boundary**

X	Y
38.5	279
41	279

**Material Boundary**

X	Y
46.5	276
49.5	276

**Material Boundary**

X	Y
51	274
54	274

**Material Boundary**

X	Y
55.5	272
61	272

**Material Boundary**

X	Y
68	266
69	262

**Material Boundary**

X	Y
42.5	278
45	278