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August 25, 2022

Our ref: 21-43

Daniel and Susan Steinborn  
2011 – 19<sup>th</sup> Avenue  
Seattle, Washington 98112

ATTENTION: Mr. Daniel and Mrs. Susan Steinborn

RE: PERMANENT RETAINING WALL DESIGN CALCULATIONS & PLANS  
8435 SE 47<sup>TH</sup> PLACE, MERCER ISLAND, WA 98040

Dear Daniel and Susan:

Ground Support PLLC is pleased to present our design calculations and plans for a permanent soil nailed retaining wall for the proposed residence located at 8435 SE 47<sup>th</sup> Place on Mercer Island, Washington. We have completed the retaining wall design submittal in accordance with our contract proposal dated November 29, 2021. The project background and soil conditions, and the retaining wall design calculations and plans are described in the following sections.

## 1. PROJECT BACKGROUND AND SOIL CONDITIONS

In preparing the permanent retaining wall design submittal, we have reviewed the following geotechnical report, and architectural drawing file:

- "Geotechnical Engineering Study, Proposed Steinborn Residence, Vacant Lot East of 8431 SE 47<sup>th</sup> Place, Parcel #3317500040, Mercer Island, Washington", prepared by Geotech Consultants, Inc., dated March 23, 2021.
- The AutoCAD drawing files named: "lower-level-permit.dwg", dated July 19, 2022, "siteplan-permit.dwg", dated August 9, 2022, and "elevations-permit-panel.dwg", dated August 9, 2022, all prepared by Ectypos Architecture.

The subject property is approximately trapezoidal shaped, and is longer in the E-W direction (~200 feet) versus the N-S direction (~110 feet). The grade rises from the entry to the site in the southwest up toward the northeast across the site, with a grade difference of about 50 feet. A driveway into the site is to be constructed which will require permanent retaining walls along its west side, and the building pad for the residence at the end of the driveway will also require permanent retaining walls along the north and northeast sides of the garage and residence. These wall needs have been combined into one long permanent soil nail retaining wall that is about 215

feet in total length. The first part of the wall extends along the driveway and is relatively short, being about 4 to 6 feet high, and will require only one lift or row of soil nails and shotcrete. At the parking area between the driveway and the garage, the wall height rises to 18-ft high and requires three lifts of nails and shotcrete. As the wall then wraps around the garage and structure it rises more and reaches a maximum height of about 23 feet, requiring four lifts of shotcrete and nails. Also there is a secondary tiered wall located behind the main wall that is about 8-ft (2 lifts) high and 31-ft long. In total, there is about 3,340 square feet (SF) of shotcrete. All of the wall areas will be comprised of a single permanent 7" shotcrete wall constructed top-down with the soil nails. However, if some areas are determined to be buried later and effectively temporary, then they could use a 4" shotcrete construction facing, and that detail has been included in the plans. But for now temporary shotcrete is not being proposed anywhere.

Based on the referenced geotechnical report, the subsurface conditions throughout the project site generally consist of a thin veneer of fill less than about 5-ft thick, underlain by very dense glacial till. Therefore, based on the conditions described in the geotechnical report, and our discussions with the geotechnical engineer, we have utilized the following soil strength parameters and pullout values for stability analyses of the permanent soil nailed walls:

| Soil Unit     | Soil Unit Weight (pcf) | Soil Friction (deg) | Soil Cohesion (psf) | Design Pullout Resistance (k/ft) |
|---------------|------------------------|---------------------|---------------------|----------------------------------|
| Fill          | 125                    | 32                  | 50                  | 1.5                              |
| Glacial Soils | 135                    | 40                  | 100                 | 3.5                              |

For the purposes of design of the permanent walls, the water table has been assumed to occur beneath the base of the excavation, in accordance with the findings from the geotechnical investigation. However, localized perched pockets or stringers of water may be encountered at the face of the excavation at any depth of excavation and in any season. The geocomposite drain board strips will be used to control the water encountered at the wall face. Standard sump pumps may be required to remove water from the base of the excavation as construction proceeds.

## **2. RETAINING WALL DESIGN CALCULATIONS AND PLANS**

### **2.1 General Design and Loading Considerations**

We have performed the shoring wall design in accordance with the 2018 International Building Code, generally accepted standards of practice for shoring wall design, and the following standard design publication: "Publication No. FHWA-IF-03-017, Geotechnical Engineering Circular No. 7, Soil Nail Walls." For all the walls, a uniform traffic surcharge of 250 psf was considered on the slopes behind the walls, even though surcharge is unlikely there. The exception is in nail Schedule D (see wall elevation) where a 500 psf surcharge was considered to account for the footing loads from the structure bearing behind the wall.

### **2.2 Soil Nail Wall Stability Analyses**

The soil nail wall stability design calculations are contained in Appendix A. Static and seismic stability analyses have been performed for the critical stages of excavation in accordance with the referenced FHWA publication using our proprietary soil nail design spreadsheet program. A total of four (4) soil nail design cross-sections were considered, with a total of twelve (12) analyses

reported below. The geometry plot and the input and output files are provided for each stability analysis in Appendix A. The files contained in Appendix A are named: 6-T, 6-P, 6-E, 18-T, 18-P, 18-E, 23-T, 23-P, 23-E, 34.5-T, 34.5-P, and 34.5-E. These file names refer to the overall design wall height in feet, and the type of analysis. "T" refers to analysis of the temporary condition to the bottom of footing or wall, and utilizes lower FS values of 1.35; "P" refers to analysis of the permanent exposed height above finished floor, and utilizes higher FS values of 1.5. And finally, "E" refers to analysis of the permanent exposed height above finished floor with seismic loading, and utilizes more reduced FS values of 1.1. (Note that the design section locations are indicated on the wall elevation sheets of the plans.)

The results in Appendix A indicate the critical nail lengths, nail strengths, and nail head strengths as determined for each series of slip surfaces searched in each soil nail stability analysis. In brief, the results of the analyses indicate that the required soil nail lengths range from 10 to 25 feet, and the required threadbar sizes range from #8 to #9 grade 75 bars. The maximum required soil nail facing capacity is found to range between 1.43 to 2.58 times the seed value of 10 kips, which is a nail head strength of 14.3 to 25.8 kips. The standard minimum facing utilized has a strength of over 40 kips. See Section 2.3 and Appendix B for a discussion of the facing design calculations.

Note that for the permanent soil nail walls, seismic slope stability analyses were performed for the final configuration, by considering a pseudo-static acceleration of 0.3g (corresponding to an MCE of 0.678g). Seismic loading was found to be more critical to the design than the permanent static loading condition for the determination of upper row nail lengths only; but nail bar sizes and facing loads were governed by static loading.

### **2.3 Permanent Wall Facing Design Calculations**

All of the soil nails are permanent, and as such, epoxy-coated. All of the shotcrete facing is also permanent, being 7" thick, and connected to the nails. Some facing areas receive a special float finish and will be visible; while others are not going to be visible, and the finish can be less smooth. Based on all of the soil nail wall analyses, a soil nail wall facing nominal strength of up to 25.8 kips is required. For the temporary construction facing (not currently used), the calculations are presented in Figures B-1 and B-2 of Appendix B for the failure modes of flexure and punching shear, respectively, and have been performed in general accordance with the methods and recommendations in the referenced FHWA soil nail design manual. The shotcrete facing is designed as a typical soil nail wall facing that spans in all directions from the localized nail head supports. From experience and precedent, a standard 4-inch construction facing, which has been successfully used in similar soils and excavations to depths up to 50 feet, will be adequate. The standard facing consists of a minimum 4-inch-thick shotcrete wall with a single layer of 6"x6"-W2.9xW2.9 steel mesh placed near the center of the facing, with an additional two #4 tic-tac-toe bars, and a 3/4"x9"x9" bearing plate. The strength of this standard facing is computed to be 42.2 kips, and is often referred to as an F40 facing, as it has a strength level of at least 40 kips.

For the permanent construction facing, the calculations are presented in Figures B-3 through B-5 for the failure modes of flexure, punching shear, and headed-stud tension, respectively. A 7-inch shotcrete facing will be required simply to provide sufficient corrosion protection to the mesh reinforcing. We have selected the steel amount based on a minimum we are comfortable with to limit cracking. The facing consists of a minimum 7-inch-thick shotcrete wall with a double layer of 4"x4"-W4xW4 steel mesh placed near the center of the facing, with an additional two #4 tic-tac-toe bars at each nail head, and a 3/4"x9"x9" bearing plate with four 1/2"x4" headed studs. The strength of this facing is conservatively (no arching) computed to be 41.5 kips.

## 2.4 Deflection Estimate

Based on our experience and precedent with the very dense soils present at this site, we estimate that the maximum horizontal and vertical retaining wall movements will be on the order of 0.05% to 0.1% of the wall height. Because the walls are up to 28 feet high, this means that we estimate that the deflections at the face of the top of the walls may be on the order of 1/4" to 1/2".

## 3. SHORING DESIGN PLANS

Our design plans consist of ten (10) drawing sheets bound separately from this letter report. The number and title for each sheet are indicated as follows:

|           |                       |
|-----------|-----------------------|
| SH1.0-1.1 | Cover Sheet and Notes |
| SH2.0     | Wall Plan             |
| SH3.0     | Wall Elevation        |
| SH4.0     | Cross-Sections        |
| SH5.0-5.1 | Details               |
| SH6.0     | Soil Nailing Sequence |
| SH7.0-7.1 | Specifications        |

## 4. CLOSURE

We trust that the permanent retaining wall design submittal is in accordance with your needs at this time. We have enjoyed working with you on this project. If you have any questions, please call us anytime at 425-922-1501.

Sincerely,

GROUND SUPPORT PLLC

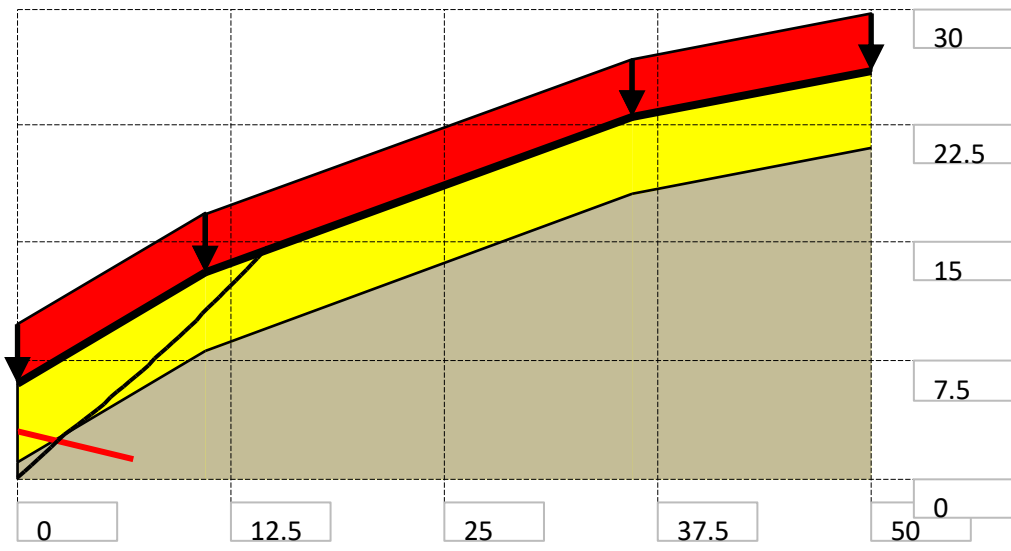


Chris J. Wolschlag, S.E., Ph.D.  
Partner

steinborn residence report r0 082522.docx



APPENDIX A  
SOIL NAIL WALL STABILITY ANALYSES



6-T

|                                |   |
|--------------------------------|---|
| Analysis Mode                  |   |
| Design(D)/Factor of Safety(FS) | D |

|   |    |
|---|----|
| Analysis Type   |    |
| Soil Nail(SN)/Tie Back(TB)/Active EP(AEP)/Passive EP(PEP) | SN |

|                              |      |
|------------------------------|------|
| General                      |      |
| Toe Segment No.              | 1    |
| Toe Specification Type (X/Y) | Y    |
| Toe Y Value                  | 0    |
| X-Base                       | 0    |
| Y-Base                       | 0    |
| Minimum Toe Angle (deg)      | 5    |
| Maximum Toe Angle (deg)      | 80   |
| No. Toe Angles               | 20   |
| Minimum Exit X Value         | 2    |
| Maximum Exit X Value         | 45   |
| No. Exit Points              | 20   |
| Water Unit Weight            | 62.4 |
| Seismic Coefficient (g's)    | 0    |

|  |      |
|--|------|
| Factors of Safety  |      |
| Service Load Design(SLD)/Load-Resistance Factor Design(LRFD) | SLD  |
| FS - Cohesion  | 1.35 |
| FS - Friction Angle  | 1.35 |
| Strength Factor - Nail Tendon                                | 0.55 |
| Strength Factor - Nail Head                                  | 0.67 |
| Strength Factor - Pullout                                    | 0.5  |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |

| Soil | Cohesion | Friction | Unit Wt. | Pullout |
|------|----------|----------|----------|---------|
| 1    | 50       | 32       | 125      | 3000    |
| 2    | 100      | 40       | 135      | 7000    |

| Piezo | X | Y |
|-------|---|---|
|       |   |   |

| Node | X  | Y  |
|------|----|----|
| 1    | 0  | 0  |
| 2    | 0  | 1  |
| 3    | 0  | 6  |
| 4    | 11 | 13 |
| 5    | 36 | 23 |
| 6    | 50 | 26 |
| 7    | 11 | 8  |
| 8    | 36 | 18 |
| 9    | 50 | 21 |

| Segment | Node 1 | Node 2 | Top Soil # | Bot. Soil # | Top PO # | Bot. PO # |
|---------|--------|--------|------------|-------------|----------|-----------|
| 1       | 1      | 2      | 0          | 2           | 0        | 2         |
| 2       | 2      | 3      | 0          | 1           | 0        | 1         |
| 3       | 3      | 4      | 0          | 1           | 0        | 1         |
| 4       | 4      | 5      | 0          | 1           | 0        | 1         |
| 5       | 5      | 6      | 0          | 1           | 0        | 1         |
| 6       | 2      | 7      | 1          | 2           | 1        | 2         |
| 7       | 7      | 8      | 1          | 2           | 1        | 2         |
| 8       | 8      | 9      | 1          | 2           | 1        | 2         |

| Surcharge | Node 1 | P1  | Node 2 | P2  | Angle |
|-----------|--------|-----|--------|-----|-------|
| 1         | 3      | 250 | 4      | 250 | 270   |
| 2         | 4      | 250 | 5      | 250 | 270   |
| 3         | 5      | 250 | 6      | 250 | 270   |

| Nail | Xs | Ys | Length | Dip | Tendon Str. | Head Str. | Fixed? | Spacing | Tieback? |
|------|----|----|--------|-----|-------------|-----------|--------|---------|----------|
| 1    | 0  | 3  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |

| Face Press | Node 1 | P1 | Node 2 | P2 | Angle |
|------------|--------|----|--------|----|-------|
|            |        |    |        |    |       |



Analysis Type: Soil Nail

Analysis Mode: Design

Nail Head Strength Factor (Multiplier): 1.98

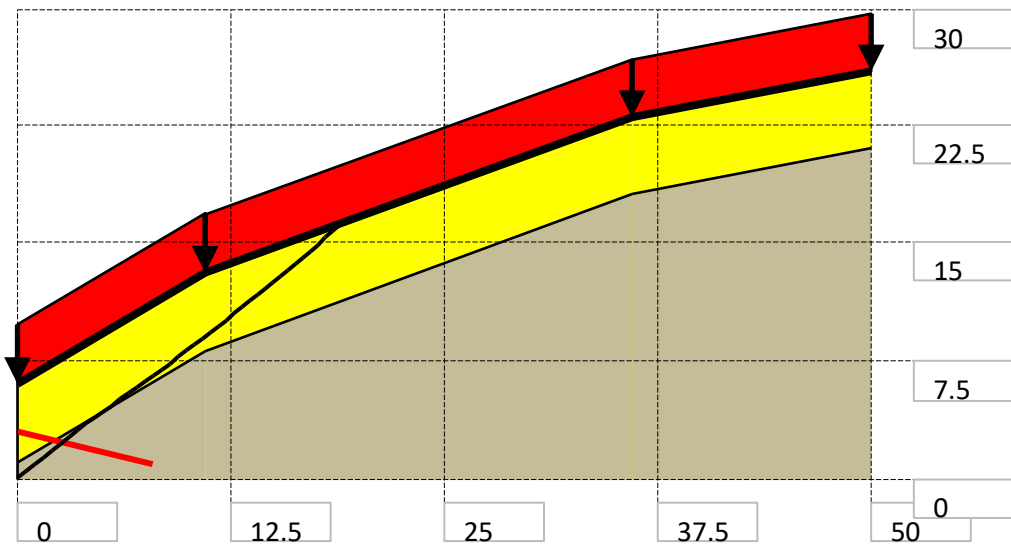
| Nail | Length | Capacity | Slip Surf. |
|------|--------|----------|------------|
| 1    | 7.0    | 29561    | 23         |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 1       | -15.71   | 18.57    | 2.00          | 72.11     | 4.46     |
| 2       | -10.19   | 13.87    | 2.02          | 68.16     | 4.55     |
| 3       | -15.94   | 21.70    | 2.74          | 68.16     | 4.98     |
| 4       | -10.08   | 15.92    | 2.73          | 64.21     | 4.98     |
| 5       | -15.46   | 24.41    | 3.55          | 64.21     | 5.38     |
| 6       | -6.99    | 12.93    | 2.74          | 60.26     | 5.38     |
| 7       | -9.68    | 17.91    | 3.54          | 60.26     | 5.38     |
| 8       | -14.44   | 26.71    | 4.46          | 60.26     | 5.73     |
| 9       | -6.60    | 14.52    | 3.56          | 56.32     | 5.73     |
| 10      | -8.99    | 19.77    | 4.44          | 56.32     | 5.73     |
| 11      | -12.79   | 28.13    | 5.41          | 56.32     | 5.86     |
| 12      | -19.91   | 43.78    | 6.57          | 56.32     | 6.26     |
| 13      | -4.65    | 12.44    | 3.55          | 52.37     | 6.26     |
| 14      | -6.02    | 16.10    | 4.47          | 52.37     | 6.26     |
| 15      | -8.02    | 21.43    | 5.46          | 52.37     | 6.26     |
| 16      | -11.03   | 29.51    | 6.56          | 52.37     | 6.26     |
| 17      | -15.90   | 42.52    | 7.84          | 52.37     | 6.48     |
| 18      | -4.10    | 13.81    | 4.47          | 48.42     | 6.48     |
| 19      | -5.23    | 17.60    | 5.46          | 48.42     | 6.48     |
| 20      | -6.80    | 22.88    | 6.56          | 48.42     | 6.48     |
| 21      | -9.03    | 30.37    | 7.84          | 48.42     | 6.48     |
| 22      | -12.28   | 41.30    | 9.20          | 48.42     | 6.54     |
| 23      | -17.18   | 57.79    | 10.79         | 48.42     | 6.90     |
| 24      | -2.74    | 12.24    | 4.47          | 44.47     | 6.90     |
| 25      | -3.39    | 15.15    | 5.47          | 44.47     | 6.90     |
| 26      | -4.25    | 19.00    | 6.58          | 44.47     | 6.90     |
| 27      | -5.40    | 24.14    | 7.86          | 44.47     | 6.90     |
| 28      | -6.94    | 31.02    | 9.22          | 44.47     | 6.90     |
| 29      | -9.02    | 40.31    | 10.82         | 44.47     | 6.90     |
| 30      | -12.64   | 56.51    | 12.51         | 44.47     | 6.90     |
| 31      | -19.19   | 85.77    | 14.40         | 44.47     | 7.02     |
| 32      | -2.05    | 13.45    | 5.48          | 40.53     | 7.02     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 33      | -2.51    | 16.47    | 6.59          | 40.53     | 7.02     |
| 34      | -3.10    | 20.31    | 7.83          | 40.53     | 7.02     |
| 35      | -3.85    | 25.29    | 9.27          | 40.53     | 7.02     |
| 36      | -4.82    | 31.63    | 10.80         | 40.53     | 7.02     |
| 37      | -6.31    | 41.39    | 12.51         | 40.53     | 7.02     |
| 38      | -8.59    | 56.37    | 14.43         | 40.53     | 7.02     |
| 39      | -12.23   | 80.26    | 16.70         | 40.53     | 7.02     |
| 40      | -18.54   | 121.69   | 19.11         | 40.53     | 7.02     |
| 41      | -1.21    | 14.67    | 6.61          | 36.58     | 7.02     |
| 42      | -1.47    | 17.76    | 7.87          | 36.58     | 7.02     |
| 43      | -1.78    | 21.61    | 9.26          | 36.58     | 7.02     |
| 44      | -2.18    | 26.41    | 10.81         | 36.58     | 7.02     |
| 45      | -2.74    | 33.26    | 12.55         | 36.58     | 7.02     |
| 46      | -3.55    | 43.00    | 14.52         | 36.58     | 7.02     |
| 47      | -4.70    | 56.96    | 16.73         | 36.58     | 7.02     |
| 48      | -6.43    | 77.91    | 19.25         | 36.58     | 7.02     |
| 49      | -9.16    | 111.06   | 22.13         | 36.58     | 7.02     |
| 50      | -13.31   | 161.33   | 25.07         | 36.58     | 7.02     |
| 51      | -0.18    | 13.32    | 6.60          | 32.63     | 7.02     |
| 52      | -0.21    | 15.88    | 7.86          | 32.63     | 7.02     |
| 53      | -0.26    | 19.03    | 9.26          | 32.63     | 7.02     |
| 54      | -0.31    | 22.87    | 10.83         | 32.63     | 7.02     |
| 55      | -0.38    | 28.09    | 12.53         | 32.63     | 7.02     |
| 56      | -0.47    | 35.18    | 14.54         | 32.63     | 7.02     |
| 57      | -0.60    | 44.85    | 16.72         | 32.63     | 7.02     |
| 58      | -0.79    | 58.56    | 19.22         | 32.63     | 7.02     |
| 59      | -1.04    | 77.85    | 22.15         | 32.63     | 7.02     |
| 60      | -1.38    | 102.88   | 24.89         | 32.63     | 7.02     |
| 61      | -1.86    | 138.59   | 28.43         | 32.63     | 7.02     |
| 62      | -2.55    | 190.14   | 32.40         | 32.63     | 7.02     |
| 63      | -3.61    | 269.16   | 36.60         | 32.63     | 7.02     |
| 64      | 0.80     | 14.44    | 7.85          | 28.68     | 7.02     |
| 65      | 0.95     | 17.08    | 9.26          | 28.68     | 7.02     |
| 66      | 1.13     | 20.27    | 10.84         | 28.68     | 7.02     |
| 67      | 1.36     | 24.42    | 12.57         | 28.68     | 7.02     |
| 68      | 1.66     | 29.88    | 14.53         | 28.68     | 7.02     |
| 69      | 2.06     | 37.08    | 16.76         | 28.68     | 7.02     |
| 70      | 2.57     | 46.31    | 19.07         | 28.68     | 7.02     |
| 71      | 3.22     | 57.94    | 21.92         | 28.68     | 7.02     |
| 72      | 4.04     | 72.70    | 24.89         | 28.68     | 7.02     |
| 73      | 5.11     | 92.06    | 28.48         | 28.68     | 7.02     |
| 74      | 6.42     | 115.67   | 31.98         | 28.68     | 7.02     |
| 75      | 8.31     | 149.66   | 36.49         | 28.68     | 7.02     |
| 76      | 12.32    | 221.75   | 41.27         | 28.68     | 7.02     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 77      | 1.95     | 15.56    | 9.25          | 24.74     | 7.02     |
| 78      | 2.28     | 18.26    | 10.83         | 24.74     | 7.02     |
| 79      | 2.71     | 21.66    | 12.52         | 24.74     | 7.02     |
| 80      | 3.25     | 26.01    | 14.49         | 24.74     | 7.02     |
| 81      | 3.94     | 31.49    | 16.68         | 24.74     | 7.02     |
| 82      | 4.76     | 38.09    | 19.11         | 24.74     | 7.02     |
| 83      | 5.79     | 46.32    | 21.83         | 24.74     | 7.02     |
| 84      | 7.07     | 56.54    | 24.86         | 24.74     | 7.02     |
| 85      | 8.65     | 69.16    | 28.22         | 24.74     | 7.02     |
| 86      | 10.61    | 84.84    | 31.98         | 24.74     | 7.02     |
| 87      | 13.05    | 104.34   | 36.39         | 24.74     | 7.02     |
| 88      | 17.53    | 140.24   | 41.01         | 24.74     | 7.02     |
| 89      | 3.26     | 16.67    | 10.81         | 20.79     | 7.02     |
| 90      | 3.82     | 19.50    | 12.51         | 20.79     | 7.02     |
| 91      | 4.51     | 23.05    | 14.48         | 20.79     | 7.02     |
| 92      | 5.35     | 27.31    | 16.61         | 20.79     | 7.02     |
| 93      | 6.35     | 32.47    | 19.03         | 20.79     | 7.02     |
| 94      | 7.58     | 38.74    | 21.74         | 20.79     | 7.02     |
| 95      | 9.07     | 46.34    | 24.76         | 20.79     | 7.02     |
| 96      | 10.87    | 55.55    | 28.16         | 20.79     | 7.02     |
| 97      | 13.05    | 66.65    | 31.97         | 20.79     | 7.02     |
| 98      | 15.64    | 79.92    | 36.15         | 20.79     | 7.02     |
| 99      | 19.94    | 101.86   | 40.82         | 20.79     | 7.02     |
| 100     | 4.77     | 17.77    | 12.53         | 16.84     | 7.02     |
| 101     | 5.56     | 20.71    | 14.43         | 16.84     | 7.02     |
| 102     | 6.49     | 24.18    | 16.60         | 16.84     | 7.02     |
| 103     | 7.61     | 28.35    | 19.02         | 16.84     | 7.02     |
| 104     | 8.95     | 33.36    | 21.74         | 16.84     | 7.02     |
| 105     | 10.55    | 39.32    | 24.65         | 16.84     | 7.02     |
| 106     | 12.45    | 46.40    | 28.03         | 16.84     | 7.02     |
| 107     | 14.71    | 54.81    | 31.82         | 16.84     | 7.02     |
| 108     | 17.38    | 64.76    | 36.07         | 16.84     | 7.02     |
| 109     | 21.38    | 79.69    | 40.51         | 16.84     | 7.02     |
| 110     | 6.47     | 18.81    | 14.46         | 12.89     | 7.02     |
| 111     | 7.47     | 21.73    | 16.58         | 12.89     | 7.02     |
| 112     | 8.67     | 25.21    | 19.00         | 12.89     | 7.02     |
| 113     | 10.08    | 29.33    | 21.63         | 12.89     | 7.02     |
| 114     | 11.75    | 34.19    | 24.65         | 12.89     | 7.02     |
| 115     | 13.71    | 39.88    | 27.90         | 12.89     | 7.02     |
| 116     | 16.00    | 46.55    | 31.67         | 12.89     | 7.02     |
| 117     | 18.67    | 54.32    | 35.89         | 12.89     | 7.02     |
| 118     | 22.44    | 65.29    | 40.35         | 12.89     | 7.02     |
| 119     | 8.36     | 19.77    | 16.56         | 8.95      | 7.02     |
| 120     | 9.61     | 22.72    | 18.98         | 8.95      | 7.02     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 121     | 11.07    | 26.19    | 21.61         | 8.95      | 7.02     |
| 122     | 12.78    | 30.24    | 24.62         | 8.95      | 7.02     |
| 123     | 14.78    | 34.95    | 27.88         | 8.95      | 7.02     |
| 124     | 17.09    | 40.43    | 31.64         | 8.95      | 7.02     |
| 125     | 19.76    | 46.74    | 35.69         | 8.95      | 7.02     |
| 126     | 23.34    | 55.20    | 40.32         | 8.95      | 7.02     |
| 127     | 10.48    | 20.69    | 18.95         | 5.00      | 7.02     |
| 128     | 11.98    | 23.66    | 21.58         | 5.00      | 7.02     |
| 129     | 13.73    | 27.11    | 24.59         | 5.00      | 7.02     |
| 130     | 15.75    | 31.09    | 27.85         | 5.00      | 7.02     |
| 131     | 18.08    | 35.69    | 31.59         | 5.00      | 7.02     |
| 132     | 20.75    | 40.96    | 35.64         | 5.00      | 7.02     |
| 133     | 24.17    | 47.72    | 40.11         | 5.00      | 7.02     |



6-P

|                                |   |
|--------------------------------|---|
| Analysis Mode                  |   |
| Design(D)/Factor of Safety(FS) | D |

|   |    |
|---|----|
| Analysis Type   |    |
| Soil Nail(SN)/Tie Back(TB)/Active EP(AEP)/Passive EP(PEP) | SN |

|                              |      |
|------------------------------|------|
| General                      |      |
| Toe Segment No.              | 1    |
| Toe Specification Type (X/Y) | Y    |
| Toe Y Value                  | 0    |
| X-Base                       | 0    |
| Y-Base                       | 0    |
| Minimum Toe Angle (deg)      | 5    |
| Maximum Toe Angle (deg)      | 80   |
| No. Toe Angles               | 20   |
| Minimum Exit X Value         | 2    |
| Maximum Exit X Value         | 45   |
| No. Exit Points              | 20   |
| Water Unit Weight            | 62.4 |
| Seismic Coefficient (g's)    | 0    |

|  |      |
|--|------|
| Factors of Safety  |      |
| Service Load Design(SLD)/Load-Resistance Factor Design(LRFD) | SLD  |
| FS - Cohesion  | 1.5  |
| FS - Friction Angle  | 1.5  |
| Strength Factor - Nail Tendon                                | 0.55 |
| Strength Factor - Nail Head                                  | 0.67 |
| Strength Factor - Pullout                                    | 0.5  |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |

| Soil | Cohesion | Friction | Unit Wt. | Pullout |
|------|----------|----------|----------|---------|
| 1    | 50       | 32       | 125      | 3000    |
| 2    | 100      | 40       | 135      | 7000    |

| Piezo | X | Y |
|-------|---|---|
|       |   |   |

| Node | X  | Y  |
|------|----|----|
| 1    | 0  | 0  |
| 2    | 0  | 1  |
| 3    | 0  | 6  |
| 4    | 11 | 13 |
| 5    | 36 | 23 |
| 6    | 50 | 26 |
| 7    | 11 | 8  |
| 8    | 36 | 18 |
| 9    | 50 | 21 |

| Segment | Node 1 | Node 2 | Top Soil # | Bot. Soil # | Top PO # | Bot. PO # |
|---------|--------|--------|------------|-------------|----------|-----------|
| 1       | 1      | 2      | 0          | 2           | 0        | 2         |
| 2       | 2      | 3      | 0          | 1           | 0        | 1         |
| 3       | 3      | 4      | 0          | 1           | 0        | 1         |
| 4       | 4      | 5      | 0          | 1           | 0        | 1         |
| 5       | 5      | 6      | 0          | 1           | 0        | 1         |
| 6       | 2      | 7      | 1          | 2           | 1        | 2         |
| 7       | 7      | 8      | 1          | 2           | 1        | 2         |
| 8       | 8      | 9      | 1          | 2           | 1        | 2         |

| Surcharge | Node 1 | P1  | Node 2 | P2  | Angle |
|-----------|--------|-----|--------|-----|-------|
| 1         | 3      | 250 | 4      | 250 | 270   |
| 2         | 4      | 250 | 5      | 250 | 270   |
| 3         | 5      | 250 | 6      | 250 | 270   |

| Nail | Xs | Ys | Length | Dip | Tendon Str. | Head Str. | Fixed? | Spacing | Tieback? |
|------|----|----|--------|-----|-------------|-----------|--------|---------|----------|
| 1    | 0  | 3  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |

| Face Press | Node 1 | P1 | Node 2 | P2 | Angle |
|------------|--------|----|--------|----|-------|
|            |        |    |        |    |       |

Analysis Type: Soil Nail

Analysis Mode: Design

Nail Head Strength Factor (Multiplier): 2.45

| Nail | Length | Capacity | Slip Surf. |
|------|--------|----------|------------|
| 1    | 8.2    | 36270    | 30         |

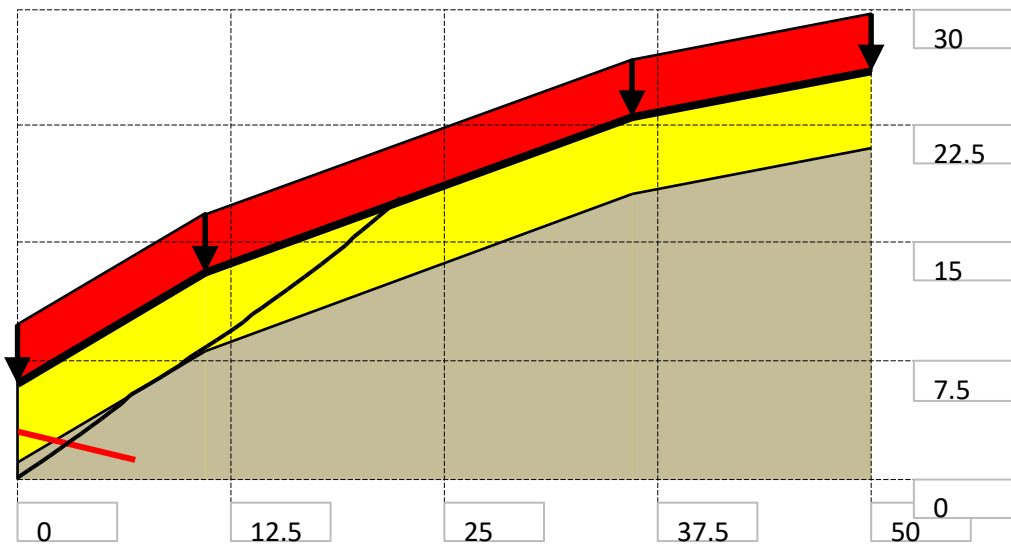
| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 1       | -17.88   | 19.25    | 2.03          | 72.11     | 4.98     |
| 2       | -18.15   | 22.47    | 2.76          | 68.16     | 5.51     |
| 3       | -11.22   | 16.03    | 2.73          | 64.21     | 5.51     |
| 4       | -17.76   | 25.37    | 3.58          | 64.21     | 5.94     |
| 5       | -7.81    | 12.98    | 2.75          | 60.26     | 5.94     |
| 6       | -10.83   | 18.00    | 3.52          | 60.26     | 5.94     |
| 7       | -16.19   | 26.90    | 4.43          | 60.26     | 6.28     |
| 8       | -7.48    | 14.61    | 3.56          | 56.32     | 6.28     |
| 9       | -10.20   | 19.94    | 4.43          | 56.32     | 6.28     |
| 10      | -14.87   | 29.07    | 5.43          | 56.32     | 6.49     |
| 11      | -23.39   | 45.72    | 6.57          | 56.32     | 6.96     |
| 12      | -5.34    | 12.49    | 3.55          | 52.37     | 6.96     |
| 13      | -6.96    | 16.28    | 4.45          | 52.37     | 6.96     |
| 14      | -9.31    | 21.78    | 5.46          | 52.37     | 6.96     |
| 15      | -12.94   | 30.27    | 6.56          | 52.37     | 6.96     |
| 16      | -18.52   | 43.31    | 7.78          | 52.37     | 7.19     |
| 17      | -4.84    | 13.89    | 4.47          | 48.42     | 7.19     |
| 18      | -6.19    | 17.79    | 5.46          | 48.42     | 7.19     |
| 19      | -8.10    | 23.26    | 6.57          | 48.42     | 7.19     |
| 20      | -10.86   | 31.20    | 7.85          | 48.42     | 7.19     |
| 21      | -14.86   | 42.68    | 9.20          | 48.42     | 7.33     |
| 22      | -21.27   | 61.10    | 10.85         | 48.42     | 7.79     |
| 23      | -3.35    | 12.29    | 4.47          | 44.47     | 7.79     |
| 24      | -4.16    | 15.27    | 5.47          | 44.47     | 7.79     |
| 25      | -5.25    | 19.24    | 6.58          | 44.47     | 7.79     |
| 26      | -6.70    | 24.56    | 7.86          | 44.47     | 7.79     |
| 27      | -8.65    | 31.74    | 9.23          | 44.47     | 7.79     |
| 28      | -11.31   | 41.50    | 10.74         | 44.47     | 7.79     |
| 29      | -16.04   | 58.81    | 12.51         | 44.47     | 7.90     |
| 30      | -25.07   | 91.95    | 14.46         | 44.47     | 8.13     |
| 31      | -2.71    | 13.54    | 5.48          | 40.53     | 8.13     |
| 32      | -3.33    | 16.64    | 6.60          | 40.53     | 8.13     |



| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 33      | -4.12    | 20.62    | 7.84          | 40.53     | 8.13     |
| 34      | -5.15    | 25.75    | 9.21          | 40.53     | 8.13     |
| 35      | -6.43    | 32.18    | 10.77         | 40.53     | 8.13     |
| 36      | -8.50    | 42.54    | 12.51         | 40.53     | 8.13     |
| 37      | -11.69   | 58.49    | 14.43         | 40.53     | 8.13     |
| 38      | -16.84   | 84.24    | 16.57         | 40.53     | 8.13     |
| 39      | -26.04   | 130.26   | 19.11         | 40.53     | 8.18     |
| 40      | -1.91    | 14.79    | 6.58          | 36.58     | 8.18     |
| 41      | -2.32    | 17.96    | 7.87          | 36.58     | 8.18     |
| 42      | -2.83    | 21.94    | 9.26          | 36.58     | 8.18     |
| 43      | -3.47    | 26.88    | 10.81         | 36.58     | 8.18     |
| 44      | -4.39    | 33.99    | 12.55         | 36.58     | 8.18     |
| 45      | -5.70    | 44.15    | 14.51         | 36.58     | 8.18     |
| 46      | -7.61    | 58.91    | 16.74         | 36.58     | 8.18     |
| 47      | -10.48   | 81.19    | 19.10         | 36.58     | 8.18     |
| 48      | -15.11   | 117.06   | 21.92         | 36.58     | 8.18     |
| 49      | -21.94   | 169.96   | 24.93         | 36.58     | 8.18     |
| 50      | -0.80    | 13.41    | 6.60          | 32.63     | 8.18     |
| 51      | -0.96    | 16.04    | 7.86          | 32.63     | 8.18     |
| 52      | -1.15    | 19.26    | 9.26          | 32.63     | 8.18     |
| 53      | -1.38    | 23.22    | 10.83         | 32.63     | 8.18     |
| 54      | -1.70    | 28.62    | 12.54         | 32.63     | 8.18     |
| 55      | -2.14    | 35.97    | 14.54         | 32.63     | 8.18     |
| 56      | -2.74    | 45.98    | 16.71         | 32.63     | 8.18     |
| 57      | -3.60    | 60.36    | 19.21         | 32.63     | 8.18     |
| 58      | -4.80    | 80.63    | 21.97         | 32.63     | 8.18     |
| 59      | -6.39    | 107.27   | 24.90         | 32.63     | 8.18     |
| 60      | -8.67    | 145.59   | 28.42         | 32.63     | 8.18     |
| 61      | -12.06   | 202.41   | 32.42         | 32.63     | 8.18     |
| 62      | -17.33   | 290.97   | 36.28         | 32.63     | 8.18     |
| 63      | 0.14     | 14.57    | 7.85          | 28.68     | 8.18     |
| 64      | 0.16     | 17.28    | 9.26          | 28.68     | 8.18     |
| 65      | 0.19     | 20.55    | 10.79         | 28.68     | 8.18     |
| 66      | 0.23     | 24.83    | 12.57         | 28.68     | 8.18     |
| 67      | 0.29     | 30.47    | 14.53         | 28.68     | 8.18     |
| 68      | 0.36     | 37.92    | 16.67         | 28.68     | 8.18     |
| 69      | 0.45     | 47.52    | 19.08         | 28.68     | 8.18     |
| 70      | 0.56     | 59.41    | 21.72         | 28.68     | 8.18     |
| 71      | 0.71     | 75.04    | 24.89         | 28.68     | 8.18     |
| 72      | 0.90     | 95.42    | 28.23         | 28.68     | 8.18     |
| 73      | 1.13     | 120.03   | 31.92         | 28.68     | 8.18     |
| 74      | 1.47     | 156.65   | 36.48         | 28.68     | 8.18     |
| 75      | 2.21     | 234.87   | 41.26         | 28.68     | 8.18     |
| 76      | 1.23     | 15.73    | 9.25          | 24.74     | 8.18     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 77      | 1.45     | 18.50    | 10.79         | 24.74     | 8.18     |
| 78      | 1.73     | 22.00    | 12.53         | 24.74     | 8.18     |
| 79      | 2.08     | 26.48    | 14.49         | 24.74     | 8.18     |
| 80      | 2.52     | 32.14    | 16.60         | 24.74     | 8.18     |
| 81      | 3.06     | 38.98    | 19.01         | 24.74     | 8.18     |
| 82      | 3.73     | 47.51    | 21.70         | 24.74     | 8.18     |
| 83      | 4.56     | 58.13    | 24.86         | 24.74     | 8.18     |
| 84      | 5.59     | 71.29    | 28.22         | 24.74     | 8.18     |
| 85      | 6.87     | 87.63    | 31.98         | 24.74     | 8.18     |
| 86      | 8.48     | 108.09   | 36.15         | 24.74     | 8.18     |
| 87      | 11.45    | 145.90   | 40.99         | 24.74     | 8.18     |
| 88      | 2.50     | 16.87    | 10.78         | 20.79     | 8.18     |
| 89      | 2.93     | 19.77    | 12.50         | 20.79     | 8.18     |
| 90      | 3.48     | 23.45    | 14.48         | 20.79     | 8.18     |
| 91      | 4.13     | 27.85    | 16.61         | 20.79     | 8.18     |
| 92      | 4.92     | 33.18    | 19.03         | 20.79     | 8.18     |
| 93      | 5.88     | 39.67    | 21.74         | 20.79     | 8.18     |
| 94      | 7.05     | 47.54    | 24.76         | 20.79     | 8.18     |
| 95      | 8.46     | 57.09    | 28.16         | 20.79     | 8.18     |
| 96      | 10.18    | 68.63    | 31.96         | 20.79     | 8.18     |
| 97      | 12.22    | 82.43    | 36.15         | 20.79     | 8.18     |
| 98      | 15.61    | 105.31   | 40.55         | 20.79     | 8.18     |
| 99      | 3.96     | 18.03    | 12.49         | 16.84     | 8.18     |
| 100     | 4.62     | 21.05    | 14.43         | 16.84     | 8.18     |
| 101     | 5.41     | 24.64    | 16.60         | 16.84     | 8.18     |
| 102     | 6.36     | 28.96    | 19.03         | 16.84     | 8.18     |
| 103     | 7.49     | 34.13    | 21.64         | 16.84     | 8.18     |
| 104     | 8.85     | 40.30    | 24.66         | 16.84     | 8.18     |
| 105     | 10.46    | 47.64    | 28.03         | 16.84     | 8.18     |
| 106     | 12.37    | 56.33    | 31.82         | 16.84     | 8.18     |
| 107     | 14.63    | 66.66    | 35.87         | 16.84     | 8.18     |
| 108     | 18.04    | 82.19    | 40.50         | 16.84     | 8.18     |
| 109     | 5.60     | 19.12    | 14.42         | 12.89     | 8.18     |
| 110     | 6.49     | 22.14    | 16.58         | 12.89     | 8.18     |
| 111     | 7.54     | 25.74    | 18.94         | 12.89     | 8.18     |
| 112     | 8.79     | 30.00    | 21.64         | 12.89     | 8.18     |
| 113     | 10.26    | 35.02    | 24.65         | 12.89     | 8.18     |
| 114     | 11.99    | 40.92    | 27.92         | 12.89     | 8.18     |
| 115     | 14.01    | 47.83    | 31.68         | 12.89     | 8.18     |
| 116     | 16.36    | 55.86    | 35.70         | 12.89     | 8.18     |
| 117     | 19.71    | 67.28    | 40.35         | 12.89     | 8.18     |
| 118     | 7.44     | 20.14    | 16.56         | 8.95      | 8.18     |
| 119     | 8.57     | 23.19    | 18.92         | 8.95      | 8.18     |
| 120     | 9.89     | 26.78    | 21.62         | 8.95      | 8.18     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 121     | 11.44    | 30.97    | 24.54         | 8.95      | 8.18     |
| 122     | 13.25    | 35.86    | 27.90         | 8.95      | 8.18     |
| 123     | 15.34    | 41.53    | 31.52         | 8.95      | 8.18     |
| 124     | 17.76    | 48.07    | 35.70         | 8.95      | 8.18     |
| 125     | 21.00    | 56.86    | 40.16         | 8.95      | 8.18     |
| 126     | 9.50     | 21.11    | 18.95         | 5.00      | 8.18     |
| 127     | 10.88    | 24.19    | 21.59         | 5.00      | 8.18     |
| 128     | 12.49    | 27.76    | 24.51         | 5.00      | 8.18     |
| 129     | 14.35    | 31.90    | 27.86         | 5.00      | 8.18     |
| 130     | 16.50    | 36.67    | 31.49         | 5.00      | 8.18     |
| 131     | 18.96    | 42.13    | 35.65         | 5.00      | 8.18     |
| 132     | 22.12    | 49.16    | 40.11         | 5.00      | 8.18     |



6-E

|                                |   |
|--------------------------------|---|
| <b>Analysis Mode</b>           |   |
| Design(D)/Factor of Safety(FS) | D |

|   |    |
|---|----|
| <b>Analysis Type</b>                                      |    |
| Soil Nail(SN)/Tie Back(TB)/Active EP(AEP)/Passive EP(PEP) | SN |

|                              |      |
|------------------------------|------|
| <b>General</b>               |      |
| Toe Segment No.              | 1    |
| Toe Specification Type (X/Y) | Y    |
| Toe Y Value                  | 0    |
| X-Base                       | 0    |
| Y-Base                       | 0    |
| Minimum Toe Angle (deg)      | 5    |
| Maximum Toe Angle (deg)      | 80   |
| No. Toe Angles               | 20   |
| Minimum Exit X Value         | 2    |
| Maximum Exit X Value         | 45   |
| No. Exit Points              | 20   |
| Water Unit Weight            | 62.4 |
| Seismic Coefficient (g's)    | 0.3  |

|  |      |
|--|------|
| <b>Factors of Safety</b>                                     |      |
| Service Load Design(SLD)/Load-Resistance Factor Design(LRFD) | SLD  |
| FS - Cohesion  | 1.1  |
| FS - Friction Angle  | 1.1  |
| Strength Factor - Nail Tendon                                | 0.74 |
| Strength Factor - Nail Head                                  | 0.91 |
| Strength Factor - Pullout                                    | 0.67 |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |

| Soil | Cohesion | Friction | Unit Wt. | Pullout |
|------|----------|----------|----------|---------|
| 1    | 50       | 32       | 125      | 3000    |
| 2    | 100      | 40       | 135      | 7000    |

| Piezo | X | Y |
|-------|---|---|
|       |   |   |

| Node | X  | Y  |
|------|----|----|
| 1    | 0  | 0  |
| 2    | 0  | 1  |
| 3    | 0  | 6  |
| 4    | 11 | 13 |
| 5    | 36 | 23 |
| 6    | 50 | 26 |
| 7    | 11 | 8  |
| 8    | 36 | 18 |
| 9    | 50 | 21 |

| Segment | Node 1 | Node 2 | Top Soil # | Bot. Soil # | Top PO # | Bot. PO # |
|---------|--------|--------|------------|-------------|----------|-----------|
| 1       | 1      | 2      | 0          | 2           | 0        | 2         |
| 2       | 2      | 3      | 0          | 1           | 0        | 1         |
| 3       | 3      | 4      | 0          | 1           | 0        | 1         |
| 4       | 4      | 5      | 0          | 1           | 0        | 1         |
| 5       | 5      | 6      | 0          | 1           | 0        | 1         |
| 6       | 2      | 7      | 1          | 2           | 1        | 2         |
| 7       | 7      | 8      | 1          | 2           | 1        | 2         |
| 8       | 8      | 9      | 1          | 2           | 1        | 2         |

| Surcharge | Node 1 | P1  | Node 2 | P2  | Angle |
|-----------|--------|-----|--------|-----|-------|
| 1         | 3      | 250 | 4      | 250 | 270   |
| 2         | 4      | 250 | 5      | 250 | 270   |
| 3         | 5      | 250 | 6      | 250 | 270   |

| Nail | Xs | Ys | Length | Dip | Tendon Str. | Head Str. | Fixed? | Spacing | Tieback? |
|------|----|----|--------|-----|-------------|-----------|--------|---------|----------|
| 1    | 0  | 3  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |

| Face Press | Node 1 | P1 | Node 2 | P2 | Angle |
|------------|--------|----|--------|----|-------|
|            |        |    |        |    |       |

Analysis Type: Soil Nail

Analysis Mode: Design

Nail Head Strength Factor (Multiplier): 1.71

| Nail | Length | Capacity | Slip Surf. |
|------|--------|----------|------------|
| 1    | 7.1    | 27628    | 38         |

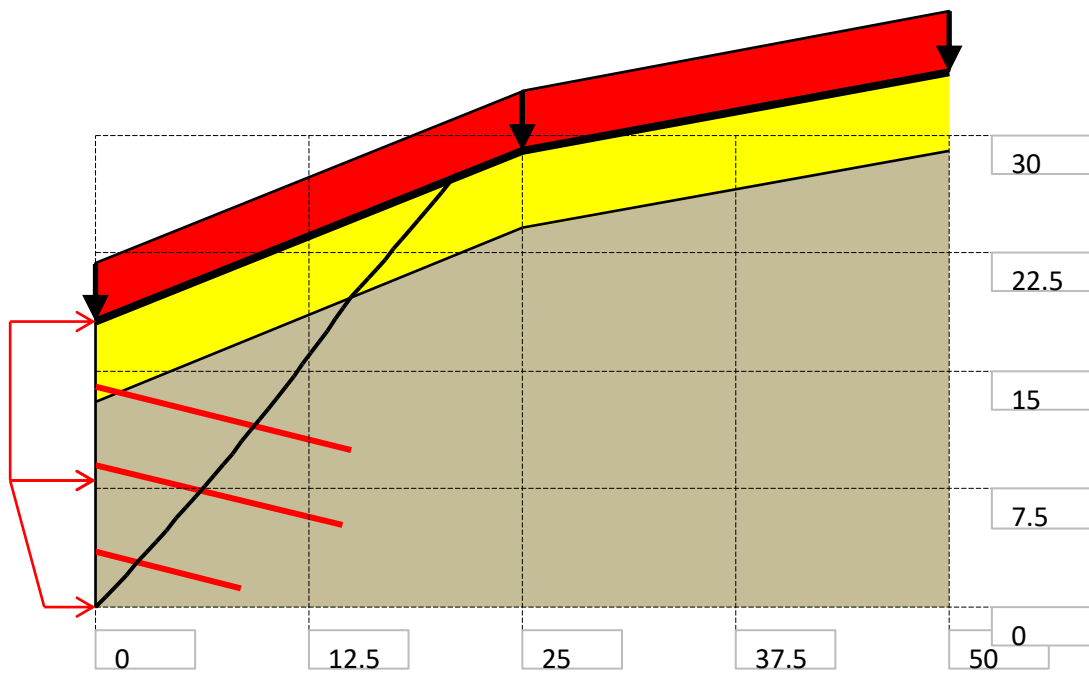
| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 1       | -12.68   | 18.26    | 2.01          | 72.11     | 3.57     |
| 2       | -8.20    | 13.75    | 2.02          | 68.16     | 3.66     |
| 3       | -12.48   | 20.92    | 2.74          | 68.16     | 4.03     |
| 4       | -7.88    | 15.54    | 2.74          | 64.21     | 4.07     |
| 5       | -11.90   | 23.48    | 3.56          | 64.21     | 4.43     |
| 6       | -5.41    | 12.80    | 2.74          | 60.26     | 4.43     |
| 7       | -7.35    | 17.38    | 3.55          | 60.26     | 4.45     |
| 8       | -10.74   | 25.40    | 4.45          | 60.26     | 4.77     |
| 9       | -4.91    | 14.28    | 3.55          | 56.32     | 4.77     |
| 10      | -6.59    | 19.16    | 4.44          | 56.32     | 4.77     |
| 11      | -9.27    | 26.95    | 5.47          | 56.32     | 5.08     |
| 12      | -13.76   | 40.02    | 6.54          | 56.32     | 5.37     |
| 13      | -3.31    | 12.31    | 3.58          | 52.37     | 5.37     |
| 14      | -4.22    | 15.73    | 4.47          | 52.37     | 5.37     |
| 15      | -5.55    | 20.68    | 5.46          | 52.37     | 5.37     |
| 16      | -7.54    | 28.07    | 6.55          | 52.37     | 5.37     |
| 17      | -10.63   | 39.59    | 7.84          | 52.37     | 5.68     |
| 18      | -2.66    | 13.56    | 4.47          | 48.42     | 5.68     |
| 19      | -3.35    | 17.11    | 5.46          | 48.42     | 5.68     |
| 20      | -4.32    | 22.05    | 6.61          | 48.42     | 5.68     |
| 21      | -5.66    | 28.88    | 7.83          | 48.42     | 5.68     |
| 22      | -7.53    | 38.42    | 9.15          | 48.42     | 5.81     |
| 23      | -10.41   | 53.15    | 10.79         | 48.42     | 6.22     |
| 24      | -1.85    | 14.81    | 5.50          | 44.47     | 6.22     |
| 25      | -2.31    | 18.42    | 6.61          | 44.47     | 6.22     |
| 26      | -2.90    | 23.19    | 7.85          | 44.47     | 6.22     |
| 27      | -3.71    | 29.61    | 9.24          | 44.47     | 6.22     |
| 28      | -4.75    | 37.97    | 10.82         | 44.47     | 6.22     |
| 29      | -6.53    | 52.19    | 12.50         | 44.47     | 6.48     |
| 30      | -9.67    | 77.20    | 14.40         | 44.47     | 6.76     |
| 31      | -0.73    | 13.18    | 5.50          | 40.53     | 6.76     |
| 32      | -0.89    | 16.03    | 6.63          | 40.53     | 6.76     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 33      | -1.10    | 19.65    | 7.88          | 40.53     | 6.76      |
| 34      | -1.35    | 24.27    | 9.26          | 40.53     | 6.76      |
| 35      | -1.68    | 30.14    | 10.79         | 40.53     | 6.76      |
| 36      | -2.17    | 38.99    | 12.50         | 40.53     | 6.76      |
| 37      | -2.91    | 52.28    | 14.52         | 40.53     | 6.80      |
| 38      | -4.07    | 72.99    | 16.68         | 40.53     | 7.05      |
| 39      | -5.98    | 107.28   | 19.08         | 40.53     | 7.05      |
| 40      | 0.19     | 14.31    | 6.61          | 36.58     | 7.05      |
| 41      | 0.23     | 17.22    | 7.86          | 36.58     | 7.05      |
| 42      | 0.28     | 20.84    | 9.26          | 36.58     | 7.05      |
| 43      | 0.33     | 25.31    | 10.87         | 36.58     | 7.05      |
| 44      | 0.42     | 31.62    | 12.54         | 36.58     | 7.05      |
| 45      | 0.54     | 40.50    | 14.51         | 36.58     | 7.05      |
| 46      | 0.70     | 53.06    | 16.73         | 36.58     | 7.05      |
| 47      | 0.95     | 71.53    | 19.24         | 36.58     | 7.05      |
| 48      | 1.32     | 100.10   | 22.10         | 36.58     | 7.14      |
| 49      | 1.93     | 145.63   | 25.28         | 36.58     | 7.14      |
| 50      | 1.27     | 15.44    | 7.89          | 32.63     | 7.14      |
| 51      | 1.51     | 18.39    | 9.30          | 32.63     | 7.14      |
| 52      | 1.81     | 22.00    | 10.82         | 32.63     | 7.14      |
| 53      | 2.21     | 26.83    | 12.59         | 32.63     | 7.14      |
| 54      | 2.75     | 33.36    | 14.53         | 32.63     | 7.14      |
| 55      | 3.48     | 42.25    | 16.83         | 32.63     | 7.14      |
| 56      | 4.50     | 54.68    | 19.35         | 32.63     | 7.14      |
| 57      | 5.93     | 72.07    | 22.15         | 32.63     | 7.14      |
| 58      | 7.65     | 92.91    | 24.93         | 32.63     | 7.14      |
| 59      | 10.31    | 125.31   | 28.41         | 32.63     | 7.14      |
| 60      | 13.41    | 162.96   | 31.83         | 32.63     | 7.14      |
| 61      | 19.17    | 232.89   | 36.56         | 32.63     | 7.14      |
| 62      | 2.52     | 16.55    | 9.29          | 28.68     | 7.14      |
| 63      | 2.97     | 19.54    | 10.83         | 28.68     | 7.14      |
| 64      | 3.56     | 23.40    | 12.56         | 28.68     | 7.14      |
| 65      | 4.33     | 28.45    | 14.52         | 28.68     | 7.14      |
| 66      | 5.34     | 35.09    | 16.75         | 28.68     | 7.14      |
| 67      | 6.64     | 43.60    | 19.19         | 28.68     | 7.14      |
| 68      | 8.23     | 54.10    | 21.88         | 28.68     | 7.14      |
| 69      | 10.29    | 67.61    | 25.09         | 28.68     | 7.14      |
| 70      | 12.93    | 84.98    | 28.47         | 28.68     | 7.14      |
| 71      | 16.24    | 106.73   | 32.44         | 28.68     | 7.14      |
| 72      | 20.68    | 135.88   | 36.48         | 28.68     | 7.14      |
| 73      | 30.05    | 197.46   | 41.25         | 28.68     | 7.14      |
| 74      | 3.94     | 17.64    | 10.82         | 24.74     | 7.14      |
| 75      | 4.65     | 20.79    | 12.56         | 24.74     | 7.14      |
| 76      | 5.55     | 24.81    | 14.54         | 24.74     | 7.14      |



| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 77      | 6.68     | 29.89    | 16.67         | 24.74     | 7.14     |
| 78      | 8.04     | 35.97    | 19.09         | 24.74     | 7.14     |
| 79      | 9.73     | 43.53    | 21.81         | 24.74     | 7.14     |
| 80      | 11.82    | 52.89    | 24.83         | 24.74     | 7.14     |
| 81      | 14.33    | 64.11    | 28.31         | 24.74     | 7.14     |
| 82      | 17.59    | 78.68    | 32.24         | 24.74     | 7.14     |
| 83      | 21.52    | 96.25    | 36.37         | 24.74     | 7.14     |
| 84      | 28.68    | 128.32   | 41.34         | 24.74     | 7.14     |
| 85      | 5.57     | 18.74    | 12.55         | 20.79     | 7.14     |
| 86      | 6.54     | 22.02    | 14.46         | 20.79     | 7.14     |
| 87      | 7.71     | 25.96    | 16.66         | 20.79     | 7.14     |
| 88      | 9.13     | 30.72    | 19.10         | 20.79     | 7.14     |
| 89      | 10.85    | 36.51    | 21.83         | 20.79     | 7.14     |
| 90      | 12.93    | 43.51    | 24.89         | 20.79     | 7.14     |
| 91      | 15.44    | 51.95    | 28.14         | 20.79     | 7.14     |
| 92      | 18.45    | 62.10    | 31.94         | 20.79     | 7.14     |
| 93      | 22.03    | 74.15    | 36.11         | 20.79     | 7.14     |
| 94      | 27.96    | 94.11    | 40.81         | 20.79     | 7.14     |
| 95      | 6.39     | 17.10    | 12.52         | 16.84     | 7.14     |
| 96      | 7.40     | 19.80    | 14.46         | 16.84     | 7.14     |
| 97      | 8.60     | 23.01    | 16.64         | 16.84     | 7.14     |
| 98      | 10.04    | 26.87    | 19.01         | 16.84     | 7.14     |
| 99      | 11.77    | 31.48    | 21.72         | 16.84     | 7.14     |
| 100     | 13.82    | 36.98    | 24.76         | 16.84     | 7.14     |
| 101     | 16.26    | 43.49    | 28.16         | 16.84     | 7.14     |
| 102     | 19.14    | 51.21    | 31.81         | 16.84     | 7.14     |
| 103     | 22.55    | 60.32    | 36.05         | 16.84     | 7.14     |
| 104     | 27.63    | 73.92    | 40.73         | 16.84     | 7.14     |
| 105     | 8.19     | 18.01    | 14.49         | 12.89     | 7.14     |
| 106     | 9.41     | 20.70    | 16.62         | 12.89     | 7.14     |
| 107     | 10.86    | 23.90    | 18.98         | 12.89     | 7.14     |
| 108     | 12.59    | 27.69    | 21.69         | 12.89     | 7.14     |
| 109     | 14.62    | 32.16    | 24.63         | 12.89     | 7.14     |
| 110     | 17.00    | 37.40    | 28.01         | 12.89     | 7.14     |
| 111     | 19.78    | 43.52    | 31.79         | 12.89     | 7.14     |
| 112     | 23.02    | 50.65    | 35.86         | 12.89     | 7.14     |
| 113     | 27.55    | 60.61    | 40.52         | 12.89     | 7.14     |
| 114     | 10.19    | 18.85    | 16.59         | 8.95      | 7.14     |
| 115     | 11.65    | 21.55    | 19.01         | 8.95      | 7.14     |
| 116     | 13.37    | 24.73    | 21.66         | 8.95      | 7.14     |
| 117     | 15.37    | 28.45    | 24.59         | 8.95      | 7.14     |
| 118     | 17.72    | 32.78    | 27.97         | 8.95      | 7.14     |
| 119     | 20.43    | 37.80    | 31.61         | 8.95      | 7.14     |
| 120     | 23.56    | 43.58    | 35.81         | 8.95      | 7.14     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 121     | 27.70    | 51.25    | 40.29         | 8.95      | 7.14     |
| 122     | 14.15    | 22.35    | 21.62         | 5.00      | 7.14     |
| 123     | 16.15    | 25.50    | 24.56         | 5.00      | 7.14     |
| 124     | 18.45    | 29.15    | 27.91         | 5.00      | 7.14     |
| 125     | 21.12    | 33.35    | 31.56         | 5.00      | 7.14     |
| 126     | 24.17    | 38.18    | 35.74         | 5.00      | 7.14     |
| 127     | 28.04    | 44.29    | 40.23         | 5.00      | 7.14     |



18-T

|                                |   |
|--------------------------------|---|
| Analysis Mode                  |   |
| Design(D)/Factor of Safety(FS) | D |

|   |    |
|---|----|
| Analysis Type   |    |
| Soil Nail(SN)/Tie Back(TB)/Active EP(AEP)/Passive EP(PEP) | SN |

|                              |      |
|------------------------------|------|
| General                      |      |
| Toe Segment No.              | 1    |
| Toe Specification Type (X/Y) | Y    |
| Toe Y Value                  | 0    |
| X-Base                       | 0    |
| Y-Base                       | 0    |
| Minimum Toe Angle (deg)      | 5    |
| Maximum Toe Angle (deg)      | 80   |
| No. Toe Angles               | 20   |
| Minimum Exit X Value         | 5    |
| Maximum Exit X Value         | 45   |
| No. Exit Points              | 20   |
| Water Unit Weight            | 62.4 |
| Seismic Coefficient (g's)    | 0    |

|  |      |
|--|------|
| Factors of Safety  |      |
| Service Load Design(SLD)/Load-Resistance Factor Design(LRFD) | SLD  |
| FS - Cohesion  | 1.35 |
| FS - Friction Angle  | 1.35 |
| Strength Factor - Nail Tendon                                | 0.55 |
| Strength Factor - Nail Head                                  | 0.67 |
| Strength Factor - Pullout                                    | 0.5  |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |

| Soil | Cohesion | Friction | Unit Wt. | Pullout |
|------|----------|----------|----------|---------|
| 1    | 50       | 32       | 125      | 3000    |
| 2    | 100      | 40       | 135      | 7000    |

| Piezo | X | Y |
|-------|---|---|
|       |   |   |

| Node | X  | Y  |
|------|----|----|
| 1    | 0  | 0  |
| 2    | 0  | 13 |
| 3    | 0  | 18 |
| 4    | 25 | 29 |
| 5    | 50 | 34 |
| 6    | 25 | 24 |
| 7    | 50 | 29 |
| 8    | 0  | 8  |

| Segment | Node 1 | Node 2 | Top Soil # | Bot. Soil # | Top PO # | Bot. PO # |
|---------|--------|--------|------------|-------------|----------|-----------|
| 1       | 1      | 2      | 0          | 2           | 0        | 2         |
| 2       | 2      | 3      | 0          | 1           | 0        | 1         |
| 3       | 3      | 4      | 0          | 1           | 0        | 1         |
| 4       | 4      | 5      | 0          | 1           | 0        | 1         |
| 5       | 2      | 6      | 1          | 2           | 1        | 2         |
| 6       | 6      | 7      | 1          | 2           | 1        | 2         |

| Surcharge | Node 1 | P1  | Node 2 | P2  | Angle |
|-----------|--------|-----|--------|-----|-------|
| 1         | 3      | 250 | 4      | 250 | 270   |
| 2         | 4      | 250 | 5      | 250 | 270   |

| Nail | Xs | Ys  | Length | Dip | Tendon Str. | Head Str. | Fixed? | Spacing | Tieback? |
|------|----|-----|--------|-----|-------------|-----------|--------|---------|----------|
| 1    | 0  | 14  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 2    | 0  | 9   | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 3    | 0  | 3.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |

| Face Press | Node 1 | P1  | Node 2 | P2 | Angle |
|------------|--------|-----|--------|----|-------|
| 1          | 1      | 0.6 | 8      | 1  | 0     |
| 2          | 8      | 1   | 3      | 1  | 0     |

Analysis Type: Soil Nail

Analysis Mode: Design

Nail Head Strength Factor (Multiplier): 1.58

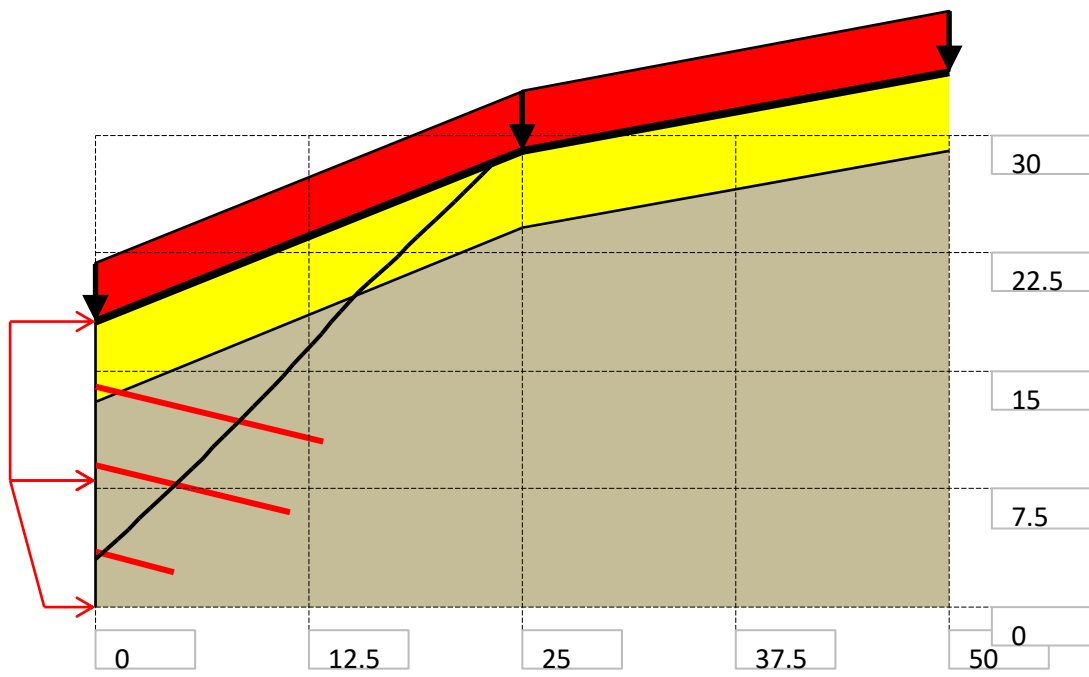
| Nail | Length | Capacity | Slip Surf. |
|------|--------|----------|------------|
| 1    | 15.5   | 45969    | 26         |
| 2    | 15.0   | 46954    | 42         |
| 3    | 8.8    | 36363    | 51         |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 1       | -60.41   | 71.38    | 5.11          | 72.11     | 8.42     |
| 2       | -33.62   | 45.78    | 5.07          | 68.16     | 8.86     |
| 3       | -40.37   | 54.96    | 5.74          | 68.16     | 9.67     |
| 4       | -51.00   | 69.44    | 6.48          | 68.16     | 10.36    |
| 5       | -69.45   | 94.57    | 7.28          | 68.16     | 10.98    |
| 6       | -22.42   | 35.40    | 5.09          | 64.21     | 10.98    |
| 7       | -25.65   | 40.50    | 5.79          | 64.21     | 10.98    |
| 8       | -29.87   | 47.16    | 6.51          | 64.21     | 10.98    |
| 9       | -36.78   | 58.08    | 7.39          | 64.21     | 11.35    |
| 10      | -46.63   | 73.63    | 8.25          | 64.21     | 11.89    |
| 11      | -65.94   | 104.12   | 9.29          | 64.21     | 12.45    |
| 12      | -17.72   | 32.78    | 5.77          | 60.26     | 12.45    |
| 13      | -19.98   | 36.95    | 6.53          | 60.26     | 12.45    |
| 14      | -23.01   | 42.57    | 7.35          | 60.26     | 12.45    |
| 15      | -27.50   | 50.87    | 8.31          | 60.26     | 12.45    |
| 16      | -34.01   | 62.90    | 9.33          | 60.26     | 12.45    |
| 17      | -44.83   | 82.91    | 10.48         | 60.26     | 12.96    |
| 18      | -64.25   | 118.82   | 11.70         | 60.26     | 13.44    |
| 19      | -14.14   | 31.10    | 6.54          | 56.32     | 13.44    |
| 20      | -15.82   | 34.78    | 7.37          | 56.32     | 13.44    |
| 21      | -18.10   | 39.80    | 8.31          | 56.32     | 13.44    |
| 22      | -21.21   | 46.65    | 9.36          | 56.32     | 13.44    |
| 23      | -25.77   | 56.68    | 10.53         | 56.32     | 13.44    |
| 24      | -32.46   | 71.39    | 11.79         | 56.32     | 13.57    |
| 25      | -44.77   | 98.45    | 13.32         | 56.32     | 14.27    |
| 26      | -63.35   | 139.31   | 14.62         | 56.32     | 14.51    |
| 27      | -11.22   | 30.00    | 7.33          | 52.37     | 14.51    |
| 28      | -12.51   | 33.46    | 8.26          | 52.37     | 14.51    |
| 29      | -14.21   | 37.99    | 9.30          | 52.37     | 14.51    |
| 30      | -16.49   | 44.09    | 10.46         | 52.37     | 14.51    |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 31      | -19.66   | 52.56    | 11.74         | 52.37     | 14.51     |
| 32      | -24.41   | 65.28    | 13.22         | 52.37     | 14.51     |
| 33      | -31.37   | 83.88    | 14.88         | 52.37     | 14.64     |
| 34      | -42.46   | 113.54   | 16.52         | 52.37     | 15.08     |
| 35      | -9.70    | 32.61    | 9.32          | 48.42     | 15.08     |
| 36      | -10.96   | 36.86    | 10.48         | 48.42     | 15.08     |
| 37      | -12.62   | 42.46    | 11.77         | 48.42     | 15.08     |
| 38      | -14.88   | 50.04    | 13.21         | 48.42     | 15.08     |
| 39      | -18.02   | 60.60    | 14.81         | 48.42     | 15.08     |
| 40      | -22.61   | 76.03    | 16.59         | 48.42     | 15.08     |
| 41      | -29.19   | 98.17    | 18.57         | 48.42     | 15.17     |
| 42      | -41.79   | 140.57   | 20.93         | 48.42     | 15.47     |
| 43      | -7.18    | 32.11    | 10.48         | 44.47     | 15.47     |
| 44      | -8.10    | 36.21    | 11.79         | 44.47     | 15.47     |
| 45      | -9.28    | 41.48    | 13.24         | 44.47     | 15.47     |
| 46      | -10.84   | 48.44    | 14.85         | 44.47     | 15.47     |
| 47      | -12.96   | 57.92    | 16.65         | 44.47     | 15.47     |
| 48      | -15.87   | 70.96    | 18.63         | 44.47     | 15.47     |
| 49      | -20.12   | 89.93    | 20.85         | 44.47     | 15.47     |
| 50      | -26.63   | 119.03   | 23.50         | 44.47     | 15.47     |
| 51      | -38.77   | 173.29   | 26.21         | 44.47     | 15.47     |
| 52      | -4.87    | 31.95    | 11.80         | 40.53     | 15.47     |
| 53      | -5.47    | 35.90    | 13.18         | 40.53     | 15.47     |
| 54      | -6.24    | 40.95    | 14.79         | 40.53     | 15.47     |
| 55      | -7.21    | 47.35    | 16.54         | 40.53     | 15.47     |
| 56      | -8.54    | 56.05    | 18.56         | 40.53     | 15.47     |
| 57      | -10.29   | 67.55    | 20.91         | 40.53     | 15.47     |
| 58      | -12.71   | 83.43    | 23.40         | 40.53     | 15.47     |
| 59      | -16.45   | 107.94   | 26.14         | 40.53     | 15.47     |
| 60      | -24.10   | 158.20   | 29.23         | 40.53     | 15.47     |
| 61      | -2.64    | 31.98    | 13.20         | 36.58     | 15.47     |
| 62      | -2.96    | 35.86    | 14.81         | 36.58     | 15.47     |
| 63      | -3.36    | 40.77    | 16.61         | 36.58     | 15.47     |
| 64      | -3.87    | 46.96    | 18.60         | 36.58     | 15.47     |
| 65      | -4.53    | 54.93    | 20.83         | 36.58     | 15.47     |
| 66      | -5.37    | 65.12    | 23.27         | 36.58     | 15.47     |
| 67      | -6.59    | 79.91    | 26.08         | 36.58     | 15.47     |
| 68      | -8.64    | 104.72   | 29.16         | 36.58     | 15.47     |
| 69      | -11.92   | 144.56   | 32.61         | 36.58     | 15.47     |
| 70      | -18.14   | 219.87   | 36.47         | 36.58     | 15.47     |
| 71      | -0.43    | 32.19    | 14.82         | 32.63     | 15.47     |
| 72      | -0.48    | 36.03    | 16.62         | 32.63     | 15.47     |
| 73      | -0.55    | 40.81    | 18.63         | 32.63     | 15.47     |
| 74      | -0.63    | 46.77    | 20.86         | 32.63     | 15.47     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 75      | -0.73    | 54.27    | 23.24         | 32.63     | 15.47     |
| 76      | -0.86    | 64.25    | 26.01         | 32.63     | 15.47     |
| 77      | -1.07    | 79.42    | 29.06         | 32.63     | 15.47     |
| 78      | -1.35    | 101.02   | 32.50         | 32.63     | 15.47     |
| 79      | -1.79    | 133.76   | 36.28         | 32.63     | 15.47     |
| 80      | -2.53    | 188.58   | 40.81         | 32.63     | 15.47     |
| 81      | 1.81     | 32.54    | 16.56         | 28.68     | 15.47     |
| 82      | 2.02     | 36.37    | 18.56         | 28.68     | 15.47     |
| 83      | 2.28     | 41.06    | 20.79         | 28.68     | 15.47     |
| 84      | 2.60     | 46.83    | 23.27         | 28.68     | 15.47     |
| 85      | 3.01     | 54.24    | 26.06         | 28.68     | 15.47     |
| 86      | 3.59     | 64.58    | 29.09         | 28.68     | 15.47     |
| 87      | 4.36     | 78.52    | 32.55         | 28.68     | 15.47     |
| 88      | 5.43     | 97.73    | 36.35         | 28.68     | 15.47     |
| 89      | 6.98     | 125.59   | 40.61         | 28.68     | 15.47     |
| 90      | 4.13     | 33.02    | 18.57         | 24.74     | 15.47     |
| 91      | 4.61     | 36.84    | 20.81         | 24.74     | 15.47     |
| 92      | 5.19     | 41.49    | 23.30         | 24.74     | 15.47     |
| 93      | 5.91     | 47.24    | 25.98         | 24.74     | 15.47     |
| 94      | 6.86     | 54.87    | 29.11         | 24.74     | 15.47     |
| 95      | 8.09     | 64.71    | 32.55         | 24.74     | 15.47     |
| 96      | 9.72     | 77.74    | 36.39         | 24.74     | 15.47     |
| 97      | 11.90    | 95.18    | 40.65         | 24.74     | 15.47     |
| 98      | 6.58     | 33.60    | 20.82         | 20.79     | 15.47     |
| 99      | 7.32     | 37.42    | 23.22         | 20.79     | 15.47     |
| 100     | 8.24     | 42.09    | 26.01         | 20.79     | 15.47     |
| 101     | 9.39     | 47.99    | 29.01         | 20.79     | 15.47     |
| 102     | 10.85    | 55.44    | 32.44         | 20.79     | 15.47     |
| 103     | 12.72    | 64.98    | 36.26         | 20.79     | 15.47     |
| 104     | 15.12    | 77.26    | 40.51         | 20.79     | 15.47     |
| 105     | 10.23    | 38.11    | 26.02         | 16.84     | 15.47     |
| 106     | 11.49    | 42.84    | 29.02         | 16.84     | 15.47     |
| 107     | 13.07    | 48.70    | 32.45         | 16.84     | 15.47     |
| 108     | 15.04    | 56.07    | 36.27         | 16.84     | 15.47     |
| 109     | 17.52    | 65.28    | 40.54         | 16.84     | 15.47     |
| 110     | 13.34    | 38.82    | 29.03         | 12.89     | 15.47     |
| 111     | 14.98    | 43.59    | 32.46         | 12.89     | 15.47     |
| 112     | 17.01    | 49.48    | 36.29         | 12.89     | 15.47     |
| 113     | 19.50    | 56.73    | 40.42         | 12.89     | 15.47     |
| 114     | 16.72    | 39.54    | 32.47         | 8.95      | 15.47     |
| 115     | 18.74    | 44.34    | 36.27         | 8.95      | 15.47     |
| 116     | 21.24    | 50.24    | 40.44         | 8.95      | 15.47     |
| 117     | 20.39    | 40.27    | 36.19         | 5.00      | 15.47     |
| 118     | 22.86    | 45.13    | 40.45         | 5.00      | 15.47     |





|                                |   |
|--------------------------------|---|
| Analysis Mode                  |   |
| Design(D)/Factor of Safety(FS) | D |

|   |    |
|---|----|
| Analysis Type   |    |
| Soil Nail(SN)/Tie Back(TB)/Active EP(AEP)/Passive EP(PEP) | SN |

|                              |      |
|------------------------------|------|
| General                      |      |
| Toe Segment No.              | 1    |
| Toe Specification Type (X/Y) | Y    |
| Toe Y Value                  | 3    |
| X-Base                       | 0    |
| Y-Base                       | 0    |
| Minimum Toe Angle (deg)      | 5    |
| Maximum Toe Angle (deg)      | 80   |
| No. Toe Angles               | 20   |
| Minimum Exit X Value         | 5    |
| Maximum Exit X Value         | 45   |
| No. Exit Points              | 20   |
| Water Unit Weight            | 62.4 |
| Seismic Coefficient (g's)    | 0    |

|  |      |
|--|------|
| Factors of Safety  |      |
| Service Load Design(SLD)/Load-Resistance Factor Design(LRFD) | SLD  |
| FS - Cohesion  | 1.5  |
| FS - Friction Angle  | 1.5  |
| Strength Factor - Nail Tendon                                | 0.55 |
| Strength Factor - Nail Head                                  | 0.67 |
| Strength Factor - Pullout                                    | 0.5  |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |

| Soil | Cohesion | Friction | Unit Wt. | Pullout |
|------|----------|----------|----------|---------|
| 1    | 50       | 32       | 125      | 3000    |
| 2    | 100      | 40       | 135      | 7000    |

| Piezo | X | Y |
|-------|---|---|
|       |   |   |

| Node | X  | Y  |
|------|----|----|
| 1    | 0  | 0  |
| 2    | 0  | 13 |
| 3    | 0  | 18 |
| 4    | 25 | 29 |
| 5    | 50 | 34 |
| 6    | 25 | 24 |
| 7    | 50 | 29 |
| 8    | 0  | 8  |

| Segment | Node 1 | Node 2 | Top Soil # | Bot. Soil # | Top PO # | Bot. PO # |
|---------|--------|--------|------------|-------------|----------|-----------|
| 1       | 1      | 2      | 0          | 2           | 0        | 2         |
| 2       | 2      | 3      | 0          | 1           | 0        | 1         |
| 3       | 3      | 4      | 0          | 1           | 0        | 1         |
| 4       | 4      | 5      | 0          | 1           | 0        | 1         |
| 5       | 2      | 6      | 1          | 2           | 1        | 2         |
| 6       | 6      | 7      | 1          | 2           | 1        | 2         |

| Surcharge | Node 1 | P1  | Node 2 | P2  | Angle |
|-----------|--------|-----|--------|-----|-------|
| 1         | 3      | 250 | 4      | 250 | 270   |
| 2         | 4      | 250 | 5      | 250 | 270   |

| Nail | Xs | Ys  | Length | Dip | Tendon Str. | Head Str. | Fixed? | Spacing | Tieback? |
|------|----|-----|--------|-----|-------------|-----------|--------|---------|----------|
| 1    | 0  | 14  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 2    | 0  | 9   | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 3    | 0  | 3.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |

| Face Press | Node 1 | P1  | Node 2 | P2 | Angle |
|------------|--------|-----|--------|----|-------|
| 1          | 1      | 0.6 | 8      | 1  | 0     |
| 2          | 8      | 1   | 3      | 1  | 0     |

Analysis Type: Soil Nail

Analysis Mode: Design

Nail Head Strength Factor (Multiplier): 2.03

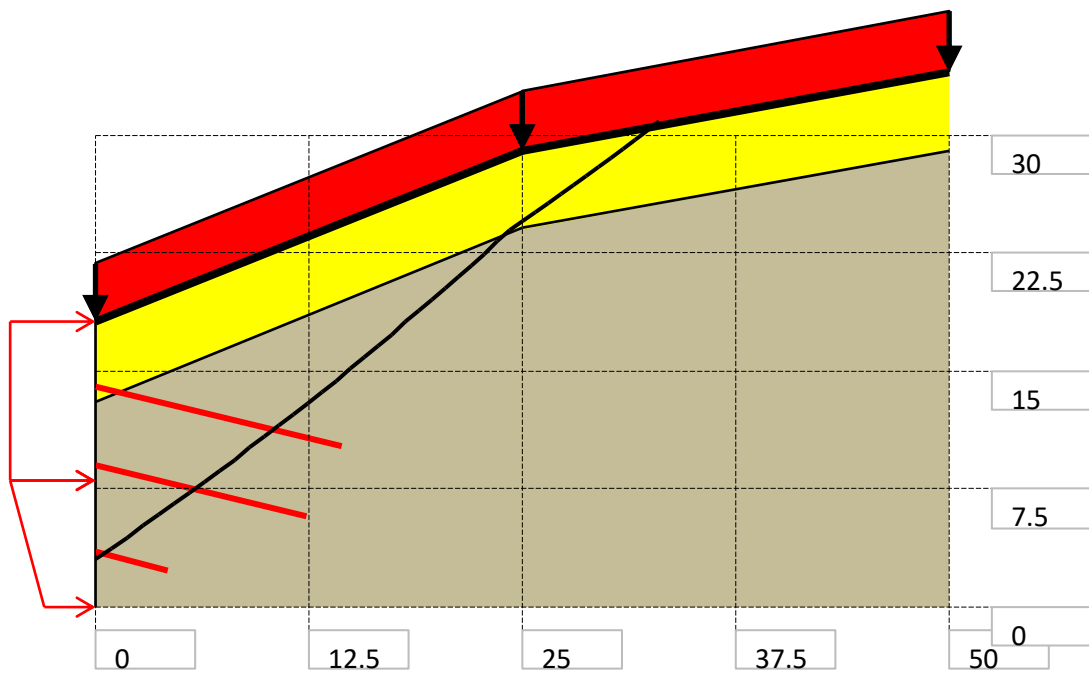
| Nail | Length | Capacity | Slip Surf. |
|------|--------|----------|------------|
| 1    | 13.8   | 37896    | 30         |
| 2    | 11.8   | 38771    | 49         |
| 3    | 4.7    | 27444    | 49         |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 1       | -39.77   | 52.23    | 5.10          | 68.16     | 6.80     |
| 2       | -50.76   | 65.83    | 5.70          | 68.16     | 7.23     |
| 3       | -73.10   | 93.48    | 6.42          | 68.16     | 7.67     |
| 4       | -24.37   | 37.82    | 5.07          | 64.21     | 7.67     |
| 5       | -29.06   | 44.52    | 5.74          | 64.21     | 7.67     |
| 6       | -36.12   | 54.61    | 6.47          | 64.21     | 7.97     |
| 7       | -47.37   | 70.67    | 7.25          | 64.21     | 8.35     |
| 8       | -71.47   | 105.11   | 8.18          | 64.21     | 8.91     |
| 9       | -16.90   | 31.08    | 5.08          | 60.26     | 8.91     |
| 10      | -19.29   | 35.06    | 5.76          | 60.26     | 8.91     |
| 11      | -22.61   | 40.58    | 6.51          | 60.26     | 8.91     |
| 12      | -27.46   | 48.63    | 7.34          | 60.26     | 8.91     |
| 13      | -35.58   | 62.11    | 8.33          | 60.26     | 9.23     |
| 14      | -49.62   | 85.44    | 9.39          | 60.26     | 10.01    |
| 15      | -71.98   | 122.59   | 10.39         | 60.26     | 10.69    |
| 16      | -13.69   | 29.76    | 5.72          | 56.32     | 10.69    |
| 17      | -15.46   | 33.23    | 6.50          | 56.32     | 10.69    |
| 18      | -17.99   | 38.16    | 7.36          | 56.32     | 10.69    |
| 19      | -21.33   | 44.70    | 8.26          | 56.32     | 10.69    |
| 20      | -26.59   | 54.99    | 9.33          | 56.32     | 10.69    |
| 21      | -34.76   | 70.95    | 10.48         | 56.32     | 10.69    |
| 22      | -48.62   | 98.05    | 11.70         | 56.32     | 11.34    |
| 23      | -11.09   | 28.94    | 6.49          | 52.37     | 11.34    |
| 24      | -12.48   | 32.19    | 7.31          | 52.37     | 11.34    |
| 25      | -14.39   | 36.65    | 8.26          | 52.37     | 11.34    |
| 26      | -16.90   | 42.54    | 9.27          | 52.37     | 11.34    |
| 27      | -20.61   | 51.20    | 10.44         | 52.37     | 11.34    |
| 28      | -26.06   | 63.95    | 11.80         | 52.37     | 11.34    |
| 29      | -34.62   | 83.99    | 13.20         | 52.37     | 11.97    |
| 30      | -50.85   | 121.94   | 14.82         | 52.37     | 12.53    |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 31      | -8.87    | 28.46    | 7.34          | 48.42     | 12.53     |
| 32      | -9.96    | 31.62    | 8.27          | 48.42     | 12.53     |
| 33      | -11.40   | 35.74    | 9.32          | 48.42     | 12.53     |
| 34      | -13.32   | 41.25    | 10.47         | 48.42     | 12.53     |
| 35      | -15.96   | 48.82    | 11.76         | 48.42     | 12.53     |
| 36      | -19.71   | 59.61    | 13.19         | 48.42     | 12.53     |
| 37      | -25.09   | 75.06    | 14.82         | 48.42     | 12.53     |
| 38      | -34.42   | 101.86   | 16.67         | 48.42     | 12.97     |
| 39      | -50.89   | 149.16   | 18.64         | 48.42     | 13.29     |
| 40      | -6.88    | 28.25    | 8.29          | 44.47     | 13.29     |
| 41      | -7.72    | 31.30    | 9.33          | 44.47     | 13.29     |
| 42      | -8.79    | 35.25    | 10.50         | 44.47     | 13.29     |
| 43      | -10.20   | 40.42    | 11.79         | 44.47     | 13.29     |
| 44      | -12.08   | 47.32    | 13.24         | 44.47     | 13.29     |
| 45      | -14.67   | 56.79    | 14.84         | 44.47     | 13.29     |
| 46      | -18.32   | 70.21    | 16.62         | 44.47     | 13.29     |
| 47      | -23.77   | 90.17    | 18.60         | 44.47     | 13.29     |
| 48      | -32.36   | 121.69   | 20.95         | 44.47     | 13.50     |
| 49      | -47.50   | 177.20   | 23.40         | 44.47     | 13.79     |
| 50      | -5.04    | 28.22    | 9.30          | 40.53     | 13.79     |
| 51      | -5.64    | 31.23    | 10.46         | 40.53     | 13.79     |
| 52      | -6.41    | 35.06    | 11.75         | 40.53     | 13.79     |
| 53      | -7.39    | 39.99    | 13.19         | 40.53     | 13.79     |
| 54      | -8.68    | 46.43    | 14.80         | 40.53     | 13.79     |
| 55      | -10.38   | 54.94    | 16.58         | 40.53     | 13.79     |
| 56      | -12.70   | 66.55    | 18.68         | 40.53     | 13.79     |
| 57      | -15.93   | 82.71    | 20.90         | 40.53     | 13.79     |
| 58      | -20.80   | 107.08   | 23.47         | 40.53     | 13.79     |
| 59      | -28.58   | 145.96   | 26.05         | 40.53     | 13.79     |
| 60      | -3.27    | 28.36    | 10.47         | 36.58     | 13.79     |
| 61      | -3.66    | 31.35    | 11.77         | 36.58     | 13.79     |
| 62      | -4.15    | 35.11    | 13.22         | 36.58     | 13.79     |
| 63      | -4.76    | 39.86    | 14.83         | 36.58     | 13.79     |
| 64      | -5.54    | 45.93    | 16.63         | 36.58     | 13.79     |
| 65      | -6.55    | 53.76    | 18.62         | 36.58     | 13.79     |
| 66      | -7.88    | 64.06    | 20.86         | 36.58     | 13.79     |
| 67      | -9.68    | 77.99    | 23.38         | 36.58     | 13.79     |
| 68      | -12.29   | 98.17    | 26.07         | 36.58     | 13.79     |
| 69      | -17.35   | 137.39   | 29.16         | 36.58     | 13.79     |
| 70      | -27.73   | 217.79   | 32.67         | 36.58     | 13.79     |
| 71      | -1.53    | 28.62    | 11.78         | 32.63     | 13.79     |
| 72      | -1.70    | 31.62    | 13.18         | 32.63     | 13.79     |
| 73      | -1.93    | 35.33    | 14.78         | 32.63     | 13.79     |
| 74      | -2.20    | 39.96    | 16.58         | 32.63     | 13.79     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 75      | -2.55    | 45.76    | 18.58         | 32.63     | 13.79    |
| 76      | -2.98    | 53.08    | 20.80         | 32.63     | 13.79    |
| 77      | -3.54    | 62.37    | 23.28         | 32.63     | 13.79    |
| 78      | -4.30    | 75.22    | 26.05         | 32.63     | 13.79    |
| 79      | -5.57    | 96.58    | 29.17         | 32.63     | 13.79    |
| 80      | -7.50    | 128.87   | 32.66         | 32.63     | 13.79    |
| 81      | -10.72   | 183.01   | 36.49         | 32.63     | 13.79    |
| 82      | -16.06   | 272.61   | 40.48         | 32.63     | 13.79    |
| 83      | 0.27     | 32.01    | 14.80         | 28.68     | 13.79    |
| 84      | 0.31     | 35.70    | 16.60         | 28.68     | 13.79    |
| 85      | 0.35     | 40.27    | 18.63         | 28.68     | 13.79    |
| 86      | 0.40     | 45.81    | 20.84         | 28.68     | 13.79    |
| 87      | 0.47     | 52.72    | 23.35         | 28.68     | 13.79    |
| 88      | 0.55     | 61.76    | 26.00         | 28.68     | 13.79    |
| 89      | 0.68     | 75.29    | 29.08         | 28.68     | 13.79    |
| 90      | 0.85     | 93.90    | 32.54         | 28.68     | 13.79    |
| 91      | 1.11     | 120.73   | 36.35         | 28.68     | 13.79    |
| 92      | 1.49     | 161.79   | 40.59         | 28.68     | 13.79    |
| 93      | 2.32     | 32.51    | 16.56         | 24.74     | 13.79    |
| 94      | 2.60     | 36.19    | 18.55         | 24.74     | 13.79    |
| 95      | 2.95     | 40.65    | 20.79         | 24.74     | 13.79    |
| 96      | 3.38     | 46.06    | 23.28         | 24.74     | 13.79    |
| 97      | 3.91     | 52.82    | 26.03         | 24.74     | 13.79    |
| 98      | 4.66     | 62.44    | 29.00         | 24.74     | 13.79    |
| 99      | 5.64     | 74.84    | 32.43         | 24.74     | 13.79    |
| 100     | 6.94     | 91.46    | 36.41         | 24.74     | 13.79    |
| 101     | 8.74     | 114.44   | 40.68         | 24.74     | 13.79    |
| 102     | 4.46     | 33.08    | 18.56         | 20.79     | 13.79    |
| 103     | 5.01     | 36.77    | 20.81         | 20.79     | 13.79    |
| 104     | 5.66     | 41.18    | 23.22         | 20.79     | 13.79    |
| 105     | 6.46     | 46.60    | 26.00         | 20.79     | 13.79    |
| 106     | 7.53     | 53.76    | 29.04         | 20.79     | 13.79    |
| 107     | 8.86     | 62.79    | 32.47         | 20.79     | 13.79    |
| 108     | 10.59    | 74.43    | 36.29         | 20.79     | 13.79    |
| 109     | 12.85    | 89.65    | 40.56         | 20.79     | 13.79    |
| 110     | 6.75     | 33.74    | 20.76         | 16.84     | 13.79    |
| 111     | 7.56     | 37.43    | 23.24         | 16.84     | 13.79    |
| 112     | 8.53     | 41.87    | 25.94         | 16.84     | 13.79    |
| 113     | 9.77     | 47.49    | 29.06         | 16.84     | 13.79    |
| 114     | 11.29    | 54.45    | 32.50         | 16.84     | 13.79    |
| 115     | 13.21    | 63.18    | 36.33         | 16.84     | 13.79    |
| 116     | 15.63    | 74.19    | 40.61         | 16.84     | 13.79    |
| 117     | 9.21     | 34.45    | 23.26         | 12.89     | 13.79    |
| 118     | 10.31    | 38.18    | 25.97         | 12.89     | 13.79    |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 119     | 11.64    | 42.72    | 29.07         | 12.89     | 13.79    |
| 120     | 13.27    | 48.29    | 32.40         | 12.89     | 13.79    |
| 121     | 15.28    | 55.15    | 36.22         | 12.89     | 13.79    |
| 122     | 17.75    | 63.60    | 40.48         | 12.89     | 13.79    |
| 123     | 11.90    | 35.21    | 25.99         | 8.95      | 13.79    |
| 124     | 13.29    | 38.97    | 28.99         | 8.95      | 13.79    |
| 125     | 14.97    | 43.54    | 32.42         | 8.95      | 13.79    |
| 126     | 17.03    | 49.09    | 36.24         | 8.95      | 13.79    |
| 127     | 19.52    | 55.85    | 40.51         | 8.95      | 13.79    |
| 128     | 14.81    | 35.91    | 29.01         | 5.00      | 13.79    |
| 129     | 16.52    | 39.73    | 32.43         | 5.00      | 13.79    |
| 130     | 18.60    | 44.34    | 36.26         | 5.00      | 13.79    |
| 131     | 21.09    | 49.88    | 40.41         | 5.00      | 13.79    |



18-E



|                                |   |
|--------------------------------|---|
| Analysis Mode                  |   |
| Design(D)/Factor of Safety(FS) | D |

|   |    |
|---|----|
| Analysis Type   |    |
| Soil Nail(SN)/Tie Back(TB)/Active EP(AEP)/Passive EP(PEP) | SN |

|                              |      |
|------------------------------|------|
| General                      |      |
| Toe Segment No.              | 1    |
| Toe Specification Type (X/Y) | Y    |
| Toe Y Value                  | 3    |
| X-Base                       | 0    |
| Y-Base                       | 0    |
| Minimum Toe Angle (deg)      | 5    |
| Maximum Toe Angle (deg)      | 80   |
| No. Toe Angles               | 20   |
| Minimum Exit X Value         | 5    |
| Maximum Exit X Value         | 45   |
| No. Exit Points              | 20   |
| Water Unit Weight            | 62.4 |
| Seismic Coefficient (g's)    | 0.3  |

|  |      |
|--|------|
| Factors of Safety  |      |
| Service Load Design(SLD)/Load-Resistance Factor Design(LRFD) | SLD  |
| FS - Cohesion  | 1.1  |
| FS - Friction Angle  | 1.1  |
| Strength Factor - Nail Tendon                                | 0.74 |
| Strength Factor - Nail Head                                  | 0.91 |
| Strength Factor - Pullout                                    | 0.67 |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |

| Soil | Cohesion | Friction | Unit Wt. | Pullout |
|------|----------|----------|----------|---------|
| 1    | 50       | 32       | 125      | 3000    |
| 2    | 100      | 40       | 135      | 7000    |

| Piezo | X | Y |
|-------|---|---|
|       |   |   |

| Node | X  | Y  |
|------|----|----|
| 1    | 0  | 0  |
| 2    | 0  | 13 |
| 3    | 0  | 18 |
| 4    | 25 | 29 |
| 5    | 50 | 34 |
| 6    | 25 | 24 |
| 7    | 50 | 29 |
| 8    | 0  | 8  |

| Segment | Node 1 | Node 2 | Top Soil # | Bot. Soil # | Top PO # | Bot. PO # |
|---------|--------|--------|------------|-------------|----------|-----------|
| 1       | 1      | 2      | 0          | 2           | 0        | 2         |
| 2       | 2      | 3      | 0          | 1           | 0        | 1         |
| 3       | 3      | 4      | 0          | 1           | 0        | 1         |
| 4       | 4      | 5      | 0          | 1           | 0        | 1         |
| 5       | 2      | 6      | 1          | 2           | 1        | 2         |
| 6       | 6      | 7      | 1          | 2           | 1        | 2         |

| Surcharge | Node 1 | P1  | Node 2 | P2  | Angle |
|-----------|--------|-----|--------|-----|-------|
| 1         | 3      | 250 | 4      | 250 | 270   |
| 2         | 4      | 250 | 5      | 250 | 270   |

| Nail | Xs | Ys  | Length | Dip | Tendon Str. | Head Str. | Fixed? | Spacing | Tieback? |
|------|----|-----|--------|-----|-------------|-----------|--------|---------|----------|
| 1    | 0  | 14  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 2    | 0  | 9   | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 3    | 0  | 3.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |

| Face Press | Node 1 | P1  | Node 2 | P2 | Angle |
|------------|--------|-----|--------|----|-------|
| 1          | 1      | 0.6 | 8      | 1  | 0     |
| 2          | 8      | 1   | 3      | 1  | 0     |

Analysis Type: Soil Nail

Analysis Mode: Design

Nail Head Strength Factor (Multiplier): 1.65

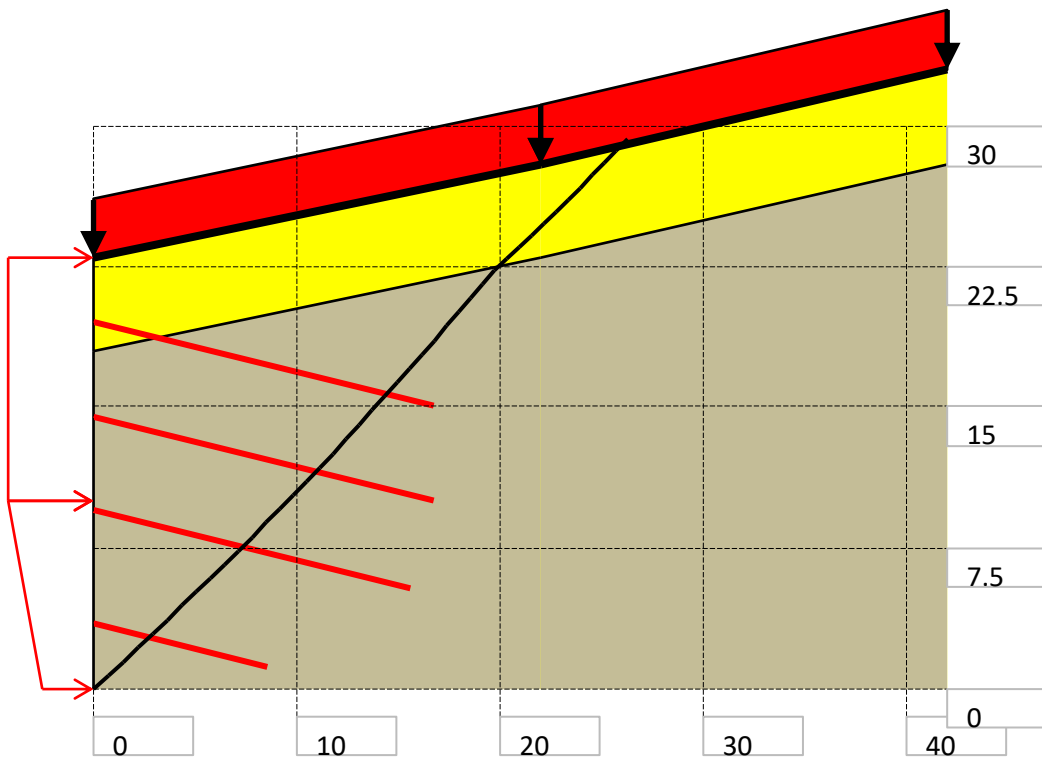
| Nail | Length | Capacity | Slip Surf. |
|------|--------|----------|------------|
| 1    | 14.9   | 32590    | 45         |
| 2    | 12.8   | 33323    | 74         |
| 3    | 4.4    | 24014    | 74         |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 1       | -28.76   | 51.20    | 5.12          | 68.16     | 0.00     |
| 2       | -36.79   | 64.66    | 5.77          | 68.16     | 0.00     |
| 3       | -17.69   | 37.90    | 5.12          | 64.21     | 0.00     |
| 4       | -20.90   | 44.23    | 5.79          | 64.21     | 0.00     |
| 5       | -25.75   | 53.82    | 6.54          | 64.21     | 6.01     |
| 6       | -33.81   | 69.72    | 7.38          | 64.21     | 6.49     |
| 7       | -11.95   | 31.25    | 5.08          | 60.26     | 6.49     |
| 8       | -13.55   | 35.03    | 5.75          | 60.26     | 6.49     |
| 9       | -15.75   | 40.25    | 6.50          | 60.26     | 6.49     |
| 10      | -18.94   | 47.78    | 7.33          | 60.26     | 6.66     |
| 11      | -23.92   | 59.56    | 8.35          | 60.26     | 7.20     |
| 12      | -32.38   | 79.56    | 9.39          | 60.26     | 7.65     |
| 13      | -9.22    | 29.81    | 5.76          | 56.32     | 7.65     |
| 14      | -10.38   | 33.18    | 6.52          | 56.32     | 7.65     |
| 15      | -11.95   | 37.74    | 7.35          | 56.32     | 7.65     |
| 16      | -14.05   | 43.86    | 8.25          | 56.32     | 7.65     |
| 17      | -17.33   | 53.38    | 9.32          | 56.32     | 7.79     |
| 18      | -22.33   | 67.92    | 10.56         | 56.32     | 8.34     |
| 19      | -31.01   | 93.17    | 11.85         | 56.32     | 8.94     |
| 20      | -6.95    | 28.87    | 6.53          | 52.37     | 8.94     |
| 21      | -7.79    | 31.99    | 7.37          | 52.37     | 8.94     |
| 22      | -8.88    | 36.06    | 8.29          | 52.37     | 8.94     |
| 23      | -10.40   | 41.73    | 9.35          | 52.37     | 8.94     |
| 24      | -12.53   | 49.65    | 10.51         | 52.37     | 8.94     |
| 25      | -15.66   | 61.32    | 11.80         | 52.37     | 8.94     |
| 26      | -20.61   | 79.75    | 13.34         | 52.37     | 9.81     |
| 27      | -29.37   | 112.37   | 14.94         | 52.37     | 10.60    |
| 28      | -4.95    | 28.28    | 7.38          | 48.42     | 10.60    |
| 29      | -5.53    | 31.24    | 8.32          | 48.42     | 10.60    |
| 30      | -6.29    | 35.09    | 9.37          | 48.42     | 10.60    |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 31      | -7.29    | 40.19    | 10.53         | 48.42     | 10.60     |
| 32      | -8.66    | 47.22    | 11.84         | 48.42     | 10.60     |
| 33      | -10.60   | 57.11    | 13.28         | 48.42     | 10.60     |
| 34      | -13.46   | 71.71    | 14.88         | 48.42     | 10.60     |
| 35      | -18.00   | 94.87    | 16.65         | 48.42     | 11.37     |
| 36      | -26.52   | 138.38   | 18.92         | 48.42     | 12.23     |
| 37      | -3.48    | 30.81    | 9.38          | 44.47     | 12.23     |
| 38      | -3.94    | 34.48    | 10.49         | 44.47     | 12.23     |
| 39      | -4.54    | 39.26    | 11.78         | 44.47     | 12.23     |
| 40      | -5.34    | 45.63    | 13.23         | 44.47     | 12.23     |
| 41      | -6.42    | 54.31    | 14.93         | 44.47     | 12.23     |
| 42      | -7.95    | 66.50    | 16.73         | 44.47     | 12.23     |
| 43      | -10.19   | 84.36    | 18.73         | 44.47     | 12.23     |
| 44      | -13.77   | 112.99   | 21.01         | 44.47     | 12.81     |
| 45      | -19.85   | 161.51   | 23.73         | 44.47     | 13.60     |
| 46      | -1.54    | 30.61    | 10.50         | 40.53     | 13.60     |
| 47      | -1.74    | 34.16    | 11.81         | 40.53     | 13.60     |
| 48      | -1.99    | 38.70    | 13.26         | 40.53     | 13.60     |
| 49      | -2.32    | 44.61    | 14.87         | 40.53     | 13.60     |
| 50      | -2.75    | 52.42    | 16.67         | 40.53     | 13.60     |
| 51      | -3.34    | 62.96    | 18.67         | 40.53     | 13.60     |
| 52      | -4.15    | 77.50    | 20.89         | 40.53     | 13.60     |
| 53      | -5.30    | 98.08    | 23.52         | 40.53     | 13.60     |
| 54      | -7.28    | 133.61   | 26.25         | 40.53     | 14.26     |
| 55      | 0.37     | 30.61    | 11.82         | 36.58     | 14.26     |
| 56      | 0.41     | 34.06    | 13.27         | 36.58     | 14.26     |
| 57      | 0.47     | 38.43    | 14.90         | 36.58     | 14.26     |
| 58      | 0.54     | 43.99    | 16.71         | 36.58     | 14.26     |
| 59      | 0.64     | 51.23    | 18.75         | 36.58     | 14.26     |
| 60      | 0.76     | 60.50    | 20.98         | 36.58     | 14.26     |
| 61      | 0.93     | 72.91    | 23.50         | 36.58     | 14.26     |
| 62      | 1.17     | 91.13    | 26.23         | 36.58     | 14.26     |
| 63      | 1.62     | 125.58   | 29.34         | 36.58     | 14.66     |
| 64      | 2.44     | 187.23   | 32.52         | 36.58     | 14.91     |
| 65      | 2.28     | 30.73    | 13.21         | 32.63     | 14.91     |
| 66      | 2.56     | 34.14    | 14.84         | 32.63     | 14.91     |
| 67      | 2.91     | 38.37    | 16.64         | 32.63     | 14.91     |
| 68      | 3.35     | 43.66    | 18.66         | 32.63     | 14.91     |
| 69      | 3.89     | 50.31    | 20.90         | 32.63     | 14.91     |
| 70      | 4.59     | 58.76    | 23.41         | 32.63     | 14.91     |
| 71      | 5.54     | 70.33    | 26.18         | 32.63     | 14.91     |
| 72      | 7.06     | 88.77    | 29.22         | 32.63     | 14.91     |
| 73      | 9.47     | 118.09   | 32.66         | 32.63     | 14.91     |
| 74      | 13.35    | 165.17   | 36.48         | 32.63     | 14.91     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 75      | 4.26     | 31.00    | 14.85         | 28.68     | 14.91     |
| 76      | 4.77     | 34.36    | 16.66         | 28.68     | 14.91     |
| 77      | 5.40     | 38.48    | 18.59         | 28.68     | 14.91     |
| 78      | 6.17     | 43.56    | 20.83         | 28.68     | 14.91     |
| 79      | 7.12     | 49.82    | 23.33         | 28.68     | 14.91     |
| 80      | 8.36     | 57.97    | 26.11         | 28.68     | 14.91     |
| 81      | 10.21    | 70.11    | 29.22         | 28.68     | 14.91     |
| 82      | 12.73    | 86.68    | 32.52         | 28.68     | 14.91     |
| 83      | 16.33    | 110.31   | 36.56         | 28.68     | 14.91     |
| 84      | 21.76    | 146.01   | 40.84         | 28.68     | 14.91     |
| 85      | 6.34     | 31.35    | 16.60         | 24.74     | 14.91     |
| 86      | 7.08     | 34.68    | 18.61         | 24.74     | 14.91     |
| 87      | 7.98     | 38.72    | 20.86         | 24.74     | 14.91     |
| 88      | 9.08     | 43.62    | 23.36         | 24.74     | 14.91     |
| 89      | 10.46    | 49.79    | 26.05         | 24.74     | 14.91     |
| 90      | 12.37    | 58.32    | 29.12         | 24.74     | 14.91     |
| 91      | 14.83    | 69.36    | 32.57         | 24.74     | 14.91     |
| 92      | 18.10    | 83.96    | 36.35         | 24.74     | 14.91     |
| 93      | 22.67    | 104.42   | 40.68         | 24.74     | 14.91     |
| 94      | 8.55     | 31.77    | 18.62         | 20.79     | 14.91     |
| 95      | 9.53     | 35.09    | 20.79         | 20.79     | 14.91     |
| 96      | 10.72    | 39.07    | 23.29         | 20.79     | 14.91     |
| 97      | 12.16    | 43.93    | 26.08         | 20.79     | 14.91     |
| 98      | 14.06    | 50.31    | 29.14         | 20.79     | 14.91     |
| 99      | 16.44    | 58.33    | 32.60         | 20.79     | 14.91     |
| 100     | 19.46    | 68.50    | 36.39         | 20.79     | 14.91     |
| 101     | 23.50    | 82.08    | 40.76         | 20.79     | 14.91     |
| 102     | 12.17    | 35.57    | 23.30         | 16.84     | 14.91     |
| 103     | 13.66    | 39.54    | 26.01         | 16.84     | 14.91     |
| 104     | 15.51    | 44.50    | 29.15         | 16.84     | 14.91     |
| 105     | 17.82    | 50.68    | 32.50         | 16.84     | 14.91     |
| 106     | 20.69    | 58.35    | 36.31         | 16.84     | 14.91     |
| 107     | 24.32    | 68.07    | 40.59         | 16.84     | 14.91     |
| 108     | 15.05    | 36.11    | 26.03         | 12.89     | 14.91     |
| 109     | 16.86    | 40.09    | 29.05         | 12.89     | 14.91     |
| 110     | 19.08    | 44.97    | 32.49         | 12.89     | 14.91     |
| 111     | 21.82    | 51.00    | 36.33         | 12.89     | 14.91     |
| 112     | 25.19    | 58.41    | 40.62         | 12.89     | 14.91     |
| 113     | 18.16    | 36.61    | 29.05         | 8.95      | 14.91     |
| 114     | 20.31    | 40.58    | 32.49         | 8.95      | 14.91     |
| 115     | 22.93    | 45.43    | 36.33         | 8.95      | 14.91     |
| 116     | 26.11    | 51.31    | 40.48         | 8.95      | 14.91     |
| 117     | 21.57    | 37.07    | 32.49         | 5.00      | 14.91     |
| 118     | 24.09    | 41.05    | 36.33         | 5.00      | 14.91     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 119     | 27.12    | 45.84    | 40.49         | 5.00      | 14.91     |



23-T

|                                |   |
|--------------------------------|---|
| Analysis Mode                  |   |
| Design(D)/Factor of Safety(FS) | D |

|   |    |
|---|----|
| Analysis Type   |    |
| Soil Nail(SN)/Tie Back(TB)/Active EP(AEP)/Passive EP(PEP) | SN |

|                              |      |
|------------------------------|------|
| General                      |      |
| Toe Segment No.              | 1    |
| Toe Specification Type (X/Y) | Y    |
| Toe Y Value                  | 0    |
| X-Base                       | 0    |
| Y-Base                       | 0    |
| Minimum Toe Angle (deg)      | 5    |
| Maximum Toe Angle (deg)      | 80   |
| No. Toe Angles               | 20   |
| Minimum Exit X Value         | 10   |
| Maximum Exit X Value         | 40   |
| No. Exit Points              | 20   |
| Water Unit Weight            | 62.4 |
| Seismic Coefficient (g's)    | 0    |

|  |      |
|--|------|
| Factors of Safety  |      |
| Service Load Design(SLD)/Load-Resistance Factor Design(LRFD) | SLD  |
| FS - Cohesion  | 1.35 |
| FS - Friction Angle  | 1.35 |
| Strength Factor - Nail Tendon                                | 0.55 |
| Strength Factor - Nail Head                                  | 0.67 |
| Strength Factor - Pullout                                    | 0.5  |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |



| Soil | Cohesion | Friction | Unit Wt. | Pullout |
|------|----------|----------|----------|---------|
| 1    | 50       | 32       | 125      | 3000    |
| 2    | 100      | 40       | 135      | 7000    |

| Piezo | X | Y |
|-------|---|---|
|       |   |   |

| Node | X  | Y  |
|------|----|----|
| 1    | 0  | 0  |
| 2    | 0  | 18 |
| 3    | 0  | 23 |
| 4    | 22 | 28 |
| 5    | 42 | 33 |
| 6    | 22 | 23 |
| 7    | 42 | 28 |
| 8    | 0  | 10 |

| Segment | Node 1 | Node 2 | Top Soil # | Bot. Soil # | Top PO # | Bot. PO # |
|---------|--------|--------|------------|-------------|----------|-----------|
| 1       | 1      | 2      | 0          | 2           | 0        | 2         |
| 2       | 2      | 3      | 0          | 1           | 0        | 1         |
| 3       | 3      | 4      | 0          | 1           | 0        | 1         |
| 4       | 4      | 5      | 0          | 1           | 0        | 1         |
| 5       | 2      | 6      | 1          | 2           | 1        | 2         |
| 6       | 6      | 7      | 1          | 2           | 1        | 2         |

| Surcharge | Node 1 | P1  | Node 2 | P2  | Angle |
|-----------|--------|-----|--------|-----|-------|
| 1         | 3      | 250 | 4      | 250 | 270   |
| 2         | 4      | 250 | 5      | 250 | 270   |

| Nail | Xs | Ys   | Length | Dip | Tendon Str. | Head Str. | Fixed? | Spacing | Tieback? |
|------|----|------|--------|-----|-------------|-----------|--------|---------|----------|
| 1    | 0  | 19.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 2    | 0  | 14.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 3    | 0  | 9.5  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 4    | 0  | 3.5  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |

| Face Press | Node 1 | P1  | Node 2 | P2 | Angle |
|------------|--------|-----|--------|----|-------|
| 1          | 1      | 0.6 | 8      | 1  | 0     |
| 2          | 8      | 1   | 3      | 1  | 0     |

Analysis Type: Soil Nail

Analysis Mode: Design

Nail Head Strength Factor (Multiplier): 1.61

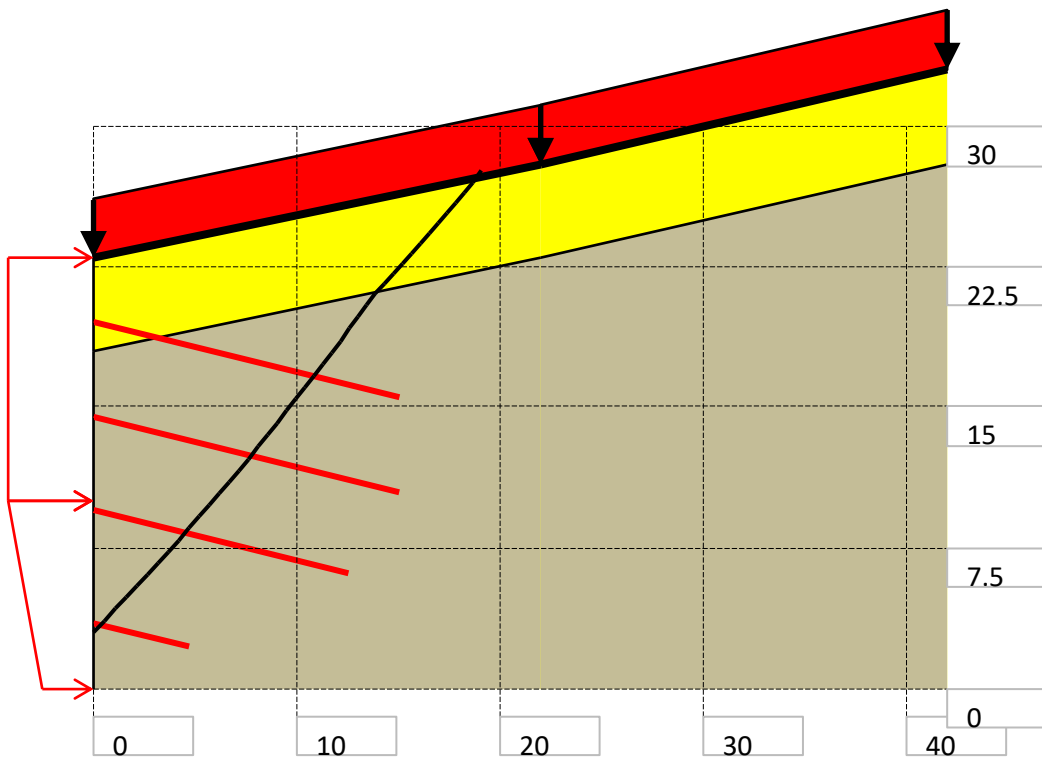
| Nail | Length | Capacity | Slip Surf. |
|------|--------|----------|------------|
| 1    | 17.3   | 47685    | 1          |
| 2    | 17.3   | 47687    | 24         |
| 3    | 16.1   | 47542    | 50         |
| 4    | 8.8    | 35899    | 50         |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 1       | -67.76   | 106.99   | 10.11         | 64.21     | 14.48    |
| 2       | -35.81   | 66.22    | 10.04         | 60.26     | 14.58    |
| 3       | -40.08   | 74.14    | 10.61         | 60.26     | 14.95    |
| 4       | -45.26   | 83.71    | 11.16         | 60.26     | 15.07    |
| 5       | -52.65   | 97.38    | 11.78         | 60.26     | 15.45    |
| 6       | -64.01   | 118.38   | 12.47         | 60.26     | 15.58    |
| 7       | -22.83   | 50.22    | 10.06         | 56.32     | 15.58    |
| 8       | -24.52   | 53.93    | 10.56         | 56.32     | 15.58    |
| 9       | -26.63   | 58.57    | 11.11         | 56.32     | 15.58    |
| 10      | -29.46   | 64.79    | 11.75         | 56.32     | 15.58    |
| 11      | -33.20   | 73.01    | 12.44         | 56.32     | 15.98    |
| 12      | -38.41   | 84.46    | 13.22         | 56.32     | 16.11    |
| 13      | -46.82   | 102.96   | 14.16         | 56.32     | 16.47    |
| 14      | -59.10   | 129.96   | 15.09         | 56.32     | 16.57    |
| 15      | -15.50   | 41.45    | 10.08         | 52.37     | 16.57    |
| 16      | -16.37   | 43.77    | 10.57         | 52.37     | 16.57    |
| 17      | -17.45   | 46.66    | 11.13         | 52.37     | 16.57    |
| 18      | -18.80   | 50.28    | 11.76         | 52.37     | 16.57    |
| 19      | -20.55   | 54.95    | 12.47         | 52.37     | 16.57    |
| 20      | -22.75   | 60.83    | 13.24         | 52.37     | 16.57    |
| 21      | -25.72   | 68.78    | 14.10         | 52.37     | 16.57    |
| 22      | -29.85   | 79.81    | 15.06         | 52.37     | 16.57    |
| 23      | -35.89   | 95.97    | 16.13         | 52.37     | 16.57    |
| 24      | -45.44   | 121.51   | 17.33         | 52.37     | 16.73    |
| 25      | -10.66   | 35.86    | 10.08         | 48.42     | 16.73    |
| 26      | -11.17   | 37.56    | 10.60         | 48.42     | 16.73    |
| 27      | -11.74   | 39.50    | 11.15         | 48.42     | 16.73    |
| 28      | -12.47   | 41.93    | 11.77         | 48.42     | 16.73    |
| 29      | -13.35   | 44.92    | 12.47         | 48.42     | 16.73    |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 30      | -14.47   | 48.66    | 13.25         | 48.42     | 16.73    |
| 31      | -15.89   | 53.44    | 14.12         | 48.42     | 16.73    |
| 32      | -17.78   | 59.81    | 15.11         | 48.42     | 16.73    |
| 33      | -20.21   | 67.98    | 16.16         | 48.42     | 16.73    |
| 34      | -23.65   | 79.55    | 17.36         | 48.42     | 16.73    |
| 35      | -28.76   | 96.73    | 18.71         | 48.42     | 16.89    |
| 36      | -36.11   | 121.46   | 20.09         | 48.42     | 17.00    |
| 37      | -49.17   | 165.39   | 21.83         | 48.42     | 17.20    |
| 38      | -7.76    | 34.70    | 11.13         | 44.47     | 17.20    |
| 39      | -8.17    | 36.51    | 11.78         | 44.47     | 17.20    |
| 40      | -8.65    | 38.65    | 12.48         | 44.47     | 17.20    |
| 41      | -9.22    | 41.23    | 13.25         | 44.47     | 17.20    |
| 42      | -9.96    | 44.50    | 14.13         | 44.47     | 17.20    |
| 43      | -10.87   | 48.58    | 15.10         | 44.47     | 17.20    |
| 44      | -12.03   | 53.80    | 16.18         | 44.47     | 17.20    |
| 45      | -13.61   | 60.86    | 17.43         | 44.47     | 17.20    |
| 46      | -15.61   | 69.80    | 18.72         | 44.47     | 17.20    |
| 47      | -18.48   | 82.59    | 20.21         | 44.47     | 17.20    |
| 48      | -22.77   | 101.79   | 21.91         | 44.47     | 17.20    |
| 49      | -29.00   | 129.62   | 23.66         | 44.47     | 17.20    |
| 50      | -40.14   | 179.41   | 25.90         | 44.47     | 17.32    |
| 51      | -5.23    | 34.33    | 12.49         | 40.53     | 17.32    |
| 52      | -5.53    | 36.30    | 13.28         | 40.53     | 17.32    |
| 53      | -5.89    | 38.66    | 14.14         | 40.53     | 17.32    |
| 54      | -6.33    | 41.58    | 15.11         | 40.53     | 17.32    |
| 55      | -6.89    | 45.21    | 16.19         | 40.53     | 17.32    |
| 56      | -7.59    | 49.80    | 17.40         | 40.53     | 17.32    |
| 57      | -8.49    | 55.72    | 18.74         | 40.53     | 17.32    |
| 58      | -9.67    | 63.47    | 20.24         | 40.53     | 17.32    |
| 59      | -11.27   | 73.97    | 21.91         | 40.53     | 17.32    |
| 60      | -13.46   | 88.33    | 23.75         | 40.53     | 17.32    |
| 61      | -16.64   | 109.22   | 25.80         | 40.53     | 17.32    |
| 62      | -21.48   | 140.98   | 28.05         | 40.53     | 17.32    |
| 63      | -30.23   | 198.39   | 30.93         | 40.53     | 17.32    |
| 64      | -2.85    | 34.51    | 14.14         | 36.58     | 17.32    |
| 65      | -3.03    | 36.75    | 15.12         | 36.58     | 17.32    |
| 66      | -3.26    | 39.47    | 16.20         | 36.58     | 17.32    |
| 67      | -3.53    | 42.82    | 17.41         | 36.58     | 17.32    |
| 68      | -3.88    | 47.01    | 18.76         | 36.58     | 17.32    |
| 69      | -4.32    | 52.33    | 20.26         | 36.58     | 17.32    |
| 70      | -4.87    | 59.04    | 21.89         | 36.58     | 17.32    |
| 71      | -5.62    | 68.11    | 23.79         | 36.58     | 17.32    |
| 72      | -6.60    | 80.00    | 25.85         | 36.58     | 17.32    |
| 73      | -7.94    | 96.24    | 28.11         | 36.58     | 17.32    |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 74      | -9.82    | 119.08   | 30.58         | 36.58     | 17.32     |
| 75      | -12.82   | 155.47   | 33.47         | 36.58     | 17.32     |
| 76      | -18.26   | 221.42   | 36.95         | 36.58     | 17.32     |
| 77      | -0.47    | 35.34    | 16.21         | 32.63     | 17.32     |
| 78      | -0.51    | 37.91    | 17.42         | 32.63     | 17.32     |
| 79      | -0.55    | 41.08    | 18.77         | 32.63     | 17.32     |
| 80      | -0.60    | 45.00    | 20.18         | 32.63     | 17.32     |
| 81      | -0.67    | 49.92    | 21.84         | 32.63     | 17.32     |
| 82      | -0.75    | 56.05    | 23.67         | 32.63     | 17.32     |
| 83      | -0.86    | 64.05    | 25.75         | 32.63     | 17.32     |
| 84      | -1.00    | 74.38    | 28.19         | 32.63     | 17.32     |
| 85      | -1.18    | 88.18    | 30.77         | 32.63     | 17.32     |
| 86      | -1.44    | 107.11   | 33.65         | 32.63     | 17.32     |
| 87      | -1.80    | 133.88   | 36.84         | 32.63     | 17.32     |
| 88      | 1.90     | 34.29    | 17.42         | 28.68     | 17.32     |
| 89      | 2.04     | 36.78    | 18.69         | 28.68     | 17.32     |
| 90      | 2.21     | 39.81    | 20.19         | 28.68     | 17.32     |
| 91      | 2.42     | 43.56    | 21.86         | 28.68     | 17.32     |
| 92      | 2.68     | 48.17    | 23.71         | 28.68     | 17.32     |
| 93      | 2.99     | 53.92    | 25.77         | 28.68     | 17.32     |
| 94      | 3.40     | 61.19    | 28.09         | 28.68     | 17.32     |
| 95      | 3.91     | 70.35    | 30.62         | 28.68     | 17.32     |
| 96      | 4.58     | 82.45    | 33.52         | 28.68     | 17.32     |
| 97      | 5.46     | 98.27    | 36.71         | 28.68     | 17.32     |
| 98      | 4.49     | 35.93    | 20.19         | 24.74     | 17.32     |
| 99      | 4.86     | 38.90    | 21.86         | 24.74     | 17.32     |
| 100     | 5.31     | 42.50    | 23.72         | 24.74     | 17.32     |
| 101     | 5.87     | 46.92    | 25.80         | 24.74     | 17.32     |
| 102     | 6.55     | 52.37    | 28.11         | 24.74     | 17.32     |
| 103     | 7.39     | 59.14    | 30.68         | 24.74     | 17.32     |
| 104     | 8.45     | 67.61    | 33.56         | 24.74     | 17.32     |
| 105     | 9.79     | 78.34    | 36.77         | 24.74     | 17.32     |
| 106     | 6.92     | 35.33    | 21.87         | 20.79     | 17.32     |
| 107     | 7.48     | 38.24    | 23.73         | 20.79     | 17.32     |
| 108     | 8.17     | 41.77    | 25.81         | 20.79     | 17.32     |
| 109     | 9.01     | 46.05    | 28.12         | 20.79     | 17.32     |
| 110     | 10.03    | 51.27    | 30.58         | 20.79     | 17.32     |
| 111     | 11.28    | 57.66    | 33.44         | 20.79     | 17.32     |
| 112     | 12.83    | 65.55    | 36.64         | 20.79     | 17.32     |
| 113     | 10.14    | 37.80    | 25.81         | 16.84     | 17.32     |
| 114     | 11.07    | 41.27    | 28.03         | 16.84     | 17.32     |
| 115     | 12.20    | 45.45    | 30.60         | 16.84     | 17.32     |
| 116     | 13.55    | 50.51    | 33.47         | 16.84     | 17.32     |
| 117     | 15.19    | 56.61    | 36.66         | 16.84     | 17.32     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 118     | 12.90    | 37.53    | 28.04         | 12.89     | 17.32    |
| 119     | 14.08    | 40.96    | 30.61         | 12.89     | 17.32    |
| 120     | 15.49    | 45.06    | 33.48         | 12.89     | 17.32    |
| 121     | 17.18    | 49.99    | 36.68         | 12.89     | 17.32    |
| 122     | 15.80    | 37.37    | 30.62         | 8.95      | 17.32    |
| 123     | 17.24    | 40.78    | 33.49         | 8.95      | 17.32    |
| 124     | 18.95    | 44.83    | 36.69         | 8.95      | 17.32    |
| 125     | 20.62    | 40.70    | 36.59         | 5.00      | 17.32    |



23-P

|                                |   |
|--------------------------------|---|
| Analysis Mode                  |   |
| Design(D)/Factor of Safety(FS) | D |

|   |    |
|---|----|
| Analysis Type   |    |
| Soil Nail(SN)/Tie Back(TB)/Active EP(AEP)/Passive EP(PEP) | SN |

|                              |      |
|------------------------------|------|
| General                      |      |
| Toe Segment No.              | 1    |
| Toe Specification Type (X/Y) | Y    |
| Toe Y Value                  | 3    |
| X-Base                       | 0    |
| Y-Base                       | 0    |
| Minimum Toe Angle (deg)      | 5    |
| Maximum Toe Angle (deg)      | 80   |
| No. Toe Angles               | 20   |
| Minimum Exit X Value         | 10   |
| Maximum Exit X Value         | 40   |
| No. Exit Points              | 20   |
| Water Unit Weight            | 62.4 |
| Seismic Coefficient (g's)    | 0    |

|  |      |
|--|------|
| Factors of Safety  |      |
| Service Load Design(SLD)/Load-Resistance Factor Design(LRFD) | SLD  |
| FS - Cohesion  | 1.5  |
| FS - Friction Angle  | 1.5  |
| Strength Factor - Nail Tendon                                | 0.55 |
| Strength Factor - Nail Head                                  | 0.67 |
| Strength Factor - Pullout                                    | 0.5  |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |

| Soil | Cohesion | Friction | Unit Wt. | Pullout |
|------|----------|----------|----------|---------|
| 1    | 50       | 32       | 125      | 3000    |
| 2    | 100      | 40       | 135      | 7000    |

| Piezo | X | Y |
|-------|---|---|
|       |   |   |

| Node | X  | Y  |
|------|----|----|
| 1    | 0  | 0  |
| 2    | 0  | 18 |
| 3    | 0  | 23 |
| 4    | 22 | 28 |
| 5    | 42 | 33 |
| 6    | 22 | 23 |
| 7    | 42 | 28 |
| 8    | 0  | 10 |

| Segment | Node 1 | Node 2 | Top Soil # | Bot. Soil # | Top PO # | Bot. PO # |
|---------|--------|--------|------------|-------------|----------|-----------|
| 1       | 1      | 2      | 0          | 2           | 0        | 2         |
| 2       | 2      | 3      | 0          | 1           | 0        | 1         |
| 3       | 3      | 4      | 0          | 1           | 0        | 1         |
| 4       | 4      | 5      | 0          | 1           | 0        | 1         |
| 5       | 2      | 6      | 1          | 2           | 1        | 2         |
| 6       | 6      | 7      | 1          | 2           | 1        | 2         |

| Surcharge | Node 1 | P1  | Node 2 | P2  | Angle |
|-----------|--------|-----|--------|-----|-------|
| 1         | 3      | 250 | 4      | 250 | 270   |
| 2         | 4      | 250 | 5      | 250 | 270   |

| Nail | Xs | Ys   | Length | Dip | Tendon Str. | Head Str. | Fixed? | Spacing | Tieback? |
|------|----|------|--------|-----|-------------|-----------|--------|---------|----------|
| 1    | 0  | 19.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 2    | 0  | 14.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 3    | 0  | 9.5  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 4    | 0  | 3.5  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |

| Face Press | Node 1 | P1  | Node 2 | P2 | Angle |
|------------|--------|-----|--------|----|-------|
| 1          | 1      | 0.6 | 8      | 1  | 0     |
| 2          | 8      | 1   | 3      | 1  | 0     |



Analysis Type: Soil Nail

Analysis Mode: Design

Nail Head Strength Factor (Multiplier): 2.06

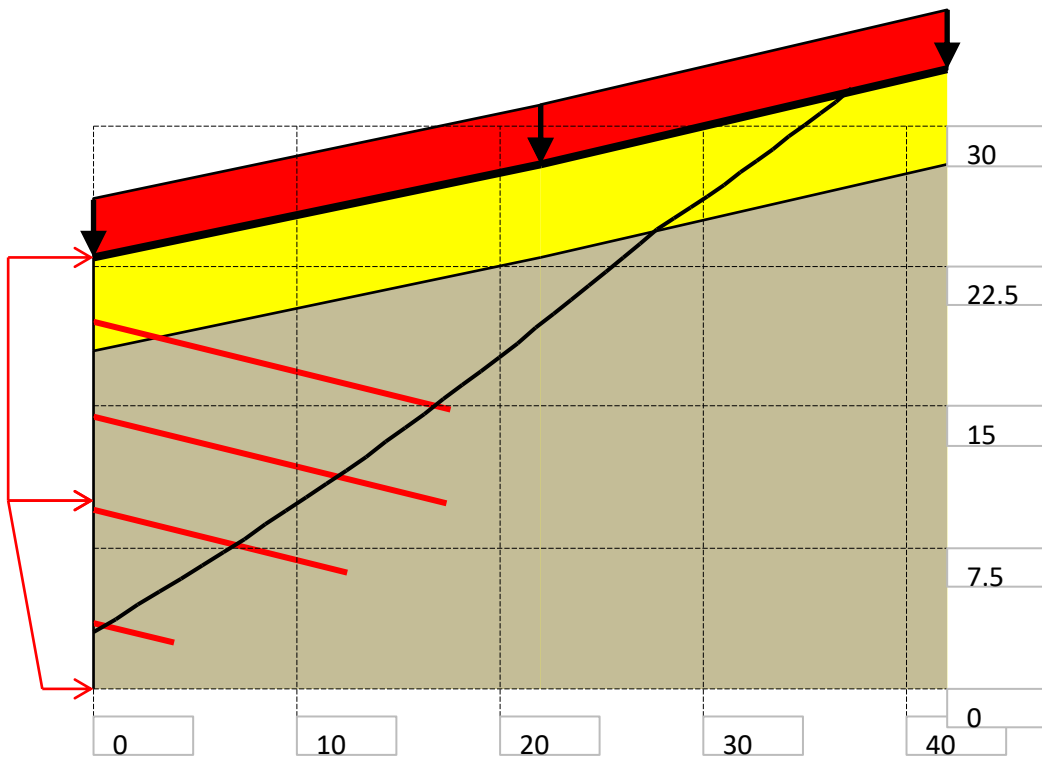
| Nail | Length | Capacity | Slip Surf. |
|------|--------|----------|------------|
| 1    | 15.6   | 41299    | 3          |
| 2    | 15.6   | 42291    | 29         |
| 3    | 13.0   | 41445    | 29         |
| 4    | 4.9    | 27998    | 55         |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 1       | -46.91   | 80.95    | 10.08         | 60.26     | 12.97    |
| 2       | -55.00   | 94.38    | 10.62         | 60.26     | 13.30    |
| 3       | -67.58   | 115.29   | 11.23         | 60.26     | 13.63    |
| 4       | -27.57   | 56.89    | 10.11         | 56.32     | 13.63    |
| 5       | -30.35   | 62.33    | 10.61         | 56.32     | 13.63    |
| 6       | -34.05   | 69.55    | 11.17         | 56.32     | 13.73    |
| 7       | -39.14   | 79.52    | 11.80         | 56.32     | 14.14    |
| 8       | -46.55   | 94.00    | 12.50         | 56.32     | 14.44    |
| 9       | -58.18   | 116.72   | 13.27         | 56.32     | 14.60    |
| 10      | -18.09   | 45.32    | 10.05         | 52.37     | 14.60    |
| 11      | -19.47   | 48.55    | 10.57         | 52.37     | 14.60    |
| 12      | -21.11   | 52.39    | 11.11         | 52.37     | 14.60    |
| 13      | -23.29   | 57.48    | 11.74         | 52.37     | 14.60    |
| 14      | -26.16   | 64.19    | 12.43         | 52.37     | 14.60    |
| 15      | -30.07   | 73.35    | 13.29         | 52.37     | 14.60    |
| 16      | -36.02   | 87.26    | 14.21         | 52.37     | 15.03    |
| 17      | -44.55   | 107.22   | 15.15         | 52.37     | 15.19    |
| 18      | -59.41   | 141.97   | 16.23         | 52.37     | 15.39    |
| 19      | -12.38   | 38.55    | 10.06         | 48.42     | 15.39    |
| 20      | -13.10   | 40.62    | 10.57         | 48.42     | 15.39    |
| 21      | -13.99   | 43.18    | 11.13         | 48.42     | 15.39    |
| 22      | -15.07   | 46.28    | 11.75         | 48.42     | 15.39    |
| 23      | -16.48   | 50.34    | 12.46         | 48.42     | 15.39    |
| 24      | -18.27   | 55.47    | 13.23         | 48.42     | 15.39    |
| 25      | -20.53   | 61.96    | 14.06         | 48.42     | 15.39    |
| 26      | -23.87   | 71.56    | 15.06         | 48.42     | 15.39    |
| 27      | -28.49   | 84.82    | 16.13         | 48.42     | 15.39    |
| 28      | -35.50   | 104.95   | 17.43         | 48.42     | 15.39    |
| 29      | -47.23   | 138.63   | 18.77         | 48.42     | 15.56    |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 30      | -8.48    | 34.10    | 10.07         | 44.47     | 15.56     |
| 31      | -8.89    | 35.60    | 10.58         | 44.47     | 15.56     |
| 32      | -9.38    | 37.41    | 11.14         | 44.47     | 15.56     |
| 33      | -9.98    | 39.62    | 11.77         | 44.47     | 15.56     |
| 34      | -10.70   | 42.25    | 12.45         | 44.47     | 15.56     |
| 35      | -11.64   | 45.70    | 13.25         | 44.47     | 15.56     |
| 36      | -12.80   | 49.96    | 14.12         | 44.47     | 15.56     |
| 37      | -14.31   | 55.49    | 15.08         | 44.47     | 15.56     |
| 38      | -16.35   | 62.97    | 16.19         | 44.47     | 15.56     |
| 39      | -19.02   | 72.75    | 17.36         | 44.47     | 15.56     |
| 40      | -22.91   | 87.01    | 18.69         | 44.47     | 15.56     |
| 41      | -28.79   | 108.61   | 20.17         | 44.47     | 15.56     |
| 42      | -38.57   | 144.45   | 21.97         | 44.47     | 15.56     |
| 43      | -6.09    | 33.48    | 11.15         | 40.53     | 15.56     |
| 44      | -6.42    | 35.12    | 11.78         | 40.53     | 15.56     |
| 45      | -6.82    | 37.10    | 12.48         | 40.53     | 15.56     |
| 46      | -7.30    | 39.52    | 13.26         | 40.53     | 15.56     |
| 47      | -7.89    | 42.49    | 14.13         | 40.53     | 15.56     |
| 48      | -8.64    | 46.25    | 15.10         | 40.53     | 15.56     |
| 49      | -9.59    | 50.99    | 16.18         | 40.53     | 15.56     |
| 50      | -10.82   | 57.15    | 17.38         | 40.53     | 15.56     |
| 51      | -12.43   | 65.19    | 18.70         | 40.53     | 15.56     |
| 52      | -14.69   | 76.48    | 20.21         | 40.53     | 15.56     |
| 53      | -17.87   | 92.42    | 21.87         | 40.53     | 15.56     |
| 54      | -22.57   | 115.92   | 23.71         | 40.53     | 15.56     |
| 55      | -30.12   | 153.70   | 25.93         | 40.53     | 15.56     |
| 56      | -41.88   | 212.50   | 27.90         | 40.53     | 15.56     |
| 57      | -3.93    | 33.42    | 12.49         | 36.58     | 15.56     |
| 58      | -4.17    | 35.26    | 13.27         | 36.58     | 15.56     |
| 59      | -4.45    | 37.50    | 14.14         | 36.58     | 15.56     |
| 60      | -4.81    | 40.24    | 15.12         | 36.58     | 15.56     |
| 61      | -5.25    | 43.63    | 16.20         | 36.58     | 15.56     |
| 62      | -5.80    | 47.91    | 17.41         | 36.58     | 15.56     |
| 63      | -6.50    | 53.33    | 18.75         | 36.58     | 15.56     |
| 64      | -7.42    | 60.44    | 20.26         | 36.58     | 15.56     |
| 65      | -8.61    | 69.72    | 21.91         | 36.58     | 15.56     |
| 66      | -10.24   | 82.28    | 23.76         | 36.58     | 15.56     |
| 67      | -12.50   | 99.85    | 25.82         | 36.58     | 15.56     |
| 68      | -15.84   | 125.68   | 28.10         | 36.58     | 15.56     |
| 69      | -21.09   | 166.39   | 30.86         | 36.58     | 15.56     |
| 70      | -29.81   | 233.90   | 33.58         | 36.58     | 15.56     |
| 71      | -1.84    | 33.90    | 14.15         | 32.63     | 15.56     |
| 72      | -1.97    | 36.01    | 15.12         | 32.63     | 15.56     |
| 73      | -2.12    | 38.59    | 16.21         | 32.63     | 15.56     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 74      | -2.31    | 41.75    | 17.34         | 32.63     | 15.56     |
| 75      | -2.54    | 45.69    | 18.68         | 32.63     | 15.56     |
| 76      | -2.84    | 50.65    | 20.17         | 32.63     | 15.56     |
| 77      | -3.21    | 56.95    | 21.83         | 32.63     | 15.56     |
| 78      | -3.69    | 65.02    | 23.68         | 32.63     | 15.56     |
| 79      | -4.32    | 75.58    | 25.87         | 32.63     | 15.56     |
| 80      | -5.17    | 89.78    | 28.18         | 32.63     | 15.56     |
| 81      | -6.34    | 109.47   | 30.75         | 32.63     | 15.56     |
| 82      | -8.03    | 137.85   | 33.61         | 32.63     | 15.56     |
| 83      | -10.58   | 180.67   | 37.04         | 32.63     | 15.56     |
| 84      | 0.28     | 32.87    | 15.13         | 28.68     | 15.56     |
| 85      | 0.30     | 34.90    | 16.15         | 28.68     | 15.56     |
| 86      | 0.32     | 37.37    | 17.35         | 28.68     | 15.56     |
| 87      | 0.35     | 40.36    | 18.68         | 28.68     | 15.56     |
| 88      | 0.39     | 44.11    | 20.19         | 28.68     | 15.56     |
| 89      | 0.43     | 48.74    | 21.86         | 28.68     | 15.56     |
| 90      | 0.48     | 54.35    | 23.67         | 28.68     | 15.56     |
| 91      | 0.55     | 61.71    | 25.78         | 28.68     | 15.56     |
| 92      | 0.64     | 70.99    | 28.08         | 28.68     | 15.56     |
| 93      | 0.75     | 83.04    | 30.64         | 28.68     | 15.56     |
| 94      | 0.90     | 99.00    | 33.50         | 28.68     | 15.56     |
| 95      | 1.11     | 120.68   | 36.91         | 28.68     | 15.56     |
| 96      | 2.44     | 34.09    | 17.36         | 24.74     | 15.56     |
| 97      | 2.63     | 36.49    | 18.71         | 24.74     | 15.56     |
| 98      | 2.86     | 39.41    | 20.21         | 24.74     | 15.56     |
| 99      | 3.14     | 43.02    | 21.90         | 24.74     | 15.56     |
| 100     | 3.48     | 47.34    | 23.74         | 24.74     | 15.56     |
| 101     | 3.90     | 52.69    | 25.81         | 24.74     | 15.56     |
| 102     | 4.42     | 59.38    | 28.12         | 24.74     | 15.56     |
| 103     | 5.08     | 67.73    | 30.70         | 24.74     | 15.56     |
| 104     | 5.91     | 78.28    | 33.56         | 24.74     | 15.56     |
| 105     | 6.97     | 91.81    | 36.76         | 24.74     | 15.56     |
| 106     | 4.52     | 33.49    | 18.72         | 20.79     | 15.56     |
| 107     | 4.87     | 35.85    | 20.21         | 20.79     | 15.56     |
| 108     | 5.29     | 38.71    | 21.89         | 20.79     | 15.56     |
| 109     | 5.80     | 42.15    | 23.75         | 20.79     | 15.56     |
| 110     | 6.43     | 46.34    | 25.73         | 20.79     | 15.56     |
| 111     | 7.18     | 51.45    | 28.04         | 20.79     | 15.56     |
| 112     | 8.11     | 57.69    | 30.61         | 20.79     | 15.56     |
| 113     | 9.26     | 65.43    | 33.49         | 20.79     | 15.56     |
| 114     | 10.66    | 74.88    | 36.65         | 20.79     | 15.56     |
| 115     | 7.11     | 35.41    | 21.82         | 16.84     | 15.56     |
| 116     | 7.73     | 38.22    | 23.68         | 16.84     | 15.56     |
| 117     | 8.47     | 41.60    | 25.75         | 16.84     | 15.56     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 118     | 9.36     | 45.66    | 28.06         | 16.84     | 15.56    |
| 119     | 10.44    | 50.57    | 30.64         | 16.84     | 15.56    |
| 120     | 11.74    | 56.48    | 33.50         | 16.84     | 15.56    |
| 121     | 13.31    | 63.66    | 36.71         | 16.84     | 15.56    |
| 122     | 9.41     | 35.11    | 23.69         | 12.89     | 15.56    |
| 123     | 10.23    | 37.91    | 25.77         | 12.89     | 15.56    |
| 124     | 11.20    | 41.24    | 28.08         | 12.89     | 15.56    |
| 125     | 12.36    | 45.20    | 30.65         | 12.89     | 15.56    |
| 126     | 13.76    | 49.96    | 33.42         | 12.89     | 15.56    |
| 127     | 15.41    | 55.61    | 36.60         | 12.89     | 15.56    |
| 128     | 11.80    | 34.94    | 25.77         | 8.95      | 15.56    |
| 129     | 12.83    | 37.72    | 28.09         | 8.95      | 15.56    |
| 130     | 14.05    | 41.02    | 30.58         | 8.95      | 15.56    |
| 131     | 15.49    | 44.93    | 33.44         | 8.95      | 15.56    |
| 132     | 17.20    | 49.55    | 36.63         | 8.95      | 15.56    |
| 133     | 15.58    | 37.64    | 30.59         | 5.00      | 15.56    |
| 134     | 17.06    | 40.92    | 33.46         | 5.00      | 15.56    |
| 135     | 18.79    | 44.77    | 36.65         | 5.00      | 15.56    |



23-E

|                                |   |
|--------------------------------|---|
| Analysis Mode                  |   |
| Design(D)/Factor of Safety(FS) | D |

|   |    |
|---|----|
| Analysis Type   |    |
| Soil Nail(SN)/Tie Back(TB)/Active EP(AEP)/Passive EP(PEP) | SN |

|                              |      |
|------------------------------|------|
| General                      |      |
| Toe Segment No.              | 1    |
| Toe Specification Type (X/Y) | Y    |
| Toe Y Value                  | 3    |
| X-Base                       | 0    |
| Y-Base                       | 0    |
| Minimum Toe Angle (deg)      | 5    |
| Maximum Toe Angle (deg)      | 80   |
| No. Toe Angles               | 20   |
| Minimum Exit X Value         | 10   |
| Maximum Exit X Value         | 40   |
| No. Exit Points              | 20   |
| Water Unit Weight            | 62.4 |
| Seismic Coefficient (g's)    | 0.3  |

|  |      |
|--|------|
| Factors of Safety  |      |
| Service Load Design(SLD)/Load-Resistance Factor Design(LRFD) | SLD  |
| FS - Cohesion  | 1.1  |
| FS - Friction Angle  | 1.1  |
| Strength Factor - Nail Tendon                                | 0.74 |
| Strength Factor - Nail Head                                  | 0.91 |
| Strength Factor - Pullout                                    | 0.67 |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |

| Soil | Cohesion | Friction | Unit Wt. | Pullout |
|------|----------|----------|----------|---------|
| 1    | 50       | 32       | 125      | 3000    |
| 2    | 100      | 40       | 135      | 7000    |

| Piezo | X | Y |
|-------|---|---|
|       |   |   |

| Node | X  | Y  |
|------|----|----|
| 1    | 0  | 0  |
| 2    | 0  | 18 |
| 3    | 0  | 23 |
| 4    | 22 | 28 |
| 5    | 42 | 33 |
| 6    | 22 | 23 |
| 7    | 42 | 28 |
| 8    | 0  | 10 |

| Segment | Node 1 | Node 2 | Top Soil # | Bot. Soil # | Top PO # | Bot. PO # |
|---------|--------|--------|------------|-------------|----------|-----------|
| 1       | 1      | 2      | 0          | 2           | 0        | 2         |
| 2       | 2      | 3      | 0          | 1           | 0        | 1         |
| 3       | 3      | 4      | 0          | 1           | 0        | 1         |
| 4       | 4      | 5      | 0          | 1           | 0        | 1         |
| 5       | 2      | 6      | 1          | 2           | 1        | 2         |
| 6       | 6      | 7      | 1          | 2           | 1        | 2         |

| Surcharge | Node 1 | P1  | Node 2 | P2  | Angle |
|-----------|--------|-----|--------|-----|-------|
| 1         | 3      | 250 | 4      | 250 | 270   |
| 2         | 4      | 250 | 5      | 250 | 270   |

| Nail | Xs | Ys   | Length | Dip | Tendon Str. | Head Str. | Fixed? | Spacing | Tieback? |
|------|----|------|--------|-----|-------------|-----------|--------|---------|----------|
| 1    | 0  | 19.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 2    | 0  | 14.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 3    | 0  | 9.5  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 4    | 0  | 3.5  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |

| Face Press | Node 1 | P1  | Node 2 | P2 | Angle |
|------------|--------|-----|--------|----|-------|
| 1          | 1      | 0.6 | 8      | 1  | 0     |
| 2          | 8      | 1   | 3      | 1  | 0     |

Analysis Type: Soil Nail

Analysis Mode: Design

Nail Head Strength Factor (Multiplier): 1.53

| Nail | Length | Capacity | Slip Surf. |
|------|--------|----------|------------|
| 1    | 18.2   | 32735    | 29         |
| 2    | 18.0   | 33367    | 81         |
| 3    | 12.9   | 32700    | 81         |
| 4    | 4.1    | 22405    | 81         |

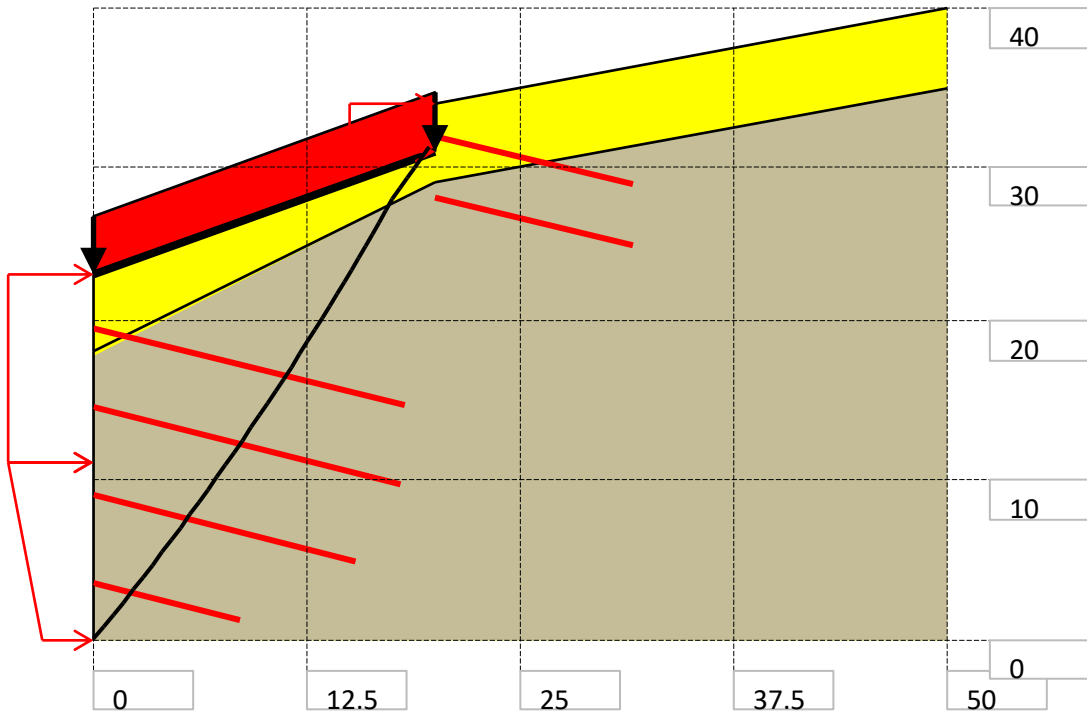
| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 1       | -32.03   | 78.73    | 10.08         | 60.26     | 10.24    |
| 2       | -36.05   | 88.24    | 10.49         | 60.26     | 10.52    |
| 3       | -43.34   | 105.46   | 11.08         | 60.26     | 10.85    |
| 4       | -18.15   | 55.79    | 10.10         | 56.32     | 10.85    |
| 5       | -19.89   | 60.85    | 10.60         | 56.32     | 10.85    |
| 6       | -22.38   | 68.08    | 11.21         | 56.32     | 11.27    |
| 7       | -25.50   | 77.14    | 11.82         | 56.32     | 11.77    |
| 8       | -30.02   | 90.30    | 12.51         | 56.32     | 12.33    |
| 9       | -37.15   | 111.01   | 13.29         | 56.32     | 12.91    |
| 10      | -11.18   | 44.63    | 10.11         | 52.37     | 12.91    |
| 11      | -11.98   | 47.62    | 10.63         | 52.37     | 12.91    |
| 12      | -12.95   | 51.23    | 11.18         | 52.37     | 12.91    |
| 13      | -14.22   | 55.96    | 11.81         | 52.37     | 12.91    |
| 14      | -15.89   | 62.16    | 12.51         | 52.37     | 12.91    |
| 15      | -18.14   | 70.57    | 13.28         | 52.37     | 12.91    |
| 16      | -21.13   | 81.70    | 14.09         | 52.37     | 13.52    |
| 17      | -26.24   | 100.72   | 15.11         | 52.37     | 14.19    |
| 18      | -33.23   | 126.75   | 16.04         | 52.37     | 14.69    |
| 19      | -6.86    | 38.04    | 10.12         | 48.42     | 14.69    |
| 20      | -7.24    | 39.98    | 10.63         | 48.42     | 14.69    |
| 21      | -7.71    | 42.35    | 11.19         | 48.42     | 14.69    |
| 22      | -8.30    | 45.38    | 11.84         | 48.42     | 14.69    |
| 23      | -9.01    | 49.01    | 12.53         | 48.42     | 14.69    |
| 24      | -9.94    | 53.76    | 13.31         | 48.42     | 14.69    |
| 25      | -11.17   | 60.02    | 14.18         | 48.42     | 14.69    |
| 26      | -12.84   | 68.55    | 15.15         | 48.42     | 14.69    |
| 27      | -15.20   | 80.58    | 16.22         | 48.42     | 14.69    |
| 28      | -18.73   | 98.60    | 17.42         | 48.42     | 15.39    |
| 29      | -24.93   | 130.28   | 18.84         | 48.42     | 16.04    |



| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 30      | -3.84    | 33.70    | 10.12         | 44.47     | 16.04     |
| 31      | -4.02    | 35.10    | 10.63         | 44.47     | 16.04     |
| 32      | -4.23    | 36.77    | 11.20         | 44.47     | 16.04     |
| 33      | -4.49    | 38.83    | 11.83         | 44.47     | 16.04     |
| 34      | -4.80    | 41.32    | 12.53         | 44.47     | 16.04     |
| 35      | -5.19    | 44.44    | 13.32         | 44.47     | 16.04     |
| 36      | -5.67    | 48.30    | 14.17         | 44.47     | 16.04     |
| 37      | -6.32    | 53.45    | 15.17         | 44.47     | 16.04     |
| 38      | -7.15    | 60.10    | 16.24         | 44.47     | 16.04     |
| 39      | -8.29    | 69.25    | 17.45         | 44.47     | 16.04     |
| 40      | -9.91    | 82.14    | 18.80         | 44.47     | 16.04     |
| 41      | -12.32   | 101.42   | 20.29         | 44.47     | 16.40     |
| 42      | -16.26   | 132.83   | 21.95         | 44.47     | 16.95     |
| 43      | -1.67    | 32.96    | 11.20         | 40.53     | 16.95     |
| 44      | -1.75    | 34.47    | 11.83         | 40.53     | 16.95     |
| 45      | -1.86    | 36.29    | 12.54         | 40.53     | 16.95     |
| 46      | -1.98    | 38.52    | 13.32         | 40.53     | 16.95     |
| 47      | -2.13    | 41.27    | 14.20         | 40.53     | 16.95     |
| 48      | -2.32    | 44.70    | 15.18         | 40.53     | 16.95     |
| 49      | -2.56    | 48.93    | 16.23         | 40.53     | 16.95     |
| 50      | -2.88    | 54.68    | 17.47         | 40.53     | 16.95     |
| 51      | -3.28    | 61.86    | 18.78         | 40.53     | 16.95     |
| 52      | -3.86    | 72.23    | 20.33         | 40.53     | 16.95     |
| 53      | -4.66    | 86.55    | 22.00         | 40.53     | 16.95     |
| 54      | -5.82    | 107.43   | 23.86         | 40.53     | 17.29     |
| 55      | -7.66    | 140.50   | 25.91         | 40.53     | 17.82     |
| 56      | 0.39     | 32.75    | 12.54         | 36.58     | 17.82     |
| 57      | 0.42     | 34.43    | 13.33         | 36.58     | 17.82     |
| 58      | 0.44     | 36.47    | 14.20         | 36.58     | 17.82     |
| 59      | 0.48     | 38.97    | 15.18         | 36.58     | 17.82     |
| 60      | 0.52     | 42.07    | 16.19         | 36.58     | 17.82     |
| 61      | 0.57     | 45.96    | 17.39         | 36.58     | 17.82     |
| 62      | 0.63     | 50.91    | 18.74         | 36.58     | 17.82     |
| 63      | 0.72     | 57.29    | 20.23         | 36.58     | 17.82     |
| 64      | 0.83     | 65.76    | 21.90         | 36.58     | 17.82     |
| 65      | 0.98     | 77.06    | 23.75         | 36.58     | 17.82     |
| 66      | 1.19     | 92.74    | 25.97         | 36.58     | 17.82     |
| 67      | 1.49     | 115.56   | 28.28         | 36.58     | 17.82     |
| 68      | 1.96     | 151.15   | 30.86         | 36.58     | 18.07     |
| 69      | 2.47     | 33.03    | 14.20         | 32.63     | 18.07     |
| 70      | 2.63     | 34.95    | 15.18         | 32.63     | 18.07     |
| 71      | 2.82     | 37.29    | 16.20         | 32.63     | 18.07     |
| 72      | 3.06     | 40.16    | 17.41         | 32.63     | 18.07     |
| 73      | 3.35     | 43.73    | 18.75         | 32.63     | 18.07     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 74      | 3.72     | 48.21    | 20.25         | 32.63     | 18.07    |
| 75      | 4.19     | 53.92    | 21.93         | 32.63     | 18.07    |
| 76      | 4.79     | 61.20    | 23.79         | 32.63     | 18.07    |
| 77      | 5.57     | 70.69    | 25.86         | 32.63     | 18.07    |
| 78      | 6.62     | 83.38    | 28.16         | 32.63     | 18.07    |
| 79      | 8.05     | 100.84   | 30.94         | 32.63     | 18.07    |
| 80      | 10.11    | 125.79   | 33.84         | 32.63     | 18.07    |
| 81      | 13.19    | 163.24   | 37.06         | 32.63     | 18.18    |
| 82      | 4.69     | 33.80    | 16.20         | 28.68     | 18.18    |
| 83      | 5.02     | 36.02    | 17.41         | 28.68     | 18.18    |
| 84      | 5.44     | 38.74    | 18.76         | 28.68     | 18.18    |
| 85      | 5.95     | 42.09    | 20.27         | 28.68     | 18.18    |
| 86      | 6.58     | 46.25    | 21.94         | 28.68     | 18.18    |
| 87      | 7.37     | 51.42    | 23.81         | 28.68     | 18.18    |
| 88      | 8.36     | 57.93    | 25.89         | 28.68     | 18.18    |
| 89      | 9.63     | 66.25    | 28.21         | 28.68     | 18.18    |
| 90      | 11.26    | 77.01    | 30.80         | 28.68     | 18.18    |
| 91      | 13.42    | 91.17    | 33.68         | 28.68     | 18.18    |
| 92      | 16.33    | 110.29   | 36.89         | 28.68     | 18.18    |
| 93      | 6.69     | 32.93    | 17.42         | 24.74     | 18.18    |
| 94      | 7.17     | 35.07    | 18.77         | 24.74     | 18.18    |
| 95      | 7.75     | 37.69    | 20.28         | 24.74     | 18.18    |
| 96      | 8.47     | 40.87    | 21.95         | 24.74     | 18.18    |
| 97      | 9.34     | 44.77    | 23.82         | 24.74     | 18.18    |
| 98      | 10.41    | 49.59    | 25.91         | 24.74     | 18.18    |
| 99      | 11.75    | 55.56    | 28.11         | 24.74     | 18.18    |
| 100     | 13.42    | 63.03    | 30.68         | 24.74     | 18.18    |
| 101     | 15.52    | 72.44    | 33.55         | 24.74     | 18.18    |
| 102     | 18.20    | 84.43    | 36.96         | 24.74     | 18.18    |
| 103     | 9.31     | 34.34    | 20.27         | 20.79     | 18.18    |
| 104     | 10.07    | 36.88    | 21.95         | 20.79     | 18.18    |
| 105     | 10.97    | 39.93    | 23.72         | 20.79     | 18.18    |
| 106     | 12.09    | 43.68    | 25.81         | 20.79     | 18.18    |
| 107     | 13.44    | 48.23    | 28.13         | 20.79     | 18.18    |
| 108     | 15.09    | 53.80    | 30.72         | 20.79     | 18.18    |
| 109     | 17.13    | 60.64    | 33.60         | 20.79     | 18.18    |
| 110     | 19.63    | 69.07    | 36.81         | 20.79     | 18.18    |
| 111     | 11.51    | 33.80    | 21.95         | 16.84     | 18.18    |
| 112     | 12.44    | 36.28    | 23.74         | 16.84     | 18.18    |
| 113     | 13.56    | 39.27    | 25.82         | 16.84     | 18.18    |
| 114     | 14.90    | 42.87    | 28.14         | 16.84     | 18.18    |
| 115     | 16.53    | 47.22    | 30.73         | 16.84     | 18.18    |
| 116     | 18.49    | 52.47    | 33.62         | 16.84     | 18.18    |
| 117     | 20.86    | 58.82    | 36.69         | 16.84     | 18.18    |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 118     | 14.93    | 35.84    | 25.82         | 12.89     | 18.18    |
| 119     | 16.26    | 38.77    | 28.14         | 12.89     | 18.18    |
| 120     | 17.85    | 42.26    | 30.63         | 12.89     | 18.18    |
| 121     | 19.75    | 46.45    | 33.51         | 12.89     | 18.18    |
| 122     | 22.02    | 51.45    | 36.72         | 12.89     | 18.18    |
| 123     | 17.58    | 35.52    | 28.14         | 8.95      | 18.18    |
| 124     | 19.13    | 38.40    | 30.64         | 8.95      | 18.18    |
| 125     | 20.97    | 41.81    | 33.51         | 8.95      | 18.18    |
| 126     | 23.16    | 45.86    | 36.73         | 8.95      | 18.18    |
| 127     | 22.23    | 38.12    | 33.52         | 5.00      | 18.18    |
| 128     | 24.35    | 41.46    | 36.73         | 5.00      | 18.18    |



34.5-T

|                                |   |
|--------------------------------|---|
| Analysis Mode                  |   |
| Design(D)/Factor of Safety(FS) | D |

|   |    |
|---|----|
| Analysis Type   |    |
| Soil Nail(SN)/Tie Back(TB)/Active EP(AEP)/Passive EP(PEP) | SN |

|                              |      |
|------------------------------|------|
| General                      |      |
| Toe Segment No.              | 1    |
| Toe Specification Type (X/Y) | Y    |
| Toe Y Value                  | 0    |
| X-Base                       | 0    |
| Y-Base                       | 0    |
| Minimum Toe Angle (deg)      | 5    |
| Maximum Toe Angle (deg)      | 80   |
| No. Toe Angles               | 20   |
| Minimum Exit X Value         | 10   |
| Maximum Exit X Value         | 48   |
| No. Exit Points              | 20   |
| Water Unit Weight            | 62.4 |
| Seismic Coefficient (g's)    | 0    |

|  |      |
|--|------|
| Factors of Safety  |      |
| Service Load Design(SLD)/Load-Resistance Factor Design(LRFD) | SLD  |
| FS - Cohesion  | 1.35 |
| FS - Friction Angle  | 1.35 |
| Strength Factor - Nail Tendon                                | 0.55 |
| Strength Factor - Nail Head                                  | 0.67 |
| Strength Factor - Pullout                                    | 0.5  |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |

| Soil | Cohesion | Friction | Unit Wt. | Pullout |
|------|----------|----------|----------|---------|
| 1    | 50       | 32       | 125      | 3000    |
| 2    | 100      | 40       | 135      | 7000    |

| Piezo | X | Y |
|-------|---|---|
|       |   |   |

| Node | X  | Y  |
|------|----|----|
| 1    | 0  | 0  |
| 2    | 0  | 18 |
| 3    | 0  | 23 |
| 4    | 20 | 31 |
| 5    | 20 | 34 |
| 6    | 50 | 40 |
| 7    | 20 | 29 |
| 8    | 50 | 35 |
| 9    | 0  | 11 |

| Segment | Node 1 | Node 2 | Top Soil # | Bot. Soil # | Top PO # | Bot. PO # |
|---------|--------|--------|------------|-------------|----------|-----------|
| 1       | 1      | 2      | 0          | 2           | 0        | 2         |
| 2       | 2      | 3      | 0          | 1           | 0        | 1         |
| 3       | 3      | 4      | 0          | 1           | 0        | 1         |
| 4       | 4      | 5      | 0          | 1           | 0        | 1         |
| 5       | 5      | 6      | 0          | 1           | 0        | 1         |
| 6       | 2      | 7      | 1          | 2           | 1        | 2         |
| 7       | 7      | 8      | 1          | 2           | 1        | 2         |

| Surcharge | Node 1 | P1  | Node 2 | P2  | Angle |
|-----------|--------|-----|--------|-----|-------|
| 1         | 3      | 250 | 4      | 250 | 270   |

| Nail | Xs | Ys   | Length | Dip | Tendon Str. | Head Str. | Fixed? | Spacing | Tieback? |
|------|----|------|--------|-----|-------------|-----------|--------|---------|----------|
| 1    | 20 | 32   | 12     | 15  | 59250       | 40000     | 1      | 6       | 0        |
| 2    | 20 | 28   | 12     | 15  | 59250       | 40000     | 1      | 6       | 0        |
| 3    | 0  | 19.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 4    | 0  | 14.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 5    | 0  | 9    | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 6    | 0  | 3.5  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |

| Face Press | Node 1 | P1  | Node 2 | P2 | Angle |
|------------|--------|-----|--------|----|-------|
| 1          | 1      | 0.6 | 9      | 1  | 0     |
| 2          | 9      | 1   | 3      | 1  | 0     |
| 3          | 4      | 1   | 5      | 1  | 0     |

Analysis Type: Soil Nail

Analysis Mode: Design

Nail Head Strength Factor (Multiplier): 1.71

| Nail | Length | Capacity | Slip Surf. |
|------|--------|----------|------------|
| 1    | 12.0   | 41335    | 26         |
| 2    | 12.0   | 42193    | 61         |
| 3    | 18.9   | 53341    | 7          |
| 4    | 18.6   | 54361    | 24         |
| 5    | 15.9   | 50407    | 24         |
| 6    | 8.9    | 37040    | 47         |

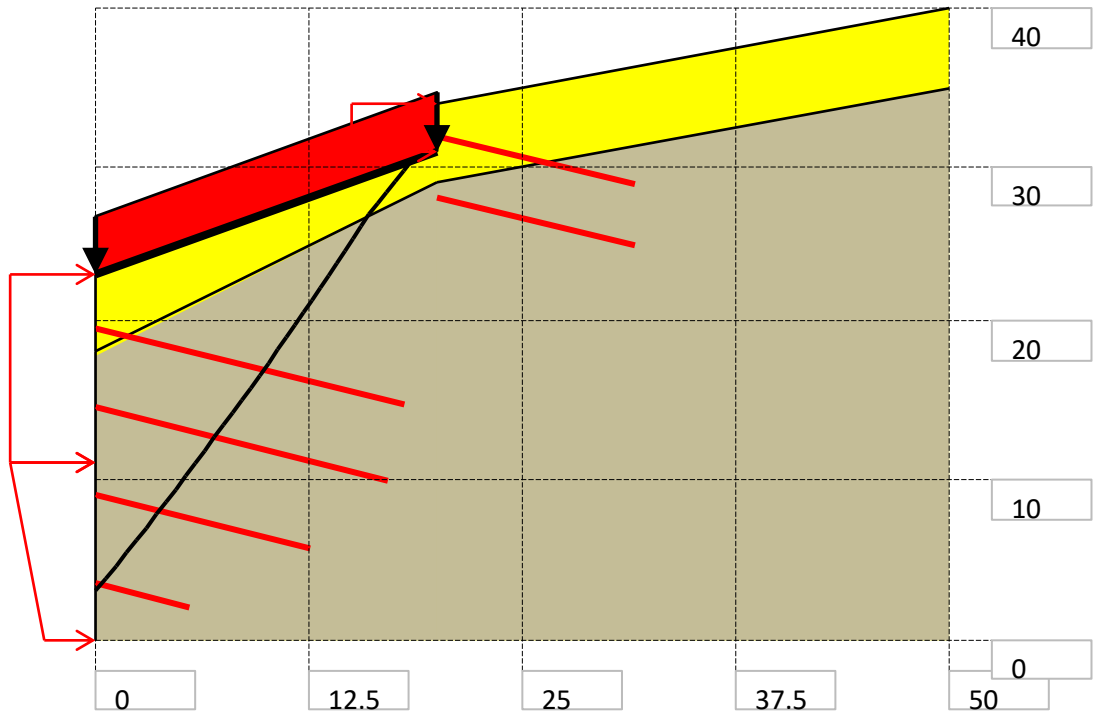
| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 1       | -60.31   | 95.24    | 10.02         | 64.21     | 14.88    |
| 2       | -71.27   | 112.53   | 10.63         | 64.21     | 15.29    |
| 3       | -35.13   | 64.97    | 10.12         | 60.26     | 15.29    |
| 4       | -39.09   | 72.30    | 10.75         | 60.26     | 15.69    |
| 5       | -44.65   | 82.58    | 11.48         | 60.26     | 16.13    |
| 6       | -53.25   | 98.49    | 12.25         | 60.26     | 16.28    |
| 7       | -64.58   | 119.44   | 13.08         | 60.26     | 16.80    |
| 8       | -22.89   | 50.34    | 10.11         | 56.32     | 16.80    |
| 9       | -24.82   | 54.59    | 10.68         | 56.32     | 16.80    |
| 10      | -27.28   | 59.99    | 11.40         | 56.32     | 16.80    |
| 11      | -30.38   | 66.82    | 12.18         | 56.32     | 16.80    |
| 12      | -34.83   | 76.59    | 13.11         | 56.32     | 16.80    |
| 13      | -41.19   | 90.59    | 14.17         | 56.32     | 17.43    |
| 14      | -49.27   | 108.35   | 15.17         | 56.32     | 17.86    |
| 15      | -15.75   | 42.11    | 10.05         | 52.37     | 17.86    |
| 16      | -16.79   | 44.90    | 10.69         | 52.37     | 17.86    |
| 17      | -18.08   | 48.34    | 11.42         | 52.37     | 17.86    |
| 18      | -19.63   | 52.49    | 12.20         | 52.37     | 17.86    |
| 19      | -21.74   | 58.14    | 13.13         | 52.37     | 17.86    |
| 20      | -24.43   | 65.32    | 14.14         | 52.37     | 17.86    |
| 21      | -28.06   | 75.03    | 15.17         | 52.37     | 17.86    |
| 22      | -33.06   | 88.40    | 16.41         | 52.37     | 18.04    |
| 23      | -40.47   | 108.20   | 17.82         | 52.37     | 18.67    |
| 24      | -52.64   | 140.75   | 19.28         | 52.37     | 18.85    |
| 25      | -49.04   | 131.14   | 19.00         | 52.37     | 18.85    |
| 26      | -67.25   | 179.81   | 22.82         | 52.37     | 18.85    |
| 27      | -10.94   | 36.81    | 10.06         | 48.42     | 18.85    |



| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 28      | -11.54   | 38.82    | 10.71         | 48.42     | 18.85     |
| 29      | -12.26   | 41.25    | 11.43         | 48.42     | 18.85     |
| 30      | -13.15   | 44.22    | 12.24         | 48.42     | 18.85     |
| 31      | -14.24   | 47.89    | 13.14         | 48.42     | 18.85     |
| 32      | -15.60   | 52.49    | 14.06         | 48.42     | 18.85     |
| 33      | -17.35   | 58.37    | 15.18         | 48.42     | 18.85     |
| 34      | -19.63   | 66.03    | 16.43         | 48.42     | 18.85     |
| 35      | -22.69   | 76.32    | 17.83         | 48.42     | 18.85     |
| 36      | -26.95   | 90.66    | 19.27         | 48.42     | 18.85     |
| 37      | -27.18   | 91.41    | 19.34         | 48.42     | 18.85     |
| 38      | -33.65   | 113.18   | 22.88         | 48.42     | 18.85     |
| 39      | -43.56   | 146.51   | 24.90         | 48.42     | 18.85     |
| 40      | -8.66    | 38.69    | 12.25         | 44.47     | 18.85     |
| 41      | -9.25    | 41.37    | 13.07         | 44.47     | 18.85     |
| 42      | -9.99    | 44.64    | 14.07         | 44.47     | 18.85     |
| 43      | -10.91   | 48.79    | 15.22         | 44.47     | 18.85     |
| 44      | -12.03   | 53.78    | 16.44         | 44.47     | 18.85     |
| 45      | -13.49   | 60.31    | 17.74         | 44.47     | 18.85     |
| 46      | -15.40   | 68.82    | 19.29         | 44.47     | 18.85     |
| 47      | -15.97   | 71.37    | 19.73         | 44.47     | 18.85     |
| 48      | -18.75   | 83.80    | 22.93         | 44.47     | 18.85     |
| 49      | -22.54   | 100.73   | 25.01         | 44.47     | 18.85     |
| 50      | -28.23   | 126.21   | 27.29         | 44.47     | 18.85     |
| 51      | -38.18   | 170.68   | 29.96         | 44.47     | 18.85     |
| 52      | -5.61    | 36.84    | 13.07         | 40.53     | 18.85     |
| 53      | -5.99    | 39.34    | 14.08         | 40.53     | 18.85     |
| 54      | -6.45    | 42.36    | 15.20         | 40.53     | 18.85     |
| 55      | -7.02    | 46.06    | 16.36         | 40.53     | 18.85     |
| 56      | -7.72    | 50.66    | 17.75         | 40.53     | 18.85     |
| 57      | -8.60    | 56.44    | 19.30         | 40.53     | 18.85     |
| 58      | -9.08    | 59.59    | 19.98         | 40.53     | 18.85     |
| 59      | -10.27   | 67.44    | 22.90         | 40.53     | 18.85     |
| 60      | -11.92   | 78.22    | 25.06         | 40.53     | 18.85     |
| 61      | -14.12   | 92.67    | 27.37         | 40.53     | 18.85     |
| 62      | -17.35   | 113.90   | 29.98         | 40.53     | 18.85     |
| 63      | -22.40   | 147.04   | 32.91         | 40.53     | 18.85     |
| 64      | -31.02   | 203.62   | 36.15         | 40.53     | 18.85     |
| 65      | -3.13    | 37.89    | 15.20         | 36.58     | 18.85     |
| 66      | -3.36    | 40.74    | 16.37         | 36.58     | 18.85     |
| 67      | -3.65    | 44.21    | 17.76         | 36.58     | 18.85     |
| 68      | -4.00    | 48.47    | 19.31         | 36.58     | 18.85     |
| 69      | -4.27    | 51.77    | 21.02         | 36.58     | 18.85     |
| 70      | -4.73    | 57.39    | 22.92         | 36.58     | 18.85     |
| 71      | -5.33    | 64.63    | 25.03         | 36.58     | 18.85     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 72      | -6.11    | 74.04    | 27.34         | 36.58     | 18.85     |
| 73      | -7.19    | 87.20    | 30.01         | 36.58     | 18.85     |
| 74      | -8.70    | 105.43   | 32.94         | 36.58     | 18.85     |
| 75      | -10.90   | 132.13   | 36.19         | 36.58     | 18.85     |
| 76      | -14.33   | 173.71   | 39.80         | 36.58     | 18.85     |
| 77      | -20.75   | 251.51   | 44.13         | 36.58     | 18.85     |
| 78      | -0.53    | 39.60    | 17.76         | 32.63     | 18.85     |
| 79      | -0.58    | 42.92    | 19.22         | 32.63     | 18.85     |
| 80      | -0.62    | 46.19    | 21.03         | 32.63     | 18.85     |
| 81      | -0.68    | 50.43    | 22.93         | 32.63     | 18.85     |
| 82      | -0.75    | 55.71    | 25.01         | 32.63     | 18.85     |
| 83      | -0.84    | 62.66    | 27.40         | 32.63     | 18.85     |
| 84      | -0.96    | 71.59    | 29.89         | 32.63     | 18.85     |
| 85      | -1.12    | 83.27    | 32.92         | 32.63     | 18.85     |
| 86      | -1.33    | 99.53    | 36.22         | 32.63     | 18.85     |
| 87      | -1.65    | 122.70   | 39.96         | 32.63     | 18.85     |
| 88      | -2.06    | 153.61   | 43.72         | 32.63     | 18.85     |
| 89      | 2.52     | 45.34    | 22.93         | 28.68     | 18.85     |
| 90      | 2.75     | 49.50    | 25.05         | 28.68     | 18.85     |
| 91      | 3.04     | 54.71    | 27.29         | 28.68     | 18.85     |
| 92      | 3.41     | 61.32    | 29.91         | 28.68     | 18.85     |
| 93      | 3.88     | 69.78    | 32.82         | 28.68     | 18.85     |
| 94      | 4.49     | 80.78    | 36.07         | 28.68     | 18.85     |
| 95      | 5.29     | 95.30    | 39.68         | 28.68     | 18.85     |
| 96      | 6.39     | 114.99   | 43.71         | 28.68     | 18.85     |
| 97      | 5.60     | 44.79    | 25.05         | 24.74     | 18.85     |
| 98      | 6.11     | 48.90    | 27.30         | 24.74     | 18.85     |
| 99      | 6.75     | 54.02    | 29.92         | 24.74     | 18.85     |
| 100     | 7.55     | 60.42    | 32.83         | 24.74     | 18.85     |
| 101     | 8.57     | 68.53    | 36.08         | 24.74     | 18.85     |
| 102     | 9.86     | 78.90    | 39.72         | 24.74     | 18.85     |
| 103     | 11.54    | 92.27    | 43.75         | 24.74     | 18.85     |
| 104     | 8.70     | 44.46    | 27.31         | 20.79     | 18.85     |
| 105     | 9.50     | 48.56    | 29.93         | 20.79     | 18.85     |
| 106     | 10.49    | 53.62    | 32.84         | 20.79     | 18.85     |
| 107     | 11.72    | 59.91    | 36.10         | 20.79     | 18.85     |
| 108     | 13.26    | 67.75    | 39.73         | 20.79     | 18.85     |
| 109     | 15.17    | 77.53    | 43.75         | 20.79     | 18.85     |
| 110     | 11.89    | 44.31    | 29.93         | 16.84     | 18.85     |
| 111     | 13.00    | 48.43    | 32.86         | 16.84     | 18.85     |
| 112     | 14.34    | 53.45    | 36.11         | 16.84     | 18.85     |
| 113     | 16.00    | 59.63    | 39.74         | 16.84     | 18.85     |
| 114     | 18.05    | 67.26    | 43.79         | 16.84     | 18.85     |
| 115     | 16.64    | 48.43    | 36.11         | 12.89     | 18.85     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 116     | 18.37    | 53.44    | 39.74         | 12.89     | 18.85    |
| 117     | 20.47    | 59.55    | 43.65         | 12.89     | 18.85    |
| 118     | 20.52    | 48.54    | 39.74         | 8.95      | 18.85    |
| 119     | 22.64    | 53.57    | 43.66         | 8.95      | 18.85    |
| 120     | 24.69    | 48.75    | 43.67         | 5.00      | 18.85    |



34.5-P

|                                |   |
|--------------------------------|---|
| Analysis Mode                  |   |
| Design(D)/Factor of Safety(FS) | D |

|   |    |
|---|----|
| Analysis Type   |    |
| Soil Nail(SN)/Tie Back(TB)/Active EP(AEP)/Passive EP(PEP) | SN |

|                              |      |
|------------------------------|------|
| General                      |      |
| Toe Segment No.              | 1    |
| Toe Specification Type (X/Y) | Y    |
| Toe Y Value                  | 3    |
| X-Base                       | 0    |
| Y-Base                       | 0    |
| Minimum Toe Angle (deg)      | 5    |
| Maximum Toe Angle (deg)      | 80   |
| No. Toe Angles               | 20   |
| Minimum Exit X Value         | 10   |
| Maximum Exit X Value         | 48   |
| No. Exit Points              | 20   |
| Water Unit Weight            | 62.4 |
| Seismic Coefficient (g's)    | 0    |

|  |      |
|--|------|
| Factors of Safety  |      |
| Service Load Design(SLD)/Load-Resistance Factor Design(LRFD) | SLD  |
| FS - Cohesion  | 1.5  |
| FS - Friction Angle  | 1.5  |
| Strength Factor - Nail Tendon                                | 0.55 |
| Strength Factor - Nail Head                                  | 0.67 |
| Strength Factor - Pullout                                    | 0.5  |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |

| Soil | Cohesion | Friction | Unit Wt. | Pullout |
|------|----------|----------|----------|---------|
| 1    | 50       | 32       | 125      | 3000    |
| 2    | 100      | 40       | 135      | 7000    |

| Piezo | X | Y |
|-------|---|---|
|       |   |   |

| Node | X  | Y  |
|------|----|----|
| 1    | 0  | 0  |
| 2    | 0  | 18 |
| 3    | 0  | 23 |
| 4    | 20 | 31 |
| 5    | 20 | 34 |
| 6    | 50 | 40 |
| 7    | 20 | 29 |
| 8    | 50 | 35 |
| 9    | 0  | 11 |

| Segment | Node 1 | Node 2 | Top Soil # | Bot. Soil # | Top PO # | Bot. PO # |
|---------|--------|--------|------------|-------------|----------|-----------|
| 1       | 1      | 2      | 0          | 2           | 0        | 2         |
| 2       | 2      | 3      | 0          | 1           | 0        | 1         |
| 3       | 3      | 4      | 0          | 1           | 0        | 1         |
| 4       | 4      | 5      | 0          | 1           | 0        | 1         |
| 5       | 5      | 6      | 0          | 1           | 0        | 1         |
| 6       | 2      | 7      | 1          | 2           | 1        | 2         |
| 7       | 7      | 8      | 1          | 2           | 1        | 2         |

| Surcharge | Node 1 | P1  | Node 2 | P2  | Angle |
|-----------|--------|-----|--------|-----|-------|
| 1         | 3      | 500 | 4      | 500 | 270   |

| Nail | Xs | Ys   | Length | Dip | Tendon Str. | Head Str. | Fixed? | Spacing | Tieback? |
|------|----|------|--------|-----|-------------|-----------|--------|---------|----------|
| 1    | 20 | 32   | 12     | 15  | 59250       | 40000     | 1      | 6       | 0        |
| 2    | 20 | 28   | 12     | 15  | 59250       | 40000     | 1      | 6       | 0        |
| 3    | 0  | 19.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 4    | 0  | 14.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 5    | 0  | 9    | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 6    | 0  | 3.5  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |

| Face Press | Node 1 | P1  | Node 2 | P2 | Angle |
|------------|--------|-----|--------|----|-------|
| 1          | 1      | 0.6 | 9      | 1  | 0     |
| 2          | 9      | 1   | 3      | 1  | 0     |
| 3          | 4      | 1   | 5      | 1  | 0     |

Analysis Type: Soil Nail

Analysis Mode: Design

Nail Head Strength Factor (Multiplier): 2.58

| Nail | Length | Capacity | Slip Surf. |
|------|--------|----------|------------|
| 1    | 12.0   | 41723    | 31         |
| 2    | 12.0   | 40089    | 58         |
| 3    | 18.7   | 56015    | 9          |
| 4    | 17.7   | 57265    | 19         |
| 5    | 13.0   | 53101    | 19         |
| 6    | 5.7    | 33861    | 29         |

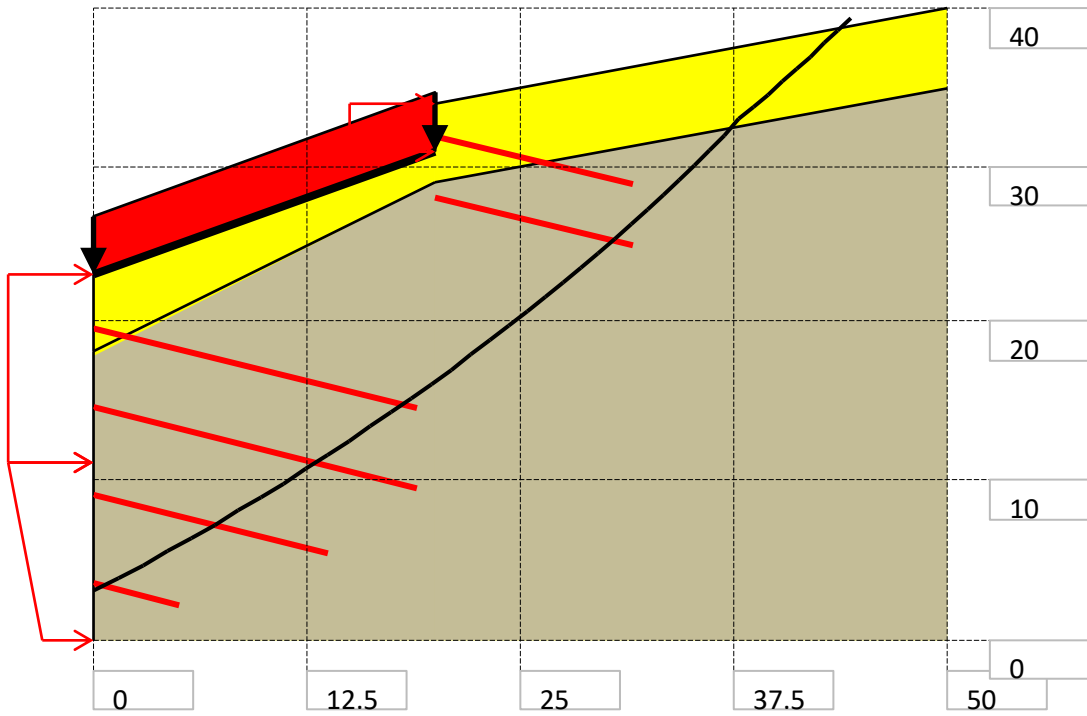
| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 1       | -43.00   | 74.45    | 10.02         | 60.26     | 14.10    |
| 2       | -50.62   | 87.11    | 10.74         | 60.26     | 14.76    |
| 3       | -61.13   | 104.58   | 11.47         | 60.26     | 15.53    |
| 4       | -26.85   | 55.48    | 10.11         | 56.32     | 15.53    |
| 5       | -29.77   | 61.20    | 10.68         | 56.32     | 15.53    |
| 6       | -33.60   | 68.68    | 11.39         | 56.32     | 15.53    |
| 7       | -38.99   | 79.22    | 12.21         | 56.32     | 15.53    |
| 8       | -46.71   | 94.31    | 13.11         | 56.32     | 16.30    |
| 9       | -58.66   | 117.66   | 14.12         | 56.32     | 17.00    |
| 10      | -18.07   | 45.27    | 10.05         | 52.37     | 17.00    |
| 11      | -19.56   | 48.77    | 10.70         | 52.37     | 17.00    |
| 12      | -21.46   | 53.19    | 11.42         | 52.37     | 17.00    |
| 13      | -23.96   | 59.06    | 12.26         | 52.37     | 17.00    |
| 14      | -27.09   | 66.37    | 13.14         | 52.37     | 17.00    |
| 15      | -31.46   | 76.60    | 14.05         | 52.37     | 17.00    |
| 16      | -37.82   | 91.46    | 15.19         | 52.37     | 17.15    |
| 17      | -46.52   | 111.82   | 16.34         | 52.37     | 17.93    |
| 18      | -60.98   | 145.65   | 17.66         | 52.37     | 18.53    |
| 19      | -75.25   | 179.03   | 18.50         | 52.37     | 18.70    |
| 20      | -12.55   | 39.06    | 10.06         | 48.42     | 18.70    |
| 21      | -13.40   | 41.48    | 10.71         | 48.42     | 18.70    |
| 22      | -14.43   | 44.45    | 11.44         | 48.42     | 18.70    |
| 23      | -15.72   | 48.13    | 12.25         | 48.42     | 18.70    |
| 24      | -17.34   | 52.80    | 13.08         | 48.42     | 18.70    |
| 25      | -19.42   | 58.77    | 14.08         | 48.42     | 18.70    |
| 26      | -22.12   | 66.51    | 15.18         | 48.42     | 18.70    |
| 27      | -25.89   | 77.36    | 16.46         | 48.42     | 18.70    |



| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 28      | -31.18   | 92.53    | 17.74         | 48.42     | 18.70     |
| 29      | -39.52   | 116.49   | 19.39         | 48.42     | 18.70     |
| 30      | -36.66   | 108.28   | 18.81         | 48.42     | 18.70     |
| 31      | -48.85   | 143.30   | 23.01         | 48.42     | 18.70     |
| 32      | -68.62   | 200.06   | 24.75         | 48.42     | 18.70     |
| 33      | -8.69    | 34.88    | 10.08         | 44.47     | 18.70     |
| 34      | -9.19    | 36.69    | 10.73         | 44.47     | 18.70     |
| 35      | -9.78    | 38.86    | 11.45         | 44.47     | 18.70     |
| 36      | -10.50   | 41.50    | 12.19         | 44.47     | 18.70     |
| 37      | -11.38   | 44.74    | 13.09         | 44.47     | 18.70     |
| 38      | -12.48   | 48.77    | 14.09         | 44.47     | 18.70     |
| 39      | -13.90   | 53.96    | 15.24         | 44.47     | 18.70     |
| 40      | -15.66   | 60.42    | 16.38         | 44.47     | 18.70     |
| 41      | -17.98   | 68.96    | 17.76         | 44.47     | 18.70     |
| 42      | -21.19   | 80.72    | 19.34         | 44.47     | 18.70     |
| 43      | -21.25   | 80.93    | 19.35         | 44.47     | 18.70     |
| 44      | -25.80   | 97.62    | 22.93         | 44.47     | 18.70     |
| 45      | -32.54   | 122.33   | 25.00         | 44.47     | 18.70     |
| 46      | -44.28   | 165.41   | 27.39         | 44.47     | 18.70     |
| 47      | -6.39    | 34.99    | 11.40         | 40.53     | 18.70     |
| 48      | -6.80    | 37.00    | 12.20         | 40.53     | 18.70     |
| 49      | -7.28    | 39.43    | 13.10         | 40.53     | 18.70     |
| 50      | -7.87    | 42.39    | 14.11         | 40.53     | 18.70     |
| 51      | -8.60    | 46.03    | 15.15         | 40.53     | 18.70     |
| 52      | -9.51    | 50.57    | 16.40         | 40.53     | 18.70     |
| 53      | -10.65   | 56.28    | 17.79         | 40.53     | 18.70     |
| 54      | -12.12   | 63.64    | 19.25         | 40.53     | 18.70     |
| 55      | -12.50   | 65.54    | 19.59         | 40.53     | 18.70     |
| 56      | -14.48   | 75.46    | 22.89         | 40.53     | 18.70     |
| 57      | -17.33   | 89.69    | 24.93         | 40.53     | 18.70     |
| 58      | -21.36   | 109.88   | 27.41         | 40.53     | 18.70     |
| 59      | -27.69   | 141.52   | 30.05         | 40.53     | 18.70     |
| 60      | -38.58   | 195.99   | 32.97         | 40.53     | 18.70     |
| 61      | -4.22    | 35.66    | 13.11         | 36.58     | 18.70     |
| 62      | -4.51    | 37.95    | 14.04         | 36.58     | 18.70     |
| 63      | -4.87    | 40.73    | 15.16         | 36.58     | 18.70     |
| 64      | -5.31    | 44.11    | 16.41         | 36.58     | 18.70     |
| 65      | -5.85    | 48.28    | 17.71         | 36.58     | 18.70     |
| 66      | -6.51    | 53.46    | 19.26         | 36.58     | 18.70     |
| 67      | -6.85    | 56.08    | 19.99         | 36.58     | 18.70     |
| 68      | -7.75    | 63.03    | 22.86         | 36.58     | 18.70     |
| 69      | -8.92    | 72.06    | 24.96         | 36.58     | 18.70     |
| 70      | -10.49   | 84.28    | 27.30         | 36.58     | 18.70     |
| 71      | -12.72   | 101.49   | 29.91         | 36.58     | 18.70     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 72      | -15.97   | 126.73   | 32.81         | 36.58     | 18.70     |
| 73      | -21.07   | 166.19   | 36.26         | 36.58     | 18.70     |
| 74      | -29.94   | 234.88   | 39.89         | 36.58     | 18.70     |
| 75      | -2.02    | 36.90    | 15.17         | 32.63     | 18.70     |
| 76      | -2.18    | 39.56    | 16.42         | 32.63     | 18.70     |
| 77      | -2.37    | 42.77    | 17.73         | 32.63     | 18.70     |
| 78      | -2.60    | 46.69    | 19.28         | 32.63     | 18.70     |
| 79      | -2.77    | 49.56    | 20.96         | 32.63     | 18.70     |
| 80      | -3.08    | 54.65    | 22.87         | 32.63     | 18.70     |
| 81      | -3.46    | 61.10    | 24.98         | 32.63     | 18.70     |
| 82      | -3.96    | 69.49    | 27.33         | 32.63     | 18.70     |
| 83      | -4.62    | 80.58    | 29.94         | 32.63     | 18.70     |
| 84      | -5.52    | 95.72    | 32.86         | 32.63     | 18.70     |
| 85      | -6.78    | 116.81   | 36.09         | 32.63     | 18.70     |
| 86      | -8.61    | 147.60   | 39.67         | 32.63     | 18.70     |
| 87      | -11.50   | 196.02   | 43.99         | 32.63     | 18.70     |
| 88      | 0.34     | 38.75    | 17.74         | 28.68     | 18.70     |
| 89      | 0.37     | 41.86    | 19.28         | 28.68     | 18.70     |
| 90      | 0.39     | 44.79    | 20.99         | 28.68     | 18.70     |
| 91      | 0.43     | 48.71    | 22.88         | 28.68     | 18.70     |
| 92      | 0.48     | 53.60    | 24.99         | 28.68     | 18.70     |
| 93      | 0.53     | 59.78    | 27.34         | 28.68     | 18.70     |
| 94      | 0.61     | 67.72    | 29.97         | 28.68     | 18.70     |
| 95      | 0.71     | 78.03    | 32.89         | 28.68     | 18.70     |
| 96      | 0.83     | 91.60    | 36.14         | 28.68     | 18.70     |
| 97      | 1.01     | 110.00   | 39.76         | 28.68     | 18.70     |
| 98      | 1.25     | 135.62   | 43.81         | 28.68     | 18.70     |
| 99      | 2.76     | 38.22    | 19.29         | 24.74     | 18.70     |
| 100     | 3.24     | 44.26    | 22.89         | 24.74     | 18.70     |
| 101     | 3.54     | 48.13    | 25.00         | 24.74     | 18.70     |
| 102     | 3.92     | 52.93    | 27.35         | 24.74     | 18.70     |
| 103     | 4.39     | 58.95    | 29.98         | 24.74     | 18.70     |
| 104     | 4.98     | 66.53    | 32.90         | 24.74     | 18.70     |
| 105     | 5.74     | 76.21    | 36.17         | 24.74     | 18.70     |
| 106     | 6.72     | 88.70    | 39.80         | 24.74     | 18.70     |
| 107     | 8.01     | 105.10   | 43.87         | 24.74     | 18.70     |
| 108     | 6.07     | 43.96    | 25.01         | 20.79     | 18.70     |
| 109     | 6.64     | 47.81    | 27.36         | 20.79     | 18.70     |
| 110     | 7.35     | 52.56    | 29.88         | 20.79     | 18.70     |
| 111     | 8.22     | 58.45    | 32.80         | 20.79     | 18.70     |
| 112     | 9.31     | 65.78    | 36.05         | 20.79     | 18.70     |
| 113     | 10.67    | 74.96    | 39.66         | 20.79     | 18.70     |
| 114     | 12.39    | 86.60    | 43.70         | 20.79     | 18.70     |
| 115     | 8.96     | 43.83    | 27.36         | 16.84     | 18.70     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 116     | 9.81     | 47.69    | 29.89         | 16.84     | 18.70    |
| 117     | 10.84    | 52.36    | 32.78         | 16.84     | 18.70    |
| 118     | 12.12    | 58.20    | 36.06         | 16.84     | 18.70    |
| 119     | 13.68    | 65.32    | 39.68         | 16.84     | 18.70    |
| 120     | 15.62    | 74.14    | 43.74         | 16.84     | 18.70    |
| 121     | 11.96    | 43.84    | 29.90         | 12.89     | 18.70    |
| 122     | 13.10    | 47.72    | 32.82         | 12.89     | 18.70    |
| 123     | 14.48    | 52.43    | 36.08         | 12.89     | 18.70    |
| 124     | 16.16    | 58.16    | 39.71         | 12.89     | 18.70    |
| 125     | 18.20    | 65.11    | 43.75         | 12.89     | 18.70    |
| 126     | 15.13    | 43.95    | 32.83         | 8.95      | 18.70    |
| 127     | 16.57    | 47.86    | 36.08         | 8.95      | 18.70    |
| 128     | 18.31    | 52.56    | 39.71         | 8.95      | 18.70    |
| 129     | 20.40    | 58.23    | 43.62         | 8.95      | 18.70    |
| 130     | 20.28    | 48.08    | 39.71         | 5.00      | 18.70    |
| 131     | 22.40    | 52.80    | 43.64         | 5.00      | 18.70    |



34.5-E

|                                |   |
|--------------------------------|---|
| Analysis Mode                  |   |
| Design(D)/Factor of Safety(FS) | D |

|   |    |
|---|----|
| Analysis Type   |    |
| Soil Nail(SN)/Tie Back(TB)/Active EP(AEP)/Passive EP(PEP) | SN |

|                              |      |
|------------------------------|------|
| General                      |      |
| Toe Segment No.              | 1    |
| Toe Specification Type (X/Y) | Y    |
| Toe Y Value                  | 3    |
| X-Base                       | 0    |
| Y-Base                       | 0    |
| Minimum Toe Angle (deg)      | 5    |
| Maximum Toe Angle (deg)      | 80   |
| No. Toe Angles               | 20   |
| Minimum Exit X Value         | 10   |
| Maximum Exit X Value         | 48   |
| No. Exit Points              | 20   |
| Water Unit Weight            | 62.4 |
| Seismic Coefficient (g's)    | 0.3  |

|  |      |
|--|------|
| Factors of Safety  |      |
| Service Load Design(SLD)/Load-Resistance Factor Design(LRFD) | SLD  |
| FS - Cohesion  | 1.1  |
| FS - Friction Angle  | 1.1  |
| Strength Factor - Nail Tendon                                | 0.74 |
| Strength Factor - Nail Head                                  | 0.91 |
| Strength Factor - Pullout                                    | 0.67 |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |
|  | 0    |

| Soil | Cohesion | Friction | Unit Wt. | Pullout |
|------|----------|----------|----------|---------|
| 1    | 50       | 32       | 125      | 3000    |
| 2    | 100      | 40       | 135      | 7000    |

| Piezo | X | Y |
|-------|---|---|
|       |   |   |

| Node | X  | Y  |
|------|----|----|
| 1    | 0  | 0  |
| 2    | 0  | 18 |
| 3    | 0  | 23 |
| 4    | 20 | 31 |
| 5    | 20 | 34 |
| 6    | 50 | 40 |
| 7    | 20 | 29 |
| 8    | 50 | 35 |
| 9    | 0  | 11 |

| Segment | Node 1 | Node 2 | Top Soil # | Bot. Soil # | Top PO # | Bot. PO # |
|---------|--------|--------|------------|-------------|----------|-----------|
| 1       | 1      | 2      | 0          | 2           | 0        | 2         |
| 2       | 2      | 3      | 0          | 1           | 0        | 1         |
| 3       | 3      | 4      | 0          | 1           | 0        | 1         |
| 4       | 4      | 5      | 0          | 1           | 0        | 1         |
| 5       | 5      | 6      | 0          | 1           | 0        | 1         |
| 6       | 2      | 7      | 1          | 2           | 1        | 2         |
| 7       | 7      | 8      | 1          | 2           | 1        | 2         |

| Surcharge | Node 1 | P1  | Node 2 | P2  | Angle |
|-----------|--------|-----|--------|-----|-------|
| 1         | 3      | 500 | 4      | 500 | 270   |

| Nail | Xs | Ys   | Length | Dip | Tendon Str. | Head Str. | Fixed? | Spacing | Tieback? |
|------|----|------|--------|-----|-------------|-----------|--------|---------|----------|
| 1    | 20 | 32   | 12     | 15  | 59250       | 40000     | 1      | 6       | 0        |
| 2    | 20 | 28   | 12     | 15  | 59250       | 40000     | 1      | 6       | 0        |
| 3    | 0  | 19.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 4    | 0  | 14.5 | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 5    | 0  | 9    | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |
| 6    | 0  | 3.5  | 1      | 15  | 10000       | 10000     | 0      | 6       | 0        |

| Face Press | Node 1 | P1  | Node 2 | P2 | Angle |
|------------|--------|-----|--------|----|-------|
| 1          | 1      | 0.6 | 9      | 1  | 0     |
| 2          | 9      | 1   | 3      | 1  | 0     |
| 3          | 4      | 1   | 5      | 1  | 0     |

Analysis Type: Soil Nail

Analysis Mode: Design

Nail Head Strength Factor (Multiplier): 2.01

| Nail | Length | Capacity | Slip Surf. |
|------|--------|----------|------------|
| 1    | 12.0   | 39056    | 30         |
| 2    | 12.0   | 39140    | 54         |
| 3    | 19.6   | 42393    | 18         |
| 4    | 19.6   | 42393    | 18         |
| 5    | 14.2   | 40031    | 92         |
| 6    | 5.2    | 28640    | 92         |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 1       | -30.07   | 74.08    | 10.08         | 60.26     | 10.64    |
| 2       | -35.10   | 85.99    | 10.78         | 60.26     | 11.15    |
| 3       | -41.78   | 101.79   | 11.47         | 60.26     | 11.59    |
| 4       | -17.83   | 54.84    | 10.10         | 56.32     | 11.59    |
| 5       | -19.65   | 60.15    | 10.74         | 56.32     | 11.59    |
| 6       | -22.17   | 67.46    | 11.49         | 56.32     | 11.86    |
| 7       | -25.55   | 77.29    | 12.31         | 56.32     | 12.38    |
| 8       | -30.48   | 91.62    | 13.11         | 56.32     | 12.82    |
| 9       | -37.41   | 111.77   | 14.05         | 56.32     | 13.39    |
| 10      | -11.23   | 44.83    | 10.12         | 52.37     | 13.39    |
| 11      | -12.14   | 48.22    | 10.79         | 52.37     | 13.39    |
| 12      | -13.25   | 52.33    | 11.42         | 52.37     | 13.39    |
| 13      | -14.69   | 57.69    | 12.23         | 52.37     | 13.39    |
| 14      | -16.59   | 64.77    | 13.13         | 52.37     | 13.39    |
| 15      | -19.10   | 74.13    | 14.12         | 52.37     | 13.52    |
| 16      | -22.85   | 88.08    | 15.29         | 52.37     | 14.36    |
| 17      | -28.41   | 108.78   | 16.42         | 52.37     | 15.24    |
| 18      | -42.24   | 160.31   | 18.38         | 52.37     | 16.45    |
| 19      | -7.00    | 38.71    | 10.13         | 48.42     | 16.45    |
| 20      | -7.44    | 41.00    | 10.78         | 48.42     | 16.45    |
| 21      | -7.99    | 43.79    | 11.44         | 48.42     | 16.45    |
| 22      | -8.67    | 47.26    | 12.25         | 48.42     | 16.45    |
| 23      | -9.51    | 51.53    | 13.13         | 48.42     | 16.45    |
| 24      | -10.63   | 57.26    | 14.17         | 48.42     | 16.45    |
| 25      | -12.08   | 64.65    | 15.19         | 48.42     | 16.45    |
| 26      | -14.04   | 74.67    | 16.46         | 48.42     | 16.45    |
| 27      | -16.71   | 88.30    | 17.82         | 48.42     | 16.45    |



| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 28      | -20.98   | 110.09   | 19.31         | 48.42     | 16.93     |
| 29      | -19.62   | 103.15   | 18.91         | 48.42     | 16.93     |
| 30      | -25.85   | 134.96   | 22.99         | 48.42     | 16.93     |
| 31      | -4.17    | 36.30    | 10.72         | 44.47     | 16.93     |
| 32      | -4.42    | 38.33    | 11.44         | 44.47     | 16.93     |
| 33      | -4.73    | 40.76    | 12.24         | 44.47     | 16.93     |
| 34      | -5.11    | 43.83    | 13.16         | 44.47     | 16.93     |
| 35      | -5.58    | 47.61    | 14.09         | 44.47     | 16.93     |
| 36      | -6.19    | 52.41    | 15.22         | 44.47     | 16.93     |
| 37      | -6.95    | 58.49    | 16.48         | 44.47     | 16.93     |
| 38      | -7.95    | 66.52    | 17.77         | 44.47     | 16.93     |
| 39      | -9.32    | 77.40    | 19.34         | 44.47     | 16.93     |
| 40      | -9.29    | 77.21    | 19.24         | 44.47     | 16.93     |
| 41      | -11.27   | 92.97    | 23.06         | 44.47     | 16.93     |
| 42      | -14.16   | 116.07   | 25.03         | 44.47     | 16.93     |
| 43      | -18.95   | 154.38   | 27.38         | 44.47     | 16.93     |
| 44      | -1.86    | 36.42    | 12.26         | 40.53     | 16.93     |
| 45      | -1.99    | 38.68    | 13.09         | 40.53     | 16.93     |
| 46      | -2.14    | 41.43    | 14.10         | 40.53     | 16.93     |
| 47      | -2.33    | 44.81    | 15.23         | 40.53     | 16.93     |
| 48      | -2.56    | 49.03    | 16.39         | 40.53     | 16.93     |
| 49      | -2.86    | 54.34    | 17.79         | 40.53     | 16.93     |
| 50      | -3.24    | 61.17    | 19.36         | 40.53     | 16.93     |
| 51      | -3.35    | 63.09    | 19.71         | 40.53     | 16.93     |
| 52      | -3.87    | 72.53    | 22.95         | 40.53     | 16.93     |
| 53      | -4.58    | 85.21    | 25.06         | 40.53     | 16.93     |
| 54      | -5.61    | 103.66   | 27.42         | 40.53     | 16.93     |
| 55      | -7.19    | 132.08   | 30.03         | 40.53     | 16.93     |
| 56      | -9.87    | 180.15   | 32.93         | 40.53     | 16.93     |
| 57      | 0.45     | 37.14    | 14.11         | 36.58     | 16.93     |
| 58      | 0.49     | 39.70    | 15.23         | 36.58     | 16.93     |
| 59      | 0.53     | 42.83    | 16.40         | 36.58     | 16.93     |
| 60      | 0.58     | 46.68    | 17.80         | 36.58     | 16.93     |
| 61      | 0.64     | 51.47    | 19.26         | 36.58     | 16.93     |
| 62      | 0.68     | 54.10    | 20.00         | 36.58     | 16.93     |
| 63      | 0.76     | 60.46    | 22.96         | 36.58     | 16.93     |
| 64      | 0.87     | 68.70    | 25.08         | 36.58     | 16.93     |
| 65      | 1.02     | 80.02    | 27.48         | 36.58     | 16.93     |
| 66      | 1.22     | 95.43    | 30.07         | 36.58     | 16.93     |
| 67      | 1.52     | 118.07   | 32.99         | 36.58     | 16.93     |
| 68      | 1.99     | 153.21   | 36.23         | 36.58     | 16.93     |
| 69      | 2.78     | 212.97   | 39.82         | 36.58     | 17.07     |
| 70      | 2.92     | 38.46    | 16.41         | 32.63     | 17.07     |
| 71      | 3.16     | 41.37    | 17.78         | 32.63     | 17.07     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngth Fac |
|---------|----------|----------|---------------|-----------|-----------|
| 72      | 3.46     | 45.01    | 19.27         | 32.63     | 17.07     |
| 73      | 3.70     | 47.89    | 21.04         | 32.63     | 17.07     |
| 74      | 4.08     | 52.55    | 22.98         | 32.63     | 17.07     |
| 75      | 4.56     | 58.37    | 25.08         | 32.63     | 17.07     |
| 76      | 5.18     | 65.98    | 27.45         | 32.63     | 17.07     |
| 77      | 6.01     | 76.03    | 30.08         | 32.63     | 17.07     |
| 78      | 7.13     | 89.68    | 33.03         | 32.63     | 17.07     |
| 79      | 8.67     | 108.38   | 36.24         | 32.63     | 17.07     |
| 80      | 10.98    | 136.37   | 39.94         | 32.63     | 18.12     |
| 81      | 14.50    | 179.12   | 44.01         | 32.63     | 19.25     |
| 82      | 5.26     | 37.57    | 17.80         | 28.68     | 19.25     |
| 83      | 5.69     | 40.40    | 19.28         | 28.68     | 19.25     |
| 84      | 6.14     | 43.36    | 21.06         | 28.68     | 19.25     |
| 85      | 6.68     | 46.88    | 22.96         | 28.68     | 19.25     |
| 86      | 7.35     | 51.29    | 25.08         | 28.68     | 19.25     |
| 87      | 8.20     | 56.89    | 27.33         | 28.68     | 19.25     |
| 88      | 9.29     | 64.04    | 29.95         | 28.68     | 19.25     |
| 89      | 10.70    | 73.30    | 32.87         | 28.68     | 19.25     |
| 90      | 12.55    | 85.50    | 36.12         | 28.68     | 19.25     |
| 91      | 15.06    | 101.99   | 39.75         | 28.68     | 19.25     |
| 92      | 18.54    | 124.82   | 43.80         | 28.68     | 19.61     |
| 93      | 8.87     | 42.69    | 22.96         | 24.74     | 19.61     |
| 94      | 9.64     | 46.14    | 25.08         | 24.74     | 19.61     |
| 95      | 10.60    | 50.44    | 27.34         | 24.74     | 19.61     |
| 96      | 11.81    | 55.83    | 29.97         | 24.74     | 19.61     |
| 97      | 13.33    | 62.63    | 32.89         | 24.74     | 19.61     |
| 98      | 15.27    | 71.30    | 36.16         | 24.74     | 19.61     |
| 99      | 17.76    | 82.44    | 39.79         | 24.74     | 19.61     |
| 100     | 21.02    | 97.05    | 43.86         | 24.74     | 19.61     |
| 101     | 12.67    | 45.64    | 27.34         | 20.79     | 19.61     |
| 102     | 13.92    | 49.86    | 29.97         | 20.79     | 19.61     |
| 103     | 15.48    | 55.09    | 32.90         | 20.79     | 19.61     |
| 104     | 17.41    | 61.59    | 36.15         | 20.79     | 19.61     |
| 105     | 19.84    | 69.79    | 39.81         | 20.79     | 19.61     |
| 106     | 22.92    | 80.13    | 43.88         | 20.79     | 19.61     |
| 107     | 15.81    | 45.30    | 29.97         | 16.84     | 19.61     |
| 108     | 17.37    | 49.47    | 32.90         | 16.84     | 19.61     |
| 109     | 19.28    | 54.59    | 36.17         | 16.84     | 19.61     |
| 110     | 21.64    | 60.89    | 39.82         | 16.84     | 19.61     |
| 111     | 24.54    | 68.66    | 43.70         | 16.84     | 19.61     |
| 112     | 19.14    | 45.11    | 32.90         | 12.89     | 19.61     |
| 113     | 21.01    | 49.22    | 36.15         | 12.89     | 19.61     |
| 114     | 23.30    | 54.26    | 39.68         | 12.89     | 19.61     |
| 115     | 26.08    | 60.37    | 43.73         | 12.89     | 19.61     |

| Surface | X Center | Y Center | Surf. X Value | Toe Angle | Lngh Fac |
|---------|----------|----------|---------------|-----------|----------|
| 116     | 22.70    | 45.01    | 36.16         | 8.95      | 19.61    |
| 117     | 24.91    | 49.09    | 39.69         | 8.95      | 19.61    |
| 118     | 27.58    | 54.03    | 43.73         | 8.95      | 19.61    |
| 119     | 29.13    | 49.02    | 43.73         | 5.00      | 19.61    |

APPENDIX B  
WALL FACING DESIGN CALCULATIONS

| Geometry & Miscellaneous Input Data  |             |
|--|-------------|
| Vertical Nail Spacing, $S_V$ (ft)  | 6.00        |
| Horizontal Nail Spacing, $S_H$ (ft)  | 6.00        |
| Facing Thickness, $t_F$ (in)   | 4.00        |
| Facing Usage (Temporary, Permanent)  | Temporary   |
| Nail Pattern (Rectangular, Staggered)  | Rectangular |
| Resistance Factor for Facing Flexure, $\phi_F$                               | 1.00        |
| Vertical Bearing Bar Continuity Factor (0 = Cutoff, 1 = Continuous)          | 0.00        |
| Continuity Factor For All Positive Moment Steel (0 = Cutoff, 1 = Continuous) | 1.00        |

| Reinforcement Details   |       |
|---|-------|
| Steel Depth, $d$ (in)   | 2.00  |
| Area of a Main Vertical Bar/Wire, $A_{MVI}$ (in <sup>2</sup> )          | 0.029 |
| Main Vertical Bar/Wire Spacing, $s_{MV}$ (in)                           | 6.0   |
| Area of Vertical Bearing Bar Reinforcement, $A_{VB}$ (in <sup>2</sup> ) | 0.40  |
| Area of a Main Horizontal Bar/Wire, $A_{MHI}$ (in <sup>2</sup> )        | 0.029 |
| Main Horizontal Bar/Wire Spacing, $s_{MH}$ (in)                         | 6.0   |
| Area of Waler Bar Reinforcement, $A_{WB}$ (in <sup>2</sup> )            | 0.40  |

| Material Properties  |      |
|--|------|
| Concrete Compressive Strength, $f_C$ (ksi)                         | 4.0  |
| Main Reinforcement Yield Stress, $F_Y$ (ksi)                       | 60.0 |
| Waler/Vertical Bearing Bar Reinforcement Yield Stress, $F_Y$ (ksi) | 60.0 |

| Facing Flexure Nailhead Capacity Calculations                                 |       |
|---|-------|
| Facing Flexure Factor, $C_F$  | 3.00  |
| Gross Reinforcement Ratio, Negative Moment, Vertical Direction, $\rho_{NV}$   | 0.26% |
| Gross Reinforcement Ratio, Positive Moment, Vertical Direction, $\rho_{PV}$   | 0.12% |
| Gross Reinforcement Ratio, Negative Moment, Horizontal Direction, $\rho_{NH}$ | 0.26% |
| Gross Reinforcement Ratio, Positive Moment, Horizontal Direction, $\rho_{PH}$ | 0.26% |
| Negative Unit Moment Capacity in Vertical Direction, $m^-_V$ (k-ft/ft)        | 1.190 |
| Positive Unit Moment Capacity in Vertical Direction, $m^+_V$ (k-ft/ft)        | 0.568 |
| Negative Unit Moment Capacity in Horizontal Direction, $m^-_H$ (k-ft/ft)      | 1.190 |
| Positive Unit Moment Capacity in Horizontal Direction, $m^+_H$ (k-ft/ft)      | 1.190 |
| Nominal Nail Head Strength in Vertical Direction, $T_{FN,V}$ (k)              | 42.2  |
| Nominal Nail Head Strength in Horizontal Direction, $T_{FN,H}$ (k)            | 57.1  |
| Design Nail Head Strength, $\phi T_{FN}$ (k)                                  | 42.2  |

**FIGURE B-1**  
Shotcrete Facing Strength - Flexure  
F40 - 4" Temporary Facing

|   |                  |
|---|------------------|
| Soil Nail Wall Facing Analysis & Design | Revised 06/26/06 |
|---|------------------|

| Geometric and Material Parameters                     |           |
|---|-----------|
| Vertical Nail Spacing, $S_V$ (ft)                     | 6.00      |
| Horizontal Nail Spacing, $S_H$ (ft)                   | 6.00      |
| Facing Thickness, $t_F$ (in)                          | 4.00      |
| Connection Type (Bearing, Headed Stud)                | Bearing   |
| Facing Usage (Temporary, Permanent)                   | Temporary |
| Resistance Factor for Facing Punching Shear, $\phi_S$ | 1.00      |
| Plate Width, $b_{PL}$ (in)                            | 8.00      |
| Plate Thickness, $t_{PL}$ (in)                        | 0.50      |
| Permanent Cover to Plate on Soil Side, $C_{PL}$ (in)  | 0.00      |
| Headed Stud Embedment Length, $L_{HS}$ (in)           | 0.00      |
| Headed Stud Spacing, $S_{HS}$ (in)                    | 0.00      |
| Grout Column Diameter, $D_{GC}$ (in)                  | 6.00      |
| Concrete Compressive Strength, $f'_C$ (ksi)           | 4.0       |

| Calculations   |       |
|--|-------|
| Nail Head Pressure Increase Factor for Punching Shear, $C_S$ | 3.00  |
| Equivalent Cone Depth, $h_C$ (in)                            | 4.00  |
| Equivalent Top Cone Diameter, $D''_C$ (in)                   | 8.00  |
| Cone Bottom Diameter, $D_C$ (in)                             | 16.00 |
| Effective Cone Diameter, $D'_C$ (in)                         | 12.00 |
| Cone Bottom Area, $A_C$ (in <sup>2</sup> )                   | 201.1 |
| Grout Column Area, $A_{GC}$ (in <sup>2</sup> )               | 28.3  |
| Shear Stress Area, $A_V$ (in <sup>2</sup> )                  | 150.8 |
| Nominal Punching Shear Stress, $v_N$ (psi)                   | 253.0 |
| Nominal Punching Shear Strength of Facing, $V_N$ (k)         | 38.1  |
| Strength Ratio From Pressure Concentration, $T_{FN}/V_N$     | 1.11  |
| Design Nail Head Strength, $\phi_S T_{FN}$ (k)               | 42.4  |

**FIGURE B-2**  
Shotcrete Facing Strength - Punching Shear  
F40 - 4" Temporary Facing

| Geometry & Miscellaneous Input Data  |             |
|--|-------------|
| Vertical Nail Spacing, $S_V$ (ft)  | 6.00        |
| Horizontal Nail Spacing, $S_H$ (ft)  | 6.00        |
| Facing Thickness, $t_F$ (in)   | 7.00        |
| Facing Usage (Temporary, Permanent)  | Permanent   |
| Nail Pattern (Rectangular, Staggered)  | Rectangular |
| Resistance Factor for Facing Flexure, $\phi_F$                               | 1.00        |
| Vertical Bearing Bar Continuity Factor (0 = Cutoff, 1 = Continuous)          | 0.00        |
| Continuity Factor For All Positive Moment Steel (0 = Cutoff, 1 = Continuous) | 1.00        |

| Reinforcement Details   |       |
|---|-------|
| Steel Depth, $d$ (in)   | 3.50  |
| Area of a Main Vertical Bar/Wire, $A_{MVI}$ (in <sup>2</sup> )          | 0.040 |
| Main Vertical Bar/Wire Spacing, $s_{MV}$ (in)                           | 4.0   |
| Area of Vertical Bearing Bar Reinforcement, $A_{VB}$ (in <sup>2</sup> ) | 0.40  |
| Area of a Main Horizontal Bar/Wire, $A_{MHI}$ (in <sup>2</sup> )        | 0.040 |
| Main Horizontal Bar/Wire Spacing, $s_{MH}$ (in)                         | 4.0   |
| Area of Waler Bar Reinforcement, $A_{WB}$ (in <sup>2</sup> )            | 0.40  |

| Material Properties  |      |
|--|------|
| Concrete Compressive Strength, $f_C$ (ksi)                         | 4.0  |
| Main Reinforcement Yield Stress, $F_Y$ (ksi)                       | 60.0 |
| Waler/Vertical Bearing Bar Reinforcement Yield Stress, $F_Y$ (ksi) | 60.0 |

| Facing Flexure Nailhead Capacity Calculations                                 |       |
|---|-------|
| Facing Flexure Factor, $C_F$  | 1.00  |
| Gross Reinforcement Ratio, Negative Moment, Vertical Direction, $\rho_{NV}$   | 0.22% |
| Gross Reinforcement Ratio, Positive Moment, Vertical Direction, $\rho_{PV}$   | 0.14% |
| Gross Reinforcement Ratio, Negative Moment, Horizontal Direction, $\rho_{NH}$ | 0.22% |
| Gross Reinforcement Ratio, Positive Moment, Horizontal Direction, $\rho_{PH}$ | 0.22% |
| Negative Unit Moment Capacity in Vertical Direction, $m^-_V$ (k-ft/ft)        | 3.139 |
| Positive Unit Moment Capacity in Vertical Direction, $m^+_V$ (k-ft/ft)        | 2.047 |
| Negative Unit Moment Capacity in Horizontal Direction, $m^-_H$ (k-ft/ft)      | 3.139 |
| Positive Unit Moment Capacity in Horizontal Direction, $m^+_H$ (k-ft/ft)      | 3.139 |
| Nominal Nail Head Strength in Vertical Direction, $T_{FN,V}$ (k)              | 41.5  |
| Nominal Nail Head Strength in Horizontal Direction, $T_{FN,H}$ (k)            | 50.2  |
| Design Nail Head Strength, $\phi T_{FN}$ (k)                                  | 41.5  |

**FIGURE B-3**  
Shotcrete Facing Strength - Flexure  
F40 - 7" Permanent Facing

|   |                  |
|---|------------------|
| Soil Nail Wall Facing Analysis & Design | Revised 06/26/06 |
|---|------------------|

| Geometric and Material Parameters                     |             |
|---|-------------|
| Vertical Nail Spacing, $S_V$ (ft)                     | 6.00        |
| Horizontal Nail Spacing, $S_H$ (ft)                   | 6.00        |
| Facing Thickness, $t_F$ (in)                          | 7.00        |
| Connection Type (Bearing, Headed Stud)                | Headed Stud |
| Facing Usage (Temporary, Permanent)                   | Permanent   |
| Resistance Factor for Facing Punching Shear, $\phi_S$ | 1.00        |
| Plate Width, $b_{PL}$ (in)                            | 9.00        |
| Plate Thickness, $t_{PL}$ (in)                        | 0.75        |
| Permanent Cover to Plate on Soil Side, $C_{PL}$ (in)  | 0.00        |
| Headed Stud Embedment Length, $L_{HS}$ (in)           | 4.00        |
| Headed Stud Spacing, $S_{HS}$ (in)                    | 6.00        |
| Grout Column Diameter, $D_{GC}$ (in)                  | 6.00        |
| Concrete Compressive Strength, $f'_C$ (ksi)           | 4.0         |

| Calculations   |       |
|--|-------|
| Nail Head Pressure Increase Factor for Punching Shear, $C_S$ | 1.00  |
| Equivalent Cone Depth, $h_C$ (in)                            | 4.75  |
| Equivalent Top Cone Diameter, $D''_C$ (in)                   | 6.00  |
| Cone Bottom Diameter, $D_C$ (in)                             | 15.50 |
| Effective Cone Diameter, $D'_C$ (in)                         | 10.75 |
| Cone Bottom Area, $A_C$ (in <sup>2</sup> )                   | 188.7 |
| Grout Column Area, $A_{GC}$ (in <sup>2</sup> )               | 28.3  |
| Shear Stress Area, $A_V$ (in <sup>2</sup> )                  | 160.4 |
| Nominal Punching Shear Stress, $v_N$ (psi)                   | 253.0 |
| Nominal Punching Shear Strength of Facing, $V_N$ (k)         | 40.6  |
| Strength Ratio From Pressure Concentration, $T_{FN}/V_N$     | 1.03  |
| Design Nail Head Strength, $\phi_S T_{FN}$ (k)               | 41.9  |

**FIGURE B-4**  
Shotcrete Facing Strength - Punching Shear  
F40 - 7" Permanent Facing



|   |                  |
|---|------------------|
| Soil Nail Wall Facing Analysis & Design | Revised 06/26/06 |
|---|------------------|

|  |       |
|--|-------|
| Geometric and Material Parameters                      |       |
| Headed Stud Diameter, $D_{HS}$ (in)                    | 0.500 |
| Headed Stud Head Diameter, $D_H$ (in)                  | 1.000 |
| Headed Stud Head Thickness, $t_H$ (in)                 | 0.500 |
| Resistance Factor for Headed Stud Tension, $\phi_{HS}$ | 1.00  |
| Headed Stud Ultimate Stress, $F_U$ (ksi)               | 60.0  |

|   |       |
|---|-------|
| Calculations  |       |
| Total Headed Stud Tension Area, $A_{HS}$ (in <sup>2</sup> ) | 0.785 |
| Design Headed Stud Strength, $\phi_{HS}T_{FN}$ (k)          | 47.1  |

**FIGURE B-5**  
Shotcrete Facing Strength - Headed Stud Tension  
F40 - 7" Permanent Facing