AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE	OF PAGES
N/A	1	74

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. *(If applicable)*
0009	12 MAR 2004	N/A	

6. ISSUED BY CODE

USACE SACRAMENTO DISTRICT
ATTN: CONTRACTING DIVISION
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

7. ADMINISTERED BY *(If other than Item 6)* CODE

SEE ITEM 6

8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)*

CODE FACILITY CODE

(√) 9A. AMENDMENT OF SOLICITATION NO.

X W91238-04-B-0009

9B. DATED *(SEE ITEM 11)*
6 FEB 2004

10A. MODIFICATION OF CONTRACTS/ORDER NO.
N/A

10B. DATED *(SEE ITEM 13)*
N/A

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

[X] The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers [ ] is extended, [X] is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(√) A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation date, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER *(Specify type of modification and authority)*

E. IMPORTANT: Contractor [ ] is not, [ ] is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

SAN LORENZO RIVER CONTRACT 3
SANTA CRUZ, CALIFORNIA

2 ENCLS

1) REVISED PAGES: ADD ENCLOSED APPENDIX F, TO THE END OF SECTION 02491.
2) REVISED DRAWING SHEETS C-2, C-3, AND C-4.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER *(Type or print)*		16A. NAME AND TITLE OF CONTRACTING OFFICER *(Type or print)*	
15B. CONTRACTOR/OFFEROR *(Signature of person authorized to sign)*	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY *(Signature of Contracting Officer)*	16C. DATE SIGNED

URS

Date: November 14, 2002

To: Tom MacDonald

From: Jennifer Benton & Chris Mueller

Subject: ***Design Analyses for Permanent Soil Nail Wall***
San Lorenzo River, Bank Stabilization
Santa Cruz, CA

This memorandum summarizes and documents design analyses for the permanent soil nail wall along the San Lorenzo River in Santa Cruz, Ca. A brief description of the project is provided to establish our understanding of proposed construction. Subsurface conditions are discussed based on review of available data; soil and rock parameters assumed in design are summarized. A description of the analytical approach to design of the wall system is presented, with the corresponding design calculations attached to this technical memorandum.

Project Description

The San Lorenzo River Contract 3 Project includes two primary components of work: bank stabilization and environmental restoration. Significant bank erosion along the project site occurred during a high flow, near-flood event in 1982. During this event part, of the Laurel Street Extension was undermined and collapsed into the river.

The bank stabilization component of the project will consist of construction of a permanent soil nail retaining wall. The soil nail wall limits extend along the right bank of the San Lorenzo River from the downstream end of the Reach 3 levee downstream of Laurel Street to the Riverside Boulevard Bridge, a distance of approximately 860 feet. The soil nail wall will consists of a 860 foot long lower wall and a 170 foot long upper wall. Soil nailing is a method of earth retention in which reinforcing elements (nails) are used to stabilize the soil mass and a reinforced shotcrete facing applied for local stability. The shotcrete can be textured or colored to enhance appearance or alternatively, an architectural finish applied. On this project it is anticipated that an architectural finish will be applied to match the native Purisima Sandstone.

Soil nail walls are constructed using an excavation and bench sequence. Excavation of the initial bench typically extends 5 to 6 feet below ground surface. At this level, holes are drilled for installation of steel threadbar and placement of nail grout. Steel reinforcement is then tied to the exposed soil slope and an initial 3 to 4 inch thick layer of shotcrete applied. Successive lifts of shotcrete and reinforcement are used to complete the facing. Once the final lift of shotcrete has reached initial set, the excavation is deepened and the process of nail installation and shotcrete placement continues until design grade is reached.

There are several aspects of site conditions that differ from more conventional soil nail installations. First, due to extensive bank erosion, it will be necessary to place controlled fills into the channel to allow for a suitable work platform and to establish finished wall line and grade. Second, since the San Lorenzo River will be subject to periodic flooding, the potential exists for development of significant hydrostatic pressures behind the wall during rapid drawdown.

Alternative bank stabilization and retaining wall systems were discussed in detail in the *Alternatives Analysis Report, San Lorenzo Contract 3* prepared by URS Corporation for the Army Corps of Engineers, June 28, 2002.

Subsurface Conditions

Subsurface conditions at the site consist of fills, alluvium, colluvium and sandstone bedrock. The alluvium varies in texture, consistency and density across the site. Generally, the alluvium becomes more coarse and clean with depth. For discussion purposes, therefore, the alluvium has been subdivided into alluvium, which includes clays, clayey sand and silty sand. (CL, SC, SM) and gravel alluvium, which includes poorly and well graded gravel and well graded sand with gravel (GP-GM, GW, SW).

The different units can be described in more detail as follows:

Existing Fill: Fill was observed at the site in the vicinity of boring B-8. The fill consists of a clayey sand with gravel overlying a poorly graded gravel with clay and sand. These fills are medium dense.

Colluvium: Colluvium was only observed in two borings (B-3 and B-4) in the vicinity of an old infilled channel. The colluvium consists of medium stiff, low plasticity clay to silt overlying loose moist silty clayey sand with a trace of gravel. The colluvium was 8-1/2 feet thick with blow counts that ranged from 5 to 18.

Alluvium: The alluvium was observed throughout most of the site and consisted of loose clayey sand to stiff sandy low plasticity clay overlying medium dense fine to medium grained silty sand ranged from approximately 10 to 20 feet thick. The clayey sand to lean clay exhibited blow counts in the range of 7 to 10, blow counts in the silty sand ranged from 13 to 23.

Gravel Alluvium: The gravel alluvium was observed as thin, laterally discontinuous layers typically 3 to 4-1/2 feet thick. It could be differentiated from the alluvium based on texture and density. It consisted of dense to very dense poorly graded gravel with silt and sand, well-graded gravel with sand, and well graded sand with gravel. The blow counts within the gravel ranged from 48 to more than 50 blows.

Weathered Purisima Sandstone: The weathered Purisima is described as light brown, highly weathered and extremely weak with reddish brown iron oxide mottling. The blowcounts ranged from 36 to more than 50, however the rock could still be drilled with an auger. The weathered zone of the Purisima was generally about 7 to 10 feet thick.

Unweathered Purisima Sandstone: The Unweathered Puisima Sandstone is described as dark olive grain, fine – grained, fresh very weak to weak, but becoming stronger with depth. The Unweathered Purisima fractured along horizontal bedding. The Unweathered Purisima Sandstone contained concretions that were extremely hard exhibiting in one case an unconfined compressive strength value of 14367psi.

Soil and rock properties for the project were developed using data from the Geotechnical Field Investigation Completed between June 10 and June 18, 2002 by URS Corporation and corresponding laboratory data. The field investigation consisted of 8 borings that are shown on sheets B3, B4 and B5. The following table lists the soil and rock properties used in this analysis.

Table 1. Soil Strength Parameters

	Friction Angle, ϕ'	Cohesion (psf) c'	Total Unit Weight (pcf)
Existing Fill	32	100	125
Colluvium	20	100	129
Alluvium	26	100	129
Gravel Alluvium	32	0	115
Weathered Purisima Sandstone	32	1000	115
Unweathered Purisima Sandstone	38	3000	115

Design Analyses

The soil nail wall was designed in general accordance with the requirements of FHWA's " Manual for Design & Construction Monitoring of Soil Nail Walls", FHWA-SA-96-069, November 1996. Nail dimensions and shotcrete thickness and reinforcement were calculated using Load and Resistance Factor Design (LRFD) as defined in AASHTO Bridge Design Specifications, 1st Edition, 1994. The LRFD approach considers the strength limit state by ensuring that design strengths of the nails exceed the applied load, multiplied by load factors that are appropriate to the uncertainty associated with the load. Design strengths are determined by applying variable resistance factors to account for the variability of the actual strengths.

Three load combinations were considered in the analyses. The first load case (typical) considered static earth pressures plus applicable dead load and live load surcharges. The second load case (extreme) considered the additional loading associated with the occurrence of a seismic event. For the seismic case, a peak ground acceleration (PGA) of 0.5g was used. This PGA corresponds to an event with a 10% probability of being exceeded in the next 50 years. A 10% probability in 50 years is the basis for most building codes and the wall is not considered an essential facility or high hazard structure. Load factors and strength reduction factors corresponding to these typical and extreme load cases are summarized in Tables 2 and 3. A third load case (design water level) considered unbalanced water pressures resulting from rapid drawdown following a flood. This case considered static earth pressures, applicable dead and live load charges as well as a water level behind the wall consistent with the Design Water Surface Elevation from the San Lorenzo Contract 1 Design Analysis 100% which was based on plans provided by the Corps for the FEMA 100-year (Corps 70-year) water surface profile. For all load cases the lower half of the wall nails were shortened for the analysis in accordance with the FHWA-SA-96-069 method for nail length distribution for design. (figure 4.11)

Table 2. Load Factors

Element	Resistance Factor Typical Case	Resistance Factor Design Water Level Case	Resistance Factor Seismic Case (Extreme Event 1)
Dead Load	1.5	1.5	1
Horizontal Earth Pressure Load	1.5	1.5	1
Live Load	1.75	1.75	0
Water Load	1	1	1
Earthquake	0	0	1

Table 3. Strength Reduction Factors

Element	Resistance Factor Typical Case	Resistance Factor Design Water Level Case	Resistance Factor Seismic Case (Extreme Event 1)
Nail Head Strength	0.9	0.9	1
Nail Tendon Tensile Strength	0.9	0.9	1
Ground-Grout Pullout Resistance	0.7	0.7	0.8
Soil Cohesion	0.9	0.9	1
Soil Friction	0.75	0.75	1

Failure modes analyzed for the soil nail wall included internal and external stability (Figures 1 and 2), as well as flexure and punching shear of the shotcrete. Internal stability considers failure of the wall system associated with pullout of the nails. Nail capacities are evaluated considering three limiting criteria: soil-grout bond stress, yield strength of the soil nail threadbar, and flexural and shear strengths of the shotcrete facing. External stability considers potential failure surfaces that pass behind the nails and includes consideration of bearing capacity, overturning, and sliding as for conventional cantilever or gravity retaining structures.

Typical sections A through E (Figures 3-7) were selected for analysis to bracket and bound the range of wall heights and ground and other loading conditions expected for construction. Typical sections showing existing and proposed grades, and soil conditions based on observations at the boring locations, are attached to this memorandum.

Internal stability calculations were made for static and earthquake loading using the computer program SNAILZ (Caltrans, 8-10-99 version). The SNAILZ program has the ability to search for the most critical failure surface, but is restricted to bi-linear failure surfaces for planes intercepting the toe of the wall and tri-linear failure surfaces for planes passing below the toe of the wall. Due to limitations in modeling anything other than nearly horizontal surfaces separating adjacent soil units, it was necessary to model two typical conditions for each wall section. Where significant fills were required to establish finish grades, the analyses were first conducted assuming a homogenous soil profile with properties representative of the fill that would be placed and compacted. Drained strength parameters for the fill corresponding to an angle of internal friction, $\phi' = 26$ degrees, and cohesion, $c' = 200$ psf were used. A second case was also modeled in which a layered profile corresponding to natural soil conditions was assumed for the analysis. The more critical condition was used to determine required nail lengths and capacities. Input and output files from the computer runs generated by SNAILZ are attached to this memorandum.

Hand calculations were performed using a Coulomb wedge analyses to provide a basis for comparison with the results obtained from SNAILZ. The SNAILZ output and hand calculations compared favorably. Hand calculations were also performed to evaluate external stability, including sliding, overturning, and bearing capacity. External stability was considered only at wall sections A and D. It was found that internal stability controls the design, so it was decided not to repeat the external stability calculations for other wall sections.

The FHWA "Manual for Design & Construction Monitoring of Soil Nail Walls" does not explicitly account for determination of thickness and reinforcement for the shotcrete facing. Instead, limits are placed on the available nail capacity based on consideration of punching shear and flexure. Tables are

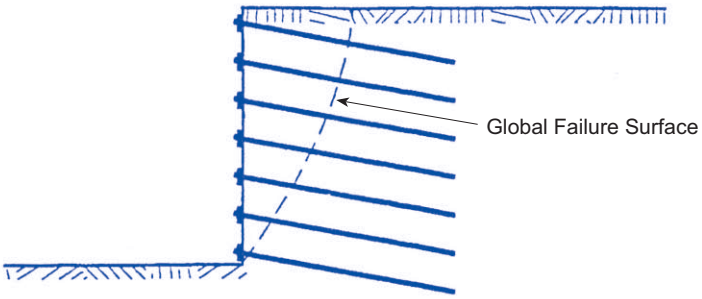
presented in the manual that summarizes required shotcrete strength, thickness, and reinforcement for a required nominal nail capacity. Preliminary indications are that the wall should consist of 10 to 12-inches of shotcrete (f′ = 4,000 psi) reinforced with # 4 bars at 12-inches each-way. Additional structural analyses will be performed as part of final design.

Summary of Results

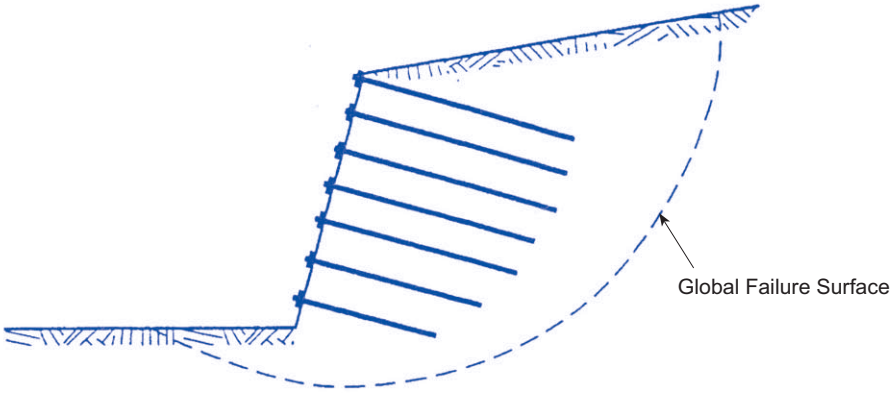
The following table summarizes the results of these internal design analyses and external stability checks. The nails analyzed were #8 Grade 60.

	Internal Stability				
Section	Size of Nail Hole (in.)	Nail Length Analyzed	Typical Case Factor of Safety	Extreme Seismic Case Factor of Safety	Design Water Level Case Factor of Safety
A H_{max}=17 feet	8	10	1.42	1.16	1.26
	6	10	1.38	1.14	1.23
B H_{max}=20.5 feet	8	25	1.16	1.13	1.11
	6	25	1.15	1.10	1.10
C H_{max}=26 feet	8	30	1.5	1.36	1.45
	6	30	1.37	1.26	1.29
D H_{max}=24.7 feet	8	30	1.39	1.12	1.33
	6	30	1.23	1.03	1.15
E Upper Wall H_{max}=7 feet	8	16	1.8	1.07	1.79
	6	16	1.63	1.04	1.62
E Lower Wall H_{max}=17 feet	8	27	1.42	1.22	1.32
	6	27	1.30	1.11	1.20

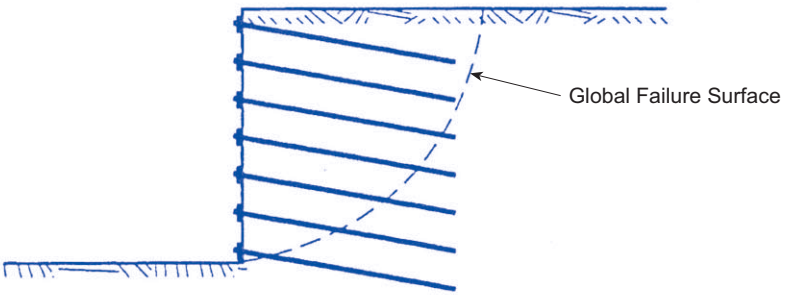
The FHWA Load and Resistance Factor Design (LRFD) design approach considers the strength limit state by ensuring that the design strengths of the nails and of the soil exceed the applied loads, multiplied by load factors that are appropriate to the level of uncertainty associated with the loads. Design strengths are determined by applying appropriate resistance factors to the strengths to account for the variability of the actual strengths. This method inherently accounts for the Factor of Safety internal to the calculation for each individual parameter. Therefore with this analysis an end resultant Factor of Safety greater than 1 is appropriate for design nail lengths. By this method the above factors of safety with the minimum 6 inch diameter drill hole indicates that these nail lengths are appropriate for the design.



INTERNAL FAILURE



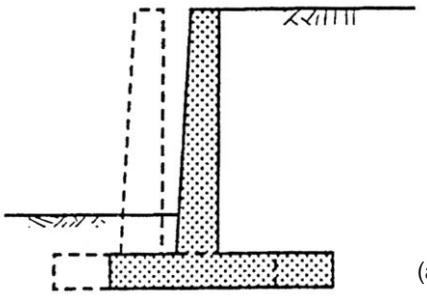
EXTERNAL OVERALL SLOPE FAILURE



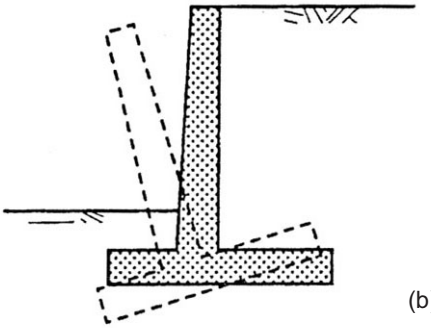
MIXED FAILURE

(Modified from FHWA-SA-96-069R Figure 4.1)

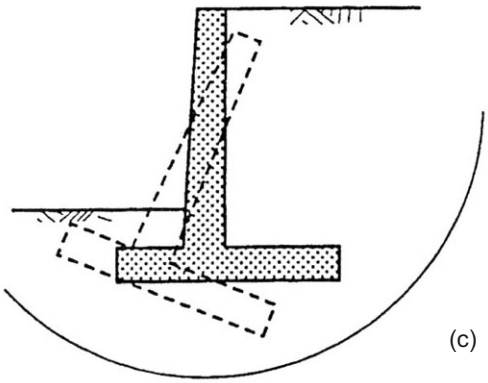
URS	Project No. 26813898 San Lorenzo River Contract 3	POTENTIAL FAILURE MODES TO BE ANALYZED FOR SOIL NAIL WALLS USING SNAILZ	Figure 1



(a) Sliding Failure along Base



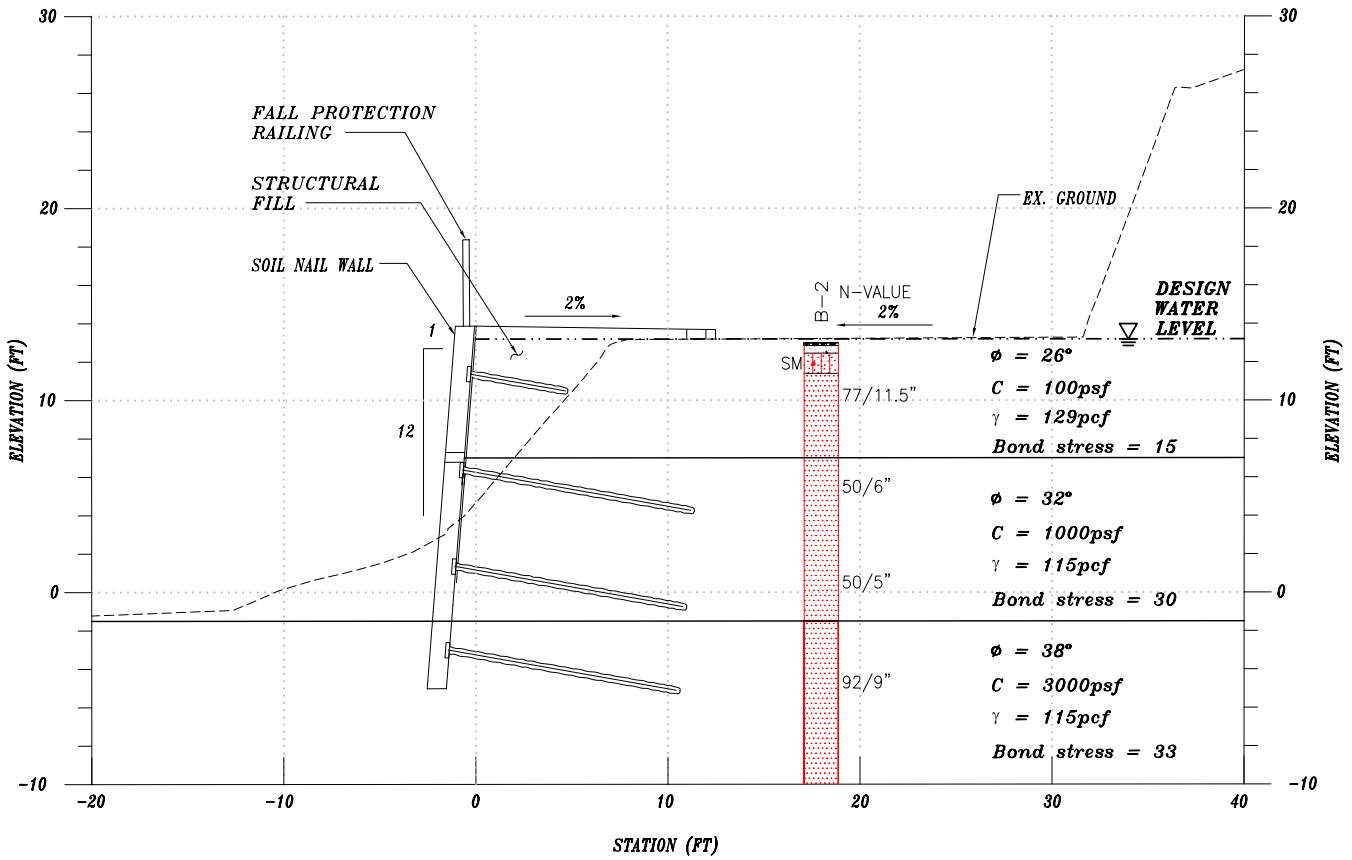
(b) Bearing Failure Associated with Overturning



(c) Deep-seated Overall Slope Sliding Failure (Bearing Capacity)

(Modified from FHWA-SA-96-069R Figure 4.4)

URS	Project No. 26813898 San Lorenzo River Contract 3	"EXTERNAL" FAILURE MODES FOR RETAINING WALLS	Figure 2



SECTION A

W-LINE STA 5+75

slr3aty6 = Typical Case
slr3ase6 = Seismic Case
slr3ah26 = Design Water Level Case

Purisima Formation (Sandstone)

10' 0 10' 20'

SCALE: 1"= 10'

Project No. 26813898	DEPARTMENT OF ARMY CORPS OF ENGINEERS	SECTION A FOR SNAILZ ANALYSIS	Figure 3
	URS Corporation		

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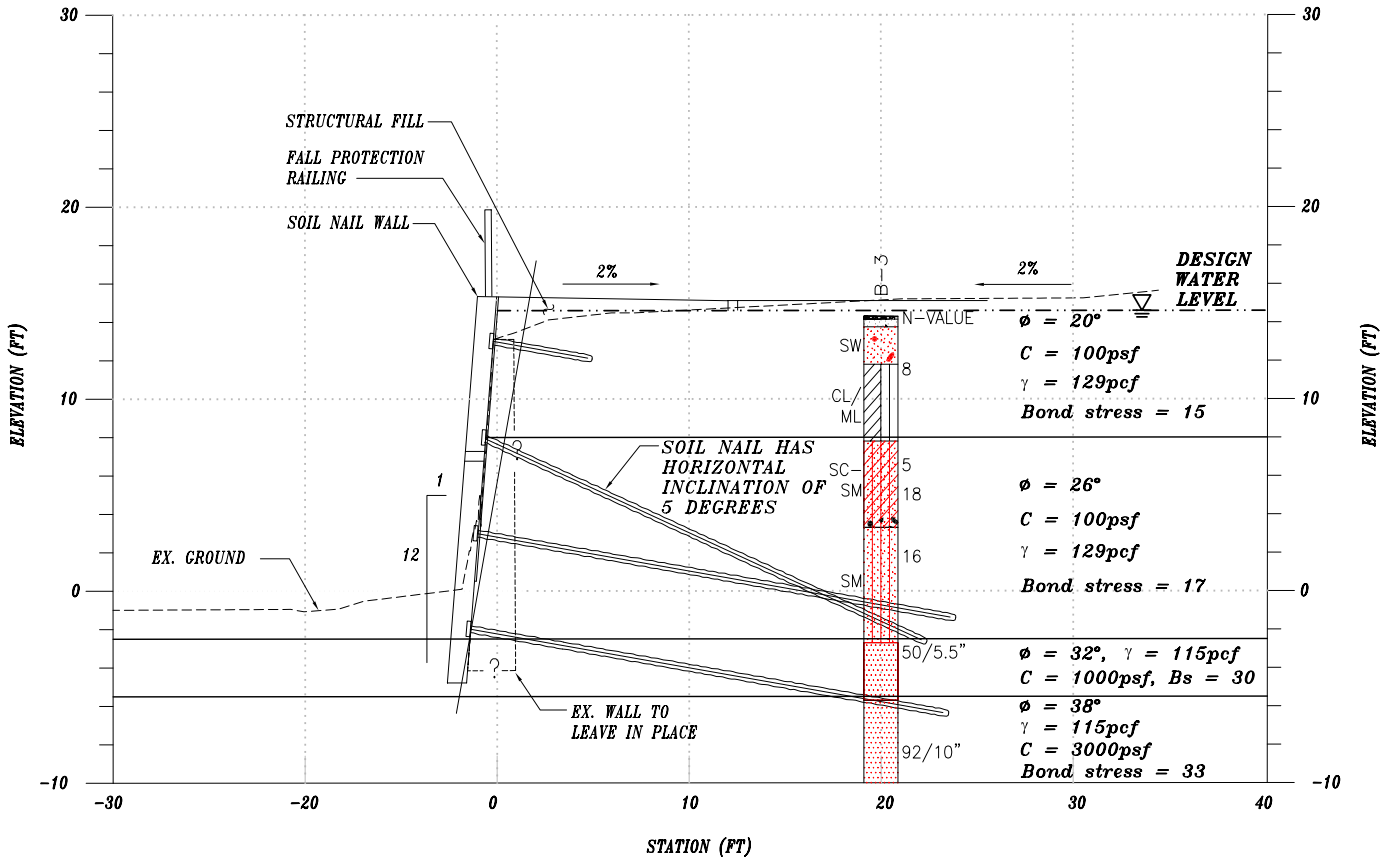

SECTION B

W-LINE STA 5+00

slr3bty6 = Typical Case
slr3bse6 = Seismic Case
slr3bh26 = Design Water Level Case

Purisima Formation (Sandstone)

10' 0 10' 20'

SCALE: 1"= 10'

Project No. 26813898	DEPARTMENT OF ARMY CORPS OF ENGINEERS	SECTION B FOR SNAILZ ANALYSIS	Figure 4
	URS Corporation		

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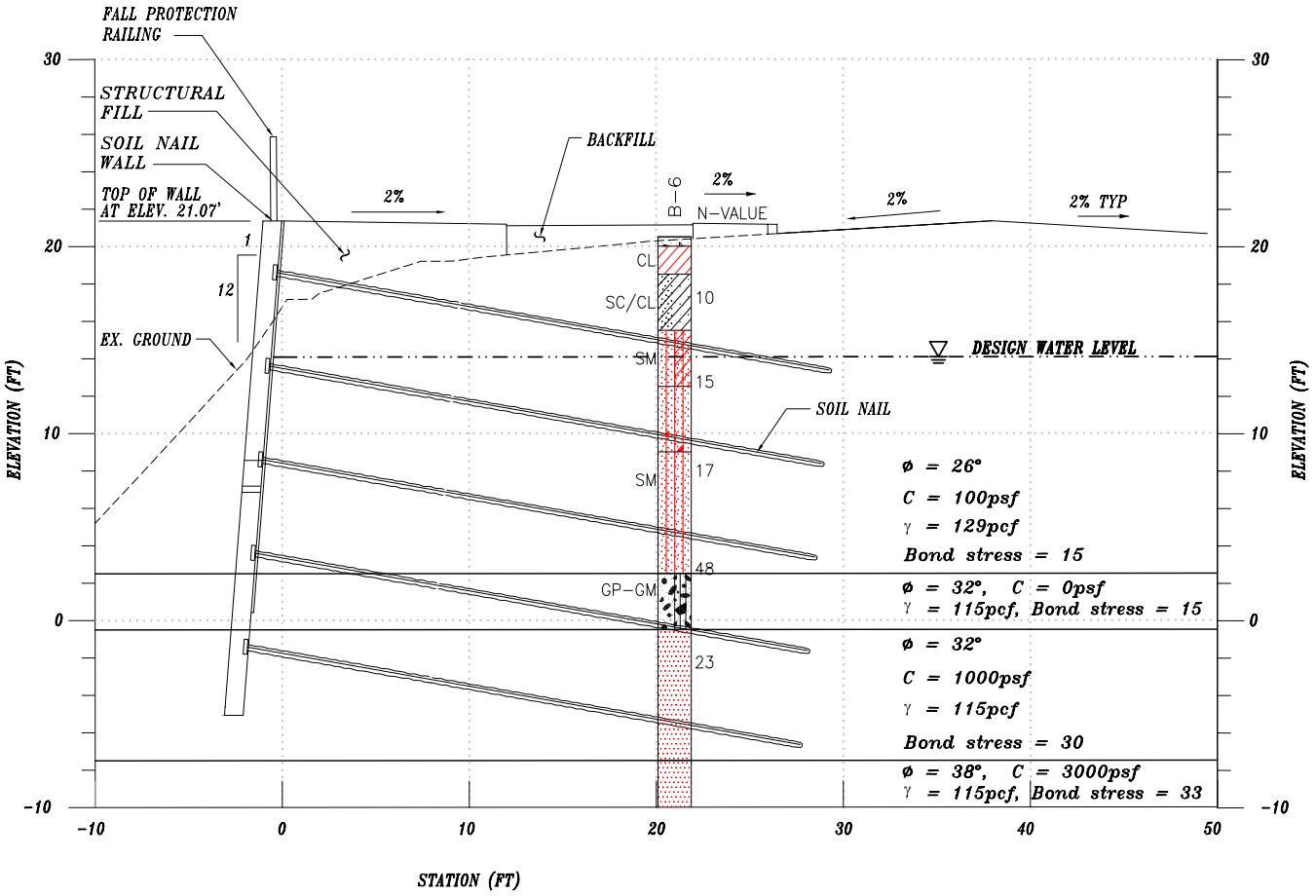

SECTION C

W-LINE STA 3+35

slr3cty6 = Typical Case
slr3cse6 = Seismic Case
slr3ch26 = Design Water Level Case

Purisima Formation (Sandstone)

10' 0 10' 20'

SCALE: 1"= 10'

Project No. 26813898	DEPARTMENT OF ARMY CORPS OF ENGINEERS	SECTION C FOR SNAILZ ANALYSIS	Figure 5
	URS Corporation		

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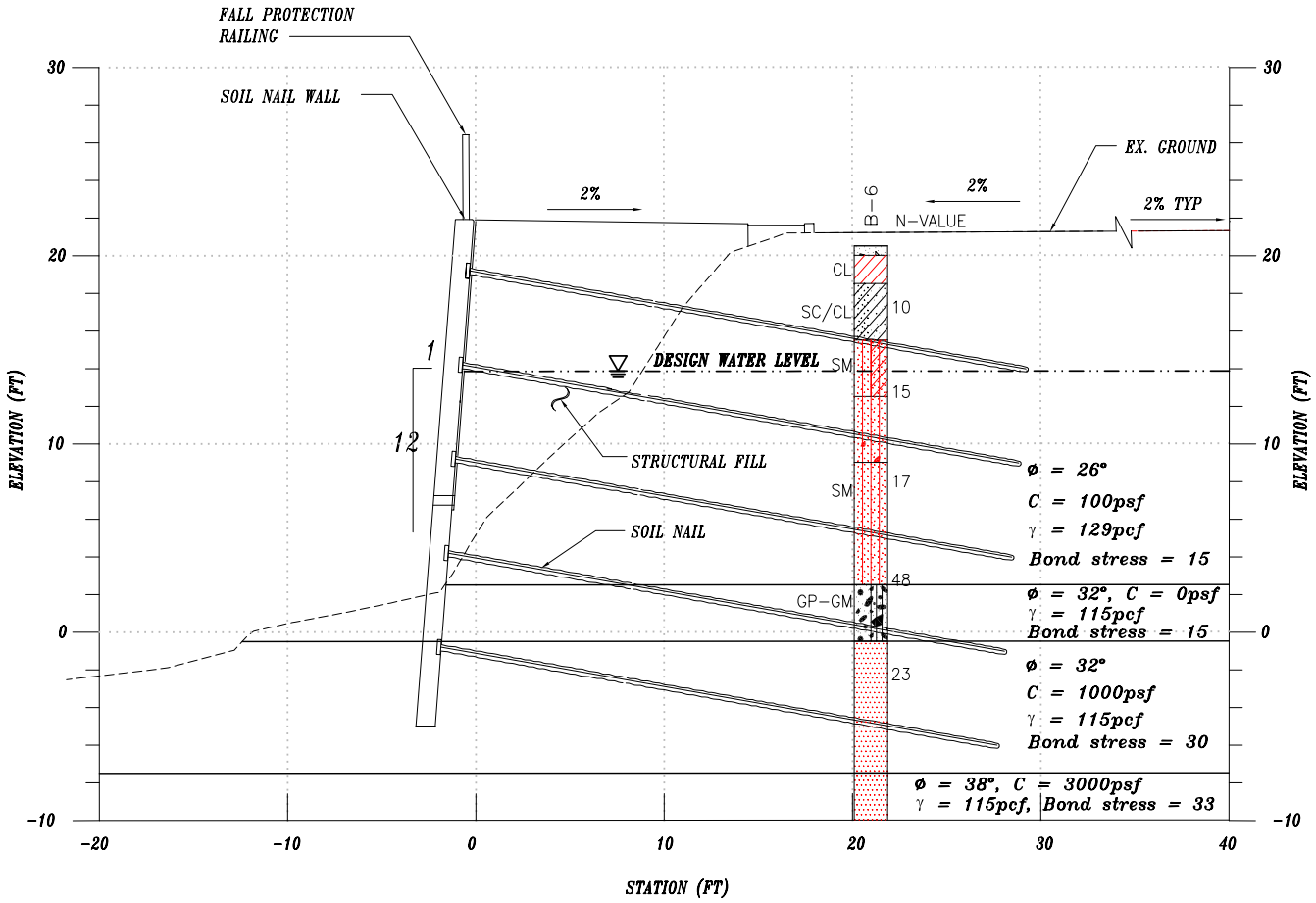

SECTION D

W-LINE STA 2+45

slr3dty6 = Typical Case
slr3dse6 = Seismic Case
slr3dh26 = Design Water Level Case

Purisima Formation (Sandstone)

10' 0 10' 20'

SCALE: 1"= 10'

Project No. 26813898	DEPARTMENT OF ARMY CORPS OF ENGINEERS	SECTION D FOR SNAILZ ANALYSIS	Figure 6
	URS Corporation		

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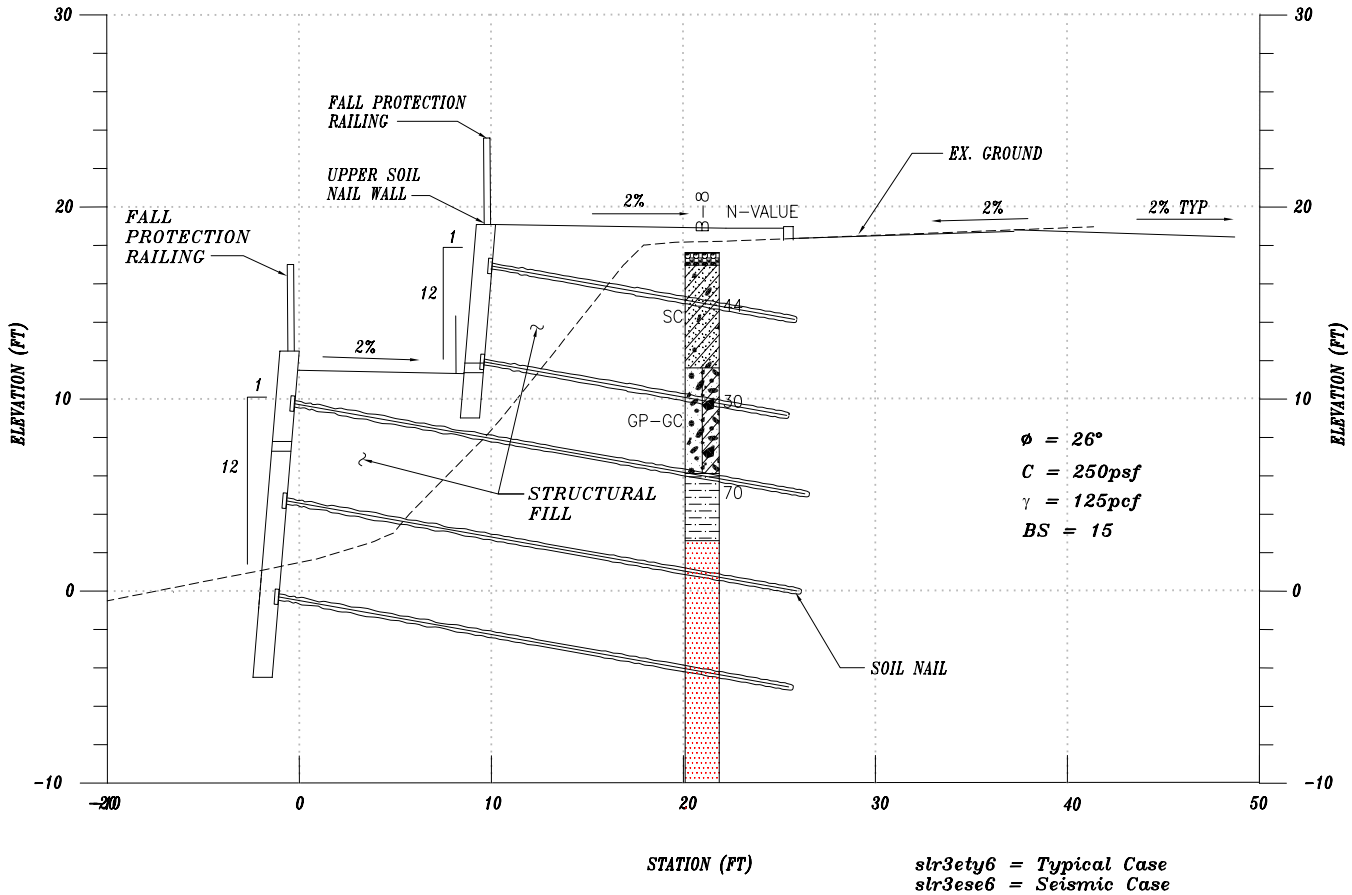

slr3ety6 = Typical Case
slr3ese6 = Seismic Case
slr3eh26 = Design Water Level Case

SECTION E
(LOWER WALL)
W-LINE STA 0+65

10' 0 10' 20'

SCALE: 1"= 10'

Project No. 26813898	DEPARTMENT OF ARMY CORPS OF ENGINEERS	SECTION E – LOWER WALL FOR SNAILZ ANALYSIS	Figure 7
	URS Corporation		

nahutto0 Feb 25, 2004 – 11:49am
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```
*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*      OFFICE OF MATERIALS AND FOUNDATIONS      *
*          Roadway Geotechnical Branch          *
*    Date: 11-17-2002          Time: 13:20:51   *
*************************************************
```

Project Identification - SLR Cont. 3 Section D Comparison to Hand Calc

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =  22.0 ft
Wall Batter                  =   0.0 degree
                               Angle   Length
                               (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0    120.0
Second Slope from 1st slope. =   0.0      0.0
Third Slope from 2nd slope.  =   0.0      0.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

There is NO SLOPE BELOW THE TOE of the wall

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      0.0 ft
End Surcharge - Distance from toe   =     10.4 ft
Loading Intensity - Begin           =    150.0 psf/ft
Loading Intensity - End             =    150.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	187.5	19.5	225.0	8.0	0.0	0.0	0.0	0.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 12.7 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	=	3
Horizontal Spacing	=	5.0 ft
Diameter of Reinforcement Element	=	1.000 in
Yield Stress of Reinforcement	=	60.0 ksi
Diameter of Grouted Hole	=	6.00 in
Punching Shear	=	80.0 kips

--------- (For ALL Levels) ---------

Reinforcement Lengths	=	30.0 ft
Reinforcement Inclination	=	10.0 degrees
Vertical Spacing to First Level	=	2.5 ft
Vertical Spacing to Remaining Levels	=	5.0 ft

```
          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

   Toe    1.262         2.4       74.5    9.1     89.9   13.2

  Reinf. Stress at Level  1 =  47.546 Ksi (Yield Stress controls.)
                          2 =  47.546 Ksi (Yield Stress controls.)
                          3 =  47.546 Ksi (Yield Stress controls.)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 2    1.184         3.6       67.9    9.5     89.9   13.2

  Reinf. Stress at Level  1 =  50.660 Ksi (Yield Stress controls.)
                          2 =  50.660 Ksi (Yield Stress controls.)
                          3 =  50.660 Ksi (Yield Stress controls.)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 3    1.143         4.7       70.3   14.0     89.9    8.8

  Reinf. Stress at Level  1 =  50.788 Ksi (Pullout controls...)
                          2 =  50.799 Ksi (Pullout controls...)
                          3 =  52.482 Ksi (Yield Stress controls.)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 4    1.102         5.9       66.1   14.4     89.9    8.8

  Reinf. Stress at Level  1 =  50.246 Ksi (Pullout controls...)
                          2 =  50.258 Ksi (Pullout controls...)
                          3 =  54.394 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 5    1.067         7.0       62.1   14.9     89.9    8.8

  Reinf. Stress at Level  1 =  49.436 Ksi (Pullout controls...)
                          2 =  49.448 Ksi (Pullout controls...)
                          3 =  54.697 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 6    1.099         8.1       65.2   19.4     89.9    4.4

  Reinf. Stress at Level  1 =  45.561 Ksi (Pullout controls...)
                          2 =  49.691 Ksi (Pullout controls...)
                          3 =  54.243 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
```

```
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE 7     1.060         9.3       62.2   19.9     89.9    4.4

  Reinf. Stress at Level  1 =  44.709 Ksi (Pullout controls...)
                          2 =  49.751 Ksi (Pullout controls...)
                          3 =  55.073 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE 8     1.039        10.4       59.4   20.5     89.9    4.4

  Reinf. Stress at Level  1 =  43.056 Ksi (Pullout controls...)
                          2 =  49.015 Ksi (Pullout controls...)
                          3 =  55.050 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE 9     1.053        11.6       53.1   19.3     89.9    6.6

  Reinf. Stress at Level  1 =  39.936 Ksi (Pullout controls...)
                          2 =  44.269 Ksi (Pullout controls...)
                          3 =  51.630 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE10     1.048        12.7       50.5   20.0     89.9    6.6

  Reinf. Stress at Level  1 =  37.604 Ksi (Pullout controls...)
                          2 =  42.657 Ksi (Pullout controls...)
                          3 =  50.695 Ksi (Pullout controls...)


      ******************************************************************
      *                 For Factor of Safety = 1.0                     *
      *         Maximum Average Reinforcement Working Force:           *
      *                   33.117 Kips/level                            *
      *****************************************************
```

```
**************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION     *
*          ENGINEERING SERVICE CENTER            *
*      OFFICE OF MATERIALS AND FOUNDATIONS       *
*          Roadway Geotechnical Branch           *
*    Date: 11-17-2002          Time: 14:19:13    *
**************************************************
```

Project Identification - SLR Contract 3 Sec. A STA 5+75 90% Submittal

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =  16.0 ft
Wall Batter                  =   4.8 degree
                              Angle   Length
                              (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0    120.0
Second Slope from 1st slope. =   0.0      0.0
Third Slope from 2nd slope.  =   0.0      0.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       = -14.0 degrees
First Slope Distance from Toe.     =  10.0 ft
Second Slope Angle.                =  10.0 degrees
Second Slope Distance from Toe.    =  20.0 ft
Vertical Depth of Search.          =   0.0 ft
Number of Searches below wall Toe. =   0
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      1.3 ft
End Surcharge - Distance from toe   =     13.3 ft
Loading Intensity - Begin           =    150.0 psf/ft
Loading Intensity - End             =    150.0 psf/ft

Begin Second Surcharge - Distance from toe =     13.8 ft
End Second Surcharge - Distance from toe   =     40.0 ft
Loading Intensity - Begin           =    650.0 psf/ft
Loading Intensity - End             =    650.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	193.5	19.5	90.0	10.5	0.0	0.0	0.0	0.0
2	172.5	24.0	900.0	21.0	0.0	9.5	40.0	9.5
3	172.5	28.5	%2700.0	23.1	-25.0	0.5	40.0	0.5

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	=	3
Horizontal Spacing	=	5.0 ft
Yield Stress of Reinforcement	=	60.0 ksi
Diameter of Grouted Hole	=	6.00 in
Punching Shear	=	80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	5.0	10.0	2.5	1.00	1.00
2	10.0	10.0	5.0	1.00	1.00
3	5.9	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.377	20.3	38.3	25.8	89.9	0.0

Reinf. Stress at Level 1 = 0.000 Ksi
2 = 7.271

```
*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*      OFFICE OF MATERIALS AND FOUNDATIONS      *
*          Roadway Geotechnical Branch          *
*    Date: 11-17-2002          Time: 14:26:42   *
*************************************************
```

Project Identification - SLR Contract 3 Sec. A STA 5+75 Seis. 90%

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =  16.0 ft
Wall Batter                  =   4.8 degree
                               Angle   Length
                               (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0    120.0
Second Slope from 1st slope. =   0.0      0.0
Third Slope from 2nd slope.  =   0.0      0.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       = -14.0 degrees
First Slope Distance from Toe.     =  10.0 ft
Second Slope Angle.                =  10.0 degrees
Second Slope Distance from Toe.    =  20.0 ft
Vertical Depth of Search.          =   0.0 ft
Number of Searches below wall Toe. =   0
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      1.3 ft
End Surcharge - Distance from toe   =     13.3 ft
Loading Intensity - Begin           =    100.0 psf/ft
Loading Intensity - End             =    100.0 psf/ft

Begin Second Surcharge - Distance from toe =     13.8 ft
End Second Surcharge - Distance from toe   =     40.0 ft
Loading Intensity - Begin           =    200.0 psf/ft
Loading Intensity - End             =    200.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	129.0	26.0	100.0	12.0	0.0	0.0	0.0	0.0
2	115.0	32.0	%1000.0	24.0	0.0	9.5	40.0	9.5
3	115.0	38.0	%3000.0	26.4	-25.0	0.5	40.0	0.5

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- EARTHQUAKE ACCELERATION ---------

Horizontal Earthquake Coefficient = 0.50 (a/g)
Vertical Earthquake Coefficient = 0.00

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels = 3
Horizontal Spacing = 5.0 ft
Yield Stress of Reinforcement = 60.0 ksi
Diameter of Grouted Hole = 6.00 in
Punching Shear = 80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	5.0	10.0	2.5	1.00	1.00
2	10.0	10.0	5.0	1.00	1.00
3	5.9	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.140	25.0	32.6	29.7	89.9	0.0

Reinf. Stress at Level 1 = 0.000 Ksi
2 = 0.000 Ksi
3 = 10.556 Ksi (Pullout controls...)

```
*******************************************************************
*                 For Factor of Safety = 1.0                      *
*         Maximum Average Reinforcement Working Force:            *
*
```

```
**************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION     *
*          ENGINEERING SERVICE CENTER            *
*      OFFICE OF MATERIALS AND FOUNDATIONS       *
*          Roadway Geotechnical Branch           *
*    Date: 11-17-2002          Time: 14:25:09    *
**************************************************
```

Project Identification - SLR Con. 3 Sec. A STA 5+75 h2o 6in

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =  16.0 ft
Wall Batter                  =   4.8 degree
                              Angle   Length
                              (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0    120.0
Second Slope from 1st slope. =   0.0      0.0
Third Slope from 2nd slope.  =   0.0      0.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       = -14.0 degrees
First Slope Distance from Toe.     =  10.0 ft
Second Slope Angle.                =  10.0 degrees
Second Slope Distance from Toe.    =  20.0 ft
Vertical Depth of Search.          =   0.0 ft
Number of Searches below wall Toe. =   0
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      1.3 ft
End Surcharge - Distance from toe   =     13.3 ft
Loading Intensity - Begin           =    150.0 psf/ft
Loading Intensity - End             =    150.0 psf/ft

Begin Second Surcharge - Distance from toe =     13.8 ft
End Second Surcharge - Distance from toe   =     40.0 ft
Loading Intensity - Begin           =    650.0 psf/ft
Loading Intensity - End             =    650.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	193.5	19.5	90.0	10.5	0.0	0.0	0.0	0.0
2	172.5	24.0	900.0	21.0	0.0	9.5	40.0	9.5
3	172.5	28.5	%2700.0	23.1	-25.0	0.5	40.0	0.5

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

The Water Table is defined by three coordinate points.

X(1)-Coordinate = 0.00 ft Y(1)-Coordinate = 15.98 ft
X(2)-Coordinate = 10.00 ft Y(2)-Coordinate = 15.99 ft
X(3)-Coordinate = 40.00 ft Y(3)-Coordinate = 16.00 ft

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels = 3
Horizontal Spacing = 5.0 ft
Yield Stress of Reinforcement = 60.0 ksi
Diameter of Grouted Hole = 6.00 in
Punching Shear = 80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	5.0	10.0	2.5	1.00	1.00
2	10.0	10.0	5.0	1.00	1.00
3	5.9	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.235	20.3	33.3	14.6	44.6	11.4

Reinf. Stress at Level 1 = 0.000 Ksi
2 = 1.101 Ksi (Pullout controls...)
3 = 8.987 Ksi (Pullout controls...)

```
*******************************************************************
*                 For Factor of Safety = 1.0                      *
*         Maximum Average Reinforcement Worki
```

```
*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*      OFFICE OF MATERIALS AND FOUNDATIONS      *
*          Roadway Geotechnical Branch          *
*    Date: 11-17-2002          Time: 14:31:04   *
*************************************************
```

Project Identification - SLR Contract 3 Sect. B STA 5+00 90% Sub.

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =  17.5 ft
Wall Batter                  =   4.8 degree
                              Angle   Length
                              (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0    120.0
Second Slope from 1st slope. =   0.0      0.0
Third Slope from 2nd slope.  =   0.0      0.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       = -14.0 degrees
First Slope Distance from Toe.     =  10.0 ft
Second Slope Angle.                =   0.0 degrees
Second Slope Distance from Toe.    =  20.0 ft
Vertical Depth of Search.          =   0.0 ft
Number of Searches below wall Toe. =   0
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      1.7 ft
End Surcharge - Distance from toe   =     13.7 ft
Loading Intensity - Begin           =    150.0 psf/ft
Loading Intensity - End             =    150.0 psf/ft

Begin Second Surcharge - Distance from toe =     14.2 ft
End Second Surcharge - Distance from toe   =     25.5 ft
Loading Intensity - Begin           =    650.0 psf/ft
Loading Intensity - End             =    650.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	193.5	15.0	90.0	10.5	0.0	0.0	0.0	0.0
2	193.5	19.5	90.0	11.9	0.0	13.0	25.5	13.0
3	172.5	24.0	900.0	21.0	-20.0	2.5	25.5	2.5
4	172.5	28.5	%2700.0	23.1	-20.0	-0.5	25.5	-0.5

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	=	4
Horizontal Spacing	=	5.0 ft
Yield Stress of Reinforcement	=	60.0 ksi
Diameter of Grouted Hole	=	6.00 in
Punching Shear	=	80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	5.0	10.0	2.5	1.00	1.00
2	25.0	25.0	5.0	1.00	1.00
3	17.5	10.0	5.0	1.00	1.00
4	7.5	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.149	8.5	39.4	5.5	73.1	14.6

Reinf. Stress at Level 1 = 0.000 Ksi
2 = 52.218 Ksi (Yield Stress controls.)
3 = 46.912 Ksi (Pullout controls...)
4 = 0.000 Ksi

```
*********************************************************************
*                 For Factor of Safety = 1.0                        *
*         Maximum Average Reinforcement Working Force:
```

```
**************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION     *
*          ENGINEERING SERVICE CENTER            *
*      OFFICE OF MATERIALS AND FOUNDATIONS       *
*          Roadway Geotechnical Branch           *
*    Date: 11-17-2002          Time: 14:32:48    *
**************************************************
```

Project Identification - SLR Contract 3 Sect. B STA 5+00 Seismic 90%

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =  17.5 ft
Wall Batter                  =   4.8 degree
                              Angle   Length
                              (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0    120.0
Second Slope from 1st slope. =   0.0      0.0
Third Slope from 2nd slope.  =   0.0      0.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       = -14.0 degrees
First Slope Distance from Toe.     =  10.0 ft
Second Slope Angle.                =   0.0 degrees
Second Slope Distance from Toe.    =  20.0 ft
Vertical Depth of Search.          =   0.0 ft
Number of Searches below wall Toe. =   0
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      1.7 ft
End Surcharge - Distance from toe   =     13.7 ft
Loading Intensity - Begin           =    100.0 psf/ft
Loading Intensity - End             =    100.0 psf/ft

Begin Second Surcharge - Distance from toe =     14.2 ft
End Second Surcharge - Distance from toe   =     25.5 ft
Loading Intensity - Begin           =    200.0 psf/ft
Loading Intensity - End             =    200.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	129.0	20.0	100.0	12.0	0.0	0.0	0.0	0.0
2	129.0	26.0	100.0	13.6	0.0	13.0	25.5	13.0
3	115.0	32.0	%1000.0	24.0	-20.0	2.5	25.5	2.5
4	115.0	38.0	%3000.0	26.4	-20.0	-0.5	25.5	-0.5

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- EARTHQUAKE ACCELERATION ---------

Horizontal Earthquake Coefficient = 0.50 (a/g)
Vertical Earthquake Coefficient = 0.00

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels = 4
Horizontal Spacing = 5.0 ft
Yield Stress of Reinforcement = 60.0 ksi
Diameter of Grouted Hole = 6.00 in
Punching Shear = 80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	5.0	10.0	2.5	1.00	1.00
2	25.0	25.0	5.0	1.00	1.00
3	17.5	10.0	5.0	1.00	1.00
4	7.5	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.104	25.0	27.7	11.3	39.2	19.4

Reinf. Stress at Level 1 = 0.000 Ksi
2 = 54.333 Ksi (Yield Stress controls.)
3 = 45.942 Ksi (Pullout controls...)
4 = 0.000 Ksi

****

```
*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*      OFFICE OF MATERIALS AND FOUNDATIONS      *
*          Roadway Geotechnical Branch          *
*    Date: 11-17-2002          Time: 14:40:59   *
*************************************************
```

Project Identification - SLR Con. 3 Sec. B STA 5+00 h2o 6in. 90%

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =  17.5 ft
Wall Batter                  =   4.8 degree
                              Angle   Length
                              (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0    120.0
Second Slope from 1st slope. =   0.0      0.0
Third Slope from 2nd slope.  =   0.0      0.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       = -14.0 degrees
First Slope Distance from Toe.     =  10.0 ft
Second Slope Angle.                =   0.0 degrees
Second Slope Distance from Toe.    =  20.0 ft
Vertical Depth of Search.          =   0.0 ft
Number of Searches below wall Toe. =   0
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      1.7 ft
End Surcharge - Distance from toe   =     13.7 ft
Loading Intensity - Begin           =    150.0 psf/ft
Loading Intensity - End             =    150.0 psf/ft

Begin Second Surcharge - Distance from toe =     14.2 ft
End Second Surcharge - Distance from toe   =     25.5 ft
Loading Intensity - Begin           =    650.0 psf/ft
Loading Intensity - End             =    650.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	193.5	15.0	90.0	10.5	0.0	0.0	0.0	0.0
2	193.5	19.5	90.0	11.9	0.0	13.0	25.5	13.0
3	172.5	24.0	900.0	21.0	-20.0	2.5	25.5	2.5
4	172.5	28.5	%2700.0	23.1	-20.0	-0.5	25.5	-0.5

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

The Water Table is defined by three coordinate points.

X(1)-Coordinate = 0.00 ft Y(1)-Coordinate = 16.61 ft
X(2)-Coordinate = 10.00 ft Y(2)-Coordinate = 16.62 ft
X(3)-Coordinate = 40.00 ft Y(3)-Coordinate = 16.63 ft

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels = 4
Horizontal Spacing = 5.0 ft
Yield Stress of Reinforcement = 60.0 ksi
Diameter of Grouted Hole = 6.00 in
Punching Shear = 80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	5.0	10.0	2.5	1.00	1.00
2	25.0	25.0	5.0	1.00	1.00
3	17.5	10.0	5.0	1.00	1.00
4	7.5	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.098	10.9	38.8	5.6	65.0	15.4

Reinf. Stress at Level 1 = 0.000 Ksi
2 = 54.641 Ksi (Yield Stress controls.)
3 = 48.460 Ksi (Pullout controls...)
4 = 0.000 Ksi

****

```
**************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION     *
*          ENGINEERING SERVICE CENTER            *
*      OFFICE OF MATERIALS AND FOUNDATIONS       *
*          Roadway Geotechnical Branch           *
*    Date: 11-17-2002          Time: 14:48:45    *
**************************************************
```

Project Identification - SLR Con. 3 Sec. C STA 3+35 90% 6in.

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =  23.1 ft
Wall Batter                  =   4.8 degree
                              Angle   Length
                              (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0    120.0
Second Slope from 1st slope. =   0.0      0.0
Third Slope from 2nd slope.  =   0.0      0.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       = -14.0 degrees
First Slope Distance from Toe.     =  10.0 ft
Second Slope Angle.                =   0.0 degrees
Second Slope Distance from Toe.    =  32.0 ft
Vertical Depth of Search.          =   0.0 ft
Number of Searches below wall Toe. =   0
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      1.9 ft
End Surcharge - Distance from toe   =     27.9 ft
Loading Intensity - Begin           =    150.0 psf/ft
Loading Intensity - End             =    150.0 psf/ft

Begin Second Surcharge - Distance from toe =     28.4 ft
End Second Surcharge - Distance from toe   =     40.0 ft
Loading Intensity - Begin           =    650.0 psf/ft
Loading Intensity - End             =    650.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	193.5	19.5	90.0	10.5	0.0	0.0	0.0	0.0
2	172.5	24.0	0.0	10.5	0.0	5.0	40.0	5.0
3	172.5	24.0	900.0	21.0	-32.0	2.0	40.0	2.0
4	172.5	28.5	%2700.0	23.0	-32.0	-5.0	40.0	-5.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	=	5
Horizontal Spacing	=	5.0 ft
Yield Stress of Reinforcement	=	60.0 ksi
Diameter of Grouted Hole	=	6.00 in
Punching Shear	=	80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	30.0	10.0	2.5	1.00	1.00
2	30.0	10.0	5.0	1.00	1.00
3	28.2	10.0	5.0	1.00	1.00
4	19.2	10.0	5.0	1.00	1.00
5	9.0	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.366	25.0	33.4	21.0	57.0	13.8

Reinf. Stress at Level 1 = 22.752 Ksi (Pullout controls...)
2 = 28.460 Ksi (Pullout controls...)
3 = 35.554 Ksi (Pullout controls...)
4 = 28.340 Ksi (Pullout controls...)
5 = 36.940 Ksi (Pullout controls...)

****

```
*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*      OFFICE OF MATERIALS AND FOUNDATIONS      *
*          Roadway Geotechnical Branch          *
*    Date: 11-17-2002          Time: 14:50:15   *
*************************************************
```

Project Identification - SLR Con. 3 Sec. C STA 3+35 Seis. 6in. 90%

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =  23.1 ft
Wall Batter                  =   4.8 degree
                              Angle   Length
                              (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0    120.0
Second Slope from 1st slope. =   0.0      0.0
Third Slope from 2nd slope.  =   0.0      0.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       = -14.0 degrees
First Slope Distance from Toe.     =  10.0 ft
Second Slope Angle.                =   0.0 degrees
Second Slope Distance from Toe.    =  32.0 ft
Vertical Depth of Search.          =   0.0 ft
Number of Searches below wall Toe. =   0
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      1.9 ft
End Surcharge - Distance from toe   =     27.9 ft
Loading Intensity - Begin           =    100.0 psf/ft
Loading Intensity - End             =    100.0 psf/ft

Begin Second Surcharge - Distance from toe =     28.5 ft
End Second Surcharge - Distance from toe   =     40.0 ft
Loading Intensity - Begin           =    200.0 psf/ft
Loading Intensity - End             =    200.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	129.0	26.0	100.0	12.0	0.0	0.0	0.0	0.0
2	115.0	32.0	0.0	12.0	0.0	5.0	40.0	5.0
3	115.0	32.0	%1000.0	24.0	-32.0	2.0	40.0	2.0
4	115.0	38.0	%3000.0	26.4	-32.0	-5.0	40.0	-5.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- EARTHQUAKE ACCELERATION ---------

Horizontal Earthquake Coefficient = 0.50 (a/g)
Vertical Earthquake Coefficient = 0.00

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels = 5
Horizontal Spacing = 5.0 ft
Yield Stress of Reinforcement = 60.0 ksi
Diameter of Grouted Hole = 6.00 in
Punching Shear = 80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	30.0	10.0	2.5	1.00	1.00
2	30.0	10.0	5.0	1.00	1.00
3	28.2	10.0	5.0	1.00	1.00
4	19.2	10.0	5.0	1.00	1.00
5	9.0	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.255	25.0	34.7	24.3	61.6	10.5

Reinf. Stress at Level 1 = 26.662 Ksi (Pullout controls...)
2 = 35.382 Ksi (Pullout controls...)
3 = 45.585 Ksi (Pullout controls...)
4 = 35.968 Ksi (Pullout controls...)
5 = 46.094 Ksi (Pullout controls...)

```
*******************************************************************
*                 For Factor of Safety = 1.0                      *
*         Maximum Average Reinforcement Working Force:            *
*                    24.485 Kips/level                            *
****************************************
```

```
*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*      OFFICE OF MATERIALS AND FOUNDATIONS      *
*          Roadway Geotechnical Branch          *
*    Date: 11-17-2002          Time: 14:46:03   *
*************************************************
```

Project Identification - SLR Con. 3 Sec. C STA 3+35 h2o 6 in 90%

--------- WALL GEOMETRY ---------

Vertical Wall Height = 23.1 ft
Wall Batter = 4.8 degree

	Angle (Deg)	Length (Feet)
First Slope from Wallcrest. =	0.0	120.0
Second Slope from 1st slope. =	0.0	0.0
Third Slope from 2nd slope. =	0.0	0.0
Fourth Slope from 3rd slope. =	0.0	0.0
Fifth Slope from 4th slope. =	0.0	0.0
Sixth Slope from 5th slope. =	0.0	0.0
Seventh Slope Angle. =	0.0	

--------- SLOPE BELOW THE WALL ---------

First Slope Angle below Toe. = -14.0 degrees
First Slope Distance from Toe. = 10.0 ft
Second Slope Angle. = 0.0 degrees
Second Slope Distance from Toe. = 32.0 ft
Vertical Depth of Search. = 0.0 ft
Number of Searches below wall Toe. = 0

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe = 1.9 ft
End Surcharge - Distance from toe = 27.9 ft
Loading Intensity - Begin = 150.0 psf/ft
Loading Intensity - End = 150.0 psf/ft

Begin Second Surcharge - Distance from toe = 28.4 ft
End Second Surcharge - Distance from toe = 40.0 ft
Loading Intensity - Begin = 650.0 psf/ft
Loading Intensity - End = 650.0 psf/ft

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	193.5	19.5	90.0	10.5	0.0	0.0	0.0	0.0
2	172.5	24.0	0.0	10.5	0.0	5.0	40.0	5.0
3	172.5	24.0	900.0	21.0	-32.0	2.0	40.0	2.0
4	172.5	28.5	%2700.0	23.0	-32.0	-5.0	40.0	-5.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

The Water Table is defined by three coordinate points.

X(1)-Coordinate = 0.00 ft Y(1)-Coordinate = 16.14 ft
X(2)-Coordinate = 10.00 ft Y(2)-Coordinate = 16.15 ft
X(3)-Coordinate = 40.00 ft Y(3)-Coordinate = 16.16 ft

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels = 5
Horizontal Spacing = 5.0 ft
Yield Stress of Reinforcement = 60.0 ksi
Diameter of Grouted Hole = 6.00 in
Punching Shear = 80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	30.0	10.0	2.5	1.00	1.00
2	30.0	10.0	5.0	1.00	1.00
3	28.2	10.0	5.0	1.00	1.00
4	19.2	10.0	5.0	1.00	1.00
5	9.0	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.287	25.0	33.4	21.0	57.0	13.8

Reinf. Stress at Level 1 = 24.146 Ksi (Pullout controls...)
2 = 30.204 Ksi (Pullout controls...)
3 = 37.733 Ksi (Pullout controls...)
4 = 30.077 Ksi (Pullout controls...)
5 = 39.204 Ksi (Pullout controls...)

```
*******************************************************************
*                 For Factor of Safety = 1.0                      *
*         Maximum Average Reinforcement Working Force:            *
*                    23.423 Kips/level                            *
**************************
```

```
**************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION     *
*          ENGINEERING SERVICE CENTER            *
*      OFFICE OF MATERIALS AND FOUNDATIONS       *
*          Roadway Geotechnical Branch           *
*    Date: 11-17-2002          Time: 14:55:20    *
**************************************************
```

Project Identification - SLR Con. 3 Sec. D STA 2+45 6 in 90%

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =  23.7 ft
Wall Batter                  =   4.8 degree
                              Angle   Length
                              (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0    120.0
Second Slope from 1st slope. =   0.0      0.0
Third Slope from 2nd slope.  =   0.0      0.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       = -11.0 degrees
First Slope Distance from Toe.     =  10.0 ft
Second Slope Angle.                =  14.0 degrees
Second Slope Distance from Toe.    =  10.5 ft
Vertical Depth of Search.          =   5.0 ft
Number of Searches below wall Toe. =   5
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      2.0 ft
End Surcharge - Distance from toe   =     16.0 ft
Loading Intensity - Begin           =    150.0 psf/ft
Loading Intensity - End             =    150.0 psf/ft

Begin Second Surcharge - Distance from toe =     20.5 ft
End Second Surcharge - Distance from toe   =     40.0 ft
Loading Intensity - Begin           =    650.0 psf/ft
Loading Intensity - End             =    650.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	193.5	19.5	90.0	10.5	0.0	0.0	0.0	0.0
2	172.5	24.0	0.0	10.5	-20.0	4.5	40.0	4.5
3	172.5	24.0	900.0	21.0	-20.0	1.5	40.0	1.5
4	172.5	28.5	%2700.0	23.1	-20.0	-5.5	40.0	-5.5

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 30.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	=	5
Horizontal Spacing	=	5.0 ft
Yield Stress of Reinforcement	=	60.0 ksi
Diameter of Grouted Hole	=	6.00 in
Punching Shear	=	80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	30.0	11.0	2.5	1.00	1.00
2	30.0	10.0	5.0	1.00	1.00
3	30.0	10.0	5.0	1.00	1.00
4	21.0	10.0	5.0	1.00	1.00
5	9.0	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.233	30.0	29.4	24.1	52.8	14.9

Reinf. Stress at Level 1 = 16.281 Ksi (Pullout controls...)
2 = 23.196 Ksi (Pullout controls...)
3 = 37.714 Ksi (Pullout controls...)
4 = 31.655 Ksi (Pullout controls...)
5 = 36.471 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.00	1.300	30.0	34.5	21.8	45.8	17.2

Reinf. Stress at Level 1 = 18.375 Ksi (Pullout controls...)
2 = 26.721 Ksi (Pullout controls...)
3 = 38.128 Ksi (Pullout controls...)
4 = 30.100 Ksi (Pullout controls...)
5 = 30.190 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
2.00	1.359	30.0	34.4	18.2	45.8	21.5

Reinf. Stress at Level 1 = 17.604 Ksi (Pullout controls...)
2 = 25.601 Ksi (Pullout controls...)
3 = 34.174 Ksi (Pullout controls...)
4 = 26.172 Ksi (Pullout controls...)
5 = 23.642 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
3.00	1.448	27.2	38.1	17.3	49.7	21.0

Reinf. Stress at Level 1 = 20.114 Ksi (Pullout controls...)
2 = 26.740 Ksi (Pullout controls...)
3 = 33.794 Ksi (Pullout controls...)
4 = 24.473 Ksi (Pullout controls...)
5 = 19.419 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
4.00	1.519	30.0	42.7	40.8	89.9	0.0

Reinf. Stress at Level 1 = 16.992 Ksi (Pullout controls...)
2 = 24.910 Ksi (Pullout controls...)
3 = 33.390 Ksi (Pullout controls...)
4 = 23.948 Ksi (Pullout controls...)
5 = 17.065 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)

```
5.00     1.502        30.0       43.7   41.5     89.9    0.0

Reinf. Stress at Level  1 =  16.752 Ksi (Pullout controls...)
                        2 =  24.494 Ksi (Pullout controls...)
                        3 =  32.788 Ksi (Pullout controls...)
                        4 =  22.966 Ksi (Pullout controls...)
                        5 =  14.213 Ksi (Pullout controls...)


    ******************************************************************
    *                 For Factor of Safety = 1.0                     *
    *         Maximum Average Reinforcement Working Force:
```

```
*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*      OFFICE OF MATERIALS AND FOUNDATIONS      *
*          Roadway Geotechnical Branch          *
*    Date: 11-17-2002          Time: 14:58:15   *
*************************************************
```

Project Identification - SLR Con. 3 Sec. D STA 2+45 6 in Seis 90%

--------- WALL GEOMETRY ---------

Vertical Wall Height = 23.7 ft
Wall Batter = 4.8 degree

	Angle (Deg)	Length (Feet)
First Slope from Wallcrest. =	0.0	120.0
Second Slope from 1st slope. =	0.0	0.0
Third Slope from 2nd slope. =	0.0	0.0
Fourth Slope from 3rd slope. =	0.0	0.0
Fifth Slope from 4th slope. =	0.0	0.0
Sixth Slope from 5th slope. =	0.0	0.0
Seventh Slope Angle. =	0.0	

--------- SLOPE BELOW THE WALL ---------

First Slope Angle below Toe. = -11.0 degrees
First Slope Distance from Toe. = 10.0 ft
Second Slope Angle. = 14.0 degrees
Second Slope Distance from Toe. = 10.5 ft
Vertical Depth of Search. = 5.0 ft
Number of Searches below wall Toe. = 5

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe = 2.0 ft
End Surcharge - Distance from toe = 16.0 ft
Loading Intensity - Begin = 100.0 psf/ft
Loading Intensity - End = 100.0 psf/ft

Begin Second Surcharge - Distance from toe = 20.5 ft
End Second Surcharge - Distance from toe = 40.0 ft
Loading Intensity - Begin = 200.0 psf/ft
Loading Intensity - End = 200.0 psf/ft

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	129.0	26.0	100.0	12.0	0.0	0.0	0.0	0.0
2	115.0	32.0	0.0	12.0	-20.0	4.5	40.0	4.5
3	115.0	32.0	%1000.0	24.0	-20.0	1.5	40.0	1.5
4	115.0	38.0	%3000.0	26.4	-20.0	-5.5	40.0	-5.5

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- EARTHQUAKE ACCELERATION ---------

Horizontal Earthquake Coefficient = 0.50 (a/g)
Vertical Earthquake Coefficient = 0.00

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 30.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels = 5
Horizontal Spacing = 5.0 ft
Yield Stress of Reinforcement = 60.0 ksi
Diameter of Grouted Hole = 6.00 in
Punching Shear = 80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	30.0	11.0	2.5	1.00	1.00
2	30.0	10.0	5.0	1.00	1.00
3	30.0	10.0	5.0	1.00	1.00
4	21.0	10.0	5.0	1.00	1.00
5	9.0	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.027	30.0	18.7	22.2	61.5	18.9

Reinf. Stress at Level 1 = 17.644 Ksi (Pullout controls...)
2 = 24.318 Ksi (Pullout controls...)
3 = 31.465 Ksi (Pullout controls...)
4 = 30.682 Ksi (Pullout controls...)
5 = 45.083 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.00	1.150	30.0	27.2	27.0	64.1	13.7

Reinf. Stress at Level 1 = 14.613 Ksi (Pullout controls...)
2 = 19.894 Ksi (Pullout controls...)
3 = 38.396 Ksi (Pullout controls...)
4 = 32.480 Ksi (Pullout controls...)
5 = 35.104 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
2.00	1.251	30.0	25.5	29.9	76.9	13.2

Reinf. Stress at Level 1 = 8.482 Ksi (Pullout controls...)
2 = 10.436 Ksi (Pullout controls...)
3 = 28.030 Ksi (Pullout controls...)
4 = 23.811 Ksi (Pullout controls...)
5 = 22.611 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
3.00	1.364	30.0	26.3	30.1	77.3	13.7

Reinf. Stress at Level 1 = 7.617 Ksi (Pullout controls...)
2 = 9.314 Ksi (Pullout controls...)
3 = 23.333 Ksi (Pullout controls...)
4 = 18.910 Ksi (Pullout controls...)
5 = 13.772 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
4.00	1.323	30.0	27.2	30.3	77.8	14.2

Reinf. Stress at Level 1 = 7.700 Ksi (Pullout controls...)
2 = 9.357 Ksi (Pullout controls...)
3 = 21.744 Ksi (Pullout controls...)
4 = 16.642 Ksi (Pullout controls...)
5 = 7.403 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)

```
5.00     1.343        30.0       28.0   30.6     78.2   14.7

Reinf. Stress at Level  1 =   7.442 Ksi (Pullout controls...)
                        2 =   8.990 Ksi (Pullout controls...)
                        3 =  19.253 Ksi (Pullout controls...)
                        4 =  13.724 Ksi (Pullout controls...)
                        5 =   0.944 Ksi (Pullout controls...)

    ********************
```

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*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*      OFFICE OF MATERIALS AND FOUNDATIONS      *
*          Roadway Geotechnical Branch          *
*    Date: 11-17-2002          Time: 15:00:55   *
*************************************************
```

Project Identification - SLR Con. 3 Sec. D STA 2+45 h2o 6in 90%

--------- WALL GEOMETRY ---------

Vertical Wall Height	=	23.7 ft	
Wall Batter	=	4.8 degree	
		Angle (Deg)	Length (Feet)
First Slope from Wallcrest.	=	0.0	120.0
Second Slope from 1st slope.	=	0.0	0.0
Third Slope from 2nd slope.	=	0.0	0.0
Fourth Slope from 3rd slope.	=	0.0	0.0
Fifth Slope from 4th slope.	=	0.0	0.0
Sixth Slope from 5th slope.	=	0.0	0.0
Seventh Slope Angle.	=	0.0	

--------- SLOPE BELOW THE WALL ---------

First Slope Angle below Toe.	=	-11.0 degrees
First Slope Distance from Toe.	=	10.0 ft
Second Slope Angle.	=	14.0 degrees
Second Slope Distance from Toe.	=	10.5 ft
Vertical Depth of Search.	=	5.0 ft
Number of Searches below wall Toe.	=	5

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe	=	2.0 ft
End Surcharge - Distance from toe	=	16.0 ft
Loading Intensity - Begin	=	150.0 psf/ft
Loading Intensity - End	=	150.0 psf/ft

Begin Second Surcharge - Distance from toe	=	20.5 ft
End Second Surcharge - Distance from toe	=	40.0 ft
Loading Intensity - Begin	=	650.0 psf/ft
Loading Intensity - End	=	650.0 psf/ft

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	193.5	19.5	90.0	10.5	0.0	0.0	0.0	0.0
2	172.5	24.0	0.0	10.5	-20.0	4.5	40.0	4.5
3	172.5	24.0	900.0	21.0	-20.0	1.5	40.0	1.5
4	172.5	28.5	%2700.0	23.1	-20.0	-5.5	40.0	-5.5

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

The Water Table is defined by three coordinate points.

X(1)-Coordinate = 0.00 ft Y(1)-Coordinate = 15.87 ft
X(2)-Coordinate = 10.00 ft Y(2)-Coordinate = 15.88 ft
X(3)-Coordinate = 40.00 ft Y(3)-Coordinate = 15.89 ft

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 30.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels = 5
Horizontal Spacing = 5.0 ft
Yield Stress of Reinforcement = 60.0 ksi
Diameter of Grouted Hole = 6.00 in
Punching Shear = 80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	30.0	11.0	2.5	1.00	1.00
2	30.0	10.0	5.0	1.00	1.00
3	30.0	10.0	5.0	1.00	1.00
4	21.0	10.0	5.0	1.00	1.00
5	9.0	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.154	30.0	29.4	24.1	52.8	14.9

Reinf. Stress at Level 1 = 17.397 Ksi (Pullout controls...)
2 = 24.785 Ksi (Pullout controls...)
3 = 40.298 Ksi (Pullout controls...)
4 = 33.824 Ksi (Pullout controls...)
5 = 38.970 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.00	1.233	30.0	34.5	21.8	45.8	17.2

Reinf. Stress at Level 1 = 19.375 Ksi (Pullout controls...)
2 = 28.175 Ksi (Pullout controls...)
3 = 40.203 Ksi (Pullout controls...)
4 = 31.738 Ksi (Pullout controls...)
5 = 31.833 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
2.00	1.286	30.0	34.4	18.2	45.8	21.5

Reinf. Stress at Level 1 = 18.598 Ksi (Pullout controls...)
2 = 27.047 Ksi (Pullout controls...)
3 = 36.104 Ksi (Pullout controls...)
4 = 27.650 Ksi (Pullout controls...)
5 = 24.977 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
3.00	1.344	30.0	35.5	18.4	46.9	21.9

Reinf. Stress at Level 1 = 17.317 Ksi (Pullout controls...)
2 = 25.108 Ksi (Pullout controls...)
3 = 33.462 Ksi (Pullout controls...)
4 = 24.538 Ksi (Pullout controls...)
5 = 19.262 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
4.00	1.450	30.0	42.7	40.8	89.9	0.0

Reinf. Stress at Level 1 = 17.794 Ksi (Pullout controls...)
2 = 26.087 Ksi (Pullout controls...)
3 = 34.967 Ksi (Pullout controls...)
4 = 25.079 Ksi (Pullout controls...)
5 = 17.871 Ksi (Pullout controls...)

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)

```
5.00     1.420        30.0       43.7   41.5     89.9    0.0

Reinf. Stress at Level  1 =  17.724 Ksi (Pullout controls...)
                        2 =  25.915 Ksi (Pullout controls...)
                        3 =  34.690 Ksi (Pullout controls...)
                        4 =  24.299 Ksi (Pullout controls...)
                        5 =  15.037 Ksi (Pullout controls...)

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*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*      OFFICE OF MATERIALS AND FOUNDATIONS      *
*          Roadway Geotechnical Branch          *
*    Date: 11-17-2002          Time: 15:05:08   *
*************************************************
```

Project Identification - SLR Con. 3 Sec. EL STA 0+65 6 in. 90%

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =  14.0 ft
Wall Batter                  =   4.8 degree
                              Angle   Length
                              (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0     10.4
Second Slope from 1st slope. =  90.0      7.0
Third Slope from 2nd slope.  =   0.0     40.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       = -14.0 degrees
First Slope Distance from Toe.     =  10.0 ft
Second Slope Angle.                =  10.0 degrees
Second Slope Distance from Toe.    =  20.0 ft
Vertical Depth of Search.          =   0.0 ft
Number of Searches below wall Toe. =   0
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      1.4 ft
End Surcharge - Distance from toe   =     20.4 ft
Loading Intensity - Begin           =    150.0 psf/ft
Loading Intensity - End             =    150.0 psf/ft

Begin Second Surcharge - Distance from toe =     24.0 ft
End Second Surcharge - Distance from toe   =     40.0 ft
Loading Intensity - Begin           =    650.0 psf/ft
Loading Intensity - End             =    650.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	187.5	19.5	225.0	10.5	0.0	0.0	0.0	0.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	=	3
Horizontal Spacing	=	5.0 ft
Yield Stress of Reinforcement	=	60.0 ksi
Diameter of Grouted Hole	=	6.00 in
Punching Shear	=	80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	27.0	10.0	2.5	1.00	1.00
2	25.9	10.0	5.0	1.00	1.00
3	8.1	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.303	22.6	20.4	12.1	56.0	20.3

Reinf. Stress at Level 1 = 30.511 Ksi (Pullout controls...)
2 = 34.215 Ksi (Pullout controls...)
3 = 12.546 Ksi (Pullout controls...)

****

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**************************************************
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*      OFFICE OF MATERIALS AND FOUNDATIONS       *
*          Roadway Geotechnical Branch           *
*    Date: 11-17-2002          Time: 15:06:36    *
**************************************************
```

Project Identification - SLR Con. 3 Sec. EL STA 0+65 Seis. 6 in. 90%

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =  14.0 ft
Wall Batter                  =   4.8 degree
                              Angle   Length
                              (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0     10.4
Second Slope from 1st slope. =  90.0      7.0
Third Slope from 2nd slope.  =   0.0     40.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       = -14.0 degrees
First Slope Distance from Toe.     =  10.0 ft
Second Slope Angle.                =  10.0 degrees
Second Slope Distance from Toe.    =  20.0 ft
Vertical Depth of Search.          =   0.0 ft
Number of Searches below wall Toe. =   0
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      1.4 ft
End Surcharge - Distance from toe   =     20.4 ft
Loading Intensity - Begin           =    100.0 psf/ft
Loading Intensity - End             =    100.0 psf/ft

Begin Second Surcharge - Distance from toe =     24.0 ft
End Second Surcharge - Distance from toe   =     40.0 ft
Loading Intensity - Begin           =    200.0 psf/ft
Loading Intensity - End             =    200.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	125.0	26.0	250.0	12.0	0.0	0.0	0.0	0.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- EARTHQUAKE ACCELERATION ---------

Horizontal Earthquake Coefficient = 0.50 (a/g)
Vertical Earthquake Coefficient = 0.00

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels = 3
Horizontal Spacing = 5.0 ft
Yield Stress of Reinforcement = 60.0 ksi
Diameter of Grouted Hole = 6.00 in
Punching Shear = 80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	27.0	10.0	2.5	1.00	1.00
2	25.9	10.0	5.0	1.00	1.00
3	8.1	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.110	25.0	18.6	13.2	53.3	20.9

Reinf. Stress at Level 1 = 36.652 Ksi (Pullout controls...)
2 = 42.514 Ksi (Pullout controls...)
3 = 16.226 Ksi (Pullout controls...)

```
*******************************************************************
*                 For Factor of Safety = 1.0                      *
*         Maximum Average Reinforcement Working Force:            *
*                    19.665 Kips/level                            *
**********************
```

```
*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*      OFFICE OF MATERIALS AND FOUNDATIONS      *
*          Roadway Geotechnical Branch          *
*    Date: 11-17-2002          Time: 15:09:11   *
*************************************************
```

Project Identification - SLR Con. 3 Sec. E Low STA 0+65 h2o 6in 90%

--------- WALL GEOMETRY ---------

Vertical Wall Height	=	14.0 ft	
Wall Batter	=	4.8 degree	
		Angle (Deg)	Length (Feet)
First Slope from Wallcrest.	=	0.0	10.4
Second Slope from 1st slope.	=	90.0	7.0
Third Slope from 2nd slope.	=	0.0	40.0
Fourth Slope from 3rd slope.	=	0.0	0.0
Fifth Slope from 4th slope.	=	0.0	0.0
Sixth Slope from 5th slope.	=	0.0	0.0
Seventh Slope Angle.	=	0.0	

--------- SLOPE BELOW THE WALL ---------

First Slope Angle below Toe.	=	-14.0 degrees
First Slope Distance from Toe.	=	10.0 ft
Second Slope Angle.	=	10.0 degrees
Second Slope Distance from Toe.	=	20.0 ft
Vertical Depth of Search.	=	0.0 ft
Number of Searches below wall Toe.	=	0

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe	=	1.4 ft
End Surcharge - Distance from toe	=	20.4 ft
Loading Intensity - Begin	=	150.0 psf/ft
Loading Intensity - End	=	150.0 psf/ft

Begin Second Surcharge - Distance from toe	=	24.0 ft
End Second Surcharge - Distance from toe	=	40.0 ft
Loading Intensity - Begin	=	650.0 psf/ft
Loading Intensity - End	=	650.0 psf/ft

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	187.5	19.5	225.0	10.5	0.0	0.0	0.0	0.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

The Water Table is defined by three coordinate points.

X(1)-Coordinate = 0.00 ft Y(1)-Coordinate = 13.98 ft
X(2)-Coordinate = 10.00 ft Y(2)-Coordinate = 13.99 ft
X(3)-Coordinate = 40.00 ft Y(3)-Coordinate = 14.00 ft

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels = 3
Horizontal Spacing = 5.0 ft
Yield Stress of Reinforcement = 60.0 ksi
Diameter of Grouted Hole = 6.00 in
Punching Shear = 80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	27.0	10.0	2.5	1.00	1.00
2	25.9	10.0	5.0	1.00	1.00
3	8.1	10.0	5.0	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.199	22.6	20.4	12.1	56.0	20.3

Reinf. Stress at Level 1 = 33.162 Ksi (Pullout controls...)
2 = 37.187 Ksi (Pullout controls...)
3 = 13.636 Ksi (Pullout controls...)

```
*******************************************************************
*                 For Factor of Safety = 1.0                      *
*         Maximum Average Reinforcement Working Force:            *
*                   15.693 Kips/level                             *
*******
```

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**************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION     *
*          ENGINEERING SERVICE CENTER            *
*      OFFICE OF MATERIALS AND FOUNDATIONS       *
*          Roadway Geotechnical Branch           *
*    Date: 11-17-2002          Time: 15:13:19    *
**************************************************
```

Project Identification - SLR Con. 3 Sec. E Upper STA 0+65 6in 90%

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =   7.0 ft
Wall Batter                  =   4.8 degree
                              Angle   Length
                              (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0    120.0
Second Slope from 1st slope. =   0.0      0.0
Third Slope from 2nd slope.  =   0.0      0.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       =   0.0 degrees
First Slope Distance from Toe.     =  20.0 ft
Second Slope Angle.                =   0.0 degrees
Second Slope Distance from Toe.    =   0.0 ft
Vertical Depth of Search.          =   0.0 ft
Number of Searches below wall Toe. =   0
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      0.6 ft
End Surcharge - Distance from toe   =     12.6 ft
Loading Intensity - Begin           =    150.0 psf/ft
Loading Intensity - End             =    150.0 psf/ft

Begin Second Surcharge - Distance from toe =     16.1 ft
End Second Surcharge - Distance from toe   =     40.0 ft
Loading Intensity - Begin           =    650.0 psf/ft
Loading Intensity - End             =    650.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	187.5	24.0	90.0	10.5	0.0	0.0	0.0	0.0
2	172.5	24.0	900.0	21.0	-20.0	-3.0	40.0	-3.0
3	172.5	28.5	%2700.0	23.1	-20.0	-12.5	40.0	-12.5

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	=	2
Horizontal Spacing	=	5.0 ft
Yield Stress of Reinforcement	=	60.0 ksi
Diameter of Grouted Hole	=	6.00 in
Punching Shear	=	80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	16.0	10.0	2.5	1.00	1.00
2	4.8	10.0	4.5	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.630	6.0	32.8	6.5	80.2	3.6

Reinf. Stress at Level 1 = 20.124 Ksi (Pullout controls...)
2 = 0.000 Ksi

****

```
*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*      OFFICE OF MATERIALS AND FOUNDATIONS      *
*          Roadway Geotechnical Branch          *
*    Date: 11-17-2002          Time: 15:15:30   *
*************************************************
```

Project Identification - SLR Con. 3 Sec. E U STA 0+65 Seis 6 in 90%

--------- WALL GEOMETRY ---------

Vertical Wall Height	=	7.0 ft
Wall Batter	=	4.8 degree

		Angle (Deg)	Length (Feet)
First Slope from Wallcrest.	=	0.0	120.0
Second Slope from 1st slope.	=	0.0	0.0
Third Slope from 2nd slope.	=	0.0	0.0
Fourth Slope from 3rd slope.	=	0.0	0.0
Fifth Slope from 4th slope.	=	0.0	0.0
Sixth Slope from 5th slope.	=	0.0	0.0
Seventh Slope Angle.	=	0.0	

--------- SLOPE BELOW THE WALL ---------

First Slope Angle below Toe.	=	0.0 degrees
First Slope Distance from Toe.	=	20.0 ft
Second Slope Angle.	=	0.0 degrees
Second Slope Distance from Toe.	=	0.0 ft
Vertical Depth of Search.	=	0.0 ft
Number of Searches below wall Toe.	=	0

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe	=	0.6 ft
End Surcharge - Distance from toe	=	12.6 ft
Loading Intensity - Begin	=	100.0 psf/ft
Loading Intensity - End	=	100.0 psf/ft

Begin Second Surcharge - Distance from toe	=	16.1 ft
End Second Surcharge - Distance from toe	=	40.0 ft
Loading Intensity - Begin	=	200.0 psf/ft
Loading Intensity - End	=	200.0 psf/ft

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	125.0	32.0	100.0	12.0	0.0	0.0	0.0	0.0
2	115.0	32.0	%1000.0	24.0	-20.0	-3.0	40.0	-3.0
3	115.0	38.0	%3000.0	26.4	-20.0	-12.5	40.0	-12.5

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- EARTHQUAKE ACCELERATION ---------

Horizontal Earthquake Coefficient = 0.50 (a/g)
Vertical Earthquake Coefficient = 0.00

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	=	2
Horizontal Spacing	=	5.0 ft
Yield Stress of Reinforcement	=	60.0 ksi
Diameter of Grouted Hole	=	6.00 in
Punching Shear	=	80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	16.0	10.0	2.5	1.00	1.00
2	4.8	10.0	4.5	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.041	25.0	8.0	15.1	26.1	11.1

Reinf. Stress at Level 1 = 5.726 Ksi (Pullout controls...)
2 = 0.000 Ksi

```
*******************************************************************
*                 For Factor of Safety = 1.0                      *
*         Maximum Average Reinforcement Working Force:            *
*                     5.726 Kips/level                            *
*******************************************
```

```
*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*      OFFICE OF MATERIALS AND FOUNDATIONS      *
*          Roadway Geotechnical Branch          *
*    Date: 11-17-2002          Time: 15:17:12   *
*************************************************
```

Project Identification - SLR Con. 3 Sec. E Upper STA 0+65 h2o 6in 90

--------- WALL GEOMETRY ---------

```
Vertical Wall Height         =   7.0 ft
Wall Batter                  =   4.8 degree
                              Angle   Length
                              (Deg)   (Feet)
First Slope from Wallcrest.  =   0.0    120.0
Second Slope from 1st slope. =   0.0      0.0
Third Slope from 2nd slope.  =   0.0      0.0
Fourth Slope from 3rd slope. =   0.0      0.0
Fifth Slope from 4th slope.  =   0.0      0.0
Sixth Slope from 5th slope.  =   0.0      0.0
Seventh Slope Angle.         =   0.0
```

--------- SLOPE BELOW THE WALL ---------

```
First Slope Angle below Toe.       =   0.0 degrees
First Slope Distance from Toe.     =  20.0 ft
Second Slope Angle.                =   0.0 degrees
Second Slope Distance from Toe.    =   0.0 ft
Vertical Depth of Search.          =   0.0 ft
Number of Searches below wall Toe. =   0
```

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

```
Begin Surcharge - Distance from toe =      0.6 ft
End Surcharge - Distance from toe   =     12.6 ft
Loading Intensity - Begin           =    150.0 psf/ft
Loading Intensity - End             =    150.0 psf/ft

Begin Second Surcharge - Distance from toe =     16.1 ft
End Second Surcharge - Distance from toe   =     40.0 ft
Loading Intensity - Begin           =    650.0 psf/ft
Loading Intensity - End             =    650.0 psf/ft
```

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	187.5	24.0	90.0	10.5	0.0	0.0	0.0	0.0
2	172.5	24.0	900.0	21.0	-20.0	-3.0	40.0	-3.0
3	172.5	28.5	%2700.0	23.1	-20.0	-12.5	40.0	-12.5

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

The Water Table is defined by three coordinate points.

X(1)-Coordinate = 0.00 ft Y(1)-Coordinate = 1.57 ft
X(2)-Coordinate = 10.00 ft Y(2)-Coordinate = 1.58 ft
X(3)-Coordinate = 40.00 ft Y(3)-Coordinate = 1.59 ft

--------- SEARCH LIMIT ---------

The Search Limit is from 1.3 to 25.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels = 2
Horizontal Spacing = 5.0 ft
Yield Stress of Reinforcement = 60.0 ksi
Diameter of Grouted Hole = 6.00 in
Punching Shear = 80.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	16.0	10.0	2.5	1.00	1.00
2	4.8	10.0	4.5	1.00	1.00

DEPTH BELOW WALL TOE (ft)	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.619	6.0	32.8	6.5	80.2	3.6

Reinf. Stress at Level 1 = 20.254 Ksi (Pullout controls...)
2 = 0.000 Ksi

```
*****************************************************************
*                For Factor of Safety = 1.0                     *
*         Maximum Average Reinforcement Working Force:          *
*                    6.904 Kips/level                           *
**************************
```