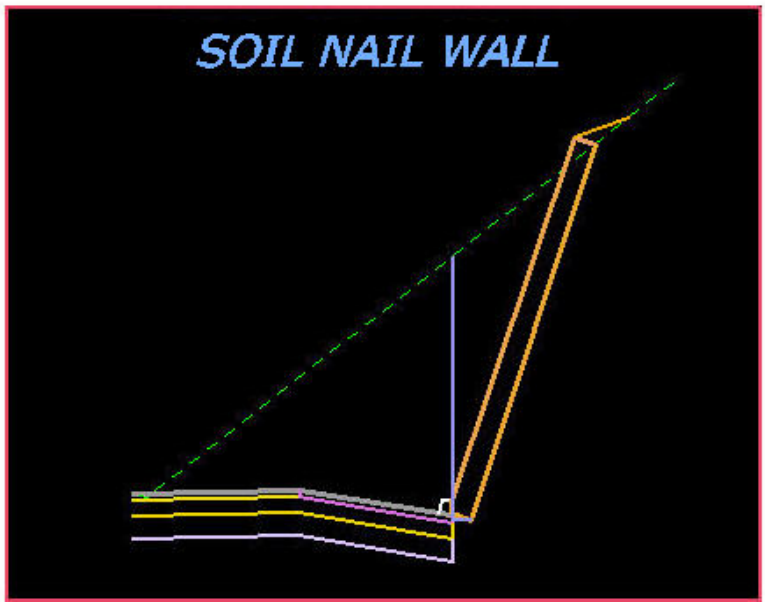
SOIL NAIL WALL

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About Retaining Wall Layout Procedures (For *CFLHD employees*)

The FLH criteria library supports nine wall types; Parapet, MSE, Soil Nail, SMSE, Cut, Fill, Gabion, Guardwall and Rockery. Creating a constructible wall layout is an iterative process, which requires the involvement of the Highway Engineer as well as the Structural and/or Geotechnical Engineer. The process requires two or three phases, depending upon the wall type.

Workflow: Soil Nail Wall Layout

Phase 1

The first phase consists of creating the initial proposed cross sections, using the CFLHD default AdHoc attributes. From these cross sections, chains and profiles are stored for the soil nail wall. This information is then given to the Structural Engineer, to assist in the determination of the appropriate project specific design criteria that will be required.

1. Draw pattern lines every five feet *through the wall site in the mainline pattern file. Use a different level for the pattern lines than the mainline cross section pattern lines. Additional cross sections may be required at the beginning and end to determine where the wall should begin and end.*
2. Cut existing ground cross sections *based on the pattern lines created in step 1.*
3. *Use the default AdHoc attributes for the soil nail wall dimensions, with the exception of the Adjacent to Curb variable. Set this to 'Y' if the soil nail wall is adjacent to the curb; or 'N' if not adjacent to curb. If the AdHoc is set to 'Y', then the plan view element acts only as a "trigger" to draw the wall adjacent to the back of the curb. If this AdHoc is set to 'N', then the plan view location of the soil nail line will set the horizontal offset of the wall. The soil nail wall line must be drawn behind the curb or paved ditch line. If the existing terrain is steep, the wall batter may need to be steeper than the default value of 3:1 (See Phase 2, steps 2 through 5 for instruction on changing AdHocs).* Run the proposed cross sections.
4. *Click on* Reports & XS Quantities *from the Road Project Manager dialog box as shown in the figure below.*

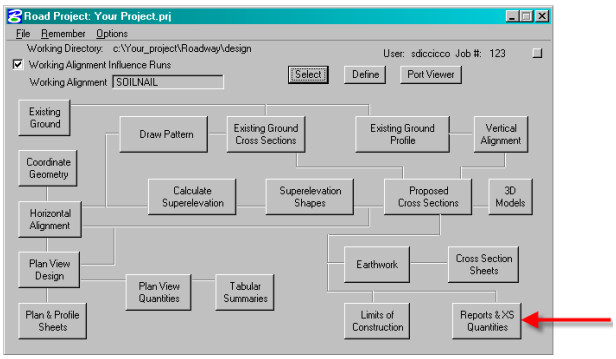

Figure 1-1: Reports & XS Quantities

5. *Click on the* Profile Grade *button in the XS Report dialog box. This will open the Profile Grade Report dialog box. Fill in the Begin and End Station of the soil nail wall station range as shown below. Do not include cross sections that do not require a Soil Nail retaining wall.*

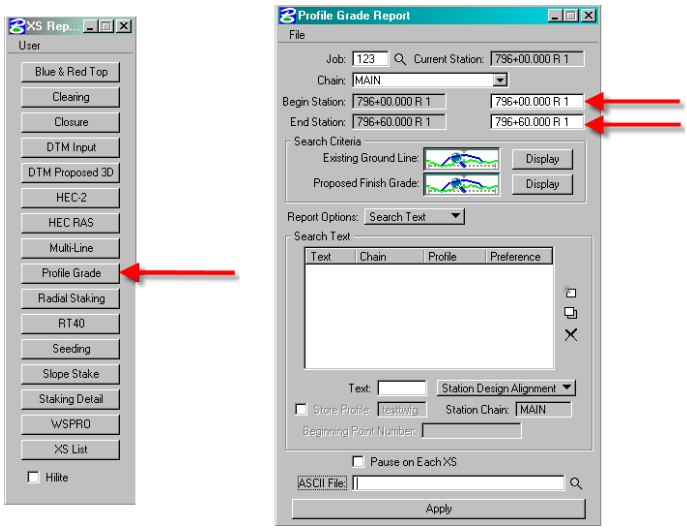

Figure 1-2: Profile Grade

6. *Under Search Criteria, click on the button next to* Existing Ground Line*. Add the Lv Names to the Existing Ground Line dialog as shown below. The Existing Ground Line should only have the existing ground level (X_E_Ground_XS) in the Lv Names. Close the dialog box.*

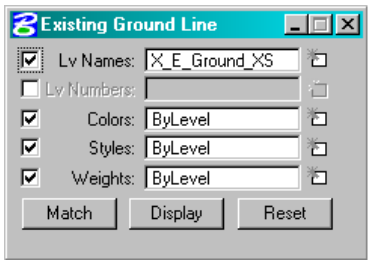

Figure 1-3: Existing Ground Line Dialog

7. *Under Search Criteria, click on the button next to* Proposed Finish Grade*. Add the Lv Names to the Proposed Finish Grade dialog. The Proposed Finish Grade must travel from catch point to catch point, and it must pass through the text points SN1 and SN3 (See Figure 1-7 for text locations). The following levels must be specified for a soil nail retaining wall: X_P_SN_Wall_Backfill; X_P_SN_Wall_Face; X_P_SN_Wall_Back and X_P_SN_Wall_Top. Close the dialog box.*

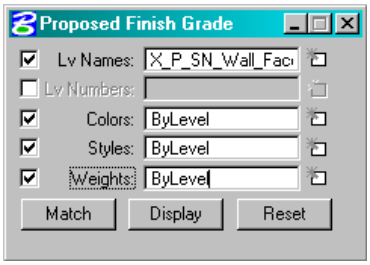

Figure 1-4: Proposed Finish Grade Dialog

8. *Pull down the* Search Text *menu and fill in the text dialog box as shown below. Select Station Text Alignment from the pull down menu. The Beginning Point Number should not be a point used in any other chain. Click on the Add tab to populate the search text field.*

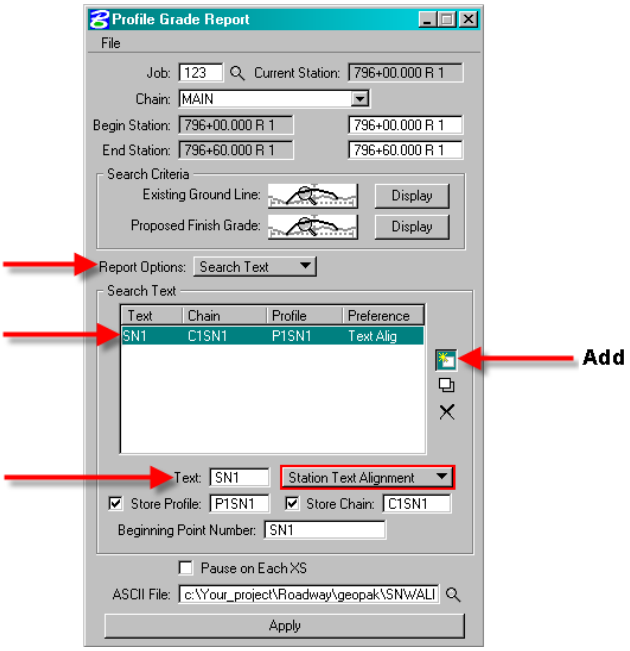

Figure 1-5: Add Profile & Chain at Bottom of Soil Nail Wall (SN1)

9. *Add the search text for the top of Soil Nail wall (SN3) as shown in the figure below. Click on the Add tab to add the text to the search text box. Click on the apply button to* generate the chains and profiles *based on the locations of the SN1 and SN3 text (See Figure 1-7).*

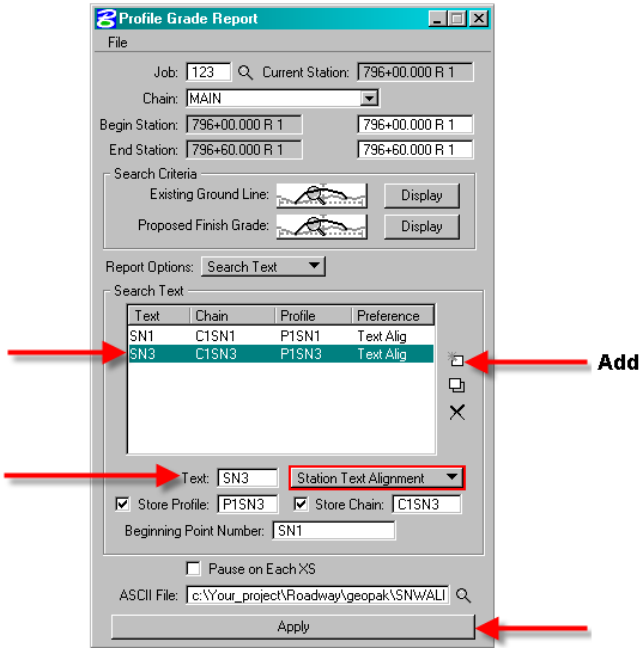

Figure 1-6: Add Profile & Chain at Top of Soil Nail Wall (SN3)

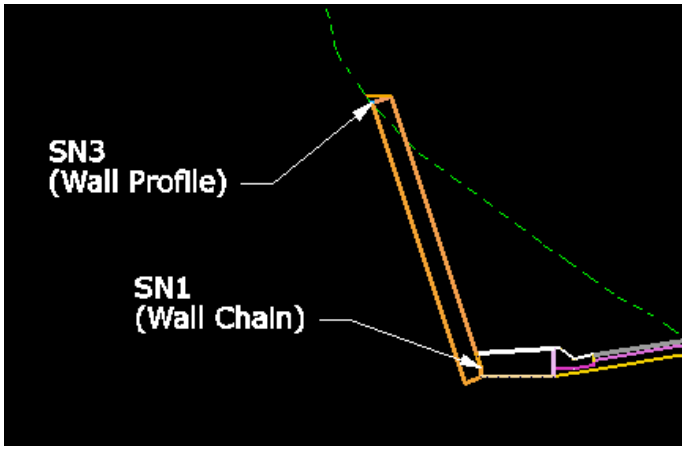

Figure 1-7: Search Text Locations

10. Create a new design file *for the wall profiles (See CADD Standards Manual for naming conventions). Open the Draw Profile from the Geopak Road Tools dialog as shown in the figure below.*

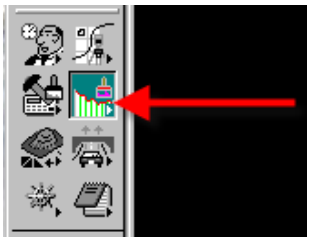

Figure 1-8: Geopak Tool Draw Profile

11. *Select the bottom of soil nail wall chain (C1SN1) in the* Draw Profile *Dialog box. Click on the dialog for Profile Cell Control as shown below.*

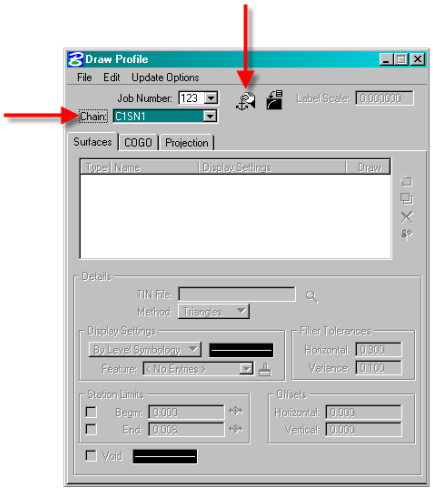

Figure 1-9: Geopak Tool Draw Profile

12. Select the Active chain. *Click on the Place Profile Cell in the Profile Cell Control dialog box as shown in the figure below.*

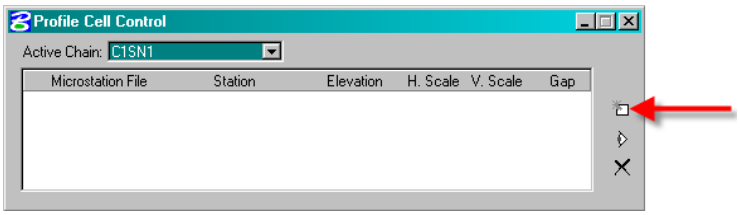

Figure 1-10: Profile Cell Control

13. *Enter the beginning station (0+00), lowest elevation and 1:1 scale in the Place Profile dialog box. Then place the curser in View 1 and click to* place the profile cell *as shown below.*

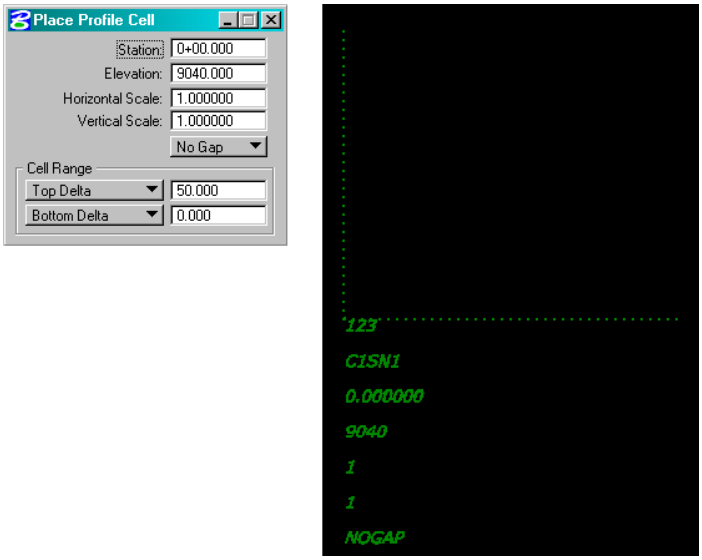

Figure 1-11: Place Profile Cell

14. *The Profile Cell Control will appear with the Active Chain information as shown in the figure below. Close the Profile Cell Control box.*

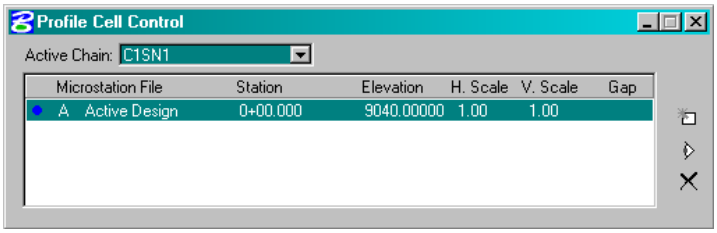

Figure 1-12: Active Profile Cell Information

15. Click on the COGO tab *in the Draw Profile box. Double click on the By Level Symbology field. Change the level symbology as shown below.*

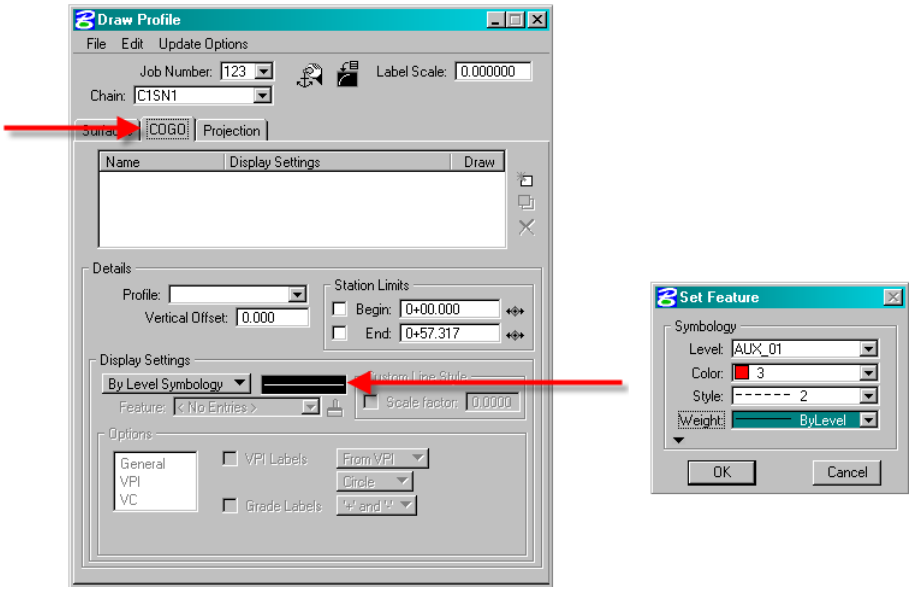

Figure 1-13: Draw Profile Dialog Box

16. *Select the bottom of soil nail wall profile (P1SN1) and click on the Add COGO Profile Settings as shown below. The* bottom of soil nail wall *profile will display in the design file.*

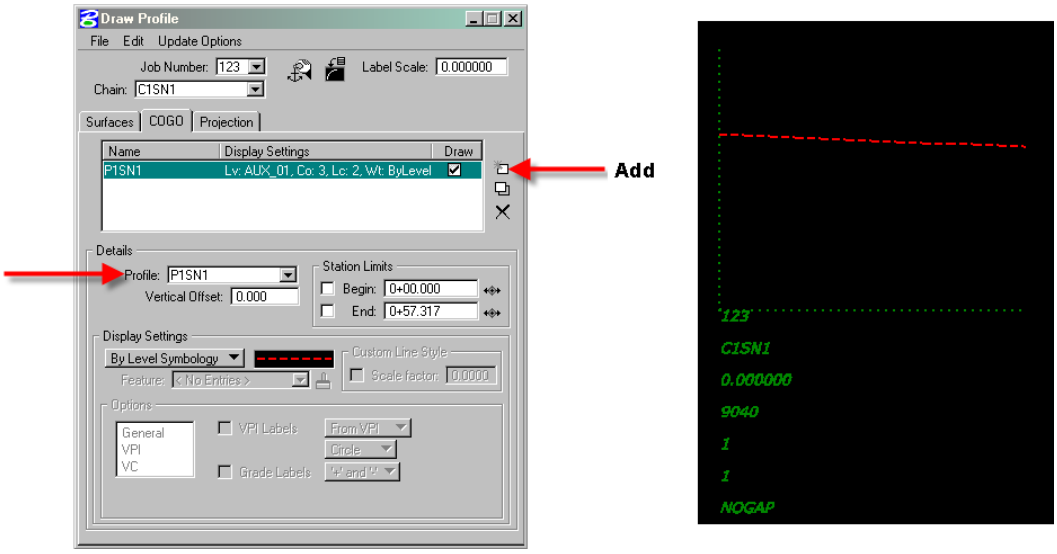

Figure 1-14: Draw Bottom of Soil Nail Wall Profile

17. Click on the Projection tab *in the Draw Profile dialog box. Select the chain and profile for the SN3 text. Double click on the By Level Symbology field and select the symbology as shown in the figure below and click on OK.*

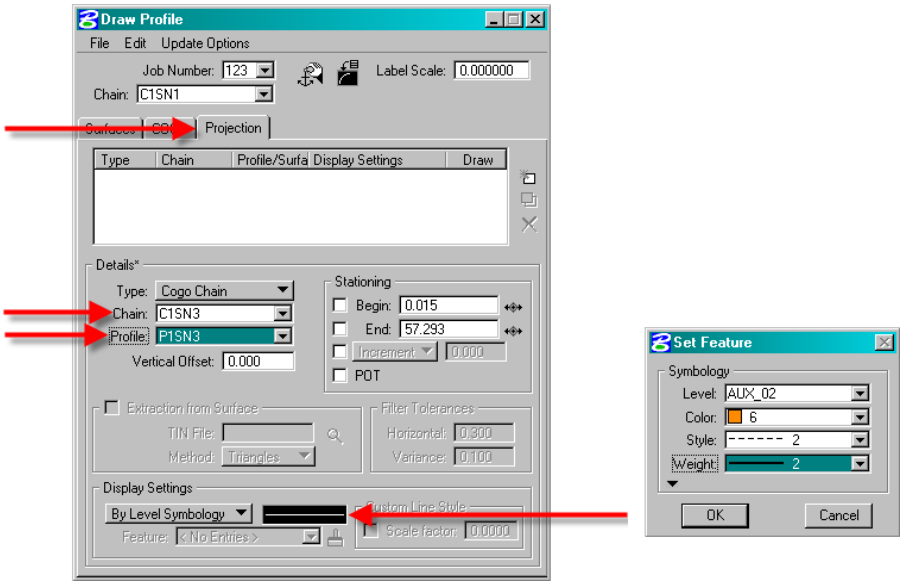

Figure 1-15: Project Profile for SN3

18. *Click on the Add COGO Profile Settings as shown below. The* top of soil nail wall *profile will be displayed in the design file.*

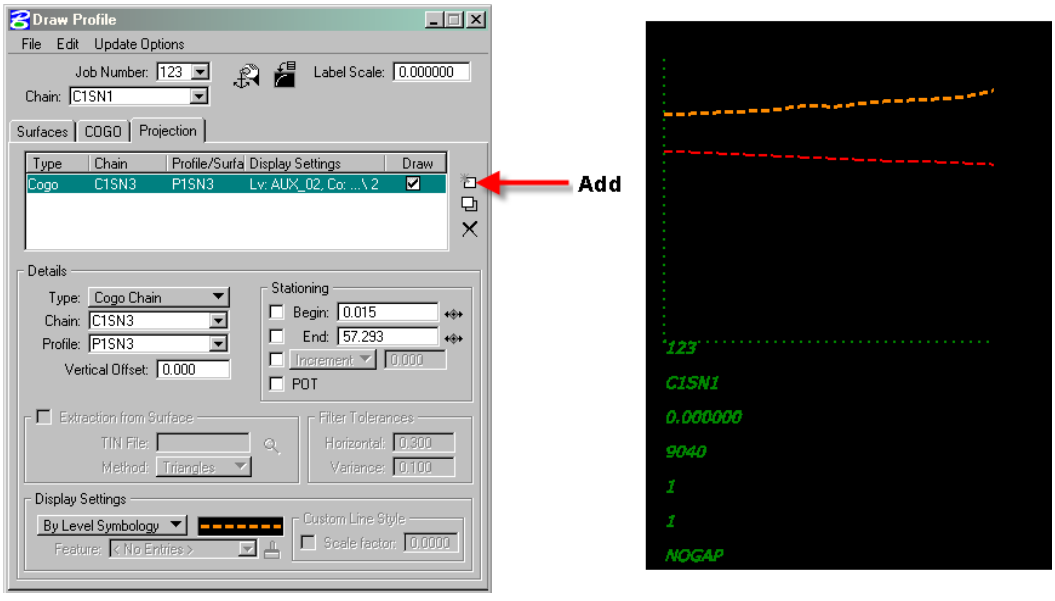

Figure 1-16: Draw Top of Soil Nail Wall Profile

19. Send the dgn files *with the wall plan view, cross sections and profiles to the Structural Engineer for the final wall layout design. Provide the Chain and Profile names for the two profiles. Include a print out of the AdHoc attributes used for the soil nail wall as shown below.*

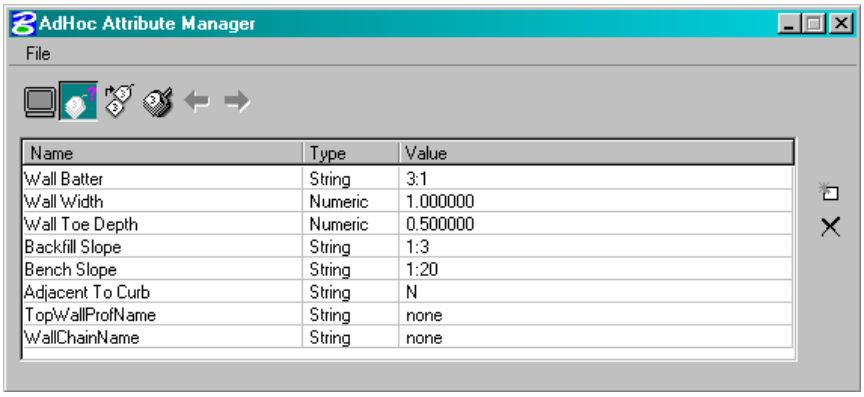

Figure 1-17: Printout of AdHoc Attributes used for Phase 1 Soil Nail Wall Layout

Phase 2

The second phase consists of producing proposed cross sections that reflect a constructible wall profile and appropriate site specific design requirements. This information is given to the Structural Engineer for review. Additional iterations of phase 2 procedures may be required.

1. *The Structural Engineer will provide a dgn file containing the designed profile for the top of the soil nail wall.* Store the profile supplied by the Structural Engineer *as P1FTW (Profile 1 Final Top of Wall), based on the bottom of wall chain created in Phase 1 (C1SN1). Click on Vertical Alignment from the Road Project Manager dialog box as shown in the figure below.*

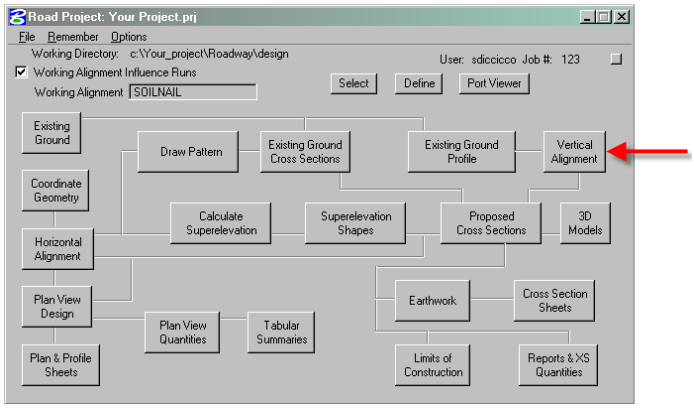

Figure 2-1: Vertical Alignment

2. *From the Settings dialog box, select PGL Chain C1SN1. Enter a Horizontal and Vertical Scale of 1. Click on the DP button and tentative snap to the origin of the Profile Cell and accept the data point. Click on OK.*

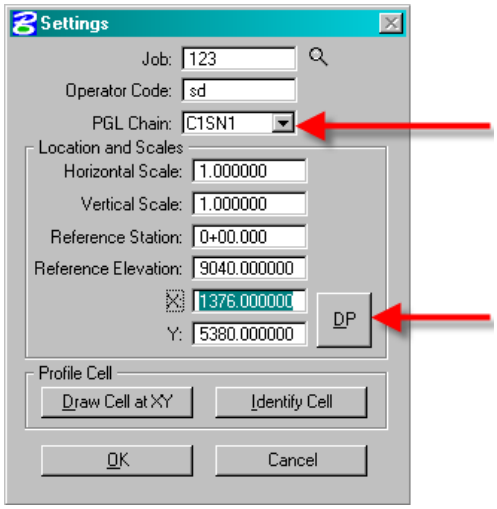

Figure 2-2: Vertical Alignment Settings Dialog

3. *Click on the Dynamic button on the Profile Generator dialog box. Tentative Snap to the first VPI of the top of soil nail wall profile and accept it. Click on the Insert button and then the Dynamic button. Tentative Snap to the second VPI and accept it. Continue the process until the entire profile has been input. Take care to capture all of the VPI's (one for each cross section).*

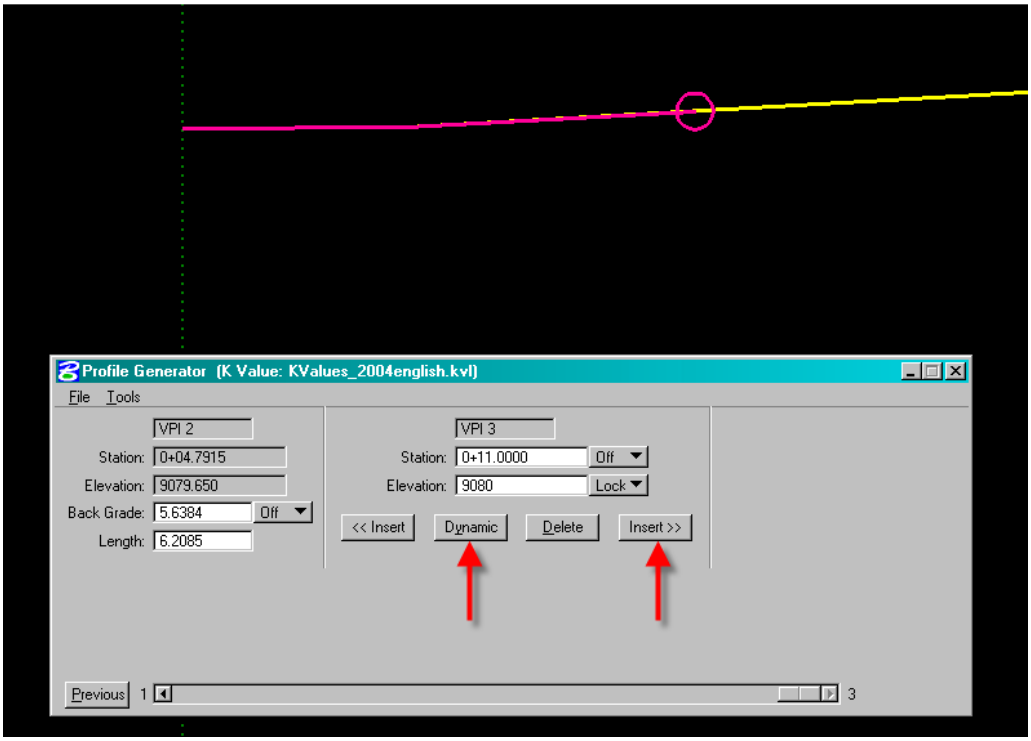

Figure 2-3: Generate Phase 2 Profile for Top of Soil Nail Wall Using Profile Generator

4. *Click on File and select Save Profile As. Save the Profile as P1FTW. Click on OK.*

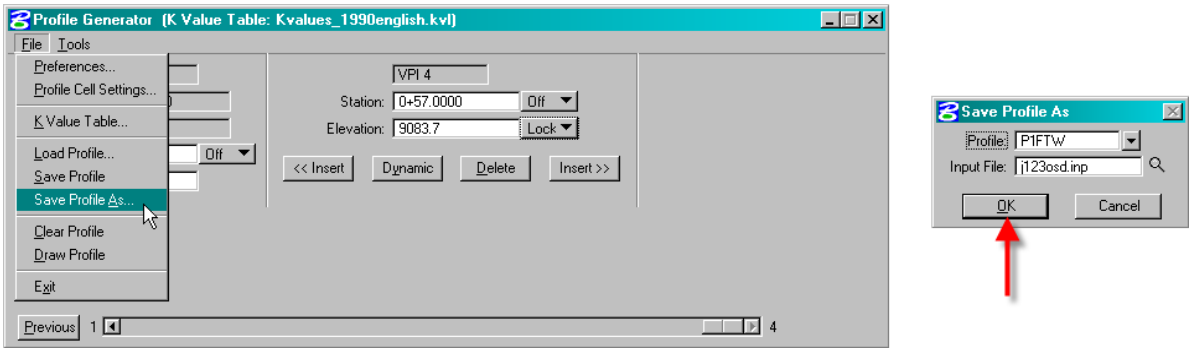

Figure 2-4: Save Phase 2 Profile for Top of Soil Nail Wall

5. Open your proposed plan dgn file *containing the soil nail wall AdHoc line. Open the AdHoc Attribute Manager as shown below. Click on File then Preferences. The Set Mode should be set to Replace. Close the Preferences dialog box.*

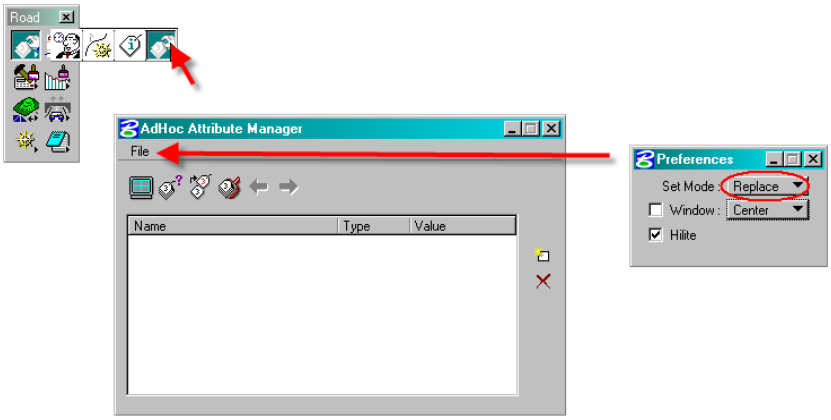

Figure 2-5: AdHoc Attribute Manager

6. *Click on the Identify Element button as shown below. Double click on the plan view soil nail wall line. The AdHoc Attributes of the line will then be displayed in the field.*

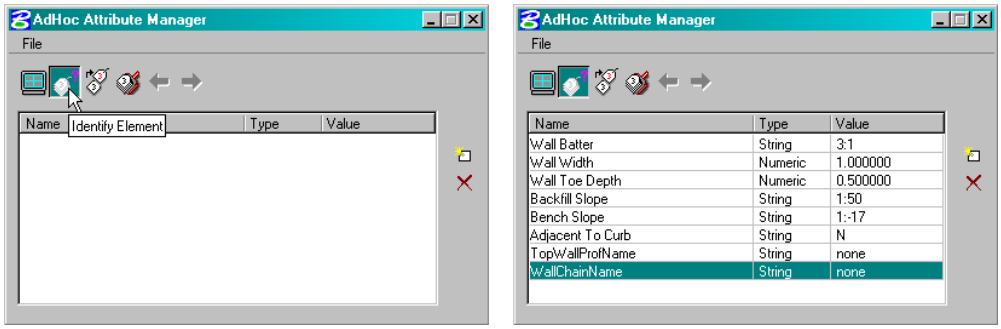

Figure 2-6: Identify Element

7. *To change any of the values, click on the value and type in the desired change as shown below. Include the top of wall profile, the bottom of wall chain and all other design parameters supplied by the Structural Engineer.*

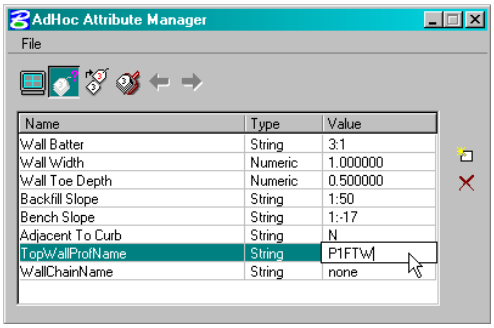

Figure 2-7: Adjust the AdHoc Values

8. *If the Design and Computation Manager is open, make sure that the 'Place Influence' and 'Adhoc Attributes' are toggled off as shown below.*

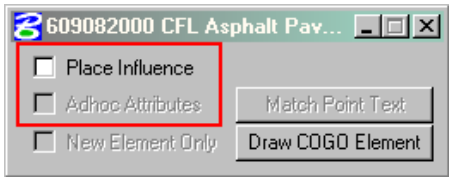

Figure 2-8: Toggle Place Influence Off

9. *Click on the* Set Attributes *button as shown below. Click on the Soil Nail wall line to identify it, and click again to accept the changes. To check if the changes have been stored, use the Identify Element button as described in step 6.*

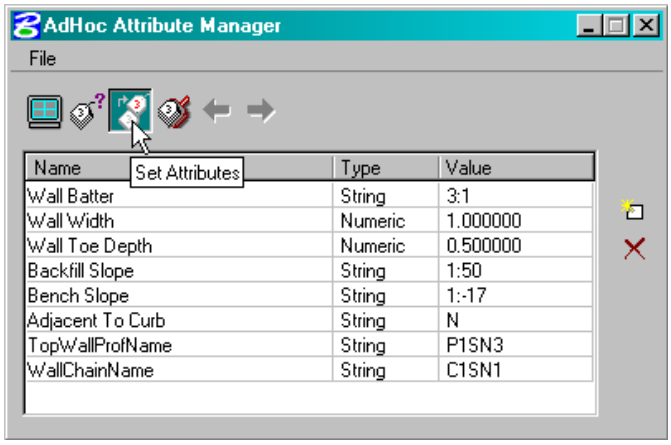

Figure 2-9: Change Soil Nail Wall AdHoc Attributes

10. Re-run the proposed cross sections *with the new AdHoc attributes.*
11. Re-draw the profiles *as described in the Phase 1 procedures.*
12. *Send the dgn files with the plan view, cross sections and profiles to the* Structural Engineer for review*. Include a print out of the Adhoc attributes as shown in the figure above. Additional iterations of phase 2 procedures may be required.*