Iowa Department of Transportation
Office of Design

Completing the G Sheet

Design Manual
**Chapter 40**
Design Survey
Specifications

Originally Issued: 09-30-11

1.) The G sheets will contain all of the field survey information for the project, (shown later in the document).
   a. The first sheet will include four parts of the Index file and the bench mark tab.
   b. The second sheet, and all that follow (as needed), will contain the diagrams of the control point references used on the project.
   c. A copy of the full Index, a list of survey symbols, and a list of utility company names are placed to the left of the first plan sheet to be used by the designers.

2.) The first step in the process is to open the MicroStation "**.sur**" file. The field survey legend will be created in the "**.sur**" file.

Because the **Legend** tool only works on active elements and not referenced elements, this process must be performed in the **TOPO** model containing the actual elements. Open the **Models** dialog by *clicking* the **Models** icon, as shown at the right.

In the **Models** dialog, switch to the **Field_TOPO_0100** model by *double-clicking* the model name in the list, as shown at the right.
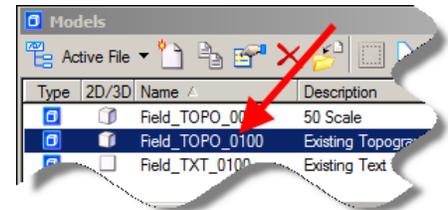
3.) Open the **Level Display** dialog box by *clicking* the menu item shown at the right.

4.) Make sure that the active model is highlighted in the upper portion of the dialog box and that all levels used in this model are turned on in the bottom part of the dialog box.
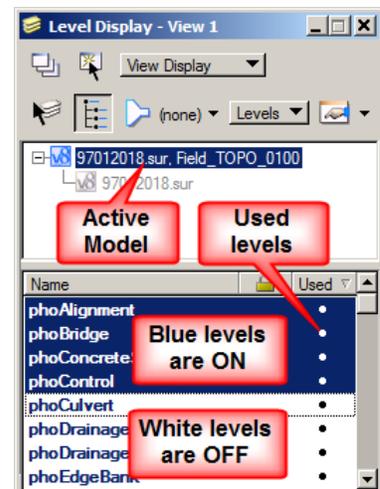
5.) From the MicroStation View Tools, *Click* the **Fit View** tool to get all of the survey information to appear within the open view.

6.) All of the survey information should now appear in the view, similar to that shown at the right.
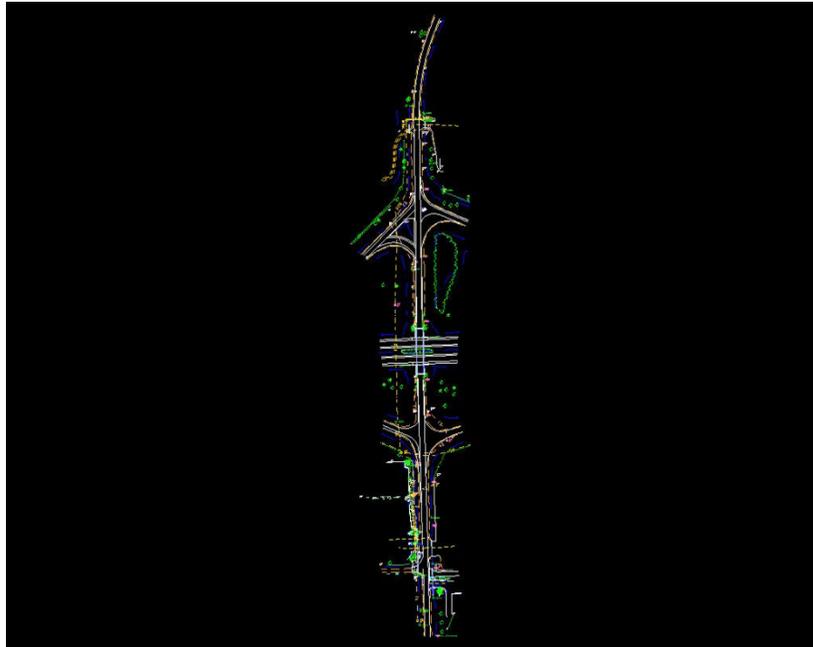
7.) To create the G Sheet Survey Element **Legend,** all active survey elements must be grouped into a **Selection Set.** The MicroStation **Element Selection** tool is located in the MicroStation **Main** menu subset of tools. The location of the **Main** menu will depend on your own personal set-up of the MicroStation environment. Locate and *click* the **Element Selection** tool, as shown at the right.
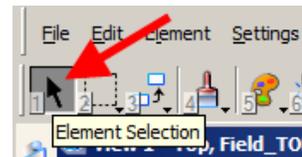

When the **Element Selection** tool is activated, the **Element Selection** tool grouping should display. Since all levels are turned on and all elements are to be added to the **Selection Set,** the easiest **Element Selection** tool to use will be the **Select All** tool, as shown at the right.

8.) With all of the elements added to the **Selection Set,** they should all be highlighted in the highlight color, similar to as shown at the right.

NOTE: If the "highlight color" has not been changed through **Workspace > Preferences > View Options,** it should be a "hot pink/purple" color, as shown here ( ).

9.) The **Place Legend** tool is accessed from the Geopak Survey tool bar.

Start GEOPAK from the MicroStation menu by selecting **Applications > GEOPAK > Activate GEOPAK**, as shown at the right.

After GEOPAK has been activated, access the GEOPAK **Survey** menu from the MicroStation menu by selecting **Applications > GEOPAK > SURVEY > Survey**, as shown at the right.
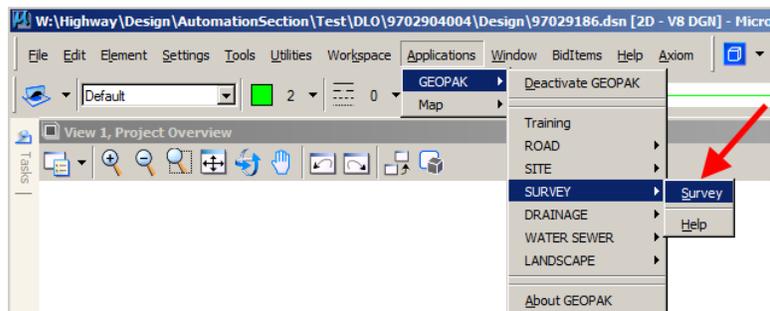
The **Survey** tool bar should display, as shown at the right.
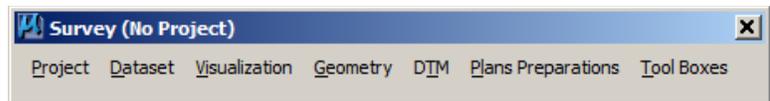
10.) Start the **Place Legend** tool from the **Survey** tool bar, as shown at the right.
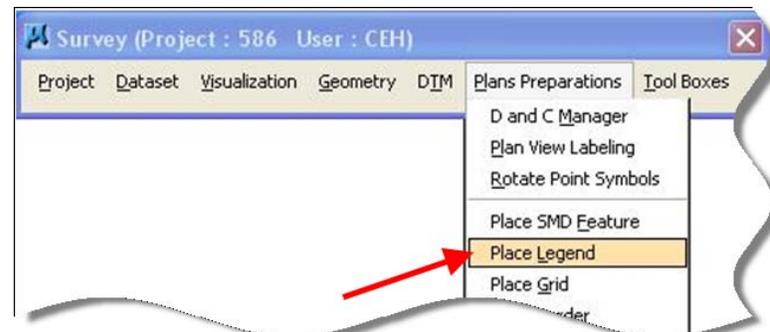
11.) In the **Place Legend** dialog, the settings should be as shown at the right.

The correct text attributes must also be set. *Double-click* the **Sample** text in the black box, as located at the right.

12.) Set the attributes to match the settings shown in the dialog box at the right and then *click* the **OK** button.
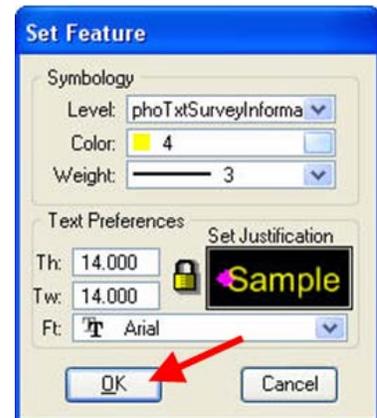
13.) *Click* on the **Place** button on the **Place Legend** dialog box.

When the cursor is moved off the dialog box and on to the MicroStation View, the new **Legend** text will be attached and will move as the mouse and cursor moves.

To place the **Legend** information into the **TOPO** model, *left-click* in an open area of the file, somewhere near the survey data, as shown below.

14.) An error message may appear after placing the legend. This occurs because some items that are placed in the model were not drawn by GEOPAK **Survey** and do not have a feature code associated with them. One example is the horizontal alignment that is placed using GEOPAK **Design and Computation (D&C) Manager**. *Click* the **OK** button to dismiss the dialog box. Check your legend data to make sure that it is correct.
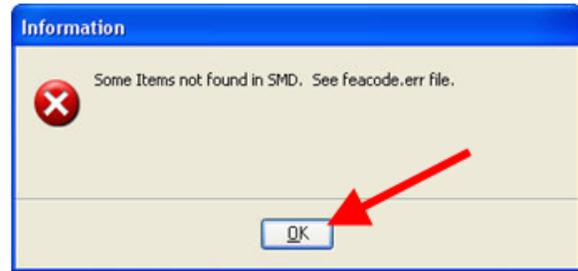
15.) Open the **Models** dialog as necessary, and switch to the **Field_G_Sheet** model, as shown at the right.
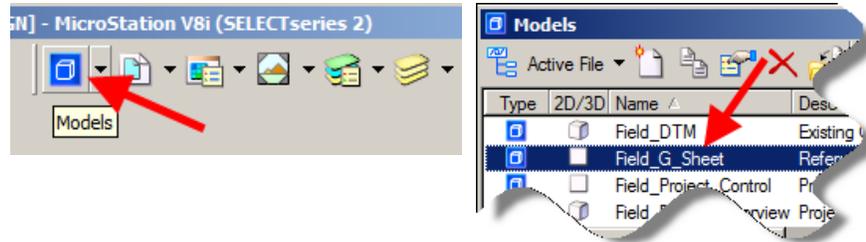
16.) A reference file is like a clear plastic sheet with a drawing on it, lying under the active file elements. The attachment of several reference files is like a stack of these clear plastic sheets with drawings, all under the active file elements. You can see through the "clear plastic sheets" and see all the elements from all the files at the same time.

   Since the active model is like the "top sheet", MicroStation elements can be drawn and manipulated in this model. With normal "reference file preference" settings, each reference file "sheet" under this "top sheet" can be seen but cannot be edited. You can see a list of all the reference file attachments by opening either the **Level Display** or the **References** dialog box. In the upper, or upper left portion of the dialog box, there is a file hierarchy "tree" view with the active model shown on top of the list and all references attached to this model listed under it, as shown below.

   There should be five models pre-attached to the **G_sheet** model.
   1: the five sheet borders
   2: the blue grid system inside all except the first sheet
   3: the Project Control model
   4: the TOPO model.
   5: the TXT model.

The **Legend** was drawn into the **TOPO** model, and is only referenced to the **G_Sheet** model. The reference **Display** must be checked (☑) ON, as shown at the right, to see the **Legend** reference in the **G_sheet** model. To do this, r*ight-click* on the **TOPO** reference in the reference list area, (shown by the upper red arrow at the right), and then *click* on the **Display** *check-box* to place a check mark (☑) next to the **Display** option.
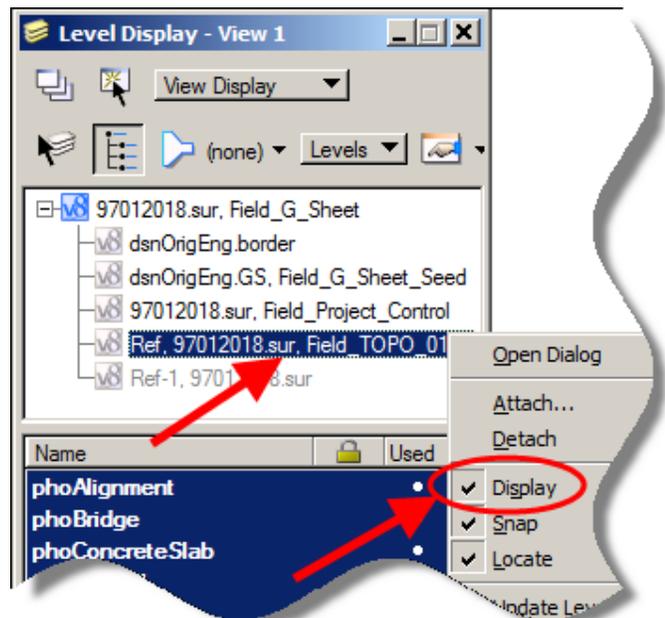
17.) MicroStation levels can also be turned ON and OFF for each individual reference attachment. This allows for the customization of the MicroStation View to nearly any way that you would want to see it.

For this step in the process, all levels in the **TOPO** reference file will be turned ON. *Select* the **View Display** and **Levels** options at the top of the dialog, as shown at the right. The easiest way to accomplish this is to identify (highlight) the correct reference file in the top portion of the **Level Display** dialog, then *right-click* anywhere in the lower portion of the dialog and select (*left-click*) the **All ON** option. This will cause all levels for the selected reference to be turned ON in the views identified at the top of the dialog.
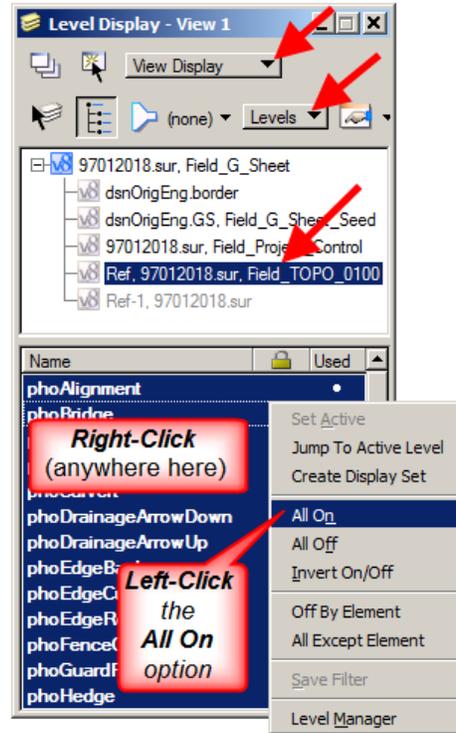
18.) *Click* the **Fit View** view-command icon to display everything within the open MicroStation view.

19.) Your screen should appear somewhat similar to the picture shown at the right, (less the big red text and arrows).

The G sheets are drawn at the coordinates x=10,000, y=10,000 so they should always appear as a small speck of information at the lower left area of the MicroStation view.

The Survey information will be located at the correct coordinate location, and therefore should always be located somewhere to the upper right direction from the G sheet information.

20.) Use the **Zoom-in**, **Zoom-out**, and **Window Area** view tools, as shown at the right, to enlarge the survey information on the screen.
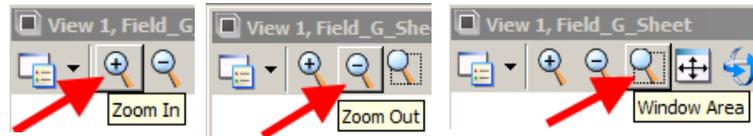
21.) You should now be able to see the legend you created, similar to that shown at the right.

22.) *Click* the **Element Selection** tool, as shown at the right.

Use the **Element Selection – Block** option to select the **Legend** information (and only the Legend information), by putting a block-shape around the data.
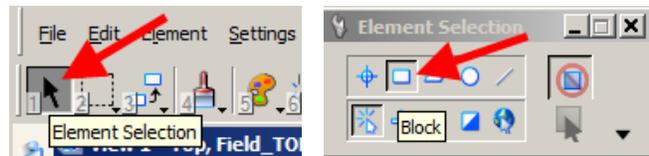
This is done by placing a *left-click* point at each of two opposite corners of the **Legend** data.

When *selected,* the **Legend** information will display in the highlighted color, the same as the Survey elements did when selected in Step 8.

23.) The next operation includes several steps to copy the **Legend** data into the model, and also locate the copied data near the "G" Sheets, located at the lower left corner of the file.

Left-click the MicroStation **Copy** command, as shown at the right.

Left-click somewhere on the highlighted **Legend** information, which will provide MicroStation with a "copy-from" point. The highlighted **Legend** information should now be moving on the screen, wherever the cursor is moved.
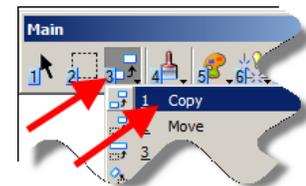

24.) While the highlighted **Legend** data is still connected to the moving cursor, *click* the **Fit View** command, as shown at the right, to show the **G_Sheets** on the screen. They will appear as a small "speck" of data at the lower left corner of the view, as shown in step 19.

25.) Again, use the **Window Area, Zoom-in,** and **Zoom-out** tools to enlarge or reduce the area shown in the view that contains the "G" Sheets. It will be necessary to be zoomed-in close enough to be able to place the copy of the **Legend** data to the left of the "G" Sheets, similar to as shown below.
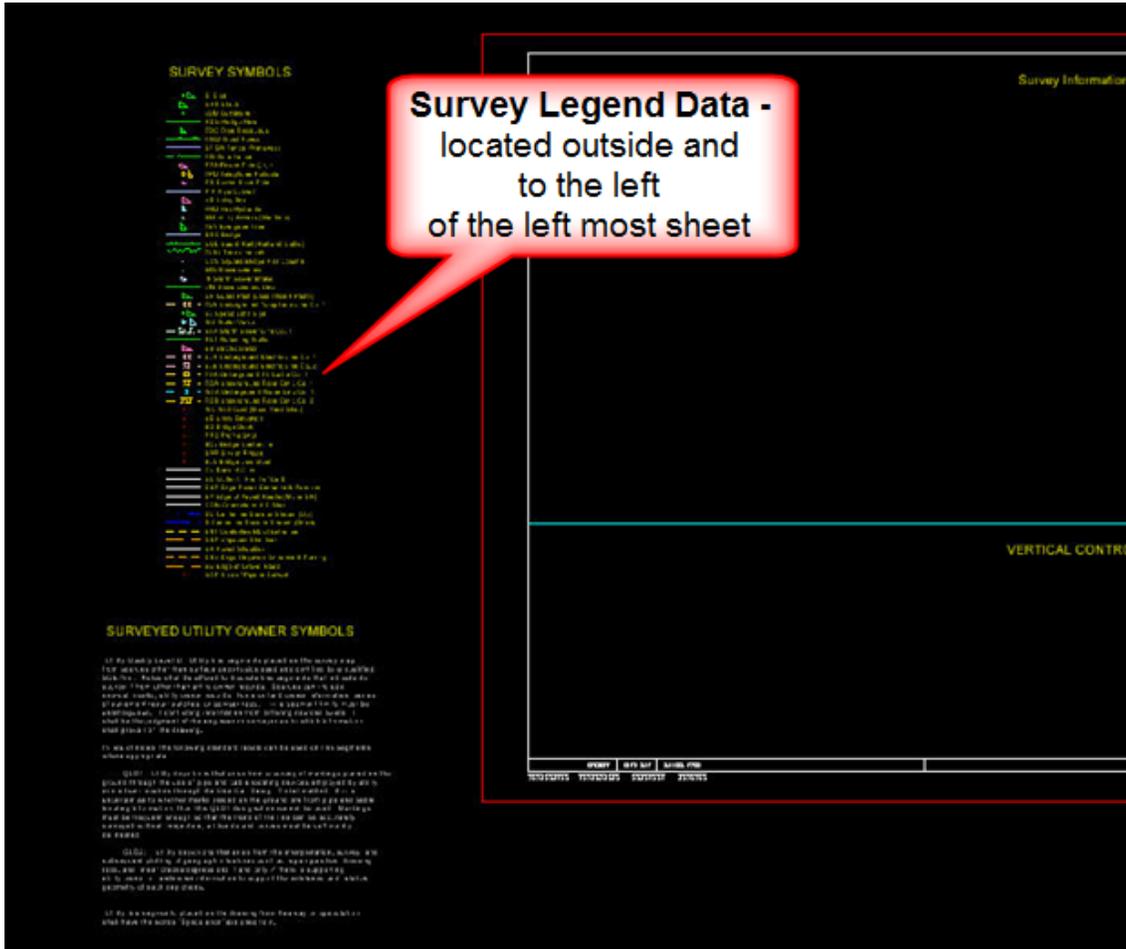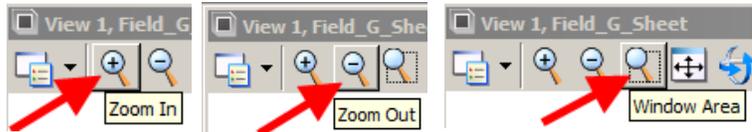
26.) After you have manipulated the view adequately to cause the sheets to appear as desired, *right-click* on the view one time and the **Window Area** or **Zoom** tools will no longer be active. If all steps were done as stated above, the highlighted **Legend** data should still be attached to the moving cursor.

(**NOTE:** If the **Legend** data is not still attached to the cursor, as indicated above, you will have to possibly open a second MicroStation view, find the referenced **Legend** data in that newly opened view, and then re-do steps 22 and 23 to get the **Legend** data back into a **Selection Set** and ready to be copied.)

The **Legend** data should now be present again and attached to the moving cursor. Position the data outside and to the left of the left most sheet, similar to as shown above. When you are satisfied with the position of the data, *left-click* to place the copy at that location. *Right-click* in the view to remove the legend from your cursor so that multiple copies are not accidentally placed into the model. *Left-click* on an empty area on your screen to un-highlight the legend.

27.) The next step is to create the **Field Utility Legend**. You may have to use the **Move** tool to re-position the **Field Located Utilities** text. This all depends on how many symbols were used and the number of utility companies.
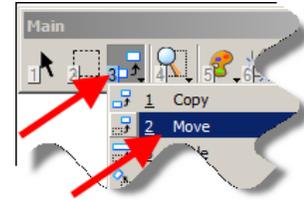
28.) You will now need to copy the individual utility symbols and text from the **Survey Symbols** list, to the Field Located Utilities area.

Click the **Element Selection** tool, as shown at the right.

Use the **Element Selection – Individual** option to select just the Utility items in the list, as shown at the right. Hold down the **Ctrl** key on the keyboard to select multiple items.
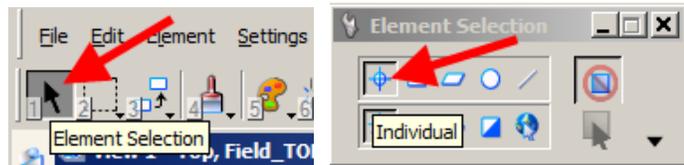
29.) *Left-click* the MicroStation **Copy** command, as shown at the right. *Left-click* once near the on the highlighted items to provide MicroStation with a "copy-from" point. A copy of the highlighted items will now be attached to the cursor. Move the highlighted items to the correct position, similar to as shown below. *Left-click* to place the copy at that location. *Right click* to release the items from the cursor and then *left-click* on a blank area of the screen to un-highlight the items.
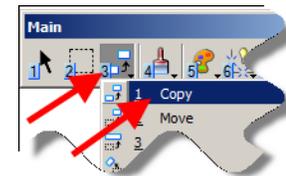
30.) If there are more utility items to copy, repeat steps 28 and 29 as often as necessary to copy all utilities to this location.

If the list has unnecessary and unwanted spaces between the individual utility items, move the items up in the list to produce a neat list appearance, as shown at the right.
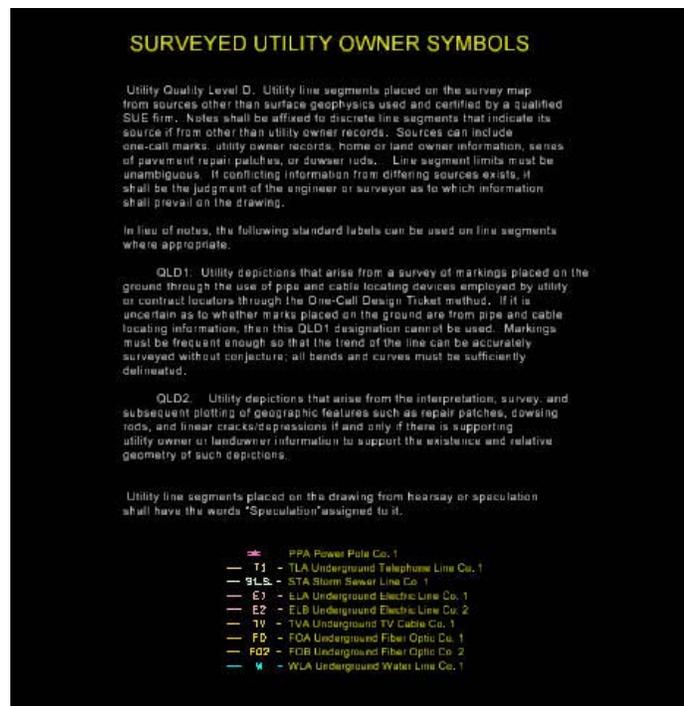
31.) The text descriptions must be edited to replace the generic descriptions with the actual company names. *Click* the MicroStation **Edit Text** command, as shown at the right, and *double-click* on the text that is to be edited.
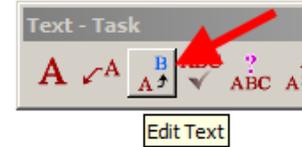
> **NOTE:** There are three **Text Editor Style** options available within the **Workspace > Preferences > Text** settings area, including **Keyin, Dialog Box,** and **Word Processor.** If the setting hasn't been changed, the default will probably be **Word Processor.** You can change this setting as desired. The **Text Editor Dialog Box** is shown below.

32.) After *double-clicking* on the text, the **Text Editor** dialog box will appear. *Highlight* the portion of the text that is to be changed.

33.) Type in the company name and then *click* the **Apply** button. The text in the utility list should correspondingly change.
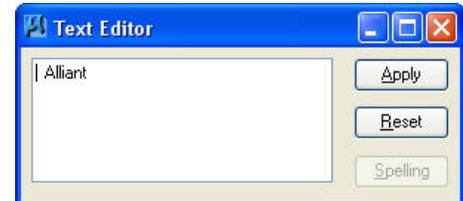
34.) Repeat steps 32 and 33 for each piece of text that is to be changed. When the editing is complete, the utility company area should appear similar to the picture below.
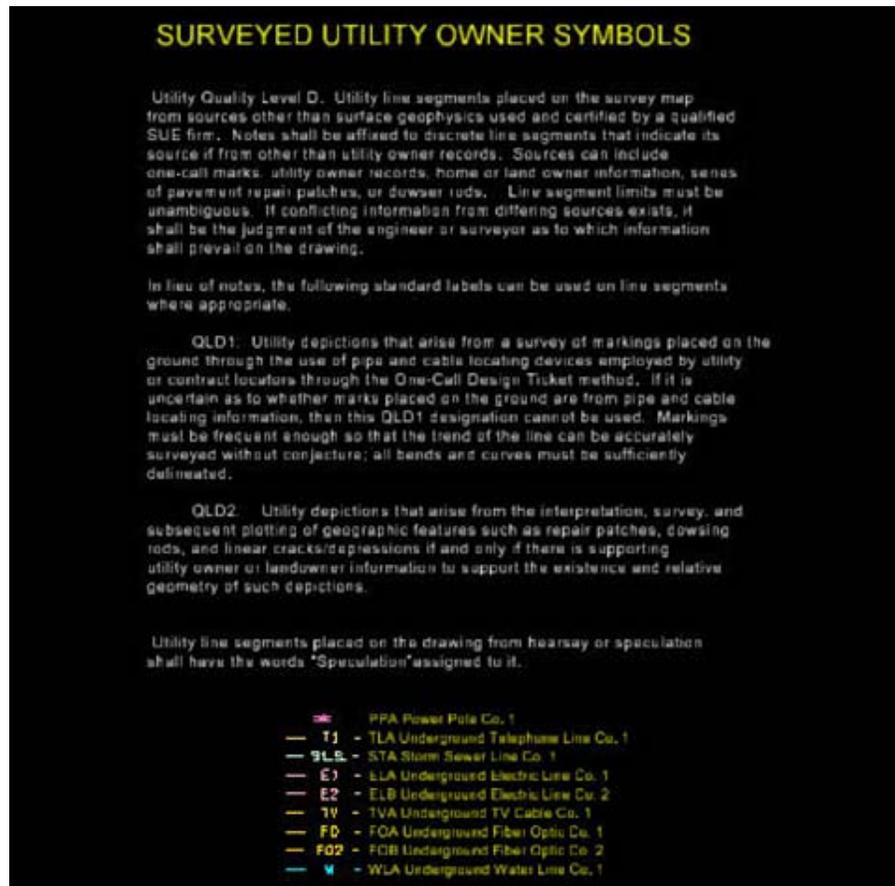
35.) When both the symbol and utility areas are complete in the *G_sheet* model, the legend that was originally placed in the **TOPO** model is no longer needed. *Click* the **Models** button and switch to the **Field_TOPO_0100** model by **double-clicking** on it, as shown above.
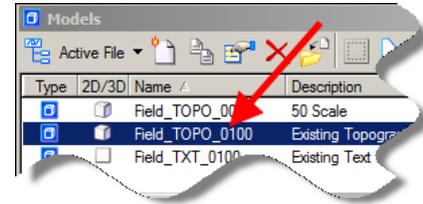
36.) Use the **Element Selection** tool to highlight the **Legend** data.
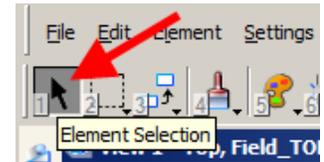
37.) *Click* on the **Delete** button and the **Legend** data will be removed from the model.

38.) The **Field_TOPO_0100** model should now be back in the original condition, as shown at the below.
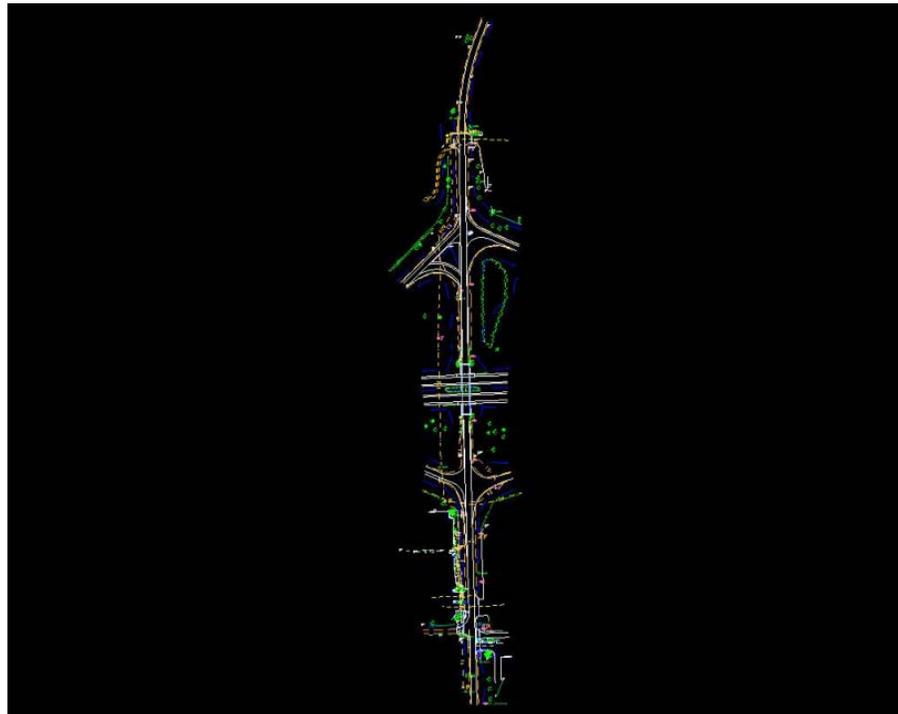
39.) The next step is to create the reference data graphic displays in the control point reference boxes. You will need to switch back to the **G_sheet** model. *Click* on the **Models** button and then *double-click* on **Field_G_Sheet** model, as shown at the right.
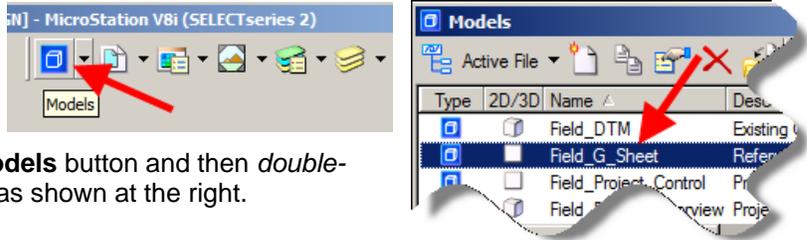
40.) The **Project Control, TOPO,** and **TXT** models must be displayed for the next step in the process. In the **Level Display** dialog, highlight all three references at one time by using a *left-click-hold-and-drag* across all three. Next, *right-click* somewhere on the blue highlighted model names to produce the *pop-up* menu shown at the right. *Click* on the "**Display**" item to place a check (☑) by it so that all three references will be displayed (turned ON).
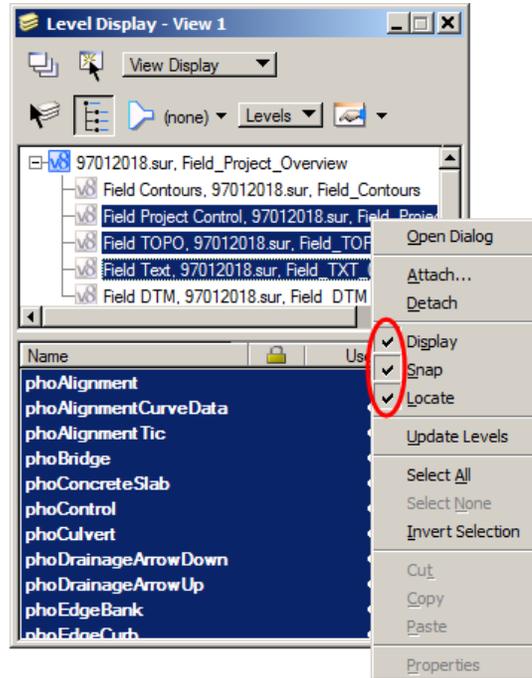
41.) Click on the **Fit View** tool to display all model information in one view. Your screen should appear similar to the view shown in Step 19.

42.) Use the **Zoom** or **Window Area** tools to zoom-in on the survey information, which should be located in the upper right hand corner of the view.
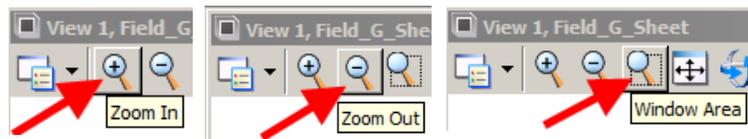
43.) After zooming-in on the location of the first control point, the view may resemble that shown below if all information on all of the levels is still displayed. If so, it should be obvious that there is far more information visible than what would be wanted in a control point reference display box.


44.) To start the process of eliminating unwanted information from the display, *click* the **Level Display** menu item, as shown at the right.

45.) *Select* (highlight) each of the displayed references individually, (**TOPO, Project Control,** and **TXT**), and turn off the levels of the items that are not needed.
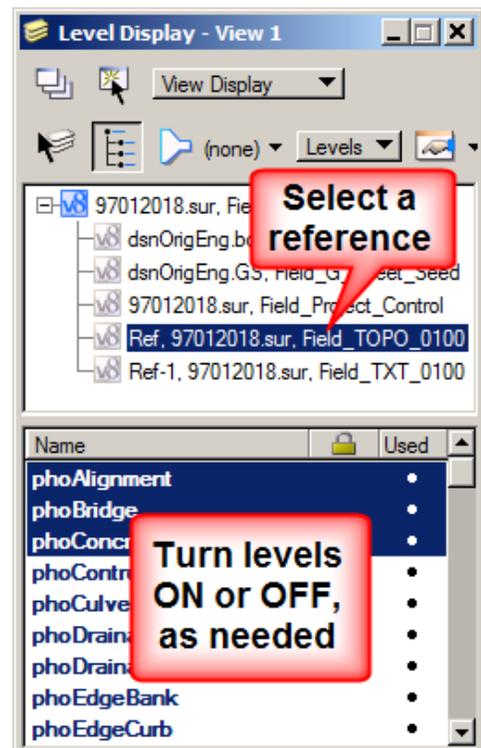
46.) After turning OFF the display
of the unwanted data, the
view should appear a lot
cleaner. But, it will still
display the information that
will help surveyors find the
control point in the future.
All unnecessary data does
not have to be turned off at
this time. There will still be
an opportunity to further edit
the view in a later step.

47.) The tools used to create the reference boxes are found in
D&C Manager. **D&C** can be started in a couple different
ways; from the Geopak **Road Tools** dialog, as shown at the
right, or from the Geopak **Survey** toolbar, under "**Plans
Preparations > D and C Manager"** as shown below.
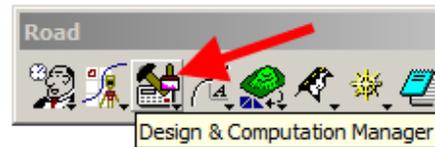
NOTE: Geopak must be activated for
either of the above two options. Refer
to step 9 for details, as necessary.
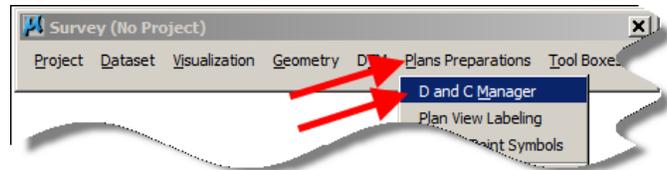
48.) When **D&C** opens, make sure the **IDOTSurvey.ddb** file is attached as shown below. If not, *select*
File > Open to locate and attach the correct file. *Double-click* on the **G_Sheet Tools** item to open
the toolbar.
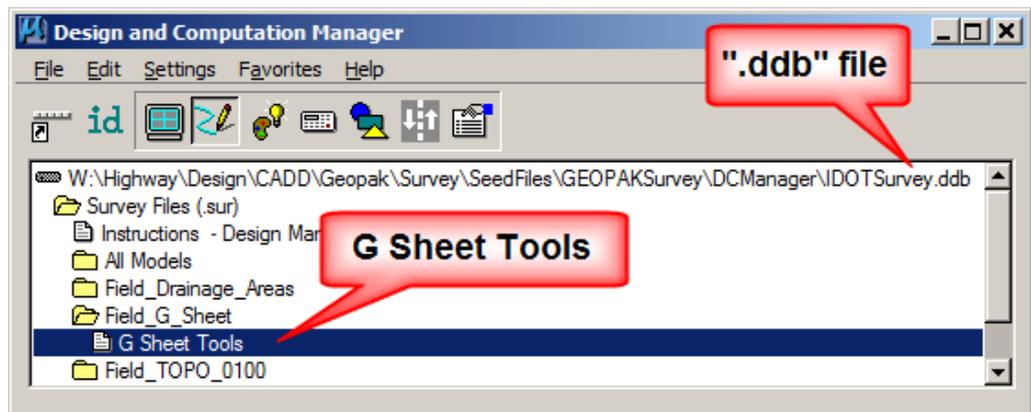
49.) The first step in creating the Control Point Reference is to place a dimension line and distance text from the control point to each reference location. On the **G_Sheet Tools** menu, *single-click* the **Place Line & Distance** item. The tool will now be started.

If the wrong model is open, a message will appear that says "**This tool must be run within the Field_G_Sheet model**".
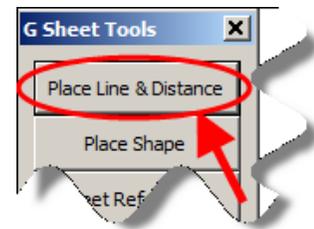
50.) After *clicking* the **Place Line & Distance** item, shown above, watch the prompts at the lower left corner of the screen for step-by-step instructions. The first instruction will be to "**Place Line > Enter first point**", as shown at the right.
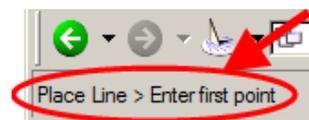
Left-click on the center of the control point circle, as shown at the right. Next, *Left-click* on the center of the reference point circle, which should cause a line to be placed between the two points. *Right-click* to stop the line placement command. After the *right-click, (*called a **Reset**), the line will be segmented and the text showing the distance between the points will be placed in the gap.

The dialog box shown at the right will then display and "ask" if you would like to place another line. If you have more reference points, *click* the **Yes** button and repeat the process by placing another line. When you have completed all lines for the control point, *select* **N**o on the dialog box.
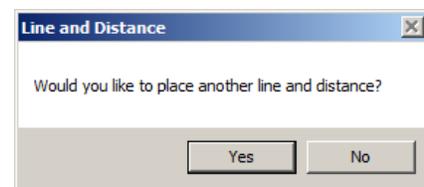
51.) The next step is to place a shape around the reference information for this control point. It will represent the area to be displayed in the "G" sheet reference box for this control point and reference information.

Click on the **Place Shape** button on the **G_Sheet Tools** toolbar, as shown at the right. Create a rectangle by l*eft-clicking* the location of any two opposite diagonal corners of a blue shape that will encompass the data to be shown in the reference box. In a later step, these blue reference boxes will be used to place the control point reference information on the "G" sheets. The chronological order of the control point placement onto the G sheets is determined by the order that the blue shapes are placed into the file. Therefore, the shapes should be created in the proper order.
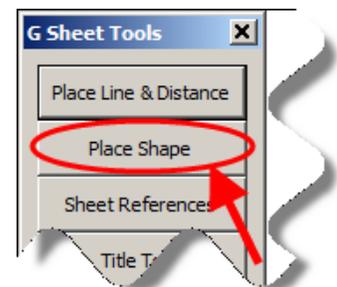
52.) The view, with the blue shape, should now resemble the picture shown below. Repeat Steps 49 through 51 for each control point that is to be placed on the G sheets.
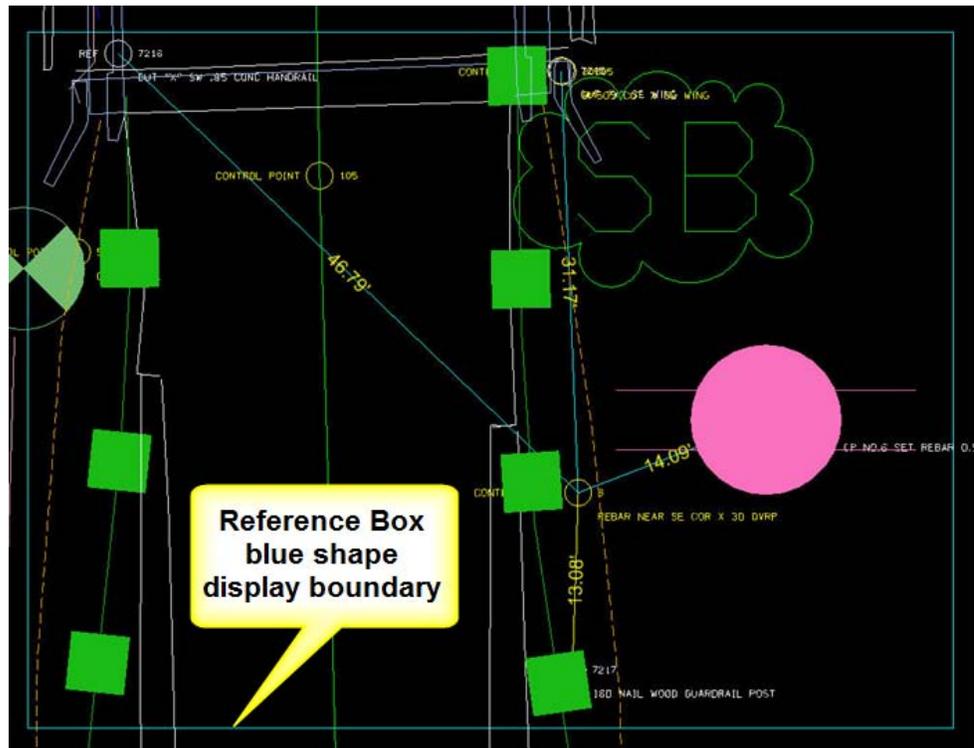
53.) If a control point falls outside the normal survey corridor, the reference information may resemble the simple drawing below, rather than the detailed survey information shown above.
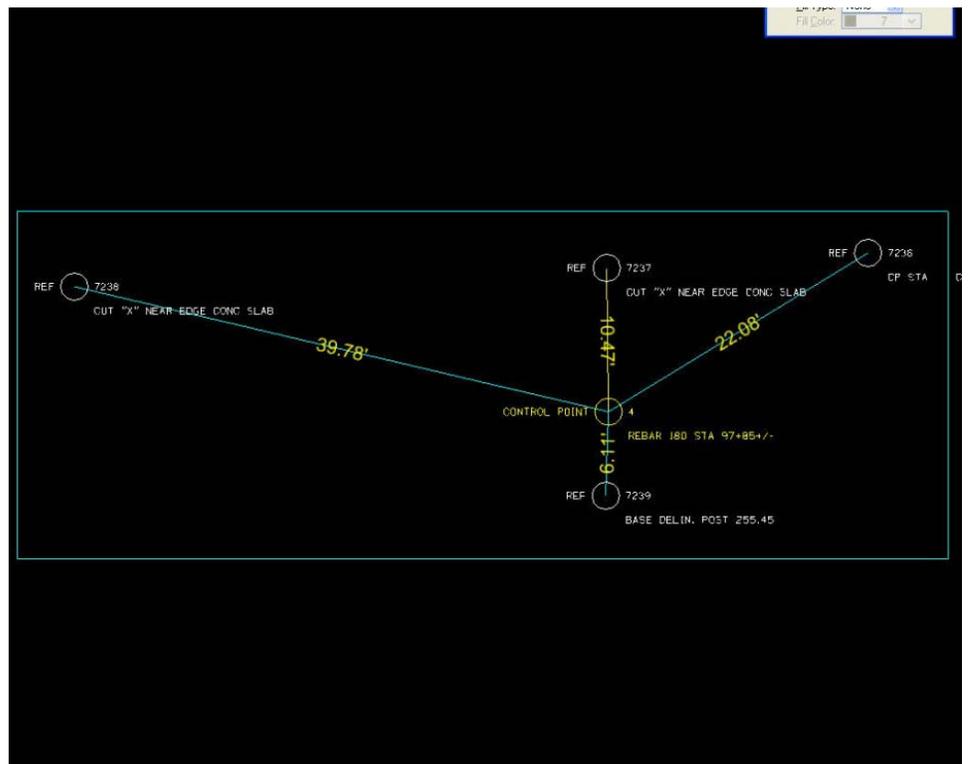
54.) When you have placed all of lines and distances and the blue box shapes, it is time to place the control point reference information onto the sheets. Use the Fit View tool to show everything in the model on your screen.

55.) After using the **Fit View** tool, the sheets should be located in the lower left corner of the view. Use the **Zoom** and **Window Area** tools to *zoom-in* on the "G" sheets.
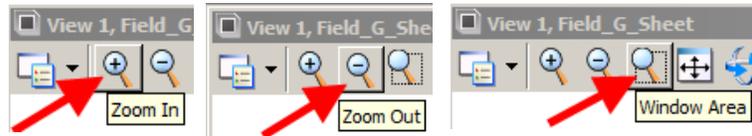
56.) The view should now resemble the one shown below.

57.) *Click* on the **Sheet References** button on the **G_Sheet Tools** toolbar. This will copy the "blue box" control point information onto the "G" sheets.
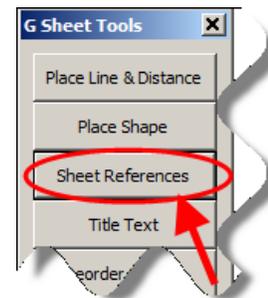
After the reference information has been placed on the "G" sheets, the program will display the "status" dialog, as shown at the right. *Click* the **OK** button to dismiss the dialog box.
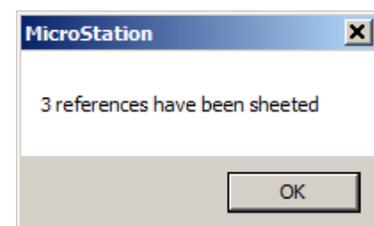
58.) When the reference data placement is complete, the view should resemble the one shown below.

59.) If the references are not in the correct order, *click* on the **Reorder Shapes** button on the **G_Sheet Tools** menu, as shown at the right, and then *click* on the blue shape that should be first on the G Sheet.
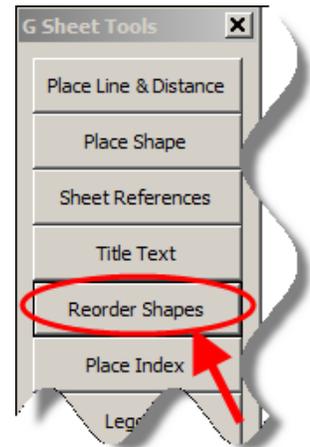
60.) After *clicking* on the shape and then *clicking* on an empty part of the screen to accept it, another box will appear showing the location number the reference will appear on the G sheet. *Click* on the **OK** button. Continue this process for each reference.
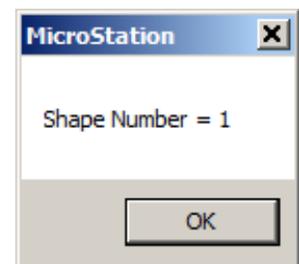
61.) To do some "clean-up" on the control point reference information that was copied to the G sheet, use the **Zoom** tools and the **Window Area** tool to view the first control point in a large enough size to work with.
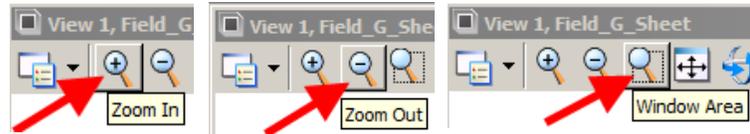
62.) The initial control point reference information could resemble the picture shown below. The survey information could still possibly contain much more data than necessary for a useful control point reference diagram.
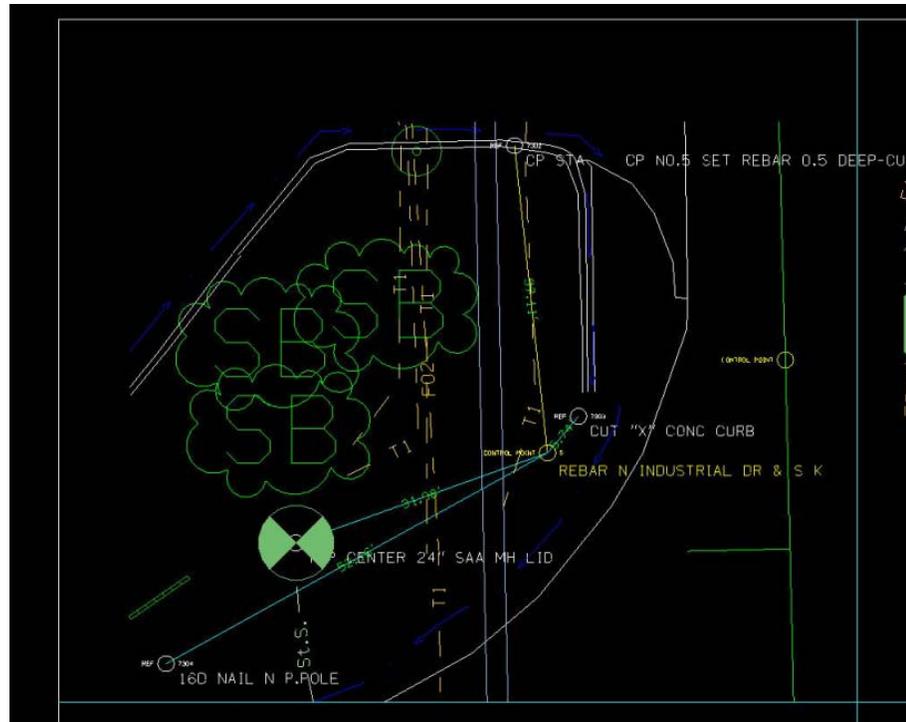
63.) Use the **Delete** tool to remove items that are not important to locating the control point. The display of an underground utility line is an example of an item that should be deleted because it is not useful as a reference item.

64.) Some scalable "symbols" may appear too large. Use the **Scale** tool to make them smaller.
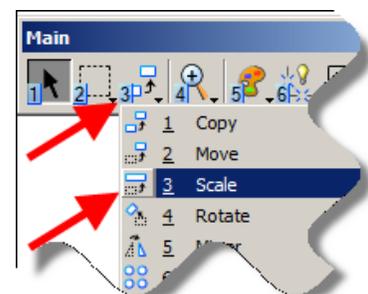
65.) Change the **X Scale** and **Y Scale** to adjust the size of the item. You can place a checkmark (☑) next to **About Element Center.** This will keep the item at the same location after scaling is complete. *Click* on the item and it will be scaled. After *clicking* on the item it will turn to the "highlight color" and a scaled copy should be attached to the cursor.

   NOTE: See step 8 for additional information on Highlight color.
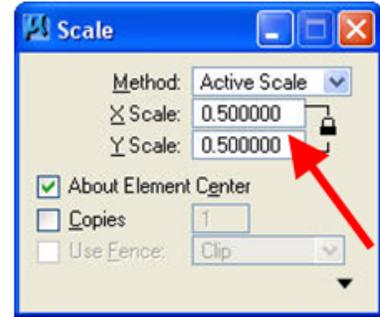
   If the scaled copy that is attached to the cursor looks correct, place a *left-click* on the screen and the original item will be replaced with the scaled version. If the scaled copy does not look correct, *right-click* somewhere in the view and the item will return to the original size. Change the **X** and **Y** scale values and try again.

66.) The reference point text descriptions will originally be one-line text. Use the **Edit Text** tool to change the text string to two lines. Start the tool and then *click* on the text that you would like to change.

   NOTE: Refer to step 32 for the three available **Text Editor** options.
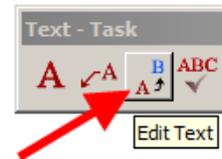
   After *clicking* the text, the selected method of **Text Editing** should display the chosen text. If changing one-line text to two-line text, place the cursor at the point where the second line is to begin and *click* the **Enter** key. This will carry the last portion of the line of text to the next line. When satisfied with the text appearance, *click* on an empty area of the view and the text will be updated. The **Edit Text** tool can also be used to edit spelling.

67.) Use the **Move** tool to adjust the location of the text so that it is readable in the box.
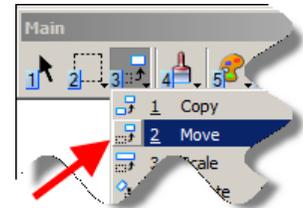
68.) Sometimes the lines do not break on each side of the measurement text. Use the Partial Delete tool, if necessary, to break the line on each side of the text.
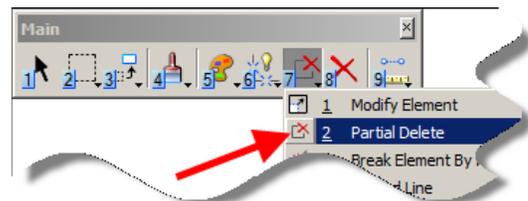
69.) The "cleaned-up" version of the control point reference could look similar to the one shown below. Compare this "clean" version to an earlier semi-cleaned-up version shown in Step 62, or even to the original total-survey-information view shown in step 43.
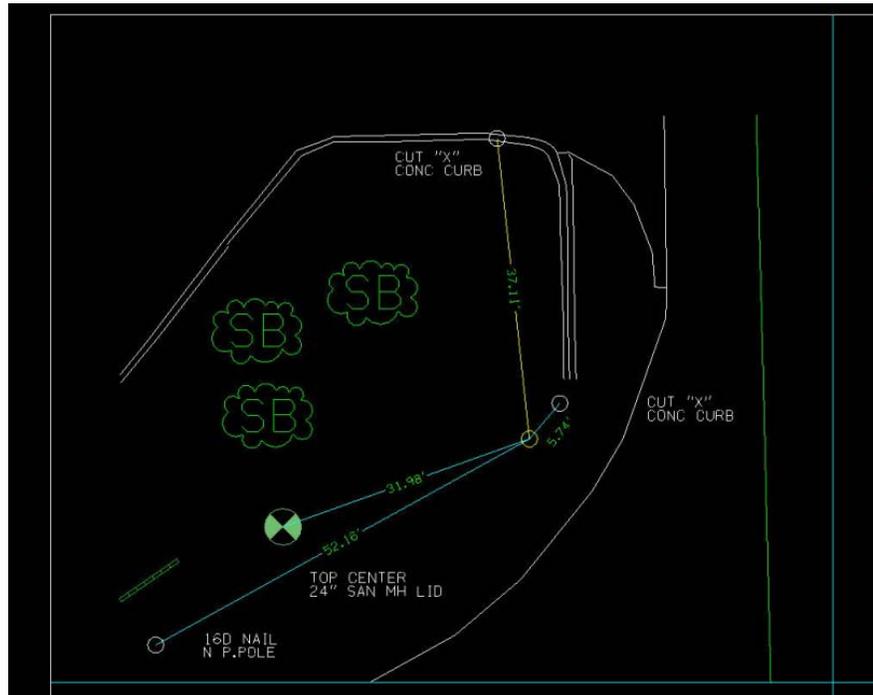
70.) It is now time to place the heading text in each reference box. *Click* the **Title Text** button on the **G Sheet Tools** menu bar, as shown at the right.
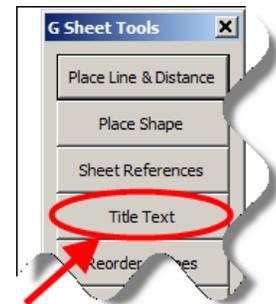

71.) The **Reference Title and Description** box will appear. The first item in this dialog is the **Sheet and Reference #** selection. The numbering for the control point reference boxes starts with 1 in the upper left corner of the reference sheet, increasing from left to right across the row, then continues at the left end of the next row. For the **Reference Title,** enter the type of control point and the station\offset, followed by the alignment name where the stationing came from. In the first **Reference Description** box, enter the control point number, the description of the point, and whether it was **Found** or **Set.** In the last **Reference Description** box, enter the Northing and Easting information for the point. This information can be copied and pasted from the COGO Navigator. When everything is complete, *click* the **Place Label** button.

72.) The control point reference box should now resemble the picture below.
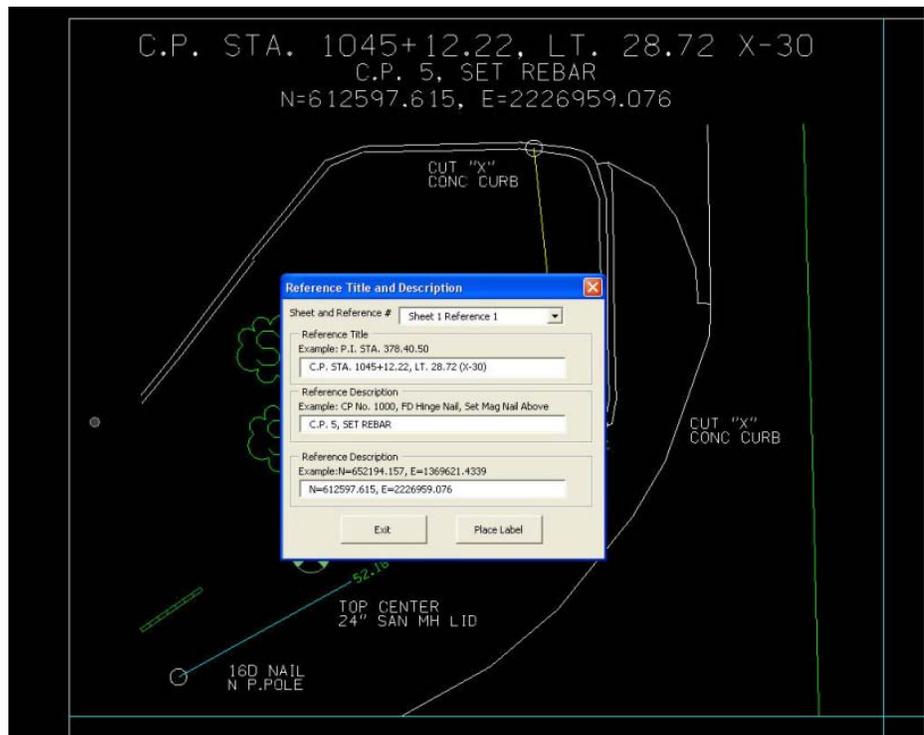

73.) The next step is to place the table that contains the information for all the bench marks used on the job. This will be placed in the Vertical Control area, in the lower part of the sheet, as shown below.
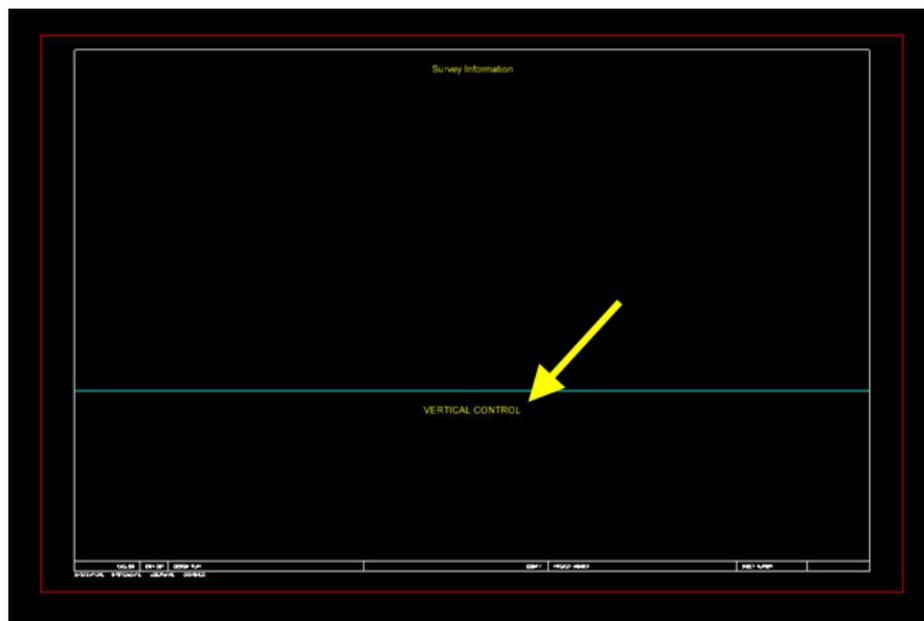
**74.) Start the Place Coordinate Table** tool from the GEOPAK **Survey** toolbar, as shown at the right.
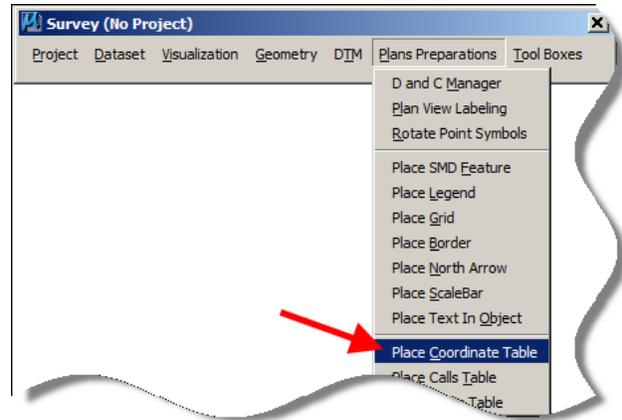
75.) The Place Coordinate Table dialog should resemble the one shown below. Complete the information and settings, as listed below.

1. In the area labeled **Table Format/Column Order**, set the "Text" field order as shown below.

2. Use the *drop-down* list arrow to change the "station compute" value to "**Compute Station value from Ref. chain**".

3. In the "**Chain to measure Station and Offset from:**" field, use the *drop-down* list arrow to *select* the appropriate alignment name.

4. In the **"Select Points for Table or Export"** area, *click* on any of the **Feature** column headers, such as the header **Station**. This will sort all of the points by that particular **Feature** code. Scroll down the list and highlight all of the bench marks (this is not shown).

5. Next, click on the **Station** column heading to sort all of the points by station. Even though some highlighted points may disappear from view while scrolling up and down the list, they are still highlighted.

6. Check (☑) the box next to the **Header** item.

7. Change the **Text Spacing (% of Text Size)** to 75, for 75%.

8. Description on next page.

**9.** Description on next page.

10. Description on next page.
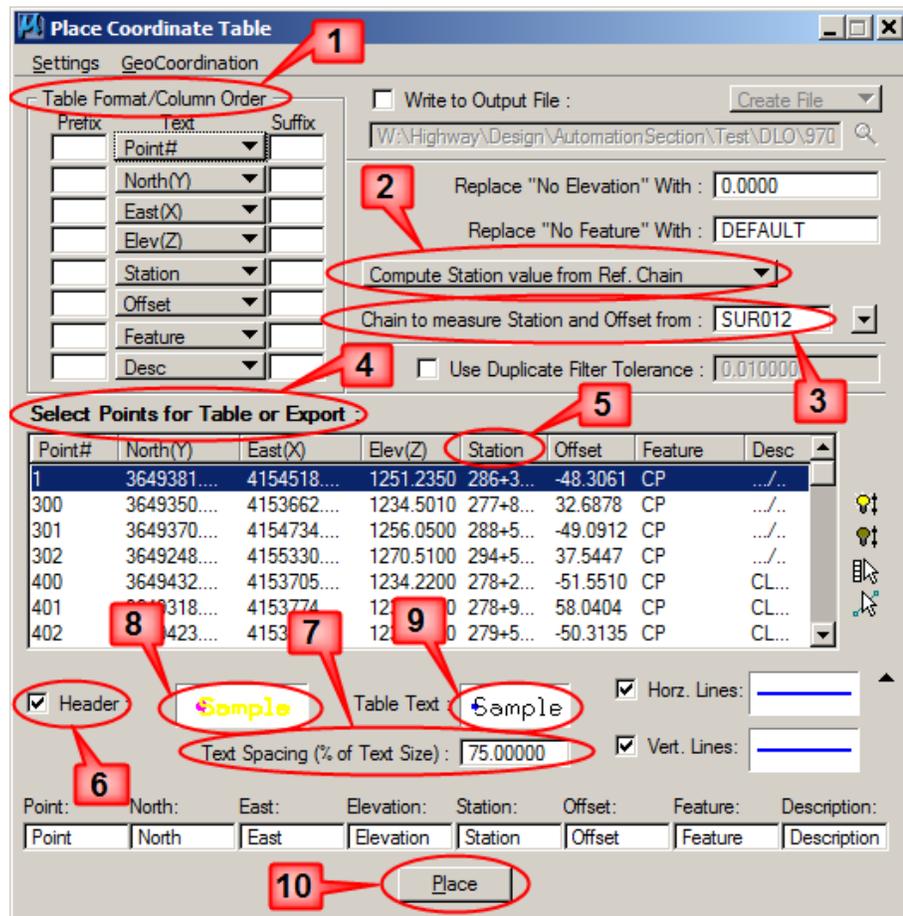
76.) **8.** (See previous page for location of #8.) In the **Place Coordinate Table** dialog, d*ouble-click* on the **Sample** text to the right of "**Header"**. Make sure the text attributes match what is shown at the right. *Click* on the **OK** button to close the box.
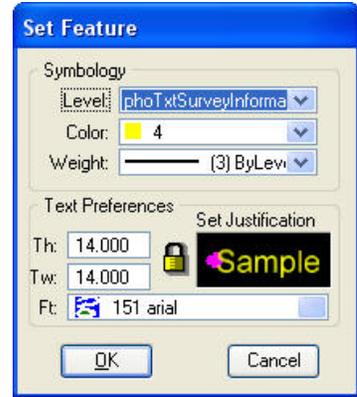
77.) **9.** (See previous page for location of #9.) In the **Place Coordinate Table** dialog, *Double-click* on the **Sample** text to the right of **Table Text:** Set the text attributes to match the ones shown at the right. When complete, *click* the **OK** button to close the dialog box.
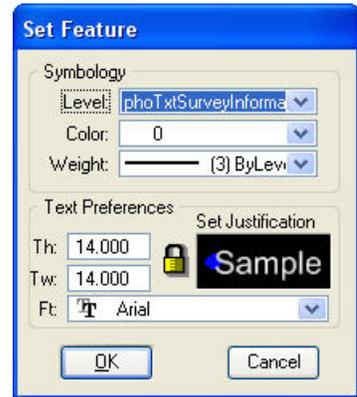
78.) **10.** (See previous page for location of #10.) You are now ready to place the benchmark table onto the G sheet. *Click* the **Place** button on the **Place Coordinate Table** dialog box (shown on the previous page). Place the table on the sheet, as shown below, centered "by eye". You may have to place multiple tables if the bench mark stationing is determined from multiple alignments.

79.) The next task is to place the index information onto the first G sheet. *Click* the **Place Index** button on the **G Sheet Tools** toolbar.

This will cause the **Select File** dialog to open, as shown below.
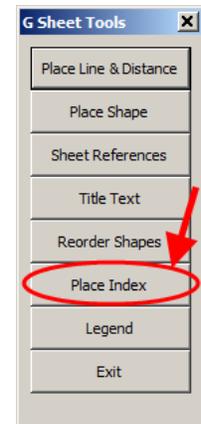
80.) The **Select File** dialog will open to the folder containing the current open MicroStation file.

The **Index File** name will normally begin with the letter "I", followed by the four-digit **Survey and Photogrammetry** (SAP) number, then three additional numbers and the doc" extension, as shown at the right. Locate and open the Index file for the project.
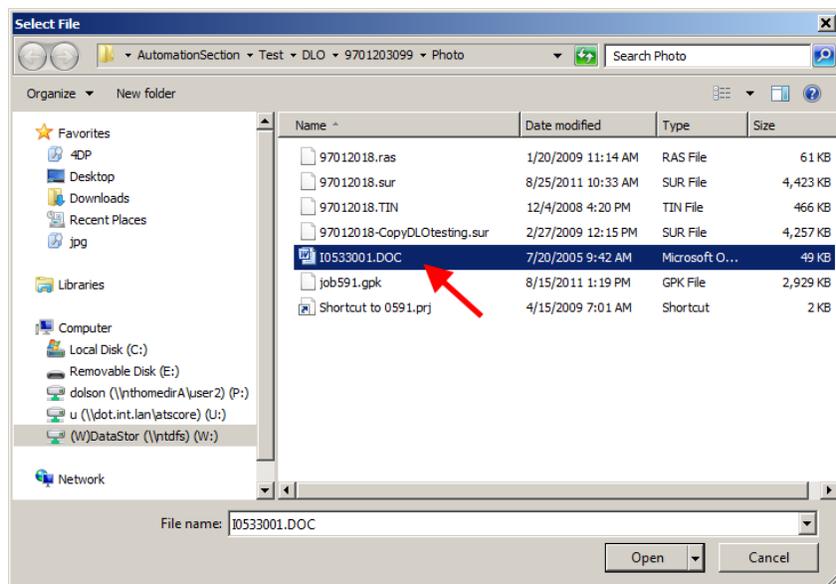
81.) The index information will now be placed to the left of the Survey Symbols.
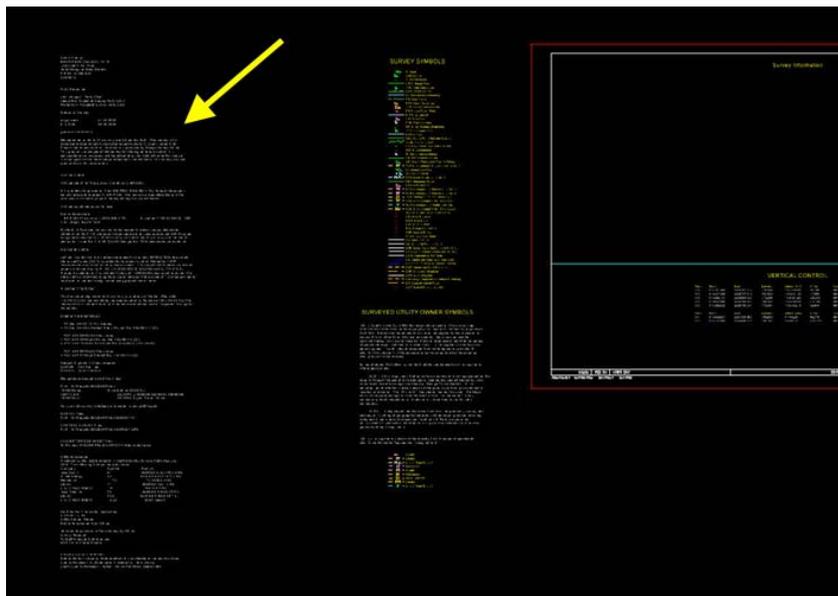
82.) After the Index information has been placed in the file, it is time to copy a portion of it to the first "G" sheet.

Click the **Element Selection** tool, as shown at the right.
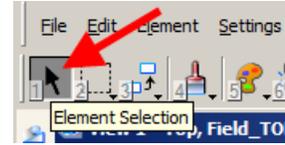
83.) *Select* (highlight) the **General, Vertical, Horizontal,** and **Alignment** information, as shown at the right.

84.) *Select* the **Copy** tool and copy the index information into the Survey Information area on the first "G" sheet.
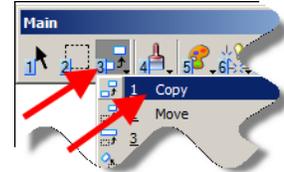
85.) If the data is short enough to only fill one column, center the information on the sheet, similar to as shown at the right.

(The example column data shown at the right is longer than one column length, but it is showing the information as it would look if centered on the sheet.)
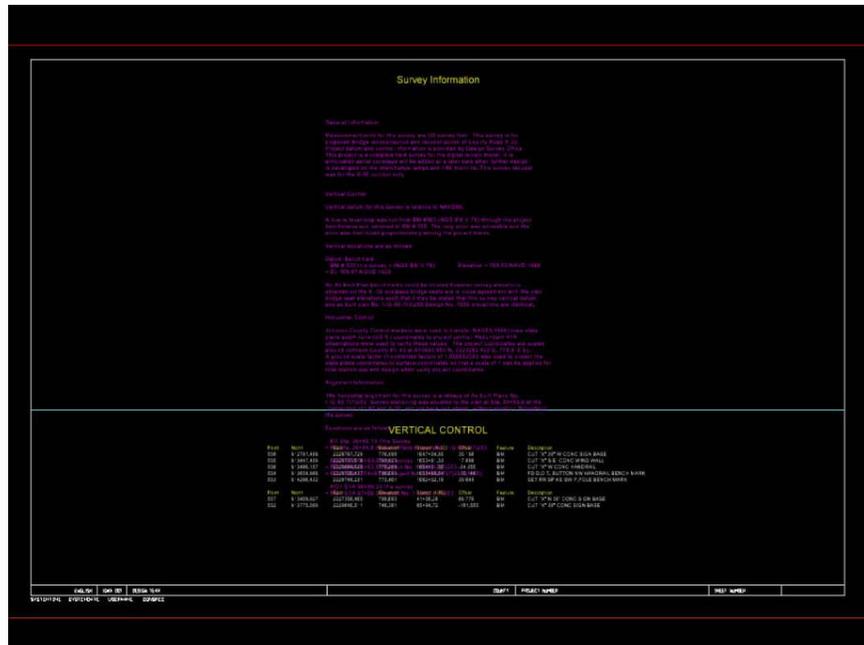
86.) If the index data is long and is to be broken into two columns, the original data should first be aligned at the left-most column location on the sheet, as shown at the right.

Place the data at the left-most column location on the sheet.
This data will be broken into two columns.
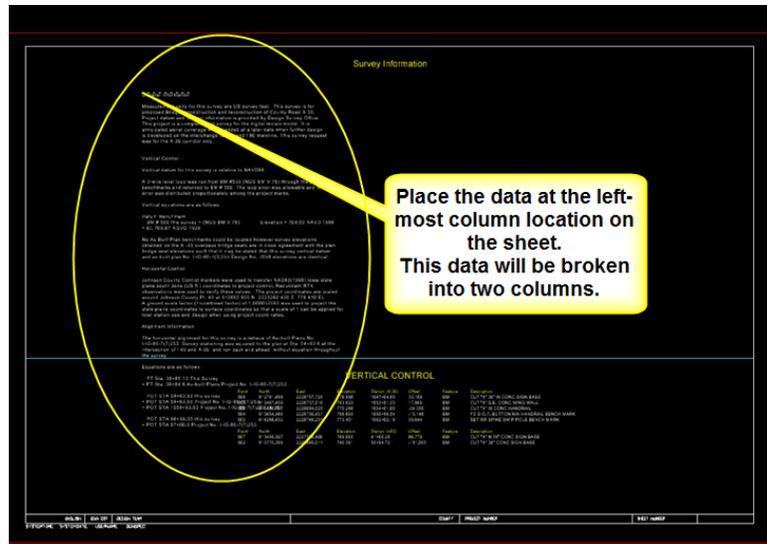
87.) When breaking the data into two columns, a helpful item is a horizontal guide line. This line will be used to help align the top of the columns of data, and to provide an attachment point when moving data to the second column. Use the Place Line tool, as shown at the right to place the temporary guide line, or use AccuDraw if that is your preference.

If using the place line tool, the angle option should be checked (☑), and the active angle should be set to 0 (zero), as shown above.

For the left end-point of the line, snap to the top line of text and begin to draw a line to the right.

(**Snap** definition is below.)

Wherever the right end-point of the line is placed will provide an attachment point for the upper left corner of the second column of text.


Horizontal Guide Line - "Snap" to the end of the top line of text for the first end-point.
Place the second line end-point at the location where the second column of data is to start.
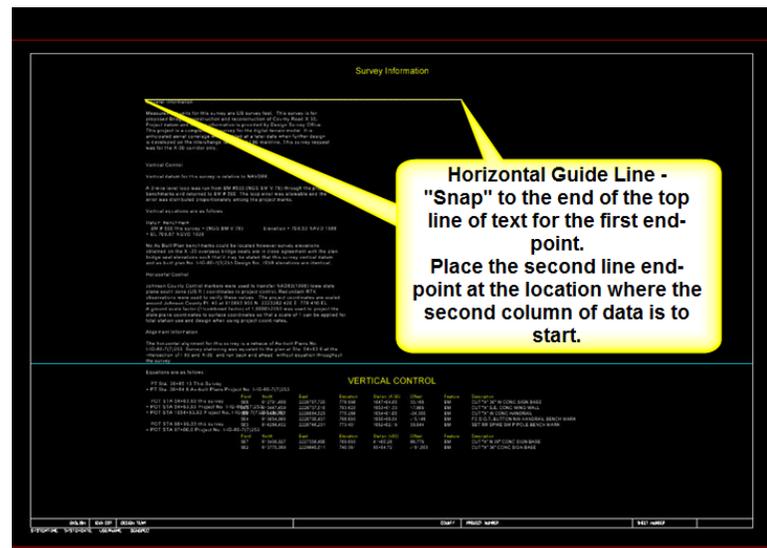
NOTE: The **SNAP** action is the MicroStation method for placing a point exactly at a specific location. There are many different **snap** modes, which can be selected under **Settings > Snaps.** The **snap** mode used here is **Keypoint Snap,** which provides for **snapping** precisely to the end of a line, or to the origin of a line of text, etc. The **snap** procedure is initiated by clicking certain mouse buttons. By default, the left and right buttons pressed at the same time initiates placing a **snap** point. A large "+" cursor will be tentatively placed at the **tentative snap** location. If the **tentative snap** location is correct, accept it with a *left-click.* If the **tentative snap** location is not correct, *click* the **snap** mouse buttons again to select a new **snap** point, and continue until satisfied.
        The mouse buttons that initiate the **snap** action can be reassigned through
                Workspace > Button Assignments > Remap Buttons

88.) Use the **Element Selection** tool, shown below, to *highlight* the data that is to be moved to the second column, as shown at the right. It is preferable to start the second column of text with a new topic, if possible.
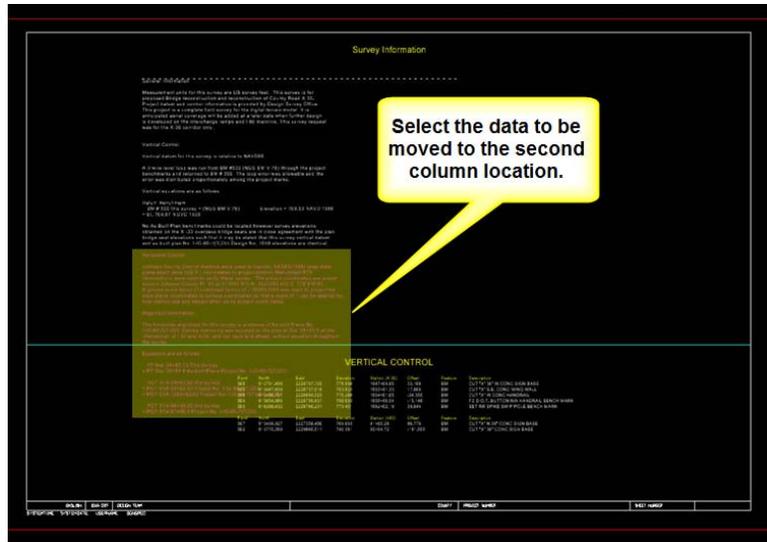
89.) After the data has been selected, *click* the **Move** tool, as shown at the right, to start the "move" process.
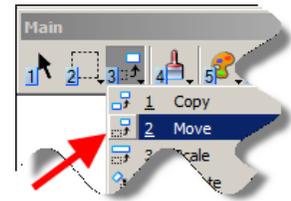
90.) *Snap* to the upper left corner of the highlighted text that is to be moved to the second column, and accept the point with a second *left-click*. A copy of the highlighted text should now be moving with the cursor.

For the Point 2 "move to" location, *snap* to the right end of the guide line and accept the point with a *left-click*. Release the "floating copy" of the text from the cursor by giving a *Reset,* (a *right-click),* somewhere in the view. The second column of data has now been created.
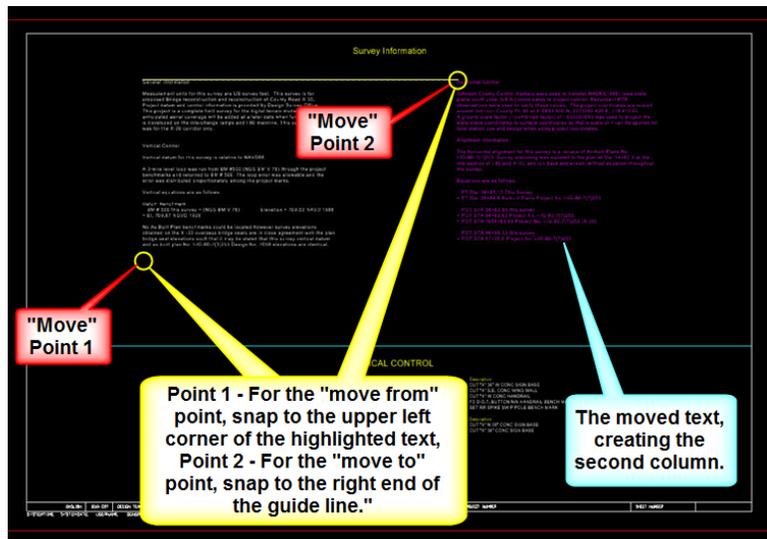
91.) You can now use the **Delete** tool to remove the guide line.

92.) The final appearance of the first G sheet should be similar to the picture below.

93.) If it is necessary to edit any of the active text, the changes can be made in a couple different ways. The text can be edited in a Microsoft Word document and re-imported into the MicroStation file. Or, you can use the Edit Text tool, as shown at the right, to make the changes in the MicroStation file. You can then open the Word document and also make the changes there. Using either of the text editing methods, the Word document and the "G" sheet text should match when completed.

   NOTE: MicroStation text editing is described in step 31.

94.) The creation of the "G" sheets is now complete, and they should resemble the picture below.

Chronology of Changes to Design Manual Section:

040D-015   Completing the G Sheet

9/30/2011   NEW
              New