Roadway Design
Extracting Existing Ground Cross Sections

This document outlines the following steps:
- Sampling existing ground from a surface
- Viewing existing ground cross sections
- Importing existing ground cross sections into a drawing

Initial Setup
- You must be attached to the correct Land Desktop project database.
- You must have defined all horizontal alignments.
- You must have a good existing ground topo and Land Desktop surface built
- You must have set the correct horizontal and vertical scales in the "Scales" tab under Projects→Drawing Setup
- You must have set the current alignment
- You must have set the current surface
- You must have loaded the Civil Design Menu Palette or Workspace

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Sampling Existing Ground From a Surface

Sampling the existing ground serves two purposes:

- To import cross sections into drawings for plotting

- To apply proposed roadway data (vertical alignments, cross section template data, cut/fill slopes, etc.)

Cross sections can only be viewed or imported into a drawing for stations that have been sampled and will be as wide as the "Swath Width" established during sampling.

Proposed roadway data will only be applied and can only be viewed in cross sections at sampled stations.

For instance, assume that the proposed high point of a road is at station 12+12 and falls in the middle of a long tangent section of the horizontal alignment. Unless you specifically sample station 12+12, Land Desktop will only sample at station 12+00 and station 12+20 (Using 20' for default sample increment for tangents) and will skip over station 12+12. Land Desktop will assume a constant transition between the points on the template applied at station 12+00 and 12+20.

Therefore, it is important to put some thought into the Section Sampling Settings and make sure to sample all critical stations along the alignment.

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1. Go to Cross Sections> Existing Ground> Sample From Surface
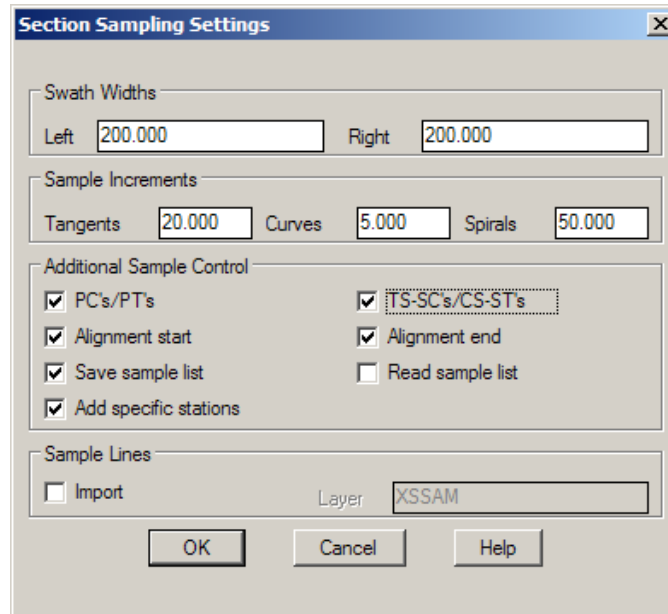
a. Swath Width – This is the distance left & right of the centerline to be sampled. You may approach this setting differently based on whether you plan to import the existing ground cross sections into a drawing to be plotted or if you are simply using the sampled data to design a roadway.

    If you want to import the existing ground cross sections into a drawing for plotting, set the Left and Right to the desired distance left and right of the centerline.

    However, if the sampling is to be used for proposed roadway design, the swath must be wide enough to contain the entire width of the proposed cross section – including ditches and cut/fill slopes. For this process, make the swath as wide as possible (as shown in picture above).

    The next settings for <u>Sample Increments</u> and <u>Additional Sample Control</u> determines how often and at what points along the alignment that the existing ground will be sampled.

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   b. Sample Increments –
      1) Tangents – Sampling at 20.0′ is sufficient.
      2) Curves/Spirals – Sampling at 5.0′ is recommended to closely approximate horizontal or spiral curves.

   c. Additional Sample Control – Always place a check in the box to:
      1) Sample PC's/PT's
      2) Sample TS-SC's/CS-ST's
      3) Sample Alignment start
      4) Sample Alignment end
      5) Save Sample List – Once sampling has been done, the complete list of sampled stations is saved in a file in the <Land Desktop Project>\align\<alignment name> folder and is named <alignment name>.smp. This file can be edited through Notepad and then used for sampling by selecting the "Read Sample List" radio button in the Section Sampling Settings dialog box.
      6) Add specific stations – Depending on project conditions, you should always sample the following stations on the alignment:

        i. 0.1′ inside each end of the alignment

   Example: If the starting and ending stations are 0+00 and 19+78.58, sample stations 0.1 and 1978.48.

        ii. At the point of intersection with other roads

        iii. At the high and low point of proposed crest or sag vertical curves

        iv. At the PC/PT of either the edge of pavement or back of curb for all intersections and cul de sacs

        v. At the start and end of a median

        vi. At the edge of pavement or back of curb of all horizontal transition points.

        vii. 0.1′ before and 0.1′ after a template change – It is recommended that you keep notes (and keep them with other project-related notes) that detail station and template settings/changes for each alignment.

          Example: You have a change from a template without a sidewalk to a template with a sidewalk at station 12+13. Sample stations 1212.9 and 1213.10.

2. After completing the dialog box, click on "OK" to finish.
3. Press the "Enter" key to accept defaults when prompted for the beginning and ending stations to be sampled.
4. Next, you will be prompted to "Enter Critical Station (or Point):".
   a. The default prompt, "Enter Critical Station" requires you to enter the station in decimal format. Of the list of specific stations to be entered (from Step 1c), use this method for:
      i. 0.1' inside each end of alignment – refer to command line to see starting and ending stations
      ii. High point/low point station of proposed vertical alignments
      iii. 0.1' before and 0.1' after a template change
   b. After typing in the specific stations, type "P" at the command prompt to allow you to use OSNAPs to pick points in the drawing and allow the software to determine the station. Of the list of specific stations to be entered (from Step 1c), use this method for:
      i. The point of intersection with other roads
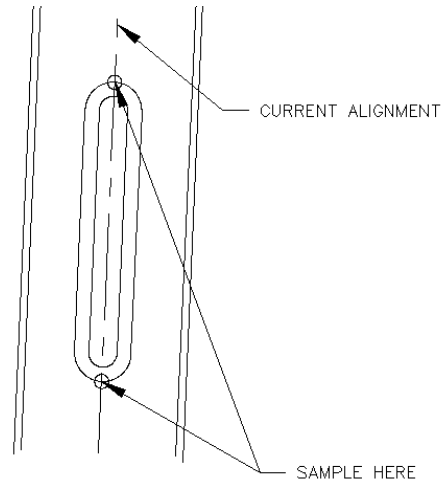   ii. At the PC/PT of either the edge of pavement or back of curb for all intersections or cul de sacs – see below
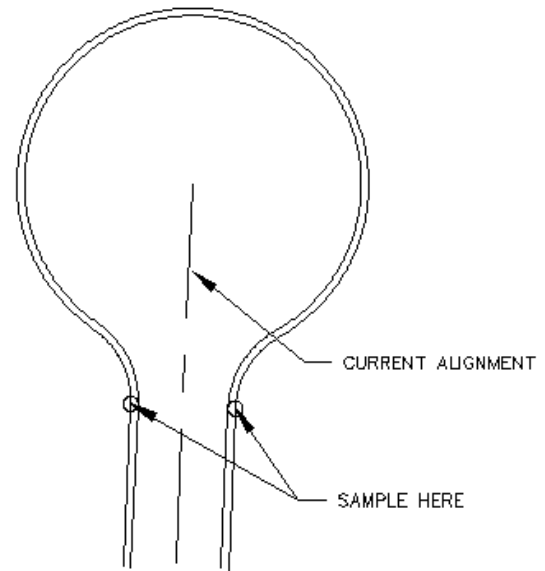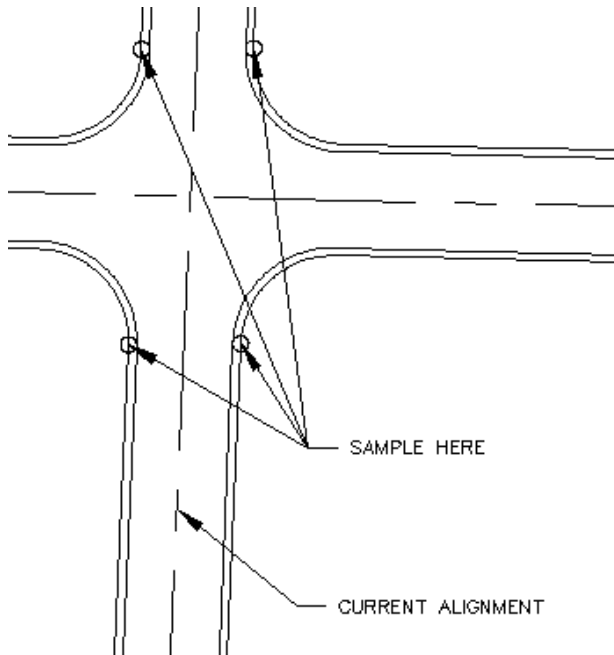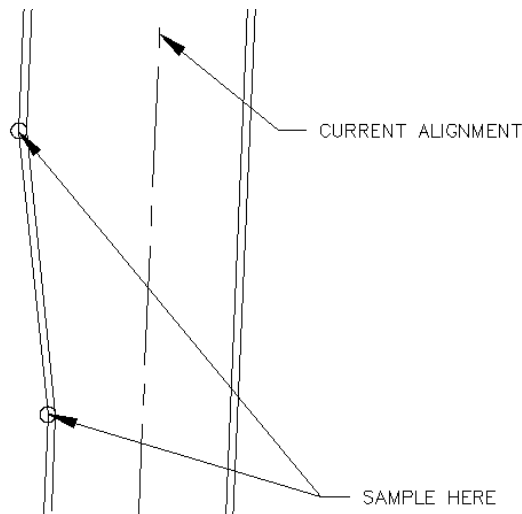
Enter Critical Station (or Point) – Continued

      iii.   At the start and end of a median (if applicable)

      iv.   At the edge of pavement or back of curb of all horizontal transition points.

5. After entering the station or selecting the points, pressing "Enter" an extra time to finish.
6. If this is the first time you have sampled the surface for this alignment, the command line will return a message similar to this:

```
Starting station: 0+00        Ending station: 8+08.31
You have sampled sections for 808.3125 feet of alignment.
```

7. If this is NOT the first time, you will also receive the following message:

```
"Overwrite existing section data [Yes/No] <No>: "
```

Answer "Yes" to this question in order to save the newly sampled data.

Roadway Design
Viewing Existing Ground Cross Sections

This process is typically done after applying proposed grading but can be beneficial after sampling existing ground cross sections to identify any problems with the existing ground surface.
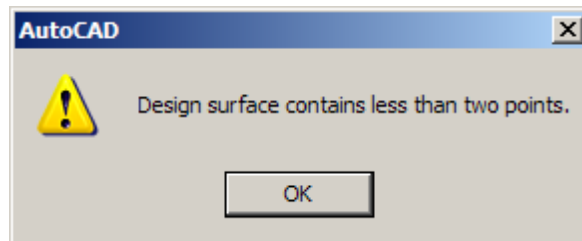
1. Go to Cross Sections> View/Edit Sections

   Possible Errors and Warnings

   - If you have not yet defined a proposed vertical alignment, you will receive the following message at the command line:
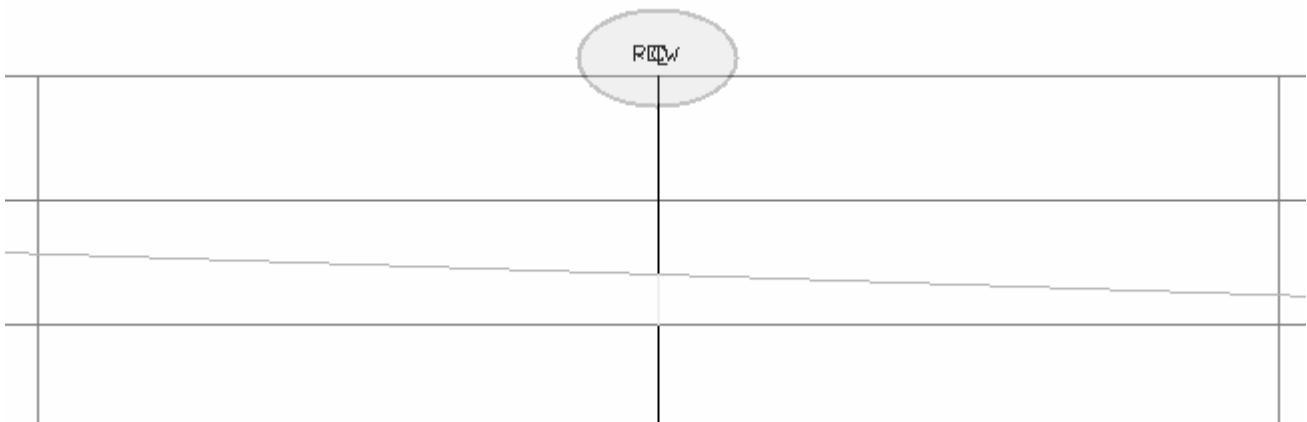
     "No vertical exists"

   - If you have defined the proposed vertical alignment but have not yet applied proposed grading (templates) you will receive the following error message:

     You can click on "OK" to continue.

   - If you have not yet defined the Right of Way width (through Design Control> Slopes) you will see the "ROW" and "CL" notations on top of one another in cross section view.

     Even if you do are not ready to apply proposed grading at this time, you can fix the Right of Way by:
     - a. Cross Sections> Design Control> Edit Design Control
     - b. Click on "OK" to accept the station range
     - c. Click on the "Slopes" button
     - d. Change the Right of Way offset for left and right sides and then click on "OK"
     - e. Click on "OK" to ignore all error messages

2. At the command line, you will see the station being viewed and the menu.

    ```
    Sta: 0+00   Section View & Display commands
    Actual/Design/Edit/Id/Next/Previous/eXit/Sta/View/Zoom <Next>:
    ```

3. Pressing "Enter" accepts the default menu item of "Next" which will progress you to the next sampled station.
4. Entering a "P" for "Previous" will revert you to the previously sampled station.
5. Entering an "S" for "Station" will take you to the next sampled station beyond the station you entered. For instance, if you type in "113.21" but have only sampled at 110.00 and 120.00, you will view station 120.00.
6. Because your standard Panning and Zooming with the wheel mouse is not available, you must use the "Z" option for "Zoom" in this menu. After typing "Z" and Enter, you'll be in the Zoom menu with a new set of options as shown below:

    ```
    Zoom [All/In/Out/Point/eXit/View/Window] <In>:
    ```
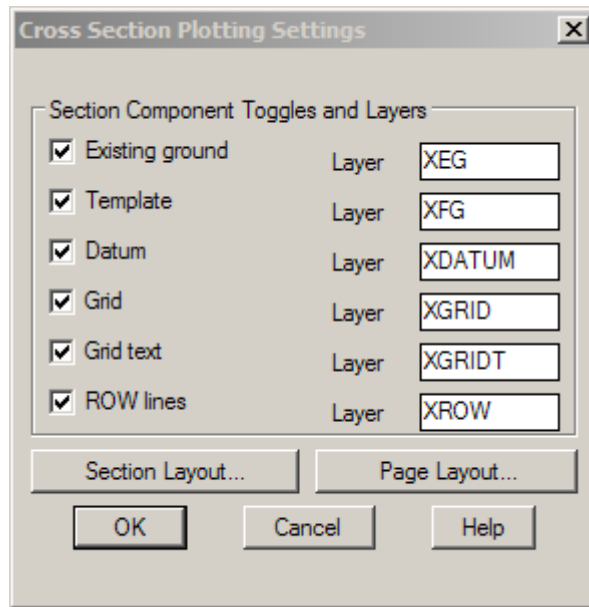
    You can exit the Zoom menu by typing "X" for "eXit" at the command line. This returns you to the main "View/Edit" menu.
7. Exit the View/Edit Sections menu by pressing the ESCape key or typing "X" for "eXit" at the main menu.
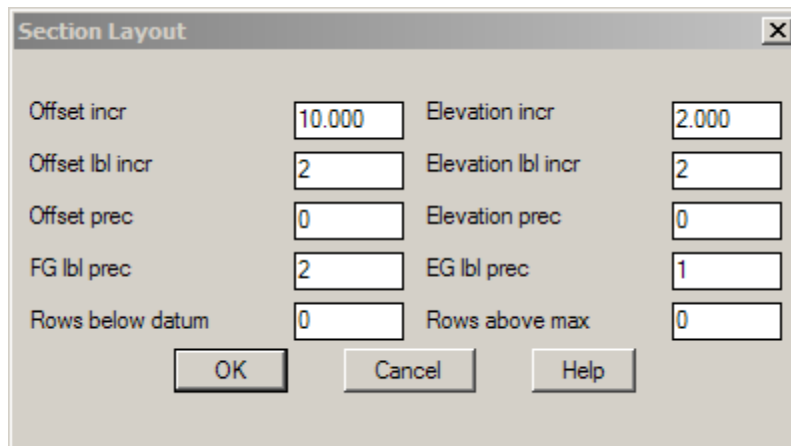
Roadway Design
Importing Existing Ground Cross Sections Into A Drawing

1. Go to Projects> Drawing Setup – Scales tab to make sure horizontal and vertical scales are set properly.
2. Go to Cross Sections> Section Plot> Set Text Style to set the current text style.
3. Go to Cross Sections> Section Plot> Settings to open the "Cross Section Plotting Settings" dialog box. Placing a check in the box next to the Section Component means that component will be drawn in each cross section on the layer specified.

Cross Section Plotting Settings

Section Component Toggles and Layers

☑ Existing ground   Layer   XEG

☑ Template   Layer   XFG

☑ Datum   Layer   XDATUM

☑ Grid   Layer   XGRID

☑ Grid text   Layer   XGRIDT

☑ ROW lines   Layer   XROW

Section Layout...   Page Layout...

OK   Cancel   Help

4. Clicking on the "Section Layout…" button allows you to specify offset (vertical grid lines) increments and precision, elevation (horizontal grid lines) increment and precision, elevation text precision and number of horizontal grid lines.

Section Layout

Offset incr	10.000	Elevation incr	2.000
Offset lbl incr	2	Elevation lbl incr	2
Offset prec	0	Elevation prec	0
FG lbl prec	2	EG lbl prec	1
Rows below datum	0	Rows above max	0

OK   Cancel   Help

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Plot Settings - Continued

5. Clicking on the "Page Layout…" button allows you to specify sheet settings such as paper size, margins, spacing and number of sheets in each column for importing pages.

Page Layout	
Sheet height	24.000
Sheet width	36.000
Left margin	1.000
Right margin	1.000
Top margin	1.000
Bottom margin	1.000
Column spacing	4
Row spacing	4
Vertical sheets	4

OK   Cancel   Help
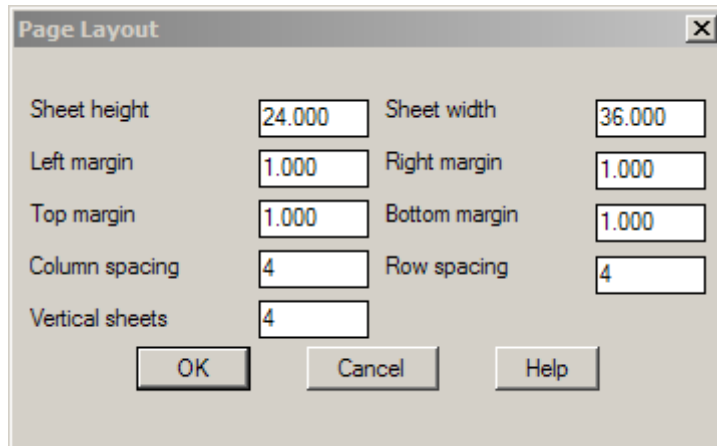
6. After completing all settings, you can import cross sections to the drawing:

   a. One at a time by: Cross Sections> Section Plot> Single and then by specifying the station.
   b. A page at a time by: Cross Sections> Section Plot> Page> S (For Single) and then specifying the first station.
   c. Multiple or All sections divided onto pages by: Cross Sections> Section Plot> Page> M (For Multiple) and then specifying station range.
   d. All sections NOT divided onto pages by: Cross Sections> Section Plot> All.