Carlson RoadNET:

Training for Engineers

LESSON 1: PREPARATION

Copy the **<project>.CRD** file from the Getac Controller (***Program Files/SurvCE/Data/***) to the ***C:/Carlson Projects/<project name>*** *folder*
Open Carlson Civil Suite and Save default drawing containing the basic Carlson Settings required ***C:/Carlson Projects/Project Name /Project Name***.
Check Settings Menu [**Drawing Setup**].
Set Units to **Metric**. Set Coordinate System to **Grid, UTM, WGS84, Zone 51. E120-126 deg**.
Press "**OK**".
Select **Civil** from the **Carlson Menus** menu.
From **Points** menu, select **Set Coordinate File**, Select ***/<project name>*** from the panel on the right. Press **OK.**
From **Points** menu, Select **Draw-Locate Points**, Press the **Draw All** button
Next draw a **Polyline** connecting all the **CL** (centerline coded) points beginning at the starting point for the new road..

RoadNET requires an existing surface model.
Select the **Surface** Menu, Triangulate and Contour.
Select **Contour** tab
Select **Labels** and untick **Add Labels**
Select **Triangulate** tab Set **<Project Name> Existing**
Press **Select**
Press **Save**
Click **OK**
NOTE: The following process shows how shrink wrap works
Select **Draw** Menu, **Shrink Wrap Entities**. Set to **Medium** shrink wrap
Click **OK**
Select **View** Menu, **Freeze Layer by Pick**. Select a contour line, press **Return**
Save the drawing.

LESSON 2: Start Road Network and Configure Settings

From the **Roads** menu, select **Road Network** to create a **New** Road Network. (.RDN) file.
After creating the Road Network file, the **Road Network Task Pane** loads as a docked dialog-box on the left side of the drawing screen.
Configure the **Road Network** by *picking the* **Settings** *button* and displaying the **Road Network Settings** dialog box. In the **Process Options** tab, *pick the* **Existing Surface** *button* and browse to and select the Existing Ground Surface (.TIN or .FLT) file to be used for the project..
Next, *switch to the* **Output Options** *tab* and *pick the* **Setup** *button* next to **Triangulate and Contour**. *Select the* **Write Triangulation File** *option* and then *pick the* **Browse** *button* to set the path and filename for the design Surface (.TIN) file for the Roads.
Also in the **Output Options** tab, *pick the* **Output File Defaults** *button* to display the **Output File Defaults** dialog box. *Pick the* **Output File Defaults** *button* to specify additional Centerline (.CL), Profile (.PRO) and Section (.SCT) files to be saved when "**Processing**" the Road Network.
Next, review the **Report Options**, **Display Options** and **Transition Defaults** tabs of the **Road Network Settings** dialog box and make any necessary changes.
Pick the **OK** *button* to close the **Road Network Settings** dialog box and then *pick the* **Save** *button* on the **Task Pane** to save the settings to the Road Network (.RDN) file.

LESSON 3: Add Roads to the Network

In the project tree, highlight **Roads** and right-click and choose **Add Road**.
After picking the **Add** button, the **Add Road** dialog box provides two methods for adding a Road to the Network. *Pick the* **Screen Pick Polyline** *button*.
The prompts then switch to the Command: line where you are prompted to *Select Centerline Polyline* in the drawing. At the next prompt, *pick the* **Assign Centerline File to Polyline** *button* and set the path and filename for the new Centerline (.CL) file.
Immediately after creating the new Centerline file, the **Profile to Use** file dialog box is displayed. In this box, you must set the path and filename for the proposed Profile (.PRO) file for the Road. By default, the new Profile (.PRO) file is named the same as the Centerline (.CL) file.

After specifying the Centerline (.CL) and Profile (.PRO) files for the Road, the **Edit Road** dialog box is displayed. The only other **Required Input File** is a Template (.TPL) file. *Pick the* **Template** *button* to browse to and select the desired Template file.

The **Edit Road** dialog box serves as the "manager" for all files relating to the specific Road. The **Edit** button in the **Road Name** area of the **Road Network: Task Pane** also displays the **Edit Road** dialog box.

Pick the **Edit** *button* to the right of the **Profile** button to open the **Road Profile Editor**.

In Carlson's **Road Network** feature, the initial design Profile is automatically generated and has only a starting and ending PVI – with the elevation at both ends tying into existing ground. The movement of the crosshairs is locked to the design Profile. The initial PVIs can be seen in the profile-grid-view where the existing ground Profile is shown in red and the design Profile in white. The initial PVIs are shown in the table-view with the "PVI Description" indicating the PVI elevation is tied to the "TARGET-SURFACE" (existing ground).

Pick the **Add PVI** *button* to create a new PVI by screen-picking a point in the profile-grid-view at the top. After picking the **Add PVI** button, the **New PVI** dialog box is displayed.

Enter a length for a vertical curve or change other settings as desired and then pick the **OK** *button*. Repeat as needed for additional PVIs and vertical curves.

Pick the **Show Sections** *button* at the bottom of the **Road Profile Editor** to display a **Section View** of the Road. Moving your crosshairs along the design Profile dynamically updates the **Section View**.

When the **Section View** window is open and active, the **Road Profile Editor** also remains open and active. If you position the **Road Profile Editor** and the **Section View** window so that the drawing view of the Road is obscured, you can move your crosshairs along the design Profile and have a dynamic design environment allowing you to see the plan-, profile- and section-views at one time. Additionally, when the **Section View** window is open, the notes at the top of the profile-grid-view include the "Cut" and "Fill" end-area at the current station along with the "Cut" and "Fill" volume for the entire Road. These calculations are dynamic and will update if changes are made to the design Profile.

Pick the **Exit** *button* to close the **Section Viewer** and then *pick the* **Save** *button* in the **Road Profile Editor** to save changes to the Profile (.PRO) file. *Pick the* **Exit** *button* to close the **Road Profile Editor.**

Repeat the steps above to define additional Roads in the Network.

See **Road Network: Adding and Editing Roads** (Elliott Enterprises website - http://carlson.smiley.ph) if you need additional assistance.

LESSON 4: Adding and Editing Intersections

After Adding the next Road, the **Road Network** command recognizes the creation of an Intersection and the Primary and Secondary Roads are displayed in the **Intersection** area of the project tree.
Select the Intersection, right-click and *pick the* **Edit Intersection** *function* to display the **Settings** tab of the **Edit Intersection** dialog box. Make changes as needed.
Note: Changes made here apply to all Corners of the Intersection.
Or, you can switch to one of the **Corner tabs –** *Front-Right*, *Back-Right*, *Front-Left*, *Back-Left* to make changes to only one Corner of the Intersection.
Pick the **OK** *button* to close the **Edit Intersection** box and save changes.
See **Road Network: Adding and Editing Intersections** if you need additional assistance.

LESSON 5: Save, Process and View the Road Network

Pick the **Save** *button* on the **Road Network Task Pane** to **Save** the Road Network (.RDN) file.
Then, *pick the* **Process** *button* on the **Road Network Task Pane** to calculate the road design and perform the functions specified in **Road Network Output Options**. The resulting contours and breaklines are displayed.
The elevated breaklines and contours can now be viewed using the **3D Viewer Window** command.
Or, use the **Surface 3D Viewer** command to view the Surface (.TIN) file as shown below.
Or, use the **Surface 3D Flyover** command to drive the Surface (.TIN) file as shown below.

LESSON 6: Creating Cross Sections from Surface Entities

Go to: {**Civil-Design**} [**Sections**] [**Input-Edit Section Alignment**]
The “**Specify an MXS file**” dialog box opens on the screen.
Highlight the “**New**” tab and navigate to the job folder where the alignment file (.mxs) will be saved and name the file. Click “**Open**”.

The command line prompt reads as follows:
CL file/< Select Polyline that represents the Centerline> **Select the <CL> drawn**.
Enter Beginning station of Alignment. Hit "**Enter**" to accept the default of 0.
The "Make MXS File Settings" box opens
Station Interval: **Enter the station interval for sections [20m].**
Right Offset: **Enter the width for the sections, right of the centerline.**
Left Offset: **Enter the width for the sections, left of the centerline**.
Type of Curve: **Select Roadway**
Prompt for Starting and Ending Stations:
Pick Offset Distances: **Allows you to specify the offsets by using the distance between two picked points in the drawing.**
Use Perimeter Polyline**: Allows the user to specify a closed polyline that will be used as the limit of the cross sections.** The offsets will be contained within this closed polyline.
Stations at Interval: **Creates cross sections at the specified interval such as every 20 meters.** If the Prompt for Starting and Ending Stations is on, then the program will apply the station interval to the user-specified range of stations. Otherwise the station interval is used along the entire centerline.
Stations at Centerline Points: **Creates cross sections at every transition point in the centerline such as the PC, PT, spiral points and end points.**
Stations at Crossing Polylines: **Allows you to select polylines that cross the centerline and create cross sections at the intersections of these polylines with the centerline.**
Odd Stations with Specified Endpoints: **Creates cross sections at stations that are entered or at picked points along the centerline.** This option also allows you to pick the left and right offset points which do not have to be perpendicular to the centerline.
Additional Odd Stations: **Creates cross sections at the specified stations but the offsets are always perpendicular to the centerline with the user-defined default offset distances.**
Change the Station Interval and the Left & Right Offsets to the desired values to capture the full section.
Use the Roadway Curve Type, **Select the Station at Intervals option.** Also select any other option that is needed for preparing your cross – section plot.
Once all options have been selected click "**Ok**".

The **“Input – Edit Section Alignment”** dialog box appears. At the top of this box, it will display the location of the newly created file. In this box it will also show the range of stations, the left & right offset, and the station interval. Here you may edit the highlighted stations, add allows the user to add more sections to the current alignment file.
If satisfied with the current stations, click “**Save**”.

You will now see the alignment on the screen. When the screen zooms in/out the alignment will disappear.

Draw the alignment: {**Civil-Design**} [**Sections**] [**Draw Section Alignment**]
The **MXS File to Draw** box opens on the screen. Navigate to the location of the alignment file that was just created. Once the file is located click “**Open**”
The **Draw MXS Section Alignment** box appears. Here the user has the option to change the layer name of alignment polylines, and if you choose to display the station labels whether they are perpendicular or parallel to the alignment lines, and the number of decimal places of the labels. Once this done click “**Ok**”.

The alignment polylines are now drawn on the topo.

Create Sections: {**Civil-Design**} [**Sections**]
The “**Choose MXS file to process**” opens on the screen.
Select the alignment file that was created and click “**Open**
The **Choose Section File to write** opens. Now, name the section file and click “**Open**”.
The Sections from Surface Model dialog box opens.
The user can now set the options for the cross sections being generated from the surface entities:
Interpolate 0 Offset Elevation of Sections: **Adds a data point at offset zero for every station with an elevation that is interpolated from the existing offset points.**
Make Profile from 0 offsets of Section: **Will create a profile based on the points created from the previous option.**
Extrapolate Endpoint Elevations from last slope: **Calculates the slope from the last two offset elevation points and calculates the elevation at the endpoint from this slope.**
Extend at Flat Grade to Right and Left MXS Limit: **Uses the last offset elevation as the end point elevation**

Cutoff at the End of Surface Data: **This option does not add offsets at the endpoints.** The sections will end at the last offset found in the surface model.
Interpolate from Surface Data beyond the MXS Limit: **Looks beyond the offset limit for more intersections with surface entities.** (Use this option for the default) With this option the **Distance to Add to MXS Limit** for Interpolation becomes available. (Set this value to a distance greater than the offset value that was set for your alignment file)
Ignore Zero Elevation Lines in Surface Model: **Ignores any line with a zero elevation.**
Breakpoint Description from Layer: **Stores the layer name of the surface entity as the description of the offset elevation point in the section file.**
Limit of Break Points Per Section: **Specifies the maximum number of breakpoints per section.**
Once the options have been selected click "**Ok**"
Select the 3D polylines, and the contour lines that are used to define the surface being used. Then hit "**Enter**".

Draw Section Files: {**Civil-Design**} [**Sections**] [**Draw Section File**]
The **Section Files for Drawing** box opens. The section file next to the 1st button will be the first file that was created, click the 2nd button if you have multiple section files to draw on the same grids. The 2nd Section File to Plot box opens. Select the 2nd section file to be plotted then click "**Open**".
Change any layers that need to be changed. Once the options have been changed click "**OK**".
The **Draw Section File** box opens. Here the user can manipulate the properties of the grid further. Click the "**Scan File to Set Defaults**" button. This will set the minimum elevation of the grid, the ranges of the station to draw, and set the right and left limits of the grid.
Horizontal Scale: **Specify the horizontal scale.**
Vertical Scale: **Specify the vertical scale**.
Link Sections to Files: **Controls the linkage of plotted sections files. It determines how changes made to the (.sct) file affect the plotted section**
Off: **No linkage**
On: **Prompt will ask whether to update the plotted sections when the (.sct) file changes.**
Auto: **Automatically updates the plotted sections when file is changed**
Axis Text Size: 0.125 – normal height. **Specify the text size scaler for the axis text.** This value is multiplied by the horizontal scale to obtain the final text height. For example, if you set

Axis Text Size to 0.125 and the horizontal scale is 50.0, then the text height will be (0.125 X 50) or 6.25

Type of Plot: **Choose between Vertical Stack, Pick Location, or Sheets.**

Fit Each Vertical Grid: **The grid bottom elevation and grid height are set automatically. and the user may specify values to add to the top and bottom of each grid.**

Ranges of Stations to Draw: **If there just certain ranges of stations to be drawn enter them here, or type ALL for all stations in the file to be drawn.**

Interval of Stations to Draw: **Input the intervals of the stations (i.e., 20, 50, 100)**.

Vertical Grid Adder to Top: **Specifies the distance that will be added to the highest. elevation of the section for the sheets and pick location options.** Only available when **Fit Each Vertical Grid** is checked on.

Grid Bottom Elevation: **Specify actual bottom elevation for each section grid.** Only available when **Fit Each Vertical Grid** is checked **OFF.**

Station Text Size: 0.25 – title height**. Specify the text size scaler for the station text label.** This value is multiplied by the horizontal scale to obtain the final text height. For example, if you set Station Text Size to 0.25 and the horizontal scale is 100.0, then the text height will be (0.25 X 100) or 25.0

Vertical Grid Adder to Bottom: **Specify the distance that will be subtracted from the lowest elevation of the section for the sheets**. Only available when **Fit Each Vertical Grid** is checked on.

Vertical Grid Height: **Specify actual grid height for each section grid.** Only available when **Fit Each Vertical Grid** is checked **OFF**.

Vertical Space Between Grids: **Specify the distance the sections are stacked above the last one plotted when drawing multiple sections.**

Draw Elev at Zero Offset: **Labels the section elevation at offset zero**. The label is drawn on the section grid just above the section line.

Draw Break Pt. Elevations: **Labels all break point elevations along the section line above each point in a section.**

Draw Break Pt. Offsets: **Labels the offset distance from zero of each break point along the section.**

Draw Break Pt. Descriptions: **Labels the descriptions of your break points if any exists.**

Draw Slopes: **Labels the slope ratio above the section line.**

Label End Areas: **Labels the end areas if there was an existing and final grade section plotted on the same section.** Click the **Set** button to the right of this toggle to set the display precision, text size scaler and layer for these labels

Circle Station Label: **Will draw the station number with a circle around it on the left and right sides of the section grid.** Click the **Set** button to the right of this toggle to set the display precision, text size scaler and layer for these labels.

Click the **Set** button to the right of this toggle to set the display precision, text size scaler and layer for these labels.

Now set the horizontal and vertical scales of the section file, the horizontal axis spacing.

Under the **Grid Line/Text Drawing Controls**, the user can adjust the right and left grid limits for the section grids. Also, the user has the option to plot the just the section line by selecting the **Plot Grid** option or plotting the section line and the text by selecting Text only.

The **Horizontal Axis Spacing Grid** specifies the distance the vertical lines of the grid will be spaced.

The **Horizontal Axis Spacing Text** specifies the interval that the text will be plotted. (labeling of stations)

The **Vertical Axis Spacing Grid** specifies the distance the horizontal lines of the grid will be spaced.

The **Vertical Axis Spacing Text** specifies the interval that text will be plotted to the left and right of the grid lines. (labeling of elevations)

Once all options have been selected click the "**Ok**" button.

If the type plot selected was **Vertical Stack**, the command prompts will be as follows: Select **Starting Point for Row of Sections**: Screen **Pick the Point**

The stack of cross – section grids are now drawn on the screen

LESSON 7: Additional Settings and Tools in the Road Network

Merge Road with Existing

Pick the **Settings** *button* on the **Road Network Task Pane** and then *pick the* **Output Options** *tab*. *Select the* **Merge Road with Existing** *option* and then *pick the* **Set** *button* to set the path and filename of a 3rd Surface (.TIN) file to be created by combining the design Surface file and the Existing Ground Surface file.

Pick the **OK** *button* to close **Road Network Settings**.

Pick the **Save** *button* on the **Task Pane** to **Save** the Road Network (.RDN) file.
Then, *pick the* **Process** *button* on the **Task Pane** to calculate the road design and perform the functions specified in **Output Options**
The combined Surface (.TIN) file can now be viewed using the **Surface 3D Viewer** command as shown below.

LESSON 8: Reports

Pick the **Report** *button* on the **Road Network Task Pane**. Then, *pick the* **Output Processing** *button* to display the report. This report displays the cut/fill and material quantities for each Road and Intersection of the Road Network.
Repeat this step but, this time, pick *the* **Input Data Files** *button* to display the report. This report displays all of the user-specified design files associated with the Road Network. For this report, you are given the option of reporting only the filename or both the path and filename.

End of Lesson