

Item to Design: Vegetated Waterway

The Process: RoadCalc uses cross section slices along with a design profile, alignment and template to perform earthwork quantity calculations and to create CAD lines and views. The designer puts the original survey into a cross section and profile format and then specifies a design profile & design template. RoadCalc will calculate cut & fill volumes and develop profile & cross section construction drawings for plotting. (Using Eagle Point 2004 Q3 4.3.0 or newer)

Three different options for Part I of the process are available, depending on the survey method used:

- A - Cross Sections Using Level
- B - Total Station Topog
- C - Total Station Cross Sections

Part II of the process is the same for all survey methods.

General Steps used to Complete the Process.

Part I

- a) Create an EP project and a RoadCalc sub project
- b) Define the waterway centerline “alignment”
- c) Process the survey data to obtain original ground Cross Sections & Profile

Part II

- d) Create the Design Profiles
- e) Determine the shape & size of the waterway.
- f) Create the Typical Sections of the WW design for each reach
- g) Run the design & review the cut/fill & volume results
If necessary repeat steps d) to f)
- h) Develop Xsection drawing sheets
- i) Develop Profile drawing sheet

- B) Input P. Press Enter.
- C) Click on the polyline that represents the CL of WW.
- 4) Click *NRCS/EP... Waterway RoadCalc >> Alignment: Convert Object...*
- 5) Click on the line that represents the centerline. Press Enter
- 6) Click a point close to the end of the waterway with the lower stationing.
- 7) Pulldown Alignment as *Centerline*.
- 8) **If** the beginning stationing of the centerline is know:
 - A) Input a Beginning stationing of the alignment. E.g. {0}
 - B) Click Apply.
- 9) Or, **If** a reference point or baseline exists along the centerline with a known stationing:
 - A) Click Station Data...
 - B) Click Reference Station...
 - C) Click in Northing
 - D) Click the **Pick In CAD** button.
 - E) Snap to the intersection of the centerline & the known baseline reference point.
 - F) Input the Station value of the baseline E.g. {350}
 - G) Click OK
 - H) Note that the Beginning Station value appears in the box. If this looks realistic Click OK
 - I) Click Apply.
- 10) Click *NRCS/EP... Waterway RoadCalc >> Alignment: Edit Data...*
- 11) Pulldown Alignment as *Centerline*.
- 12) Review the alignment points & coordinates. Click Close.

Place Station Labels into Drawing

- 1) From AutoCAD Click *EP... Drafting*. (Drafting menu will appear within CAD menu)
- 2) Click *Annotate... Alignment Stationing...*
- 3) Click Defined Alignments...
- 4) Select the Centerline and Click OK
- 5) Click Apply Click Close
- 6) Click *EP... AutoCAD...* to switch out of the Drafting menu.

Cut cross sections from the Original Ground & Subsurface TIN

- 1) Click *NRCS/EP... Waterway RoadCalc >> Cross Section: Extract from Surface...*
- 2) Checkmark *Stationing Interval* and Input the spacing of the cross sections that you want to use. You can choose specific cross sections to plot later. E.g. {100}
- 3) Checkmark *Mark Stations for Extraction*
- 4) Click OK.
- 5) Checkmark surfaces to extract for *Ognd & Subsurf*.
- 6) Pulldown the Surface Model name to the correct surface model that exists in the EP project. *Ognd => Original Ground, Subsurf=> Stripping*
- 7) Input left corridor edge as a negative. E.g {-80}
- 8) Input right corridor edge as a positive. E.g {80}

Road Calc for Waterway Design – Part I
Survey Method B –Topog

- 9) The stationing list shows the locations marked to have sections created.
- 10) To add an additional station such as at a fence, Click **New Station**, then input the stationing E.g. {525}. Click .
- 11) When ready to have sections created Click .

View the Cross Section Data

- 1) Click *NRCS/EP... Waterway RoadCalc >> Cross Section: Edit Data...*
- 2) Highlight the desired station in the top half of the screen and the data points for that station will appear in the bottom portion of the screen.
- 3) Click on the **Query Cross Section** icon to preview any Cross Section. Use the + or – buttons to scroll through each of the cross sections. Click when done.
- 4) Click

Create an Existing Ground Profile

- 1) Click *NRCS/EP... Waterway RoadCalc >> Profile: Extract from Surface ...*
- 2) Pulldown Profile Name as *Ognd*.
- 3) Pulldown the original ground name for Surface Model. E.g. *Ognd*.
- 4) Click .
- 5) Select the centerline alignment object.
- 6) Click Save Changes as .
- 7) Click **Zoom Extents** to see the profile of the Original Ground extracted from the surface model.

Continue with Instructions in Part II

Road Calc for Waterway Design – Part II

Eagle Point Steps using the NRCS/EP Customized Menu

Item to Design: Vegetated Waterway

Notation Method

Button to Press *Displayed Text* **Icon** Action {Text to Enter} Menu Item...

Things to do First

Use one of the Part I methods to create the existing ground cross sections & profile.

Switching between Views

Use *NRCS/EP... WW RoadCalc >>Alignment... View Alignment ...* to see the alignment (plan) view drawing.

Use *NRCS/EP... WW RoadCalc >>Cross Section... Edit Data...* Then **Click Query Cross Section** to view cross sections.

Use *NRCS/EP... WW RoadCalc >>Profile... View Profile Graphics...* to see the profile view.

Review the Original Ground Profile

- 1) **Click** *NRCS/EP... Waterway RoadCalc>> Profile: Edit Data...*
- 2) **Pulldown** to *Ognd*
- 3) To print the data, **click** the **Generate Profiles Report icon** and **select** the *Ognd Profile* as the one to print

Create the Design Profile (Centerline of Waterway) – Graphical Option

- 1) Use *NRCS/EP... WW RoadCalc >> Profile: View Profile ...* to make sure you are in the profile view.
- 2) **Click** **Polyline**.
- 3) **Draw** a line which represents the proposed profile of the centerline of waterway. Do not worry about the correctness of these lines yet. Just get the general location of it.
- 4) **Click** *NRCS/EP... WW RoadCalc >> Profile:Convert Object...*
- 5) **Select** the line for the proposed FL of Waterway.
- 6) **Press** **Enter**
- 7) **Click** **Next**
- 8) **Pulldown** to *Centerline*
- 9) **Click** **Finish**. The waterway profile line becomes red.
- 10) **Click** *NRCS/EP... WW RoadCalc >> Profile: Edit Data...*
- 11) **Pulldown** to *Centerline*
- 12) **Double Click** to edit any VPI.
- 13) **Change** the stations to “even” amounts. **Input** the correct elevations for the VPIs.
- 14) **Click** **Apply**.
- 15) **Click** **Close**
- 16) **Double Click** to edit the next VPI.

Road Calc for Waterway Design – Part II

- 17) Change the stations to “even” amounts. Input the correct elevations for the VPIs.
- 18) Click Apply.
- 19) Click Close
- 20) Repeat as needed.
- 21) Note the Grades for each reach of the waterway. (To print the data, click the **Generate Profiles Report icon** and select the *Centerline Profile* as the one to print.)
- 22) To check elevations of the Original Ground:
 - A) Click Spot Elevations...
 - B) Pulldown Profile to *Ognd*
 - C) Input the Station where you want to know the elevation
 - D) Click Calculate
 - E) Click Close
- 23) Click Close.

Create the Design Profile (Centerline of Waterway) – Data Entry Option

- 1) Click *NRCS/EP... WW RoadCalc >> Profile: Edit Data...*
- 2) Pulldown to *Centerline*
- 3) Click *New VPI*.
- 4) Input the beginning Station. Press Tab
- 5) Input the Planned Elevation. Click Apply.

6) <u>Pull</u> <u>down</u> Method to <i>Station/Elevation</i>	Or	<u>Pull</u> <u>down</u> Method to <i>Grade/Distance</i>
7) <u>Input</u> the Station		<u>Input</u> the Grade
8) <u>Input</u> the Elevation		<u>Input</u> the Distance
9) <u>Click</u> <u>Apply</u>		<u>Click</u> <u>Apply</u>

- 10) Repeat for as many reaches as you need.
- 11) Watch for the Red planned Centerline Profile polyline in the CAD drawing.
- 12) Click Close.
- 13) Note the Grades for each reach of the waterway. (To print the data, click the **Generate Profiles Report icon** and select the *Centerline Profile* as the one to print.)
- 14) Click Close.

Determine Shape of Waterway

- 1) Click *NRCS/EP... WW RoadCalc >> Define WW Channel Shape ...* to display the Define Channel box that shows the planned reaches of the waterway.
- 2) Click Calculate Shape to open up your default software for designing a waterway.
- 3) Compute the waterway design shape for all reaches, print those results, and then minimize or close the external waterway tool.

Road Calc for Waterway Design – Part II

Create the Typical Section for your Waterway Shapes

- 1) From the *Design Channel* screen click to create templates for the design shapes.
- 2) Pulldown to the desired shape *{Parabolic}* or *{Trapezoidal}*.
- 3) **If** the shape is parabolic
 - A) Pulldown to Parabolic
 - B) Input the planned Width and Depth.
- 4) **Or**, If the shape is trapezoidal
 - A) Pulldown to Trapezoidal
 - B) Input the Bottom Width, Depth, and Side Slope
- 5) Click if you need to input more channel shapes.
- 6) Click when you are done entering the last shape.

Assign the Typical Section for your Waterway Shapes

- 1) In the *Design Channel* screen pulldown the Channel Section to the correct designed shape for each Reach.
- 2) Click when you are done selecting each shape.

Run the Preliminary Design & View the Sections

- 1) Click *NRCS/EP... WW RoadCalc >> Process: Run Design ...*
- 2) Pulldown Method to *Step Through All*
- 3) Click
- 4) Pulldown the surface name to *Waterway*. Notice the depth of cut or fill at the various locations on the cross section by clicking the **Move left** or **Move right** arrows.
- 5) Click *View Next Cross Section* to scroll through the sections
- 6) Click

View the Centerline Profile Cut Values

- 1) Click *NRCS/EP... WW RoadCalc >> Output: Elevation/Depth at Offsets ...*
- 2) Click Depth
- 3) Pulldown Bottom Top to *Ognd*
- 4) Pulldown Bottom Surface to *Waterway*
- 5) Click **New Offset** icon
- 6) Input 0 for the offset value to get the Centerline Cut/Fill. Click
- 7) If you wish to print the result Click the **Printer** icon.
- 8) Click

View the Cut Values at the Edges of the Waterway

- 1) Click *NRCS/EP... WW RoadCalc >> Output: Cross Section Staking ...*
- 2) Click

Road Calc for Waterway Design – Part II

- 3) View the *Toe Depth* Column to see the amount of cut or fill at the edge of the waterway at each cross section. A Cut means that the WW edge is in excavation. The Toe Offset is ½ of the top width at that station. If you scroll right you can see other info.
- 4) If you wish to print the results click the **Printer** icon. Click
- 5) Click

Review & Print Volumes

For Cross Sectional Volume Calculations (Starts & Stops at non-Phantom cross sections)

- 1) Click *NRCS/EP... WW RoadCalc >> Output: Volumes ...*
- 2) Click **Print**
- 3) Click

Develop Xsection sheets

- 1) Click *NRCS/EP... WW RoadCalc >> Output: Cross Section Sheets ...*
- 2) Click
- 3) Highlight Stations to plot or not plot and Click mark on or mark off.
- 4) Click
- 5) Pulldown Format to *Sheet settings*.
- 6) Click
- 7) On the Sheet Dimensions Tab make changes to the # of Columns, etc
- 8) On the Grid Spacing Tab make changes to the Scales, etc
- 9) Click
- 10) Click **New Cross Section Sheets**
- 11) Click
- 12) Highlight the Sheet Number that you want to view.
- 13) Click **View Cross Section Sheets** (Binoculars)
- 14) Click

Develop Profile sheet

- 1) Click *NRCS/EP... WW RoadCalc >> Output: Plan & Profile Sheets ...*
- 2) Pulldown Format to *Sheet settings*.
- 3) Click
- 4) Select the Profile Tab and make changes to the Datum Elevation Interval. Click
- 5) Pulldown Format to *Station/Elevation Intervals*.
- 6) Click
- 7) Make changes to the Profile View Stationing & Elevation Intervals. Click
- 8) Click **New Plan & Profile Sheets**
- 9) Click
- 10) Click **View Cross Section Sheets** (Binoculars)
- 11) Click *View... Regen All...* if needed to make the grids reappear.
- 12) Click

Road Calc for Waterway Design – Part II

- 13) To adjust the fit on the sheets Click *NRCS/EP... WW RoadCalc >> Output: Adjust Plan & Profile Sheets*
- 14) Click the black arrows to shift the sheet to line up the profile better.

Other Notes

If you change the Profile scales, you must go back to the *View Profile Graphics* in order for them to be rescaled correctly.

When you change a design, it does not delete the drawing sheets that are created using *NRCS/EP... WW RoadCalc >> Output: Cross-section...* or *NRCS/EP... WW RoadCalc >> Output: Plan & Profile...* You can remove them by highlighting those sheets in the dialog box and click on the **Delete Sheets** button if that particular sheet is not currently open.