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Eagle Point Solution to a Frequently Asked Question

How to Create an On-Road Dam using RoadCalc

Summary:
This document explains the process of creating an on-road dam with a vertical curve and with a wave berm at normal pool level.

Product: Eagle Point Software™ 2002
Release: 2002 Q1 or 2.1.0 and greater
Platform: All
Related documents:

As always, should you have any questions regarding any phase of installation, contact Eagle Point Technical Assistance at (800) 477-0909.

Notation Method

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

Things to Do First

1. Create an Eagle Point project that contains the original ground surface and a subsurface for the stripping.
2. Open the Eagle Point project that has the original ground surface to use, and have only one dwg file open.
3. In AutoCAD, click on *Tools… Options…System…*.
4. Checkmark *Single drawing compatibility mode*. Click OK.

Starting a RoadCalc Sub-Project Using an NRCS Prototype

1. At the EP Main Menu, click on *File… New…*.
2. Click **Create New Project Icon** located in lower left-hand corner.
3. Highlight *RoadCalc Sub Project* and click Next.
4. Make sure that the correct main project name is highlighted in the top box.
5. Input a project description. E.g. {Dam On Road}.
6. At the prototype setting pull down to select *NRCS 11x17* or *NRCS 22x34*.
7. Click Next.
8. Highlight the main project drawing and click Finish.
9. At the Open Project box highlight the Road Calc project.
10. Click OK.
11. Click on EP Main Menu *Tools…Plot Scales…*.
12. Input the horizontal scale that you will use in a plan & profile sheet. Example 1” = {100} feet. Press Tab.
13. Input the vertical scale that you will use in a plan & profile sheet. Example 1” = {5} feet. Press Tab.
14. Click OK.

15. Click on EP Main Menu *System…Embedded CAD Menus…* so that a checkmark shows and EP is placed into the CAD menu.
16. Click on *EP…Road Calc…* so that the RoadCalc menus are placed into the CAD menu.

Note: You can minimize the Eagle Point & RoadCalc menus but you should NOT close out the EP main menu.

Place an Object for the Centerline and Convert it to the Alignment

1) From CAD, click **Polyline**.
2) Draw a line that represents the centerline of the dam.
3) Click *Alignments… Convert Object to Alignment*….
4) Click on the line that represents the centerline.
5) Click a point near the left end of the dam as the beginning.
6) Pull down Alignment as *Centerline*.
7) **If** the beginning stationing of the centerline is know:
   A) Input a Beginning stationing of the alignment. E.g. {0}.
   B) Click Apply.
8) 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.
9) Click *Alignments… Edit Alignment Data*….
10) Pull down Alignment as *Centerline*.
11) Review the alignment points & coordinates.
   A) Double click any PI to edit the data. Click OK for changes to take affect. The alignment line in CAD is updated to the new coordinates.
      i) Click Curve Data… to input the length of a horizontal curve. Input the length in the L row and press Tab to have it take affect. Click Close.
   B) Click Close.

Create an Existing Ground Profile

1) Click *Profiles… Extract from Surface Model*….
2) Pull down Profile Name as *Ognd*.
3) Pull down the original ground name for Surface Model. E.g. *Ognd*.
4) Click OK.
5) Select the centerline alignment object.
6) Click Save Changes as Yes.
7) Click **Zoom Extents** to see the profile of the Original Ground extracted from the surface model.

Create the Design Profiles (Centerline and Berm)

1) Click **Polyline**.
2) Draw lines in the profile view which represent the profile of the top of dam and of the wave berm. Do not worry about the correctness of these lines yet. Just get the general location of them. An on-road dam might have a left end profile that matches the existing road slope, a middle level grade, and a right end profile that matches the existing road slope.
3) Click *Profiles… Convert Objects to Profile*….
4) Select the line for the top of dam.
5) Press Enter.
6) Click Next.

7) Pull down to *Centerline*
8) Click Finish. The top of dam line becomes red.
9) Click *Profiles*… *Edit Data*….
10) Pull down to *Centerline*.
11) Double Click to edit the VPI.
12) Change the stations to “even” amounts. Input the correct elevations for the VPIs.
13) Click Apply.
14) Click Close.
15) Double click to edit the next VPI.
16) Change the stations to “even” amounts. Input the correct elevations for the VPIs.
17) Click Apply.
18) Click Close.
19) Repeat as needed.
20) Click Curve Data… to input the length of a vertical curve in the L line. Press Tab for the change to apply. Use the **Right Arrow icon** to move to the next VPI. Observe the begin curve and end curve stations of the current, previous and next columns to make sure that the vertical curves do not overlap. Click Close.
21) Click Close.
22) Click *Profiles*… *Manage*….
23) Click **New Profile**
24) Input a name for the profile. E.g. {Wave Berm only}. Press Tab.
25) Click OK.
26) Click Close.
27) Click *Profiles*… *Convert Objects to Profile*….
28) Select the line for the wave berm.
29) Press Enter.
30) Click Next.
31) Pull down to *Wave Berm only*.
32) Click Finish. The wave berm line changes color.
33) From the RoadCalc Menu, click *Profiles*… *Edit Data*….
34) Pull down to *Wave Berm only*.
35) Double click to edit the VPI.
36) Change the stations to “even” amounts. Input the correct elevations for the VPIs.
37) Click Apply.
38) Click Close.
39) Double click to edit the next VPI.
40) Change the stations to “even” amounts. Input the correct elevations for the VPIs. (This is for the downstream edge of the wave berm).
41) Click Apply.
42) Click Close.
43) Repeat steps 39 to 42 as needed.
44) Click Close.

Define the Names of the RoadCalc Surfaces

1) Click *Cross Sections*… *Manage Surfaces*….
2) The NRCS prototype already has some surface names pre-named. Original surface names for Original Ground and Subsurface (stripping) and a design surface for Dam are already there. You could add a stream channel cleanout that was created in your EP project using Site Design. Click New, input a name {SCCO}, pulldown *Type* to *Absolute*. Click OK.
3) Click Close.

Cut Cross-Sections from the Original Ground and Subsurface TIN

1) Click *Cross Sections*… *Extract Cross Sections*….

2) Checkmark *Stationing Interval* and input the spacing of the cross-sections that you want to use for toes. You can choose specific cross sections to plot later. E.g. {10}.
3) Checkmark *Mark Stations for Extraction*.
45) Click OK.
4) Checkmark surfaces to extract for *Ognd* & *Subsurf*.
5) Pull down the Surface Model name to the correct surface model that exists in the EP project. *Ognd* => *Original Ground*, *Subsurf*=> *Stripping*.
6) Input left corridor edge as a negative. E.g. {-250}.
7) Input right corridor edge as a positive. E.g. {250}.
8) The stationing list shows the locations marked to have sections created.
9) To add an additional station such as at the centerline of the pipe, click New Station and input the stationing E.g. {525}. Click OK.
10) When ready to have sections created Click OK.
11) From the RoadCalc Menu, click *Cross Sections*… *Edit Cross Section Data*….
12) To graphically view the sections click the **Query Cross Section icon** (to the right of the binoculars).
13) Review the cross-section by clicking the **right arrow icon**.
14) Review the next section by click the **View Next Cross-Section icon** (has a + symbol) .
15) When done click Close.
16) To view the data highlight the station in the upper part of the screen and view the data in the lower half.
17) Click Close.

Create the Simple Typical Section for Your Top Width

1) Click *Typical Sections*… *Manage Typical Sections*….
2) Click **New Typical Section**.
3) Input a name the simple top width configuration. E.g. {26TW 0.6 crown} Press Tab.
4) Input an extra description needed. E.g. {26 foot top width. Centerline is crowned 0.6 higher than the shoulders}.
5) Click OK.
6) Click Close.
7) Click *Typical Sections*… *Construct Typical Sections*….
8) Pull down to *26TW 0.6 Crown*.
9) Click **View Typical Section Graphic**. (Binoculars)
10) Click for save Yes.
11) Click **Precision Input** (Micrometer).
12) Input {A} for Absolute coordinate entry. Press Enter.
13) Input {0} Press Enter (X coordinate).
14) Input {0} Press Enter (Y coordinate).
15) Input {1} Press Enter (PT code of 1 for centerline).
16) Input {XY} for Change in X & Y values entry method. Press Enter.
17) Input {26} Press Enter (change in X value).
18) Input {-.6} Press Enter (change in Y value).
19) Input {9} Press Enter (PT code of 9 for Edge of Road).
20) When right side of typical section looks correct click **Mirror Right to Left**.
21) Click **Define Typical Section**.
22) Click OK.
23) Click Close.

Create the Condition (outside slopes) to Be Used

1) From the RoadCalc Menu, click *Process*… *Manage Condition Tables*….
2) Click New Condition Table.
3) Input a name describing the use. E.g. {Normal 3 to 1 cut & fill}
4) Highlight Cut.
   A) To edit double click the condition factors and make changes. Click OK.

5) Highlight Fill and repeat.
6) Click Close.

Specify the Typical Section and Condition (Outside Slopes)

1) Click *Process… Edit Design Locations….*
2) In the upper half of the screen, click **New Typical Section Location**.
3) Input the station that you want to start building earthwork at: {50}.
4) Pull down the correct typical section: {26TW 0.6 Crown}.
5) Click OK.
6) In the lower half of the screen, click **New Condition Table Location**.
7) Input the station that you want to start building the earthworks: {50}.
8) Pull down the correct left condition table: {Normal 3 to 1 cut & fill}
9) Pull down the correct right condition table: {Normal 3 to 1 cut & fill}
10) Click OK.
11) Click Close.

Run the Preliminary Design and View the Sections

1) Click *Process… Run Design….*
2) Pull down Method to Step Through All.
3) Click Run.
4) Click **View Next Cross-Section** to scroll through the sections.
5) Click Close.

Extract Downstream Toes as a Preliminary Estimate for Road Ditch Profile

1) Click *Output… Profiles from PT Codes….*
2) Checkmark Extract for PT Code *1000* (left) and pull down surface as *Des_Dam*.
3) Click OK.

This new line is helpful for determining the planned profile for the downstream road ditch. Convert this object to a defined profile for the downstream road ditch.

4) Click *Profiles… Manage….*
5) Click **New Profile**.
6) Input a name for the profile. E.g. {Downstream Road Ditch}. Press Tab.
7) Click OK.
8) Click Close.
9) Click *Profiles… Convert Objects to Profile….*
10) Select the line for the Downstream Road Ditch.
11) Press Enter.
12) Click Next.
13) Pull down to *Downstream Road Ditch*.
14) Click Finish. The line changes color.
15) Click *Profiles… Edit Data…*
16) Pull down to *Downstream Road Ditch*.
17) Click Raise/Lower Profile.
18) Input the approximate depth of ditch that you want to have. E.g. {-2.5}.
19) Click OK.
20) Click Close.
21) Click **Polyline**. Visually use this profile to draw a final downstream ditch profile. Keep the ditch profile above original ground where no downstream ditch is wanted.
22) Click *Profiles… Convert Objects to Profile….*
23) Select the new “final” line for the Downstream Road Ditch.
24) Press Enter.
25) Click Next.
26) Pull down to *Downstream Road Ditch*
27) Click Finish. The line changes color.

28) Click *Profiles*… *Edit Data*….
29) Pull down to *Downstream Road Ditch*.
30) Click OK.
31) Double click to edit the next VPI.
32) Change the stations to “even” amounts. Input the correct elevations for the VPIs.
33) Click Apply.
34) Click Close.
35) Repeat editing the VPIs as needed.
36) Click Close.

Extract Upstream Toes as a Preliminary Estimate for Road Ditch and Wave Berm Profile

1) Click *Output*… *Profiles from PT Codes*….
2) Checkmark Extract for PT Code *1001* (right) and pull down surface as *Des_Dam*.
3) Click OK.

This new line is helpful for determining the planned profile for the upstream road ditch.

4) Click *Profiles*… *Manage*…
5) Click **New Profile**.
6) Input a name for the profile. E.g. {Upstream Ditch & Berm}. Press Tab.
7) Click OK.
8) Click Close.
9) Click *Profiles*… *Convert Objects to Profile*….
10) Select the line for the Upstream Road Ditch.
11) Press Enter.
12) Click Next.
13) Pull down to *Upstream Ditch & Berm*.
14) Click Finish. The line changes color.
15) Click *Profiles*… *Edit Data*….
16) Pull down to *Upstream Ditch & Berm*.
17) Click Raise/Lower Profile.
18) Input the approximate depth of ditch that you want to have. E.g. {-2.5}.
19) Click OK.
20) Click Close.
21) Click **Polyline**. Visually use this profile to draw a final upstream ditch/wave berm profile.
22) Click *Profiles*… *Convert Objects to Profile*….
23) Select the line for the Upstream Ditch/Wave Berm.
24) Press Enter.
25) Click Next.
26) Pull down to *Upstream Ditch & Berm*.
27) Click Finish. The line changes color.
28) Click *Profiles*… *Edit Data*….
29) Pull down to *Upstream Ditch & Berm*.
30) Double click to edit the next VPI.
31) Change the stations to “even” amounts. Input the correct elevations for the VPIs.
32) Click Apply.
33) Click Close.
34) Repeat editing the VPIs as needed.
35) Print out the profile data.
36) Click Close.

Create the Typical Section for the Embankment with Wave Berm

1) Click *Typical Sections*… *Manage Typical Sections*….
2) Highlight the simple dam section *26TW 0.6 Crown*.
3) Click **Copy Typical Section**.
4) Input a name for the dam with berm. E.g. {26TW Road & 20 Wave}. Press Tab.

5) Input an extra description needed. E.g. {26' TW Road with 0.6 Crown, 3:1 slope down to 20' sloping wave berm on 10:1}.
6) Click OK.
7) Click Close.
8) Click *Typical Sections… Construct Typical Sections….*
9) Pull down to *26TW Road & 20 Wave*.
10) Click **View Typical Section Graphic**. (Binoculars)
11) Click for save Yes.
12) Click **Cut and Fill Detail**.
13) Click **Precision Input** (Micrometer).
14) Input {A} for Absolute coordinate entry. Press Enter.
15) Input {26}. Press Enter (X coordinate).
16) Input {-.6}. Press Enter (Y coordinate).
17) Input {0}. Press Enter (a PT code already exists at this location).
18) Input {XH} for change in X & H slope values entry method. Press Enter.
19) Input {6}. Press Enter (change in X value)
20) Input {-3}. Press Enter (H/V ratio)
21) Input {3}. Press Enter (PT code of 3 for Toe of Foreslope – downstream edge of berm).
22) Input {XH}. for Change in X & H slope values entry method. Press Enter.
23) Input {20}. Press Enter (change in X value).
24) Input {-10}. Press Enter (H/V ratio).
25) Input {4} Press Enter (PT code of 4 for Toe of Cutslope – upstream edge of berm).
26) Click **Define Typical Section**.
27) Click OK.
28) Click Close.

Create the Typical Sections for the Embankment with Upstream Road Ditch

1) Click *Typical Sections… Manage Typical Sections….*
2) Highlight the dam section *26TW Road & 20 Wave*.
3) Click **Copy Typical Section**.
4) Input a name for the simple dam with an upstream road ditch. E.g. {26TW 12' US Ditch}. Press Tab.
5) Input an extra description needed. E.g. {26 foot top width, 3:1 slope to 12' BW upstream ditch}.
6) Click OK.
7) Click Close.
8) Click *Typical Sections… Construct Typical Sections….*
9) Pull down to *26TW 12' US Ditch*.
10) Click **View Typical Section Graphic**. (Binoculars)
11) Click for save Yes.
12) Select the line that goes between PT 3 & 4.
13) Modify Properties so that the line is 12’ long and level.
14) Move the PT 4 symbol to the new end of the line.
15) Click Define Typical Section.
16) Click OK.
17) Click Close.

Associate Special Profiles (wave berm, etc)

1) Click *Process… Associate Alignment and Special Profiles….*
2) Click **New PT Code Association**.
3) Pull down PT Code to *3*.
4) Click *Right*.
5) Pull down Alignment to *None*.
6) Pull down Profile to *Upstream Ditch & Berm*.
7) Pull down Control Type to *Slope*.
8) Pull down Control PT Code to *3*.

9) Click OK.
10) Click Close.

For Each Reach Specify the Typical Section and Condition (Outside Slopes) to be Used

1) Click *Process… Edit Design Locations….*
2) In the upper half of the screen, click **Modify Typical Section Location**.
3) Pull down the correct Typical section: {*26TW 12' US Ditch*}.
4) Pull down Transition Type as: {*Do not transition*}.
5) Click OK.
6) In the upper half of the screen, click **New Typical Section Location**.
7) Input the station that you want to switch to the wave berm. Refer to the profile data printout. {100}.
8) Pull down the typical section for the wave berm: {*26TW Road & 20 Wave*}.
9) Click OK.
10) In the upper half of the screen, click **New Typical Section Location**.
11) Input the station that you want to switch back to the rod ditch. Refer to the profile data printout. {560}.
12) Pull down the typical section for the road ditch: {*26TW 12' US Ditch*}.
13) Click OK.
14) Click Close.

Run the Preliminary Design and View the Sections

1) Click *Process… Run Design….*
2) Pull down Method to *Step Through All*.
3) Click Run.
4) Click *View Next Cross Section* to scroll through the sections.
5) Review the sections and determine if any profile or stationing changes are needed.
6) Click Close.

Create Surface Model from Road

1) Click *Output… Printouts: Create Surface Model from Road….*
2) Click **Mange Surface Models**.
3) Click the **New Surface Model Icon**. This brings up New Surface Model box.
4) Click on the **Library icon** (looks like books on a shelf) and select the *Embankment* surface model. Click Load Prototype. Click Yes. Click Close.
5) Input a Description name. E.g. {Embk}, which would represent embankment.
6) Once you have settings done click OK.
7) Click Close to close out Manage Surface Models.
8) Pull down Road Surface Model to *Embk*.
9) Click OK.

Review and Print Volumes For Cross Sectional Volume Calculations

1) Click *Output… Printouts: Volumes….*
2) Click **Print**.
3) Click Close.

For Prismoidal Calculations use *Site Design… Volumes… Prismoidal….*

Develop Cross-Section Sheets

1) Click *Output… Graphics: Cross Section Sheets….*
2) Click Stations to Plot.
3) Pull down Format to *Sheet settings*.
4) Click Edit.
5) Make changes to the Scales, # of Columns, etc. Click OK.
6) Highlight Stations to plot or not plot and Click mark on or mark off.
7) Click OK.

8) Click **New Cross-Section Sheets**.
9) Click OK.
10) Highlight the Sheet Number that you want to view.
11) Click **View Cross-Section Sheets**. (Binoculars)

Develop Plan/Profile Sheet

1) Click *Output… Graphics: Breaklines from PT codes*….
2) Checkmark PT codes 9, 3, 4, 1000, and 1001and pull down surface to *Des_Dam*.
3) Click OK.
4) Select lines and move them to the correct layers. {C.Plan.Embk}.
5) Click *Output… Graphics: Plan & Profile Sheets*….
6) Pull down Format to *Sheet settings*.
7) Click Edit.
8) Make changes to the Grid Spacings. Click OK.
9) Pull down Format to *Station/Elevation Intervals*.
10) Click Edit.
11) Make changes to the Stationing Offset & Intervals. Click OK.
12) Click **New Plan & Profile Sheets**.
13) Click OK.
14) Click **View Cross-Section Sheets**. (Binoculars)
15) Click *Output… Graphics: Adjust Plan & Profile Sheets*….
16) Click the black arrows to shift the sheet to line up the profile & plan better.

Submitted by Norman Friedrich.