Overview: Create the grading, surface model and earthwork volumes for a rectangular earthen storage pond. A surveyed site with a surface model covering the footprint of the embankment is needed. The NRCS Storage Pond tool is used.

Software: AutoCAD Civil 3D 2016, NRCS C3D 2016 Customization & template

### C3D Steps

| Notation Method | Button to Press | Displayed Text | Icon | Action {Text to Enter} | Menu Item...
|-----------------|----------------|----------------|------|-----------------------|-----------------|
| Prerequisite

Follow the instructions for creating *Original Ground Contours*.

**Earthen Storage Pond**

Place an Earthen Storage Pond object onto the project
1) Click NRCS ... NRCS Storage Ponds... Storage Pond....
2) Input the dimensions, slopes and top of fill elevation.
3) Pulldown Inner Feature Line Style = Embankment Feature Line
4) Pulldown Outer Feature Line Style = Embankment Feature Line
5) Pulldown Elevation Label Style = Feature Line Elevations Start End
6) If you are inserting more than one Storage Pond, rename the AcadGroup Name. (e.g. StoragePond2, etc)
7) Click Insert into Drawing.
8) Select the point in CAD for the lower left corner of the inside top of fill.

Adjust the location and elevation of the storage pond layout
9) Click NRCS ... NRCS Storage Ponds... Turn On:Selection by Group to enable the object group selection.
10) Turn off the OsnapZ elevation setting: Type Osnap Press Enter, Type 1 Press Enter (This allows you to use Osnaps without changing the Elevation of the objects.)
11) To move the group and maintain the same elevation:
   a) Select any line of the pond, Click the group’s grip.
   b) Click the new location of the storage pond.
12) To change the elevation of the storage pond:
   a) Select any line of the group,
   b) Right-Click Rasie/Lower Feature lines
   c) Input the elevation change. E.g. {1.5}. Enter. Use negative to lower.
13) To rotate the storage pond:
   a) Select the group.
   b) Right-Click Basic Modify... Rotate...
   c) Click to set a pivot point.
   d) Move your cursor to obtain the new rotation angle and click.
14) When done moving and rotating type Osnaps Press Enter, Type 0 Press Enter These steps can also be used after the grading has been applied.
Create the outer grading to the ground surface.
15) Home... Create Design... Grading... Grading Creating Tools...
16) Click Set the Grading Group .
17) Set the Site to Storage Pond. Click OK
18) Click Create Grading Group
19) Input a Grading Group Name E.g. { Storage Pond 1} Click OK
20) Click Set the Target Surface . Select Ognd. Click OK
21) Pulldown the Select a Grading Criteria to Slope or Grade to Surface (Cut and Fill)
22) Click Create Grading. 
23) Select the outer storage Pond line. Click outside of the storage pond.
24) Apply to entire length? Input Y Press Enter
27) Slope or grade? Input S Press Enter.
29) Press ESC to exit the command
30) Close the Grading Creation Toolbar

Create the storage pond surface
31) Select the outer grading.
32) Grading...Modify... Grading Group Properties...
33) On the Information Tab checkmark Automatic Surface Creation.
34) Type = TIN Surface. Set the Name to Storage Pond. Style = Grid Magneta 5x5.
35) Click Ok. Click Ok Click Ok
36) Select the Storage Pond group. (Not the outer grading.)
37) Right-click... Click Add to Surface as Breaklines...
38) Select Surface = Storage Pond. Click OK.
39) Supplementing factors: Checkmark Distance = 5’
40) Click Ok.
41) If Panorama displays crossing breaklines click the checkmark to dismiss the message.

Computing the Cut and Fill Volume for the Storage Pond

Compute earthwork volumes
42) Click Analyze... Volumes and Materials... Volumes Dashboard
43) In Panorama click Create new Volume Surface
44) Input a Name E.g. {V Storage Pond - Ognd}
45) Set the Style = _<off> Click Ok
46) Set the Base Surface = Ognd. Set the Comparison Surface = Storage Pond
47) Click Ok
48) In Panorama click Create new Volume Entry
49) Input a Name E.g. {V Storage Pond - Strip}
50) Set the Style = _<off> Click Ok
51) Set the Base Surface = Strip. Set the Comparison Surface = Storage Pond
52) Click Ok
53) Volume surfaces get created and Quantities will be displayed in the Dashboard.
54) Save the drawing.

You can go back and modify the location, rotation, or elevation of the grading to improve the volumes and layout. Be sure to select the Storage Pond selection group and NOT the outer grading. The outer grading will update automatically.

55) In Composite Volumes click Re-compute Volumes to make sure they are current.
56) Use Generate Cut/Fill Report to create a report. It can be saved or information can be copied from the report into Word or Excel Document
57) In Civil 3D click dismiss to close the Volumes Dashboard Panorama.

To track depths of the Storage Pond.
58) Use Home…Palettes… Coordinate Tracker on the Ognd – Storage Pond surface to see the Cut or Fill depths.

Tools in the NRCS Ribbon:
NRCS … NRCS Storage Ponds…
- Manage Object Groupings. Allows you to manage and modify objects within a group.
- Turn Off:Selection by Group. When Selection by Group is turned off, objects in a group are selected individually.
- Turn On:Selection by Group. When Selection by Group is turned on, all objects in a group are selected just by selecting one object.