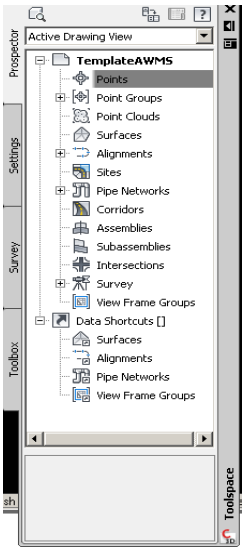
SOUTH DAKOTA NRCS CIVIL 3D 2010 DRAFTING NOTE

AWMS EXAMPLE

This drafting note will proceed through the steps of developing a set of plans for an agricultural waste management system. A description of the site used for the example is given later in the note. The template that is recommended for this project is the AWMS template developed by SD NRCS. This template will help to speed customization and flow of the project, as it is designed specifically for AWMS applications. This template is available here . This note will use commands primarily from the Ribbon. The Tool Palettes are another good option for commands that are useful in drafting NRCS conservation practices, including AWMS.

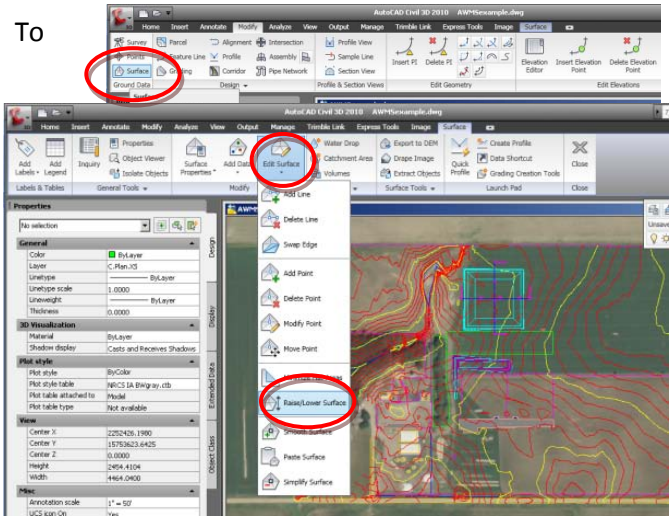
Figure 1: Toolspace



To begin, start AutoCAD Civil 3D 2010 and open a new drawing using the AWMS template. Throughout this template and tutorial overview, it will be assumed that the user has a general knowledge of Civil 3D procedures. Should assistance on a specific procedure in Civil 3D be required, see the resources at http://nrcs.myvbooks.com/LoginForm.spr.

Once the template is loaded, a surface for the existing ground must be created. The SD C3D 2010 – Dam Section 1 help sheet provides information on how to develop the ground surface. This help sheet is available here and provides a detailed overview of how to import points from a survey and create a ground surface from them. The Minnesota Civil 3D help sheets, available at http://www.mn.nrcs.usda.gov/technical/eng/MNDWG_Reference_Guides.html, also provide detailed information about many different parts of the survey process, points management process, and surface creation. Series 100 to 400 in the MN help sheets are most applicable to the creation of a surface.

Figure 2: Command for Raising or Lowering a Surface



It is also useful to create a stripped surface model. To construct a stripped surface, a surface is created identical to the original ground with the named Stripped. Once this surface is created, it can be lowered by clicking on Modify – Surface, which opens the surface section of the Ribbon. From that section, the selection was made to Edit Surface – Raise/Lower Surface. Enter brings up the selection box for the surface, Stripped is selected, and -0.5 is entered to lower the surface by 0.5' (6", or other depth as needed).

Figure 3: Example Site

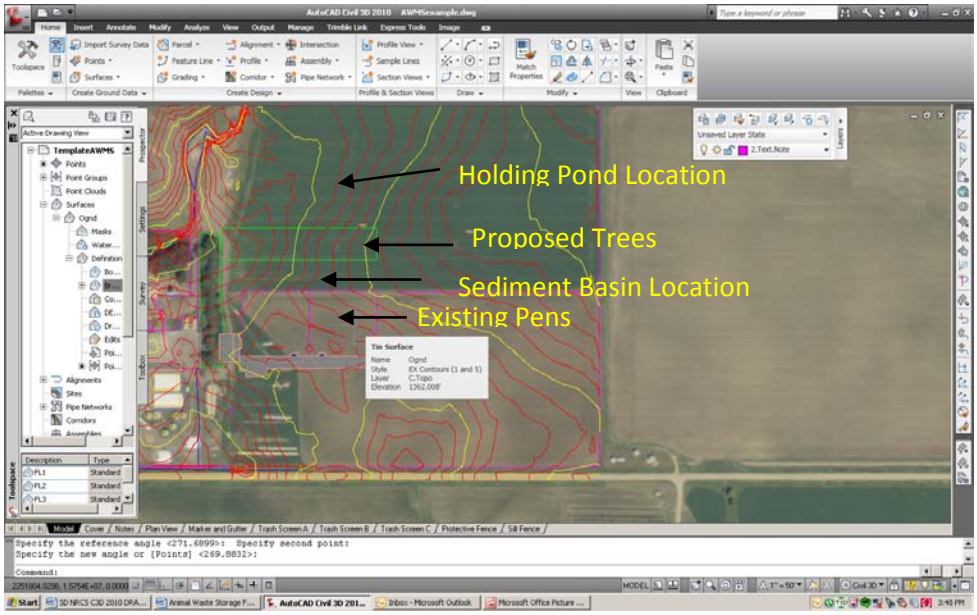


Figure 3 shows the example site that will be used throughout these instructions. Two feed lot pens with a capacity of approximately 500 head are shown. The north direction is up on all drawings for this example. The topography trends from east to west toward the farmstead and towards a drainage way that flows around the north and west sides of the farmstead. There are two existing pens with the bunks along the south side (shown by the hatched area). They are fairly flat, with the runoff exiting to the north and west. The green lines show existing trees to the west and proposed trees located to the north. There will be a sediment basin to the north of the pens to collect runoff which will be conveyed to a holding pond to the north of the new trees. The trees to the north will also allow for some clean water diversion between the pond and the sediment basin. The creek is shown coming from the north, then flowing to the west and south on the other side of the farmstead. The ortho photo is shown for reference only – See MN Help Sheet 1200 at http://www.mn.nrcs.usda.gov/technical/eng/MNDWG_Reference_Guides.html for more information on insertion of georeferenced images or shape files. Note that at the time the photo was taken, the two pens were not yet constructed.

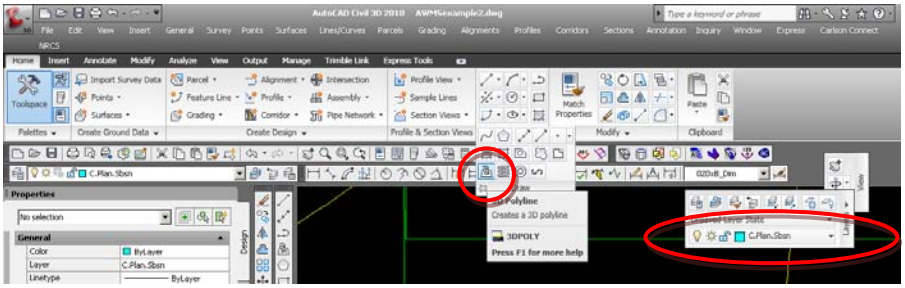
Design and Drafting of Sediment Basin

For this example, the sediment basin will be the first component of the system to be designed and drafted. Since the feedlot pens are already constructed and are fairly new, the existing fences will not be able to be disturbed. The topography indicates that the wastewater exits from the west pen, therefore the north side of the west pen is where the sediment basin will be placed.

For this sediment basin, a sloped bottom is to be used, sloping from elevation 1358.0 on the east to 1356.0 on the west, with a bottom that is 30' wide and 250' long. The top of fill elevation will be 1359.5, which allows for 0.5 acre feet (19,391 cubic feet) of solids storage, for the routed 25-year, 24-hour storm to be passed through the basin and for 1.0' of freeboard. This information came from a hydrology and hydraulics analysis performed using the SITES routing program. For the creation of the sediment basin lines, the layer selected is C.Plan.Sbsn in the layer dropdown box. The basin will be north of the west lot because the water flows out of that area and not out of the east lot. Starting at the fence junction, a 10' area of space

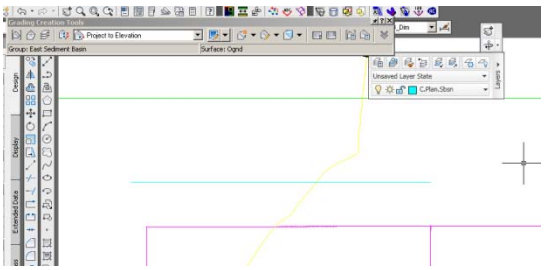
was left to the north of the pens to allow for supports of a wind fence that is part of the north fence of the pens. The elevation at that location is approximately 1362.0. Using a 6:1 slope to a bottom elevation of 1358.0 would require another 24' in the horizontal direction. A construction line was drawn north 36' from the fence junction to give the initial location to start the sediment basin bottom.

Figure 4: 3D Polyline Command



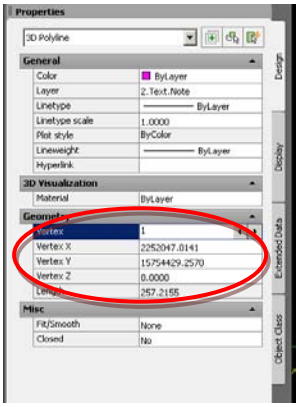
The 3d polyline command is found in the ribbon under Home – Draw – 3dpoly.

Figure 5: Sediment Basin Bottom Line 1



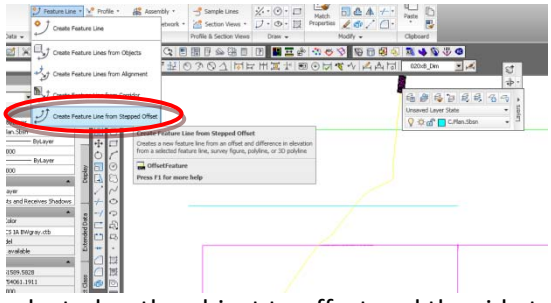
The first point to select is where to start the line. For this example, a point to the north and west of the corner of the fence line is selected. Using the ortho osnap, the line is extended 250' to the east by moving the cursor to that direction from the starting point and typing 250 into the command line. Typing enter closes the command. The south line of the sediment basin is now in place.

Figure 6: Editing 3dpolyline with Properties Window



Editing the elevations of the 3Dpolyline vertexes can be done easily through the properties box. In the Geometry section, each vertex can be cycled through and the elevation can be modified as needed. In the example here, the first vertex was assigned an elevation of 1356.0 and the second vertex assigned an elevation of 1358.0. If the properties window is not open in Civil 3D, it can be opened at any time by typing Properties into the command line.

Figure 7: Offset of 3Dpolyline for Sediment Basin



To create the north edge of the basin bottom, the Create Feature Line from Stepped Offset can be used from the ribbon, located under Home – Create Design –Feature Line - Create Feature Line from Stepped Offset. This will offset the 3d polyline as another 3d polyline, because no feature lines have been created yet. The offset distance for this example is 30' (horizontal). The line that was just drawn is selected as the object to offset and the side to offset is selected as to the north. The elevation difference is

0' (flat bottom parallel to flow). The line will then be created and the command can be ended by hitting enter.

To finish the basin bottom, 3dpolylines are used to connect the ends of the lines on the west side and the east side of the basin bottom. For each end, click on the end of one line, hit enter to accept the elevation (which should be correct if the previous lines are drawn correctly), click on the end of the other line, and then hit enter again to confirm the elevation. The rectangle for the basin floor is shown in Figure 8.

Figure 8: Completed Sediment Basin Bottom

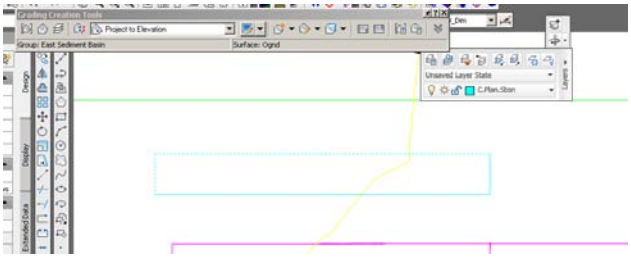
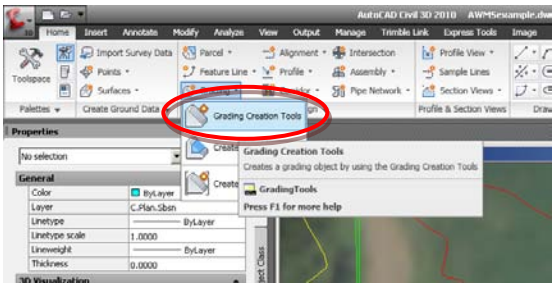
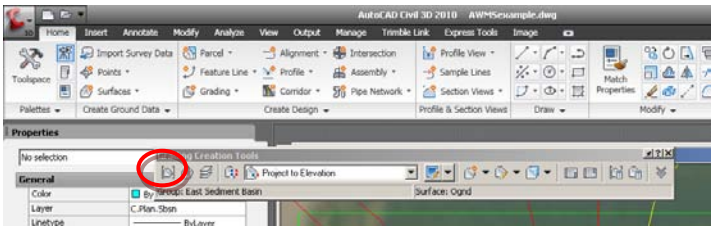


Figure 9: Opening the Grading Toolbar



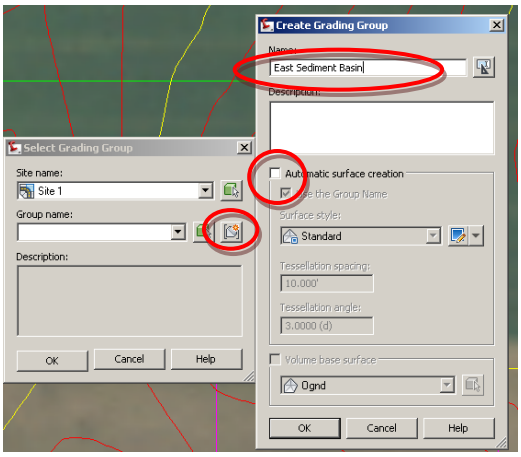
To create a top of fill elevation at 1359.5, grading commands within Civil 3D are utilized. Grading will enable easier creation of the level top from the non-level basin floor. The Grading Creation Tools toolbar can be opened using Home – Design – Grading – Grading Creation Tools.

Figure 10: Grading Creation Tools



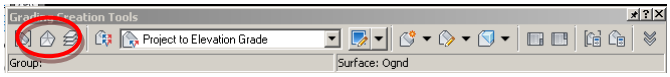
The grading toolbar is generally worked through in a left to right direction. First, the grading group must be set or created. The left most icon of the toolbar starts this command.

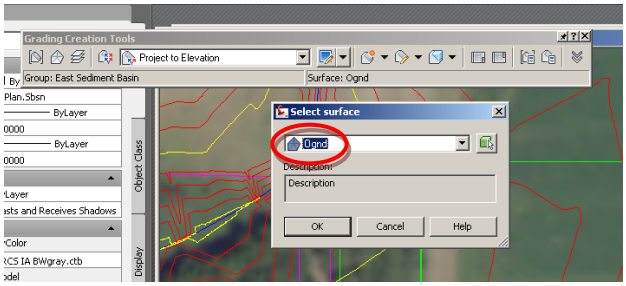
Figure 11: Grading Group Creation



In the select grading group dialog box that opens, the first line allows for selection of the Site. There is only one site in the example here, therefore Site 1 is the appropriate selection. The Group name should be reflective of the grading group that it will apply to. Here, a new grading group was created with the name East Sediment Basin. Clicking on the icon to the right of the Group Name box will open the Create Grading Group dialog box. The group was given the name East Sediment Basin. The automatic surface creation box was not selected for the example.

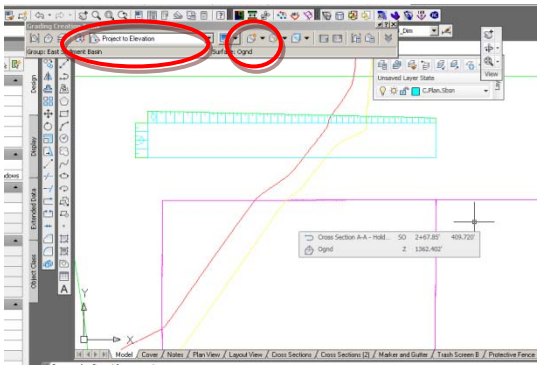
Figure 12: Target Surface Selection





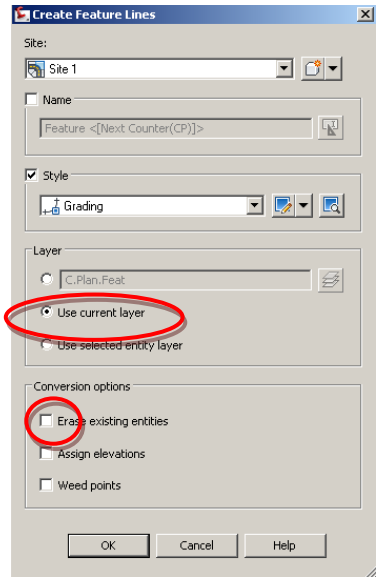
The second icon in the Grading Creation Tools toolbar allows for designation of the surface model to be used for gradings that extend to a surface. For this example, the original ground surface was set as the target surface.

Figure 13: Grading of Basin Bottom Lines to Elevation 1359.5



The top of fill is to be constructed at elevation 1359.5. This elevation was determined by a hydrology run in SITES based on the approximate stage-storage for a basin with a 30' x 250' bottom and 3:1 side slopes. To grade to this elevation, the Project to Elevation Slope option is selected in the drop down box for the grading type. The Create Grading command is two icons to the right of the grading type selection dropdown.

Figure 14: Create a Feature Line

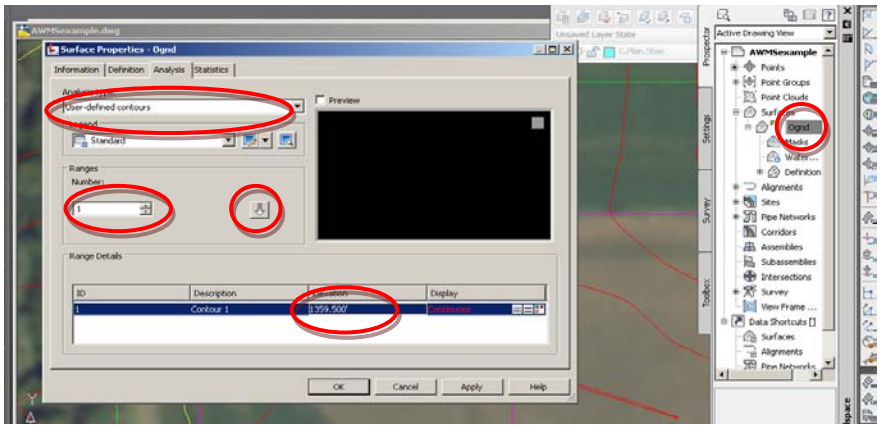


At this point, the user is prompted to select the feature to be graded. For this example, the west line for the basin bottom was selected. When the 3dpolyline is selected, the Create Feature Lines dialog box will be opened. In this box, the user can specify the Site, Style, Layer, and other options for the Feature Line that will be created. For this example, the current layer (C.Plan.Sbsn) was used and the option to Erase existing entities was unselected.

A point away from the line (to the west) was chosen for the grading direction, the enter key was pressed for confirming the grading for the entire width, 1359.5 was entered as the elevation, enter was pressed to confirm the 3:1 slope and the grading was then completed. This process was repeated for the north edge of the basin bottom, projecting to the north side and the result is shown in Figure 13 (actual look of gradings will depend on the grading type and options that are set in Civil 3D).

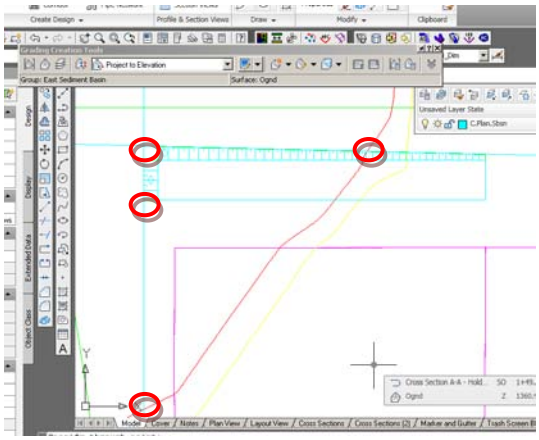
To finish creation of the inside edge of the basin top, two other steps were performed.

Figure 15: Creation of User Defined Contour



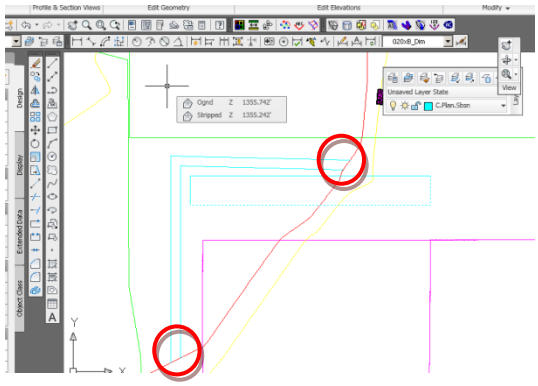
First, a user-defined contour was created for the Ogrnd surface at elevation 1359.5. This is done through the surface properties dialog box under the Analysis tab. This box is opened by right-clicking on the surface name in the Prospector tree and selecting properties. In the box that opens, the drop down was set to user defined contour, the range to 1, and the arrow was pressed to create the contour. In the range details box, the contour elevation was set to 1359.5, apply was pressed, and there was a new contour placed on the elevation 1359.5.

Figure 16: Inside Top of Basin Creation



Two construction lines were created along the top edge of the projections to elevation 1359.5 as shown in Figure 16. The red line is the user-defined contour that was created. The top edge of the basin was drawn by creating a 3d polyline and selecting the points where the construction lines cross the user contour and the gradings, using the osnap for intersection and end point. Once the 3dpolyline was drawn, the gradings and construction lines were deleted.

Figure 17: Sediment Basin Embankment

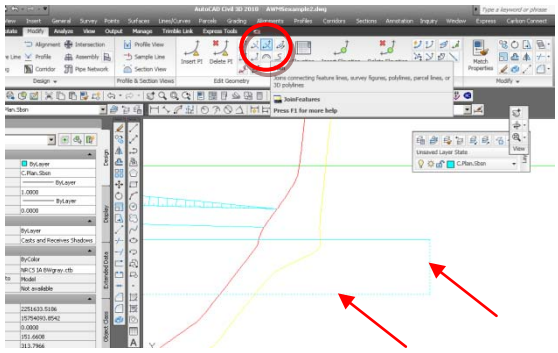


To create the outside edge of the basin top, the Create Feature Line from Stepped Offset command was used with an offset of 10' and elevation difference of 0. The lines are then extended to where they would cross the user contour using the extension and the intersection osnaps.

To grade the slope toward the lot, 6:1 slopes will be used to allow easier access for cleaning. The south and east lines of the sediment basin bottom will be graded at 6:1 slopes.

To obtain a continuous corner grading, these lines should be joined prior to performing the grading. The join command is located under Modify – Edit Geometry. Note that other commands that reside in this area of the Ribbon are break, trim, fillet, and other useful commands to use during drafting and grading.

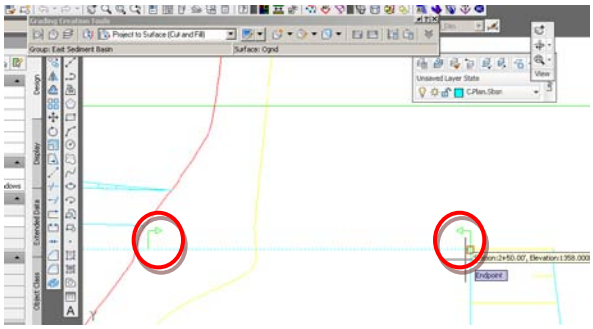
Figure 18: Joining of Basin Bottom Polylines



The toe locations of the slopes will also be determined by grading, using the Ognd as the target surface. In the Grading Creation Tools dialog box, the option to Project to Surface (Cut and Fill) was selected. The grading to the outside of the fill was created using 3:1 slopes and projecting from the outside feature line.

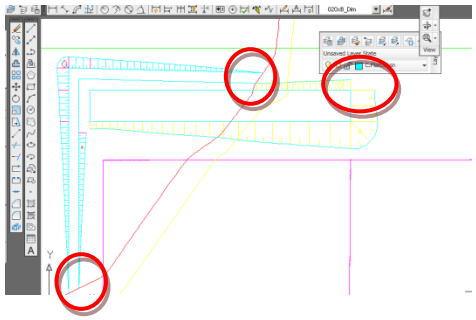
After the two lines have been joined, the grading can be performed by selecting the Create Grading icon from the toolbar. The joined line was selected and the direction was picked as toward the feedlot. Enter was pressed to perform the grading for the entire width, 6 was input for 6:1 slopes both in the cut and fill directions, and the grading was completed.

Figure 19: Grading of North Side Basin Bottom



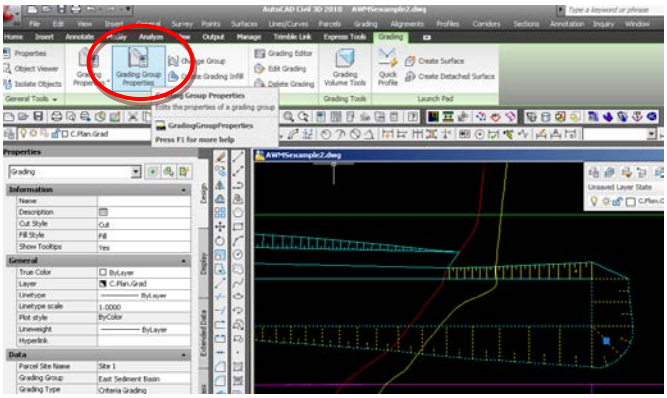
This leaves two areas that have not yet been graded – part of the north side that will be in cut and the inside part of the embankment for the west side. To grade these areas, the option to not grade the entire line length was selected. Using the Project to Surface (Cut and Fill) option, a new grading was started. The north edge of the basin bottom was selected, the direction to grade was picked as north, then N for no was entered when prompted if the grading was to be applied to the entire length. When this option is selected, a prompt for a location to start the grading requires that a start point for the grading be either picked on screen or entered as a station. Figure 19 shows a selection of two points along the north basin bottom. The green arrows show the area that will be graded. After selecting the two points and confirming the stations of those points, the slopes were entered as 3 for 3:1 and the grading is completed. A similar process to grade the southern, inside portion of the west basin embankment completes the gradings for the sediment basin.

Figure 20: Connection Line Locations for Basin



To finalize the basin lines in preparation for modeling, the ends of the embankments were connected with 3dpolylines and 3dpolylines were also drawn in spots where small gaps existed between gradings.

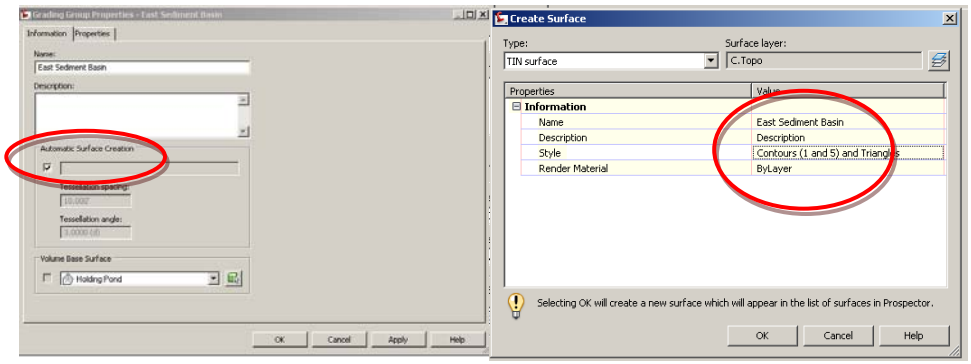
Figure 21: Opening Grading Group Properties



The sediment basin was then modeled as a surface. To complete this modeling, one of the gradings was selected and the Grading Group Properties option was selected from the Ribbon.

On the Information tab of the Grading Group Properties dialog box, the pick box for Automatic Surface Creation was selected. This will open the create surface dialog box where the name, description, and style for the new surface were set. The default name for the surface will be the same name as the Grading Group. The name for this example was left as East Sediment Basin and the Style was set for Contours (1 and 5) and Triangles.

Figure 22: Surface Model Creation from Grading Group



Clicking Ok twice generated the basin surface model as shown in Figure 23. There is a portion of the sediment basin that is not covered by the model as only the gradings have been used to generate the model. To create the complete surface model, the rest of the basin lines are added as breaklines.

Figure 23: Surface Model Basin Surface Model with Triangles

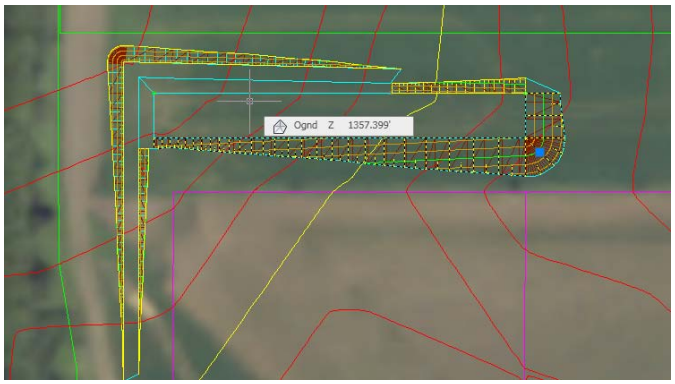
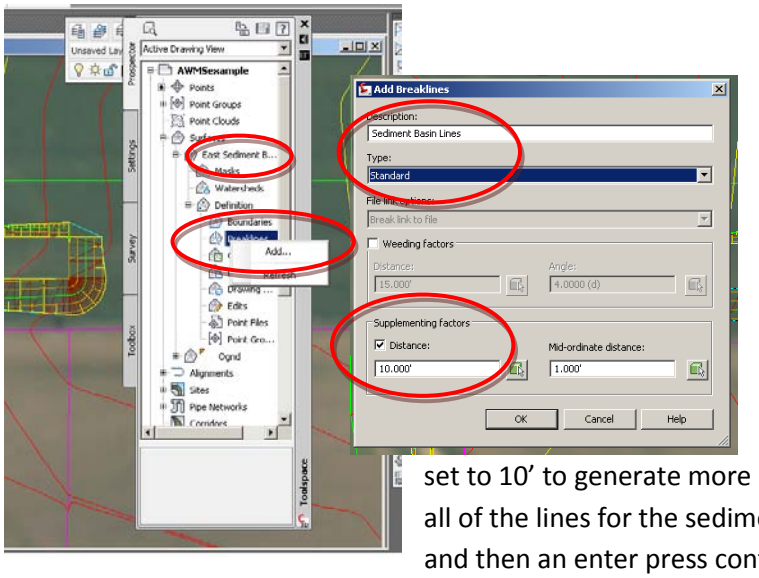
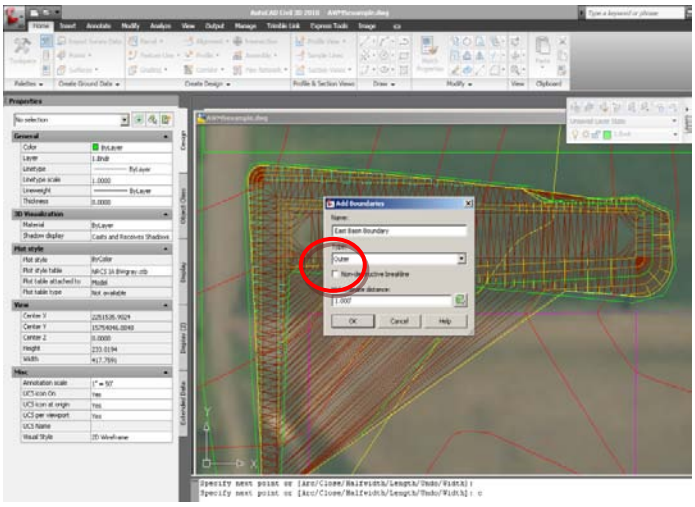


Figure 24: Addition of Breaklines to Basin



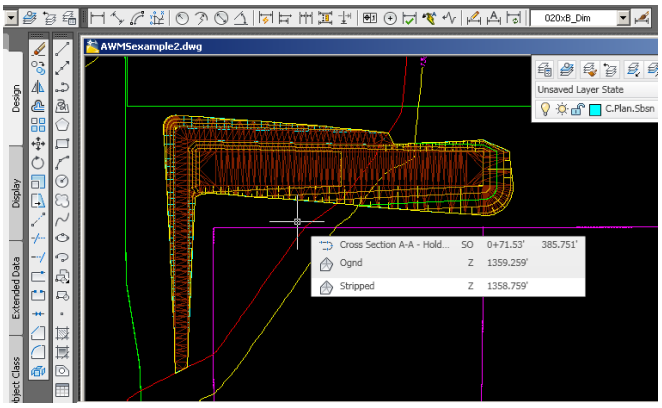
To add the breaklines, the definition for the East Sediment Basin surface model is expanded in the prospector tree and a right-click on the Breaklines option and selection of Add will open the Create Breaklines dialog box. The description for the lines is Sediment Basin Lines for the example here. To create a better surface, the supplementing factors distance was set to 10' to generate more nodes for triangulation. After clicking Ok, all of the lines for the sediment basin bottom were selected in Civil 3D and then an enter press confirms the selection.

Figure 25: Adding a Boundary to Basin Surface Model



The result is a model that has lines that extend between the two parts of the sediment basin. To remove the unwanted area from the basin model, a boundary can be added to the surface model definition. The boundary was drawn as a polyline and was drawn close to the outside toes of the gradings for the sediment basin. In a similar matter to adding the breaklines, the boundary was added by right-clicking on Boundary in the prospector tree, clicking add, naming the boundary, unselecting the Non-destructive breakline option and then selecting Ok and clicking on the boundary.

Figure 26: Sediment Basin Surface Model

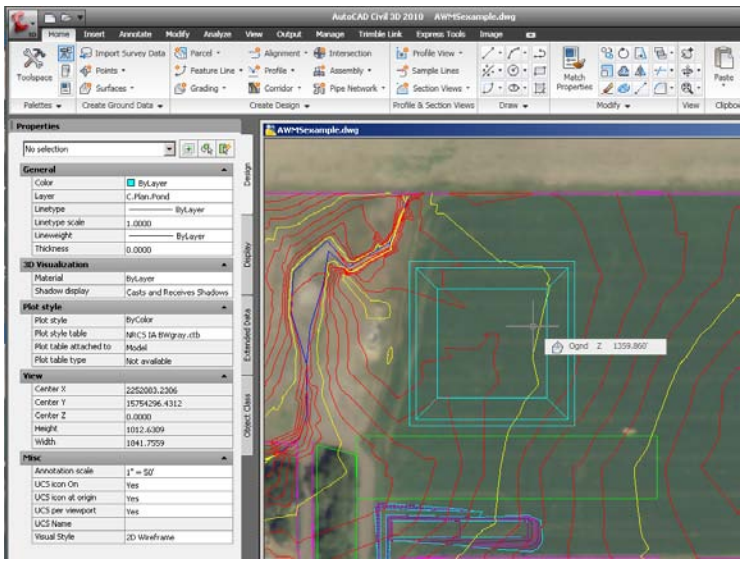


Turning off the boundary layer (1.Bndr or another layer as user defined) and the slope patterns and setting the surface model type to PR Contours (1 and 5) yields a completed sediment basin.

Design and Drafting of Holding Pond

For this example, the holding pond will be 200' by 200' on the bottom with a bottom elevation of 1348.0, a maximum operating level of 1354.5, and a top of fill elevation of 1361.0. There are two ways that could have been used to generate the holding pond for this example. The first way is to draw the pond with 3d polylines in a similar fashion to how the sediment basin was drawn. This method will be shown first. The second method would be to use the Place Storage Pond in CAD feature from the NRCS menu. This method will also be shown. Note that the Place Storage Pond in CAD feature is most useful for rectangular or square holding pond configurations.

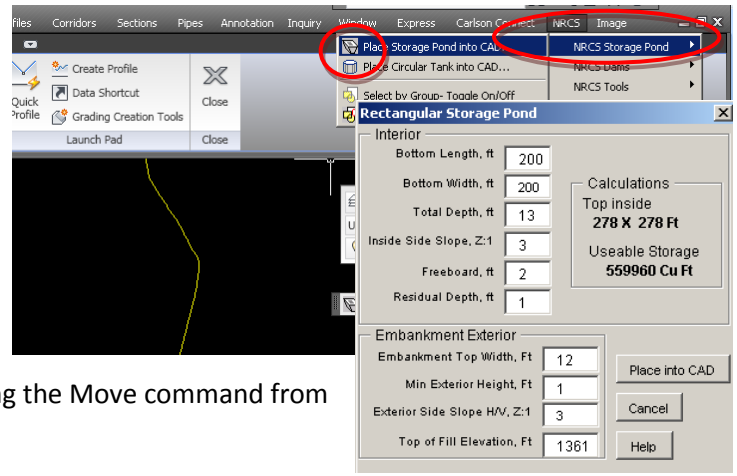
Figure 27: Holding Pond Outline



The layer for the lines drawn for the pond is C.Plan.Pond. To start, a 3dpolyline for the bottom is drawn and then offset to give the top edges of the pond fill using the Create Feature Line from Stepped Offset command. The horizontal distance was 39 and the vertical distance was 13 for the inside of the pond fill, then a stepped offset with a 12' horizontal offset and a 0' vertical offset gave the outside edge of the top. Connecting the corners of the top to the bottom with feature lines completes the outline of the pond structure. The pond was placed to the north of the trees by estimating how far north to place it where the toes would not encroach on the trees.

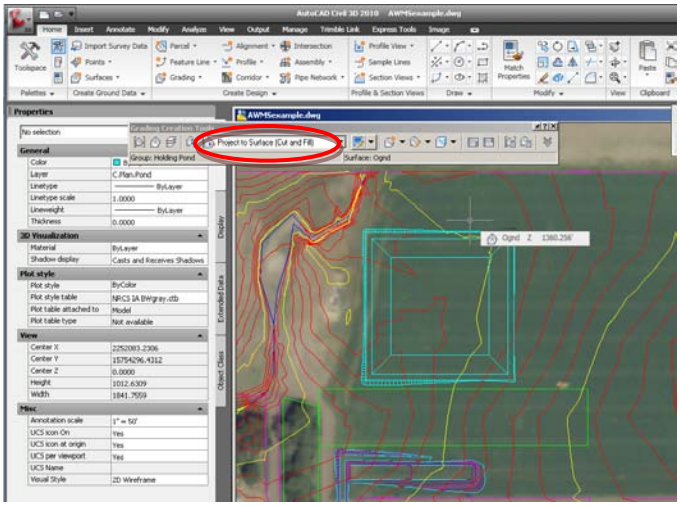
For the second method, click the Place Storage Pond in CAD from the NRCS Tools toolbar (if open) or find the command from the NRCS dropdown menu.

Figure 28: Storage Pond Entry Box



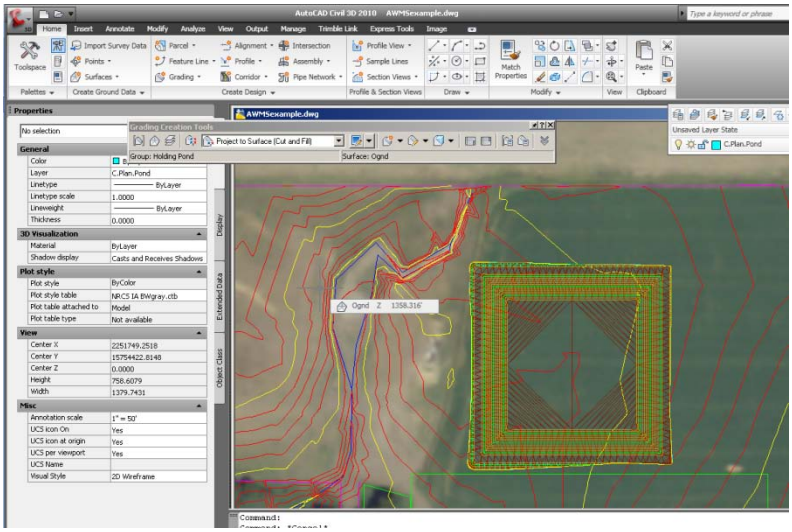
The input box for the Rectangular Storage Pond allows for the information regarding the pond size to be input. Once the data has been correctly input into the box, click the Place into CAD icon and select the location for the bottom left corner of the pond. This will place the pond as a set of polylines and should be ready to be graded as will be shown in the following steps. The pond can be moved once placed by using the Move command from the right-click menu or from the Ribbon.

Figure 29: Pond Dike Grading



The Project to Surface (Cut and Fill) grading method was used on the outside edge of the pond dike to complete the grading for the pond. A new grading group named Holding Pond was created and the Ognd surface was used as the target surface for the grading. The slopes on the outside of the pond were projected at 3:1 H:V. This grading procedure applies to both of the methods that could have been used to draft the lines for the holding pond.

Figure 30: Completed Holding Pond Surface Model



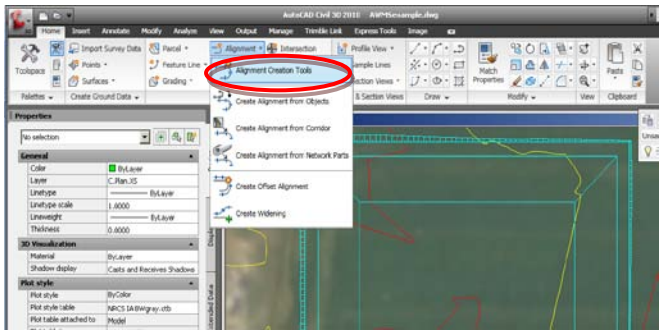
To complete the surface model for the holding pond, the grading group properties window was opened and the automatic surface generation was selected in the same manner as the sediment basin surface above. The feature lines for the holding pond were added to the surface model definition as breaklines, resulting in the surface model for the holding pond being completed as shown below. The Contours (1 and 5) and Triangles was used for the model in the figure.

This is the end of the drafting that will be performed in this example. In the real project, a diversion is needed to the east side of the holding pond to prevent runoff from entering the pond. Other components were included as part of the overall system for this producer, however the process for these components is similar enough to the sediment basin and holding pond drafting that they do not warrant inclusion here.

Creation of Alignments and Profiles

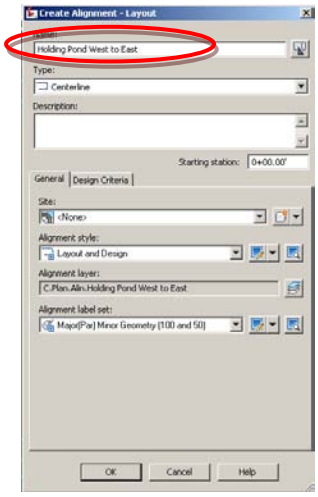
The next step in preparation of plans for an AWMS is to generate cross sections for the important parts of the system. In Civil 3D, cross sections are referred to as profile views. Profile views show a profile of a surface model along an alignment.

Figure 31: Alignment Creation Tools



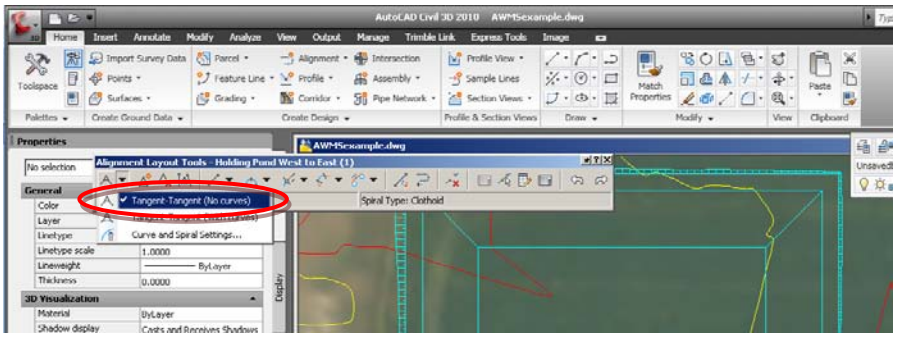
The holding pond was the first component that the alignments were defined for. The surface model properties were changed so the model type was No Display. To draw the alignment, the Alignment Creation Tools command was used under Home – Design – Alignment – Alignment Creation Tools.

Figure 32: Create Alignment Dialog Box



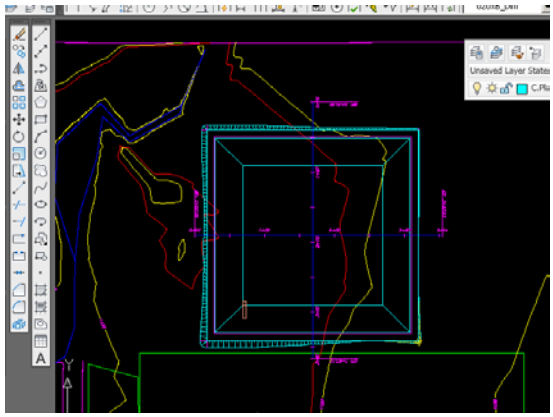
This opens the Create Alignment – Layout dialog box as shown below. For this example, the alignment to be created was named Holding Pond West to East. This box contains many options that can be set for the alignment, including the start station, alignment type, alignment style, and the alignment label set. None of these were changed for the example. Clicking on Ok completes the setup of the alignment and opens the toolbar for the creation of the alignment.

Figure 33: Alignment Creation



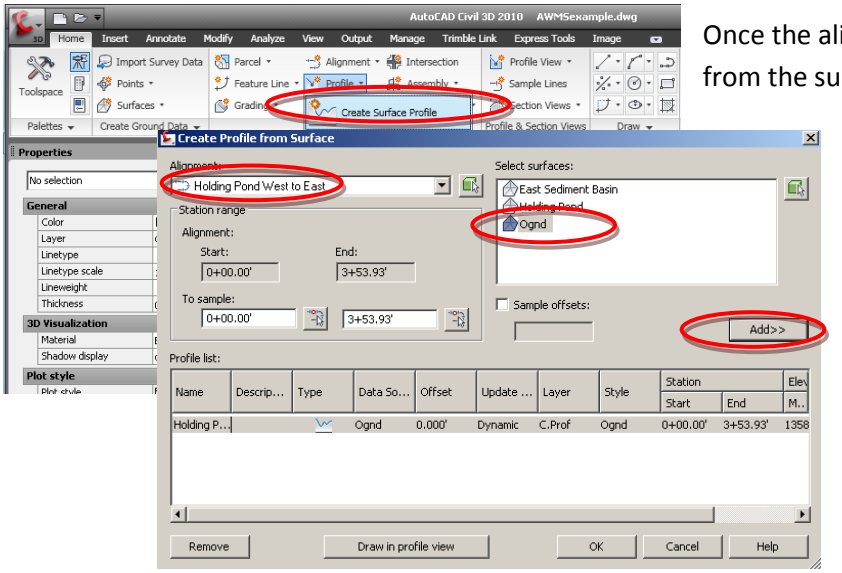
The alignment toolbar contains many different options for drawing alignments. For this case, the Tangent-Tangent (No curves) type is selected under the first button dropdown**.**

Figure 34: Alignments for Holding Pond



The command prompts for the first point of the alignment. The first point is selected as the midpoint of the west pond bottom by using an Osnap to midpoint. The second point is picked as a point to the east of the outside toe of the pond. Clicking on the alignment and dragging the left side to a point to the west of the outside toe yields a finished alignment that crosses the pond in the west to east direction as shown. The same process is used to generate an alignment from north to south for the holding pond.

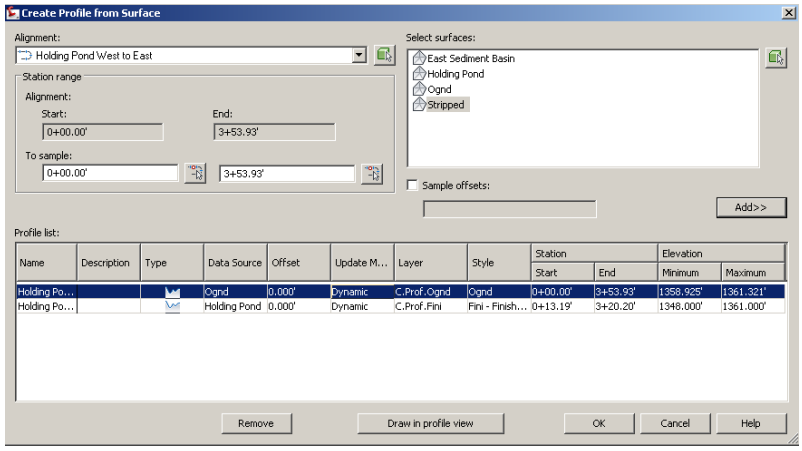
Figure 35: Create Surface Profile



Once the alignments are prepared, the profiles from the surface models can be generated. To start a profile, the command is selected Home – Create Design – Profile – Create Surface Profile. The Create Profile from Surface Box is opened. To create a profile, the Alignment is selected and then the surface is selected from which to take the profile. The first profile for the example is from the Holding Pond West to East alignment and the Ognd profile. Click Add to create the profile.

Once the profile has been added, the profile shows up in the Profile list (the bottom part of the dialog box). Changes can still be made in the profile list for the Layer and Style of the profile. For the example, the layer for the profile was changed to C.Prof.Ognd. The style for the Ognd profile is correct.

Figure 36: Creation of Profile from Surface



The process is repeated for the Holding Pond surface model. The Holding Pond profile is placed on the C.Prof.Fini layer and the style is set to Fini – Finished Design.

For the stripped profile, the Station range to sample is modified to match the holding pond stations. This will allow it to be shown only under the holding pond, as that will be the required stripping extents. The Stripped profile is set on the C.Prof.Strp layer and the style is set to Stripped. Clicking on Ok will complete the process of creating profiles from the surface models. Note that once the profiles have been created, the layer and style cannot be changed in the profile list in the Create Profile from Surface dialog box.

Figure 37: Stripped Surface Profile Creation

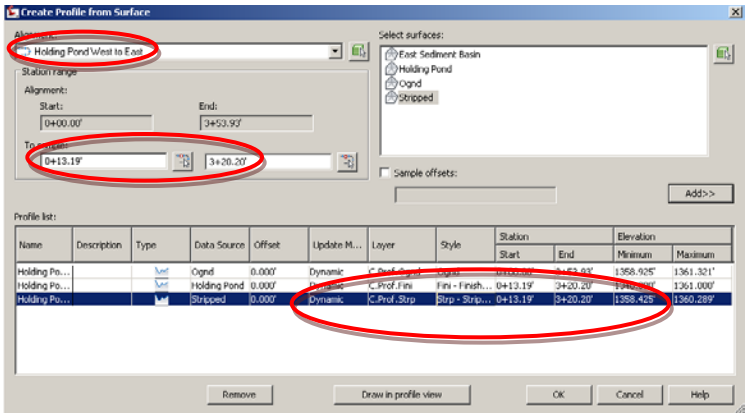
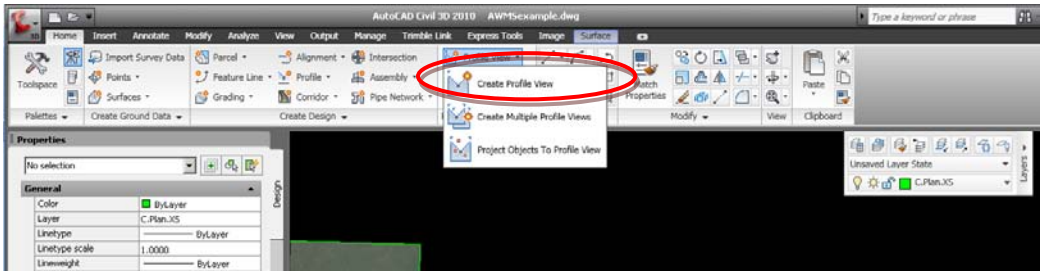
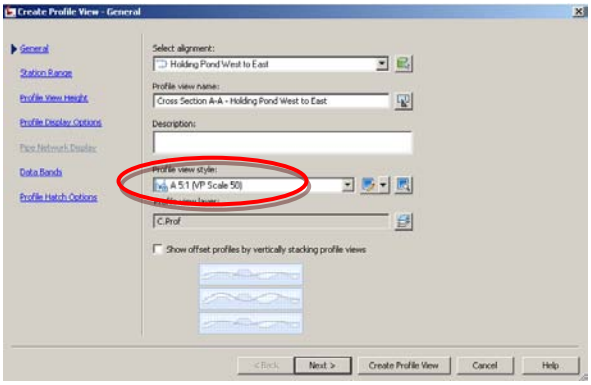


Figure 38: Creation of Profile View



To create a Profile View for the profiles that were just created, the command can be started by using the Ribbon command under Home – Profile and Section Views – Create Profile View.

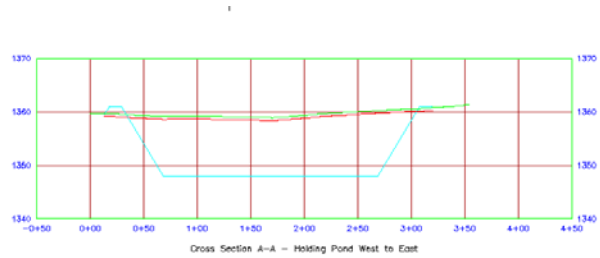
Figure 39: Profile View Creation Dialog Box



This will open the Create Profile View dialog box. On the general page of this box, the alignment, Profile View name, Profile view style, and Profile view layer can be set. For this example, the alignment is Holding Pond West to East, the name was changed to Cross Section A-A – Holding Pond West to East, the style was set at A 5:1 (VP Scale 50), and the layer was left as the default.

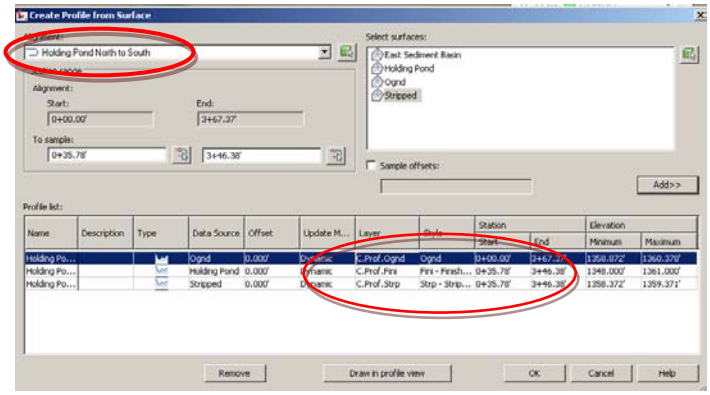
Listed on the left of the dialog box above are the other sections of the profile view creation process. The station range and view height can be change, the display options can be modified, data bands can be applied, and hatch options can be set. For this example, no further changes are needed at this time. For detailed information about the options for profile views, see http://www.mn.nrcs.usda.gov/technical/eng/MNDWG_Reference_Guides.html#Profiles .

Figure 40: Completed Profile View in Modelspace



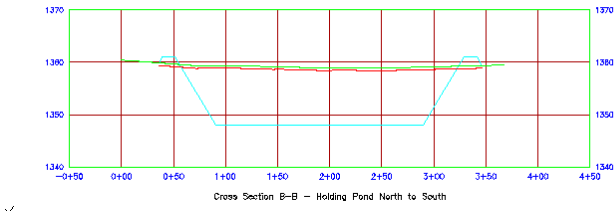
By clicking on Create Profile View, the profile view is ready to be placed in model space. Selection of a location that is outside the area of the existing surface models gives a completed cross section as shown in Figure 40.

Figure 41: Holding Pond North to South Profile Creation



The north to south alignment and profile for the holding pond are generated in a manner similar to the west to east profile.

Figure 42: Holding Pond North to South Profile View

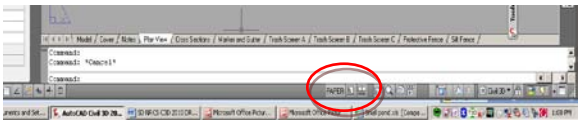


The same process is used to create profiles for all other components of the waste management system that need to have cross sections shown to enable construction. For this example, similar profiles to the holding pond profiles were prepared for the sediment basin.

Preparation of Plan Sheets

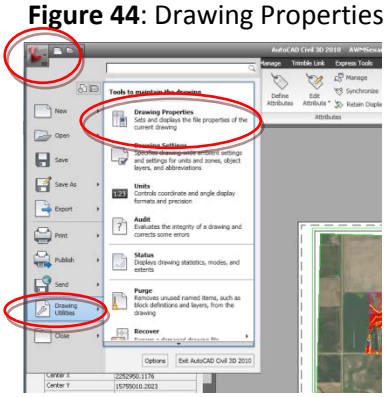
After all the drafting is completed in model space, the next part of the process is to prepare the plan sheets for the project. Note that this is a time consuming process and it is usually beneficial to do as little of this process as possible until the design is final and no further changes will be required.

Figure 43: Layout Tabs



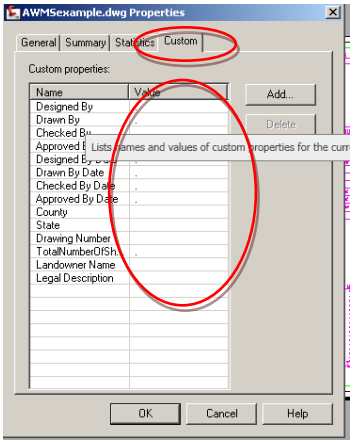
The tabs across the bottom of the sheet indicate the preloaded layouts for the AWMS template. If the tabs are not shown, right click on the black model space square and select Display Layout and Model Tabs to un-hide them.

Figure 44: Drawing Properties



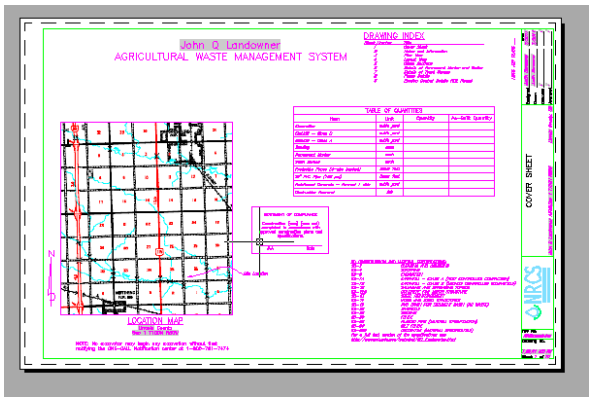
The first step in the plan sheet preparation process is to complete the fields in the drawing properties box. This box is accessed by clicking on the symbol in the upper left of the screen and selecting Drawing Utilities – Drawing Properties.

Figure 45: Drawing Properties Dialog Box



The Value column for each field in the Custom tab should be completed as applicable. This information will be used in generation of the title block information for each sheet and will thus help with consistency across the drawing set.

Figure 46: Cover Sheet



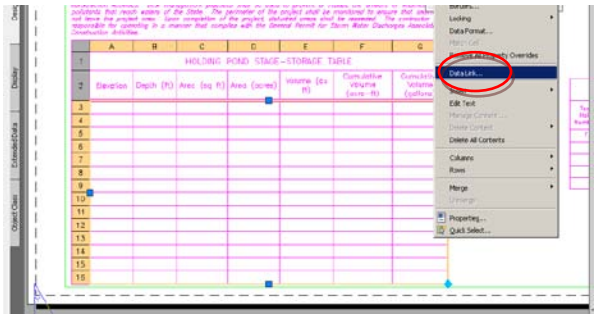
The cover sheet is the first sheet of the plan set. The primary items to be completed on this sheet are the location map, the table of quantities, the drawing index, and the list of specifications.

For this example, the location map was created by taking a snapshot from a SD DOT county map in adobe (pdf) form. These maps are available from SD DOT here. The maps are also available in AutoCAD drawing form (dwg).

Figure 47: Notes Sheet

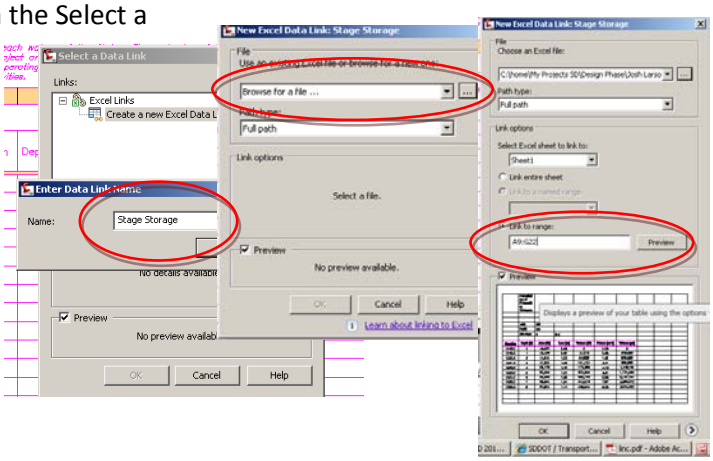
The second page of a typical AWMS set of plans is the notes and information sheet. The notes on the left side will need to be updated, added to, or subtracted from as applicable to a specific site. Double click on the text to open the text in an editing box. The holding pond stage-storage table in the bottom left is able to be edited in the same manner as an Excel table. The data can be entered into the table manually or a data link can be created to an excel table.

Figure 48: Data Link Creation



To create a link to an excel table, first create the correct number of rows and columns in the AutoCAD table. To add rows or columns, right click and select row or column, then add above/below or left/right. In Excel, change the font of the text to RomanS, note the cells that are in the upper left and lower right of the data range to be input, and then save the file and close it. Within the table in AutoCAD, select the cells where the data is to be input. Right click and select Data Link.

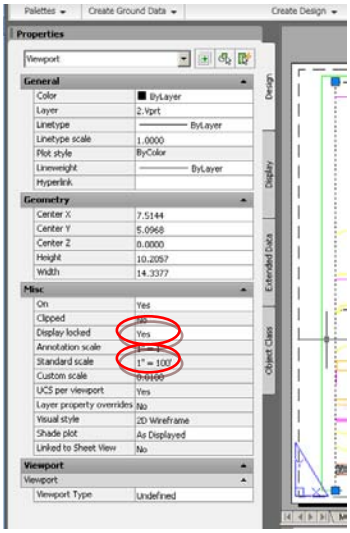
Figure 49: Data Link Creation for Stage Storage Table



In the Select a Data Link dialog box, click on Create a new Excel Data Link and enter a name for the link then click Ok. In the New Excel Data Link box, click on the … box under File and find the excel file where the data is to be imported from. In the next dialog box that opens, select Link to range and enter the range for the cells to be imported, then click Ok and Ok. The data should now be in the table.

The tables on the right side of the drawing are optional. The scale of the boring table provided is 1' to 0.2 drawing units. The lab test table is particularly valuable if there are multiple locations for the borrow material. The plan view layout comes preloaded with a north arrow, benchmark box, a viewport, and a scale that is linked to the scale of the viewport. If the drawing has been regenerated after changing the viewport scale, the linked scale bar should accurately reflect the scale of the viewport. The benchmark box is a table and can be edited as needed to show the benchmark information for the site.

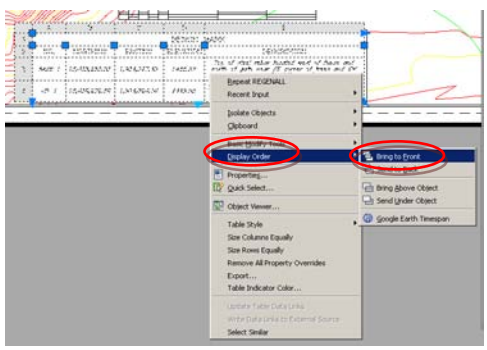
Figure 50: Viewport Properties



The first step in preparation of the viewport is to double click within the viewport to activate model space and then scroll and zoom to the site location. Once the site looks approximately how it should on the plan, switch to paper space by clicking the word Model on the bottom of the screen. Then left click on the viewport border, right click, and then select properties (unless the properties window is already open).

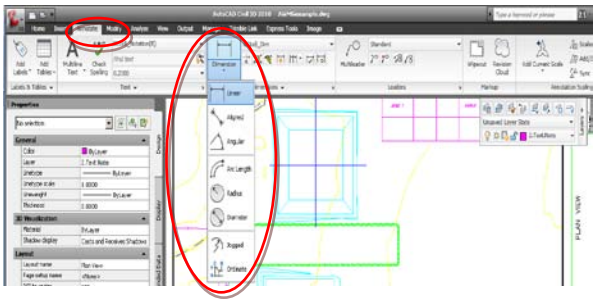
Change the Standard scale to a value that will allow for measurement with a standard engineering scale (1" = 10', 1" = 50', etc.). Change the option for Display locked to Yes to avoid scaling issues from arising during the dimensioning process.

Figure 51: Bringing Benchmark Box to Front



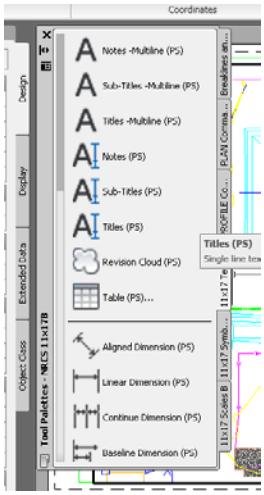
Another issue that may occur is to have the benchmark box be on top of contours and/or other parts of the plan view. To fix this issue, draw a polyline around the benchmark box. Type wipeout, press enter to select the polyline type, select the polyline and click enter to confirm. Type Y or N to either delete or save the line and a wipeout will be created. If the table is no longer visible, click on where it was and it will be selected. Right click and select Display Order and "bring to front" to put it on top of the wipeout.

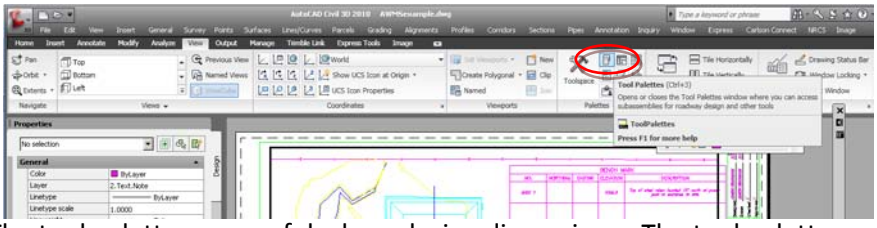
Figure 52: Dimensions



Dimensioning of the plan view is usually best done in paper space. This allows the components to be shown in closer views in additional viewports without having dimension overlap or conflict. The styles to be used according to the National CADD Standards are 001xB_Notation(B) for the text and 001xB_Dim for the dimensions. The most common dimensions are located under Annotate – Dimensions and are accessed through the drop-down menu Dimension. Generally speaking, the layer that should be used when dimensioning in paper space is 2.Text.Note.

Figures 53 and 54: Tool Palettes





The tool palettes are useful when placing dimensions. The tool palettes contain many preloaded dimensioning commands, symbols, blocks, scales, and other related items that can be used to dimension the plan view. To open the tool palette, click View – Palettes – Tool Palettes. The figure shows the 11x17 text section of the tool palette. The plan view can be dimensioned to show all pertinent information.

The original ground contours need to be labeled to clarify what the intervals are that are displayed. Most commonly, the interval will be 5'. To label the contours, double click on the viewport to activate model space. Click on Modify – Ground Data - Surface and then Labels and Tables – Add Labels – Contour – Multiple. Click on the existing ground surface or hit enter and select it from the list. Click Ok and then draw a line where the contours are desired to be labeled. The line can have multiple nodes or multiple lines can be drawn to ensure that sufficient labeling of contours is achieved. Once labeled, the minor contour labels may need to be turned off (C.Topo.Ognd.Anot.Minor layer).

Figure 55: Contour Label Creation

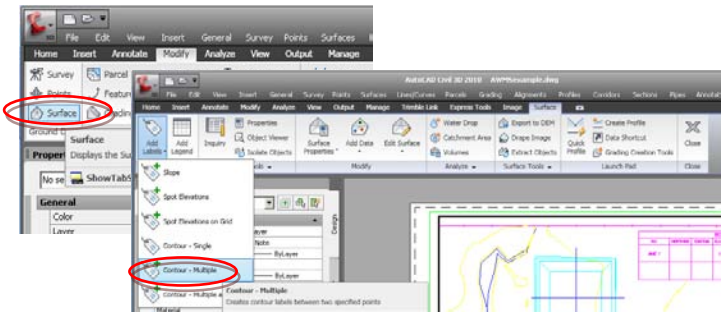


Figure 56: Contour Label Line

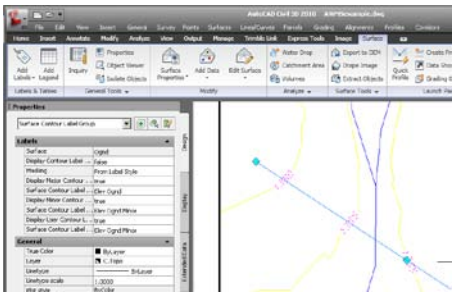
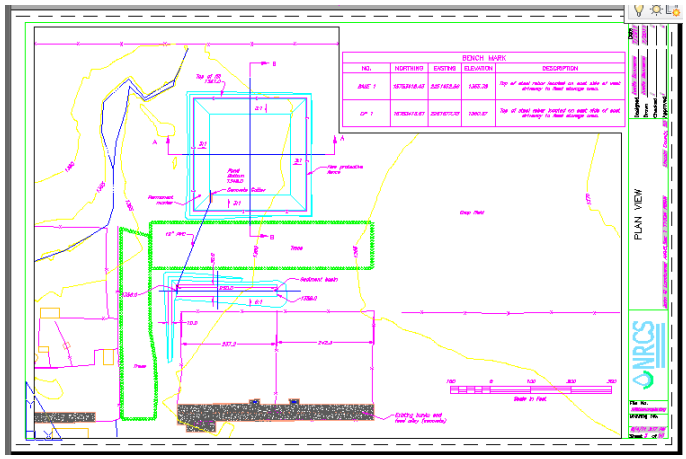


Figure 57: Plan View



The dimensioned plan view is shown in Figure 57. A few items to note are the addition of the pipe, gutter, and permanent marker. The pipe and gutter were added in model space and will be made into a profile to show clearly the ground, sediment basin, and holding pond structure details in the area of the outlet.

To create a Layout View for the plan set, right click on the Plan View tab, select Move or Copy, then select to place the copied layout before the

Cross Sections layout and ensure that Create a copy is selected. The new layout will have the name Plan View (2) or something similar. Right click and select Rename, then enter Layout View as the new name.

Figure 58: Creation of Layout View

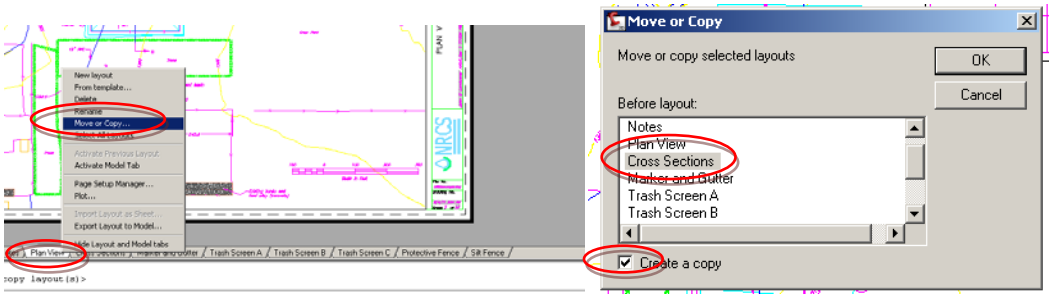
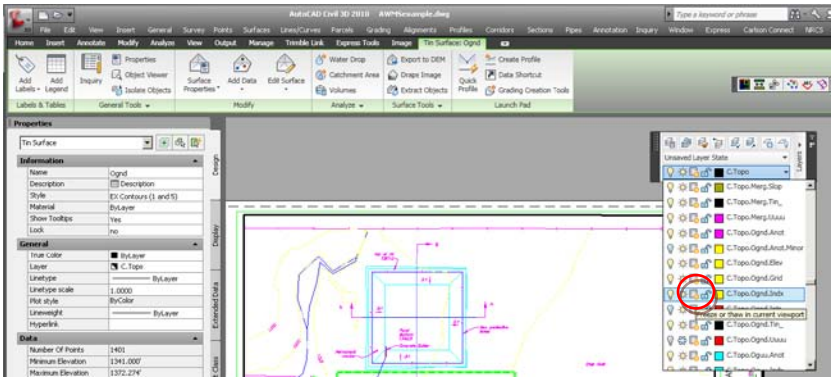


Figure 59: Layer Freeze in Current Viewport



For a layout view, it is often useful to have the contour lines turned off. To turn these off in one layout only, use the layer freeze in current viewport feature of AutoCAD as shown in the figure.

Figure 60: Layout View

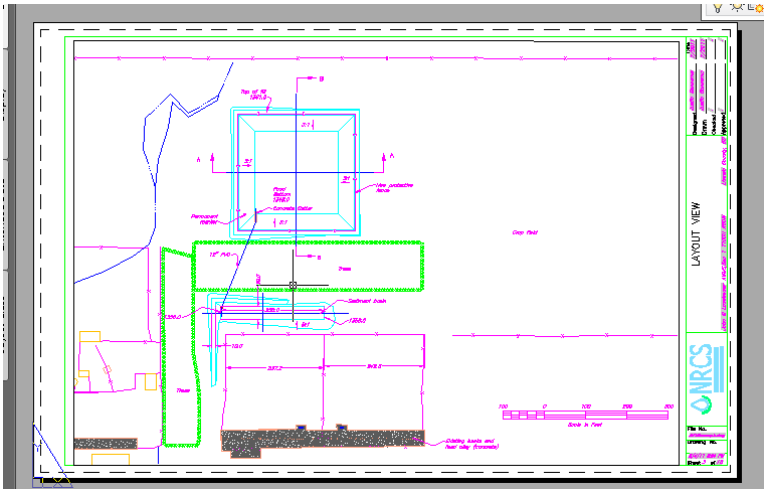
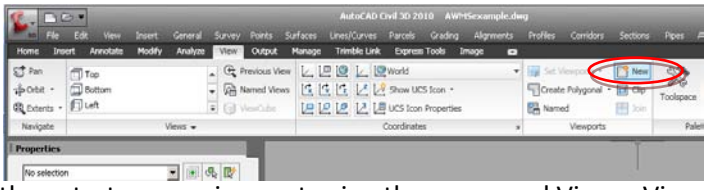
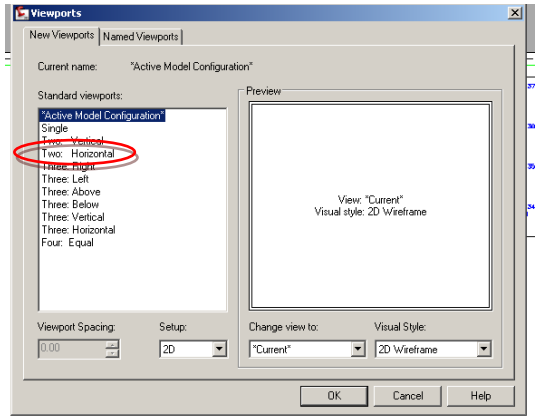


Figure 61: New Viewport Creation



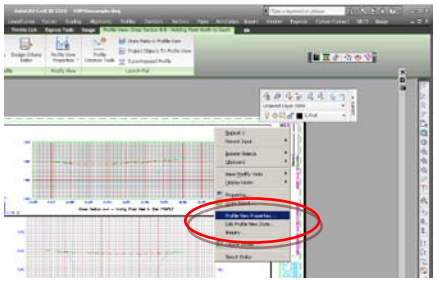
One preloaded cross section layout exists in the template. To ready this drawing for printing, first a viewport must be created. To create a viewport, set the layer to 2.Vprt and then start a new viewport using the command View – Viewports – New.

Figure 62: Viewport Creation Dialog Box



The Viewports dialog box contains numerous options for creating the new viewport. Configurations of 1, 2, 3, or 4 viewports are available to be created. For profile display, 2D wireframe is the most common visual style. For this example, the Two: Horizontal option was selected, as the first cross section sheet will display the two holding pond profiles. Each viewport will need to be zoomed and have the scale set to match the scale that was set for the profile view in that viewport.

Figure 63: Profile View Properties Command



After zooming so the west to east profile of the pond is shown in the top window and the north to south profile of the pond is shown in the bottom window, it is evident that the profiles are too tall for the size of the viewports. To make them fit the windows, the Profile View Properties can be modified to change the elevation range. Selecting the profile view, right-clicking, and selecting Profile View Properties opens the Profile View Properties window. The Elevation tab allows for a user to enter an elevation range. Here, each profile was set for a range of 1340 to 1370.

Figure 64: Profile View Properties Dialog Box

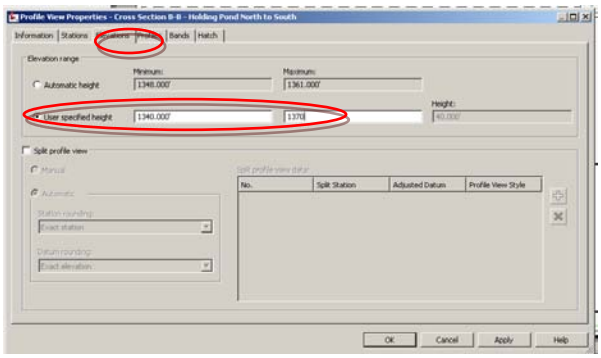
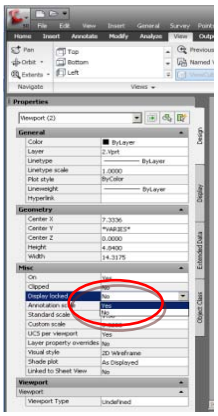


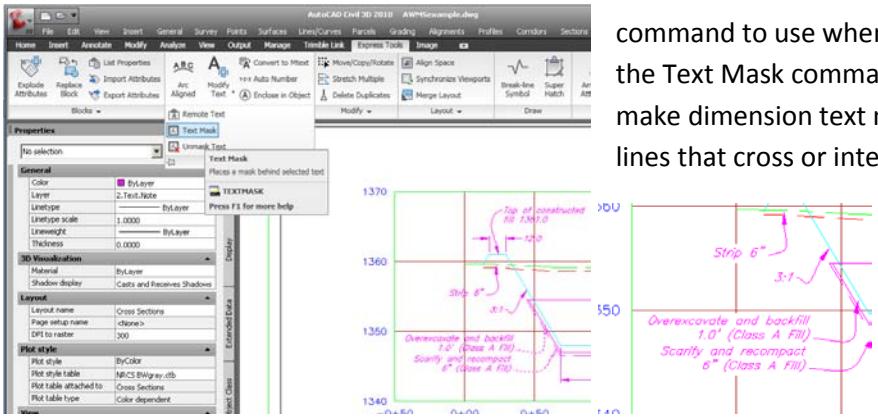
Figure 65: Profile View Lock



The properties window can be used to lock the viewports. This will help avoid unintended scaling issues when switching between model space and paper space.

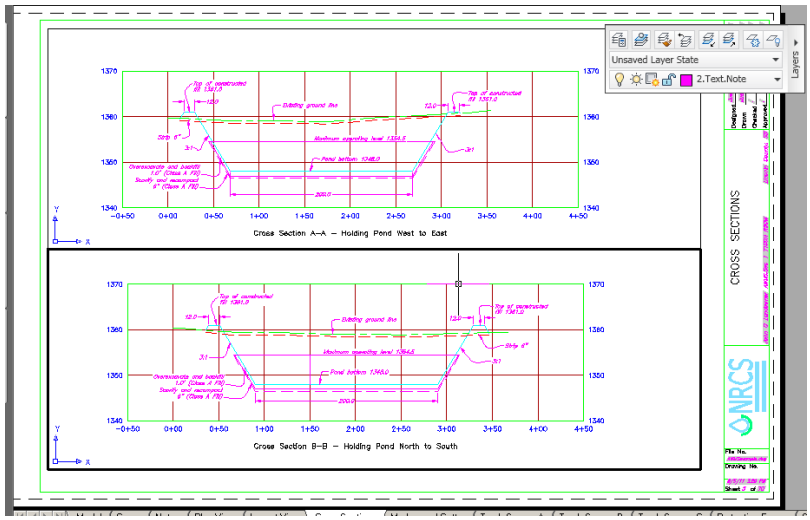
Once the viewports are set, the profile views can be dimensioned. For profile views, it is often easiest to dimension in model space. To do so, the dimension style and text style should be set to match the scale of the viewport. For this example, the viewports are at a 1" to 50' scale, thus the dimensions in model space were placed using the 050xB_Dim style.

Figure 66: Text Mask Command



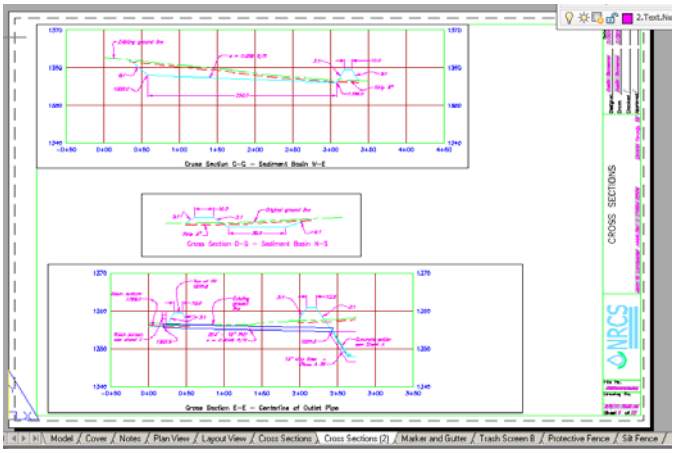
A useful dimensioning is command will gridlines and any dimensions. This in the Ribbon Express Tools – Mask. The text to is selected and executes the command to use when the Text Mask command. This make dimension text mask the lines that cross or intersect the command is under Text – Text be masked then enter command.

Figure 67: Holding Pond Cross Sections Layout



This figure shows a completed cross section sheet for the holding pond cross sections. A similar process would be followed to generate as many cross section sheets as are needed to show all sediment basins, diversions, and other structural details.

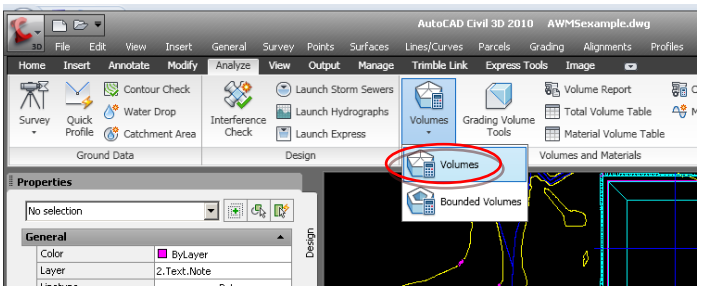
Figure 68: Sediment Basin Cross Sections Layout



Here, page 6 of the example plans is shown. This page shows the cross sections developed for the sediment basin.

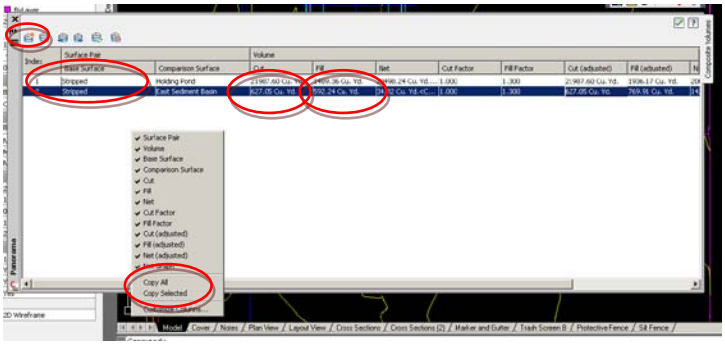
Quantities

Figure 69: Volumes Command



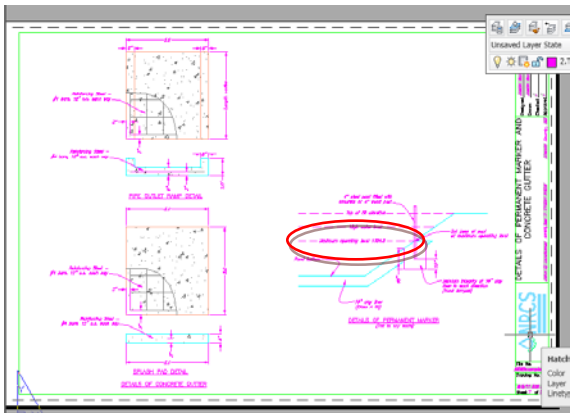
The time when quantities should be determined will vary from project to project. For this example, it was known that the excavation would significantly exceed the required borrow for earthfill, so the quantities were determined after the cross sections were plotted, allowing for easy verification that the surface models are accurately triangulated. In the event where the cut/fill needs to balance, the quantities would likely be determined after placing the holding pond, sediment basins, diversions, etc., and then adjustments in location, depth, or size would be made to achieve a workable cut/fill balance for the project.

Figure 70: Volumes Box



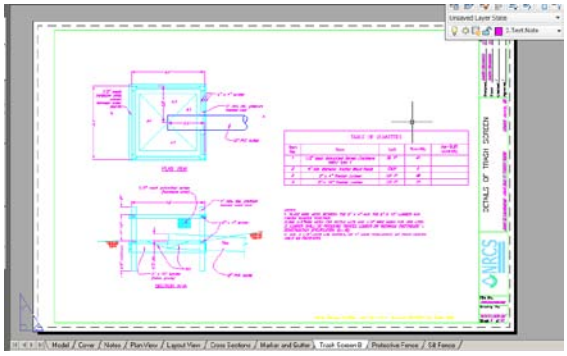
The volumes command for surfaces that have been graded is under Analyze – Volumes and Materials – Volumes – Volumes. This will open the Panorama window with the Composite Volumes tab shown. The left most icon on the top of the window creates a new entry. Each entry allows comparison of two different surfaces, showing the cut and fill between them. The table allows for a compaction factor for cut or fill to be entered, which may be useful depending on the method that will be used to determine overall quantities and balance cut and fill. Dropdown boxes within the table allow for the surfaces to be compared to be selected. Once the cut and fill quantities have been determined, the table can either be copied and pasted into excel. Right-clicking anywhere in the table will open the dialog shown that allows for the copy. Once all the desired quantities are determined, they can be entered into the table of quantities on the Cover sheet.

Figure 71: Permanent Marker and Concrete Gutter Standard Drawing



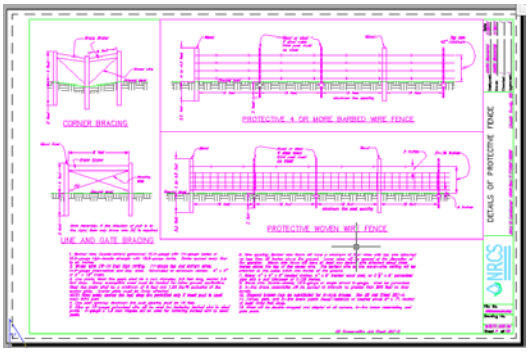
A standard drawing is included showing the typical splash pad and a permanent marker detail that is similar to the SD DENR marker recommendation. The only dimension that must be changed here is the maximum operating level elevation. As an aside, it may be useful to consider a more elaborate marker in the case where irrigation is to be intensively managed (such as if a center pivot is used to empty the pond).

Figure 72: Trash Screen Standard Drawing



Three standard drawings are supplied for trash screens. Type A is a screen with a vertical drop pipe to an elbow. Type B is a screen with a straight pipe outlet and Type C is similar to Type B only it shows barbed wire above the screen to allow for exclusion of animals from the outlet area. In this example, the Type B screen was used. The layouts for Type A and Type C can thus be deleted from the file. The pipe diameter will need to be updated if a size other than 12" is used. A note should be added or the quantities table changed if more than one trash screen is to be installed.

Figure 73: Protective Fence Layout



The final two drawings included in the template are for the protective fence and the erosion control measures. These are standard drawings and should not require updating except for the page number for each.

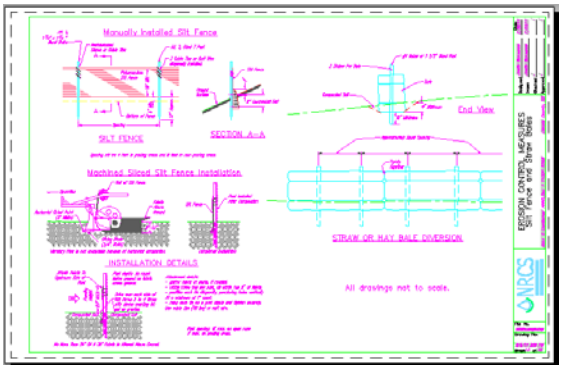



Figure 74: Erosion Control Layout