

SOUTH DAKOTA NRCS CIVIL 3D 2010 DRAFTING NOTE

DAM – POINTS AND SURFACES

INSERTING SURVEY POINTS AND CREATING A GROUND SURFACE

In this example a ground surface will be created from a GPS topographic survey. The survey points will be imported as a .csv file. Description key sets and point groups are explained and applied to the imported points. A breakline will be created along the centerline of the stream. Examples of edits to the surface will be demonstrated. Contour elevation labels are added to the contour lines. For more information, see [MN NRCS AutoCAD Civil 3D Quick Reference Guide Section 300](#) for points and [Section 400](#) for surfaces.

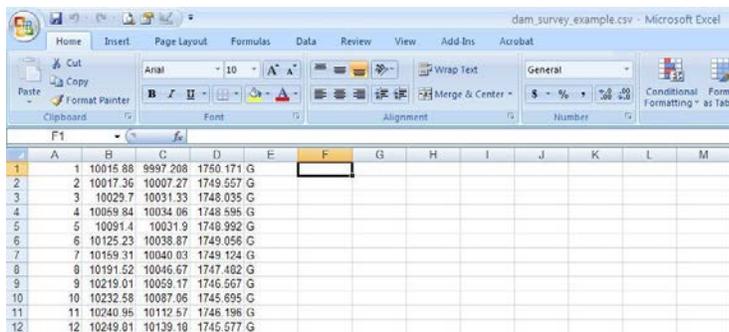
For more information go to the [National Engineering Manual Part 541](#), Drafting and Drawings, and go to the [National Engineering Handbook Part 641](#) for Computer Aided Design (CAD) Standards.

Import Points From a .CSV File

South Dakota NRCS has modified the AutoCAD Civil 3D National NRCS template for SD conservation practices and these drafting notes use the SD templates found on the SD NRCS Engineering web page under [CAD Resources](#).

Survey points are collected in the field using a total station or survey grade GPS. Code the points as shown in Table 1 (on page 10) in order for the description key sets and point groups to work properly with the SD NRCS template. The points are downloaded from the survey instrument and stored on a computer as a .csv file, which is a data file. Each point needs to have a point number, northing, easting, elevation, and description.

Figure 1: Sample .csv file



	A	B	C	D	E	F	G	H	I	J	K	L	M
1		1	10015.88	9997.288	1750.171	G							
2		2	10017.36	10007.27	1749.557	G							
3		3	10029.7	10031.33	1748.035	C							
4		4	10059.84	10034.06	1748.595	G							
5		5	10091.4	10031.9	1748.992	G							
6		6	10125.23	10038.87	1749.056	G							
7		7	10159.31	10040.03	1749.124	G							
8		8	10191.52	10046.67	1747.482	G							
9		9	10219.01	10059.17	1746.567	G							
10		10	10232.58	10087.06	1745.895	G							
11		11	10240.95	10112.57	1745.196	G							
12		12	10249.01	10139.10	1745.577	G							

On the Insert Ribbon, select Points From File as shown in Figure 2 and this will open the Import Points Window. In the Import Points window, Figure 3, select the format of the .csv file (PNEZD comma delimited), the file location, and add Points to Point Group (EX – Surface points group). PNEZD stands for point number, northing, easting, elevation, and description of point. The EX – Surface points group includes all the points except the control points when developing the existing ground surface. Also the EX – Surface point group is already placed under the Ognd surface Definition in the Toolspace Palette. The surface name for the original ground survey is Ognd.

Figure 2: Inserting Points from a .csv file.

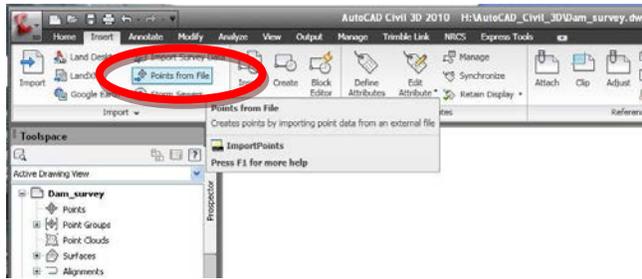


Figure 3: Import points window.



If the points do not display, right click on Point Groups in Toolspace and click on Update. Also, click on the zoom extents to zoom to all the points imported. Under the Toolspace, as shown in Figure 5, the yellow exclamation mark indicates by rebuild the surface. Right click on the Ognd surface and select Rebuild, which is a manual rebuild, or Rebuild – Automatic. This will update the surface and display the contour lines.

Figure 4: Imported survey points

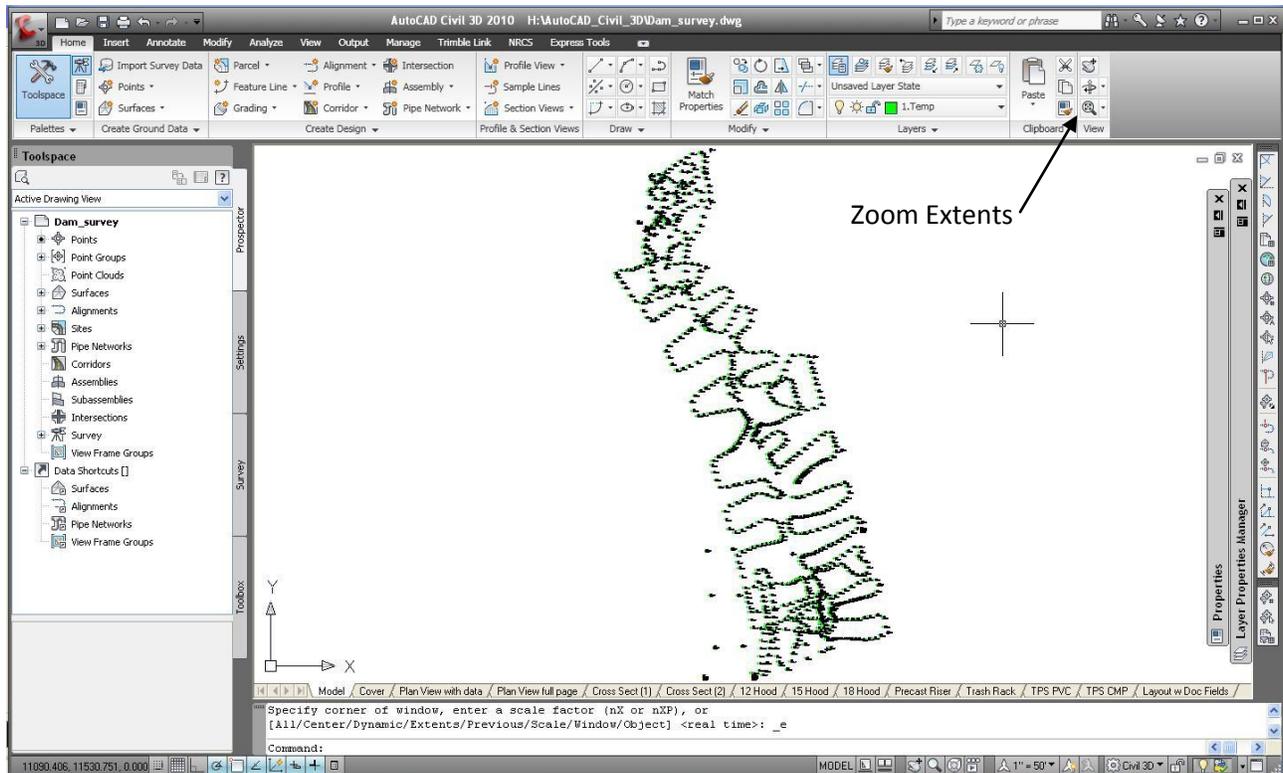
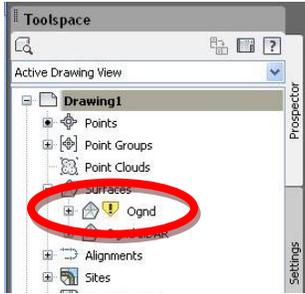


Figure 5: Toolspace with the Ognrd surface needing to be rebuilt.

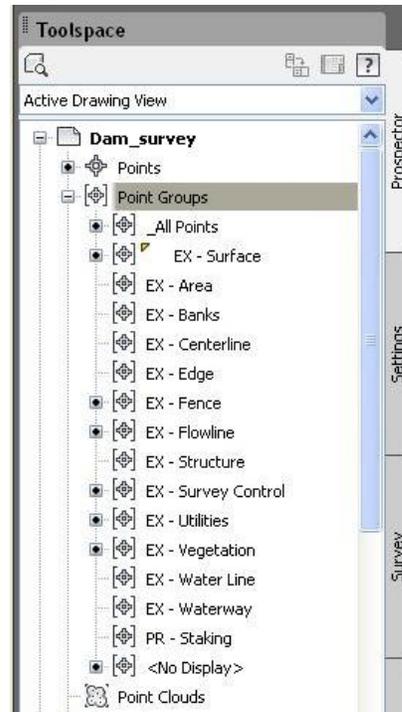
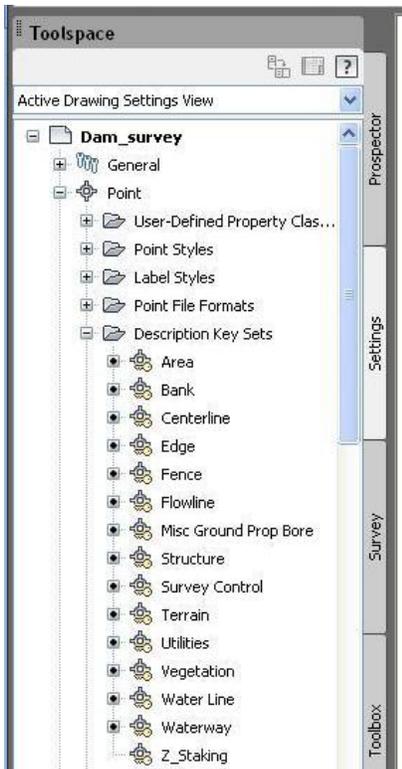


Description Key Sets And Point Groups

The national NRCS AutoCAD Civil 3D template usdanrcsc3d2010rev1.0(11x17).dwt has point groups and description key sets created. The South Dakota templates include everything that is included in the national NRCS template. Description keys are a tool used to automatically control the visibility of points that meet certain criteria. Description key sets allow the user to set the point style, point label style, and the layer for a raw point. For example, the Vegetation description key set includes any points surveyed as TC or TD for a coniferous tree or deciduous tree. These survey points (see Figure 8) have a point style showing a coniferous tree or deciduous tree, the point label will show the point number, elevation, and point description, and the layer the point will be placed on is V.Fcod.Vege. Description keys only work for newly imported, created, or converted points.

Figure 6: Description Key Sets from the template.

Figure 7: Point Groups



The polylines are added to the definition for the Ognd surface as a breakline. Under the Ognd surface in the Toolspace, expand the Definition. Right click on breaklines as shown in Figure 10 and this will display the Add Breakline Window, Figure 11. When OK is clicked, the command prompt will ask the user to select the objects to be made breaklines. Select the polylines just created. Figure 12 shows the surface with the contours after the centerline breakline is added.

Figure 10: Add a breakline to the definition of the Ognd Surface.

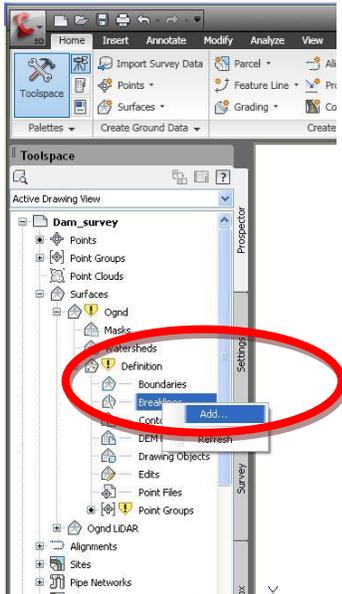


Figure 11: Add breakline window

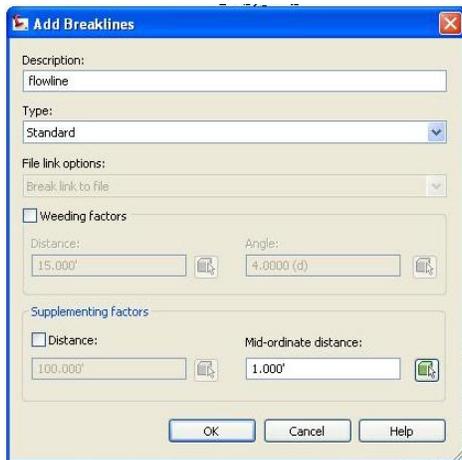
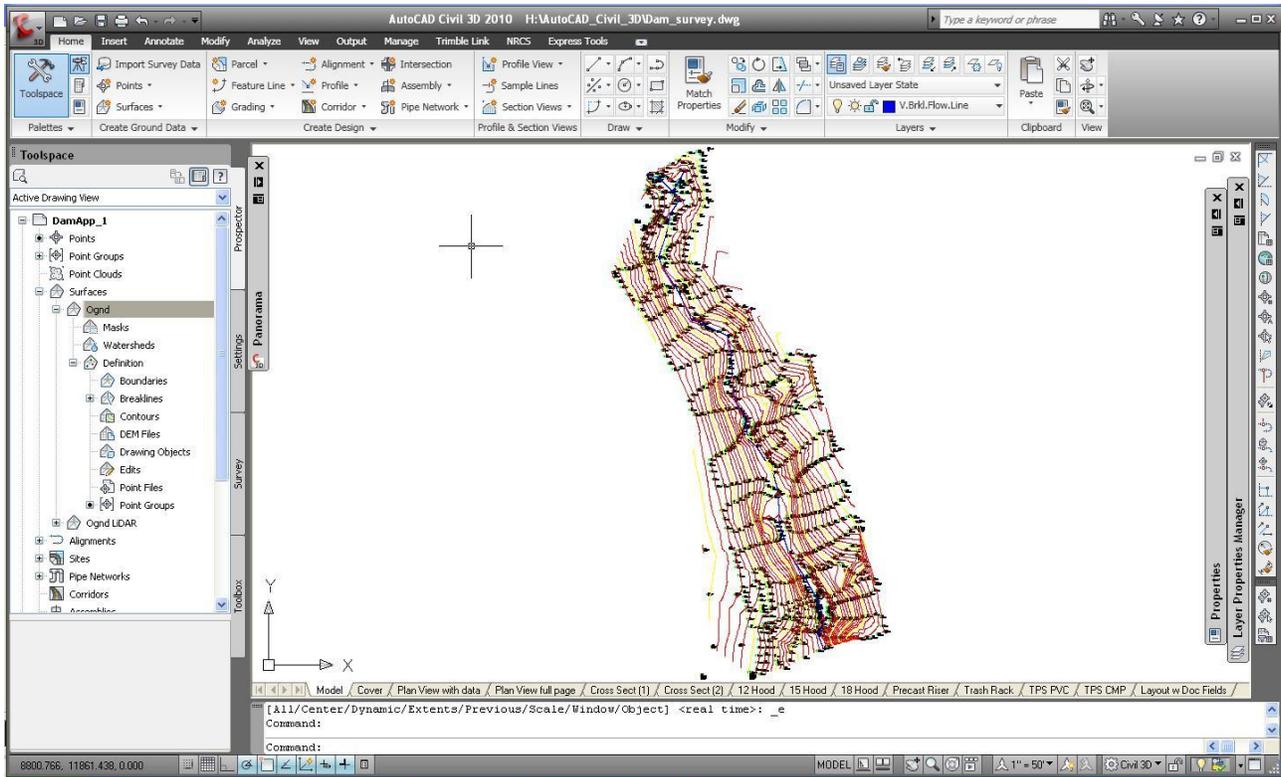


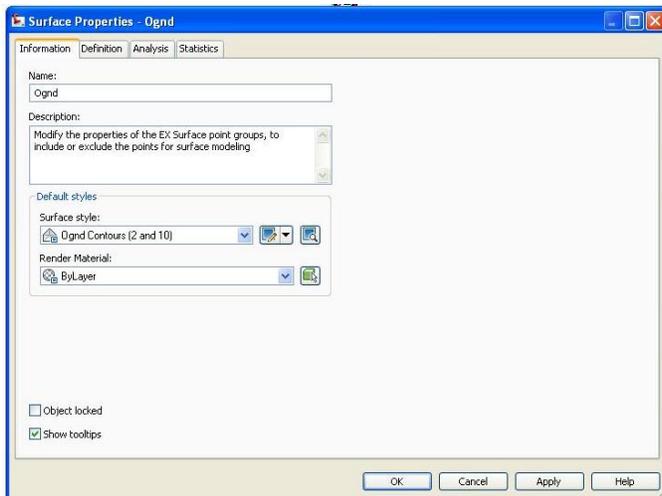
Figure 12: Surface created with the a breakline



Modify The Surface

The surface has been created from the survey points and a breakline has been added down the centerline of the stream channel. There are other modifications to the surface that can be made. One option is to change the surface style of the Ognd surface. Right click on the Ognd Surface in the Toolspace Palette and then click on surface properties. This will open the Surface Properties window shown in Figure 13. There are several surface styles that are already created.

Figure 13: Surface Properties window



For the following examples the surface style Contours (2 and 10) with triangles.

Swap Edge changes the internal direction of the triangulation. The triangulation forms two triangles within four points with two possible ways to form the triangles. The swap edge edit changes how the triangles are formed from one solution to the other.

Figure 14: Swap Edge Edit before

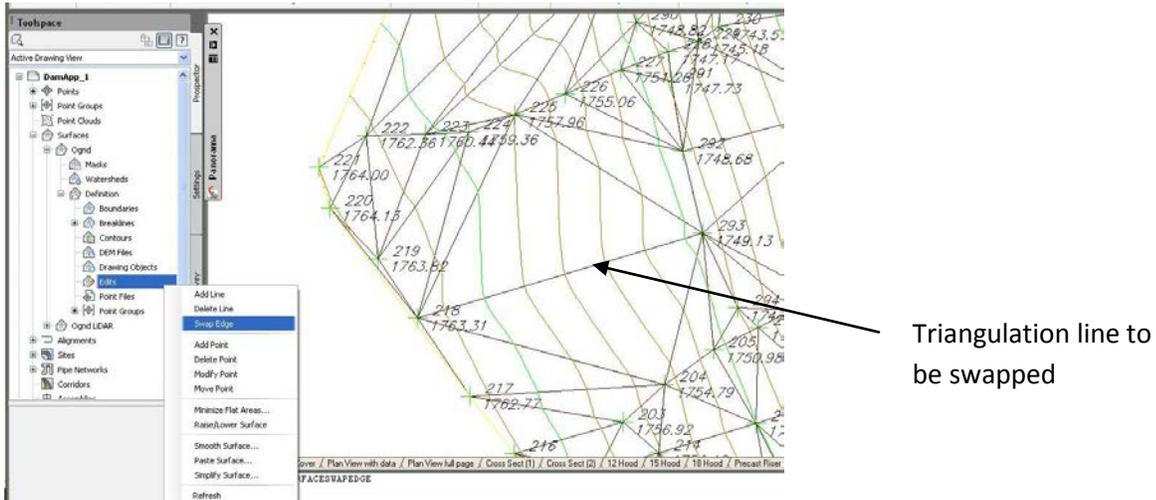
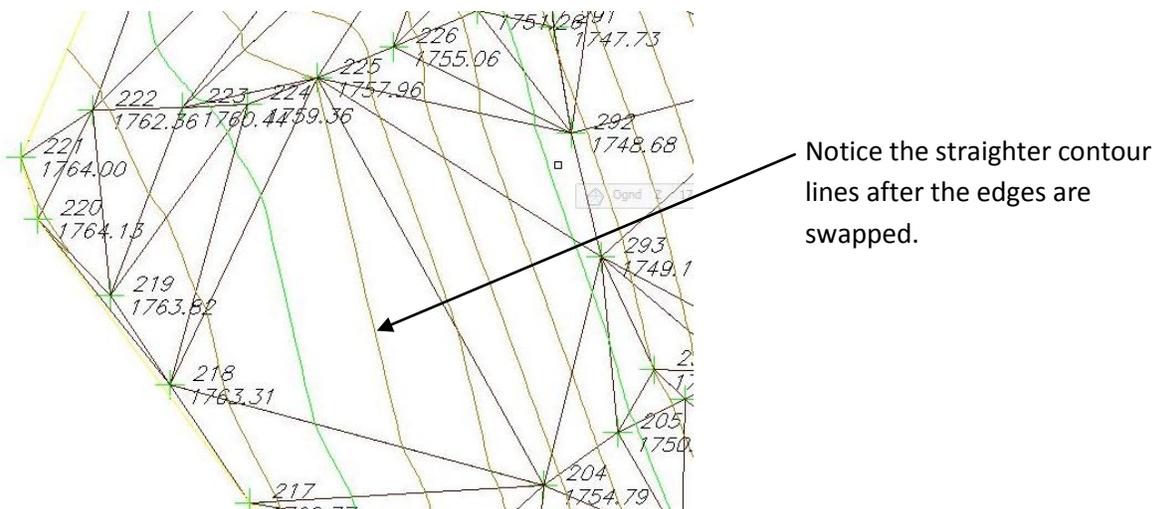


Figure 15: Swap Edge Edit after



Delete Line removes a connection between two points. This can be used to clean up the edge of the surface or remove bad data from an area where there should not be triangulation.

Figure 16: Delete Line edit before

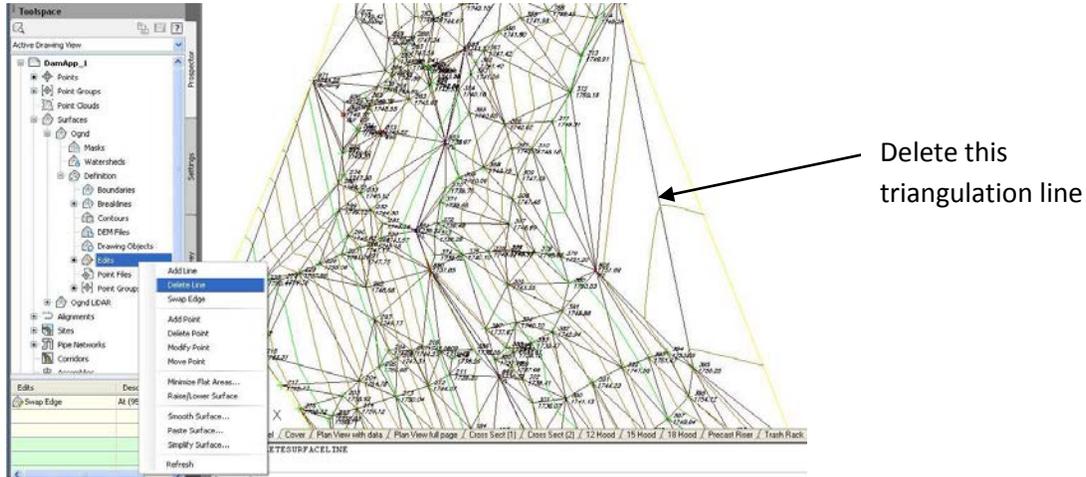
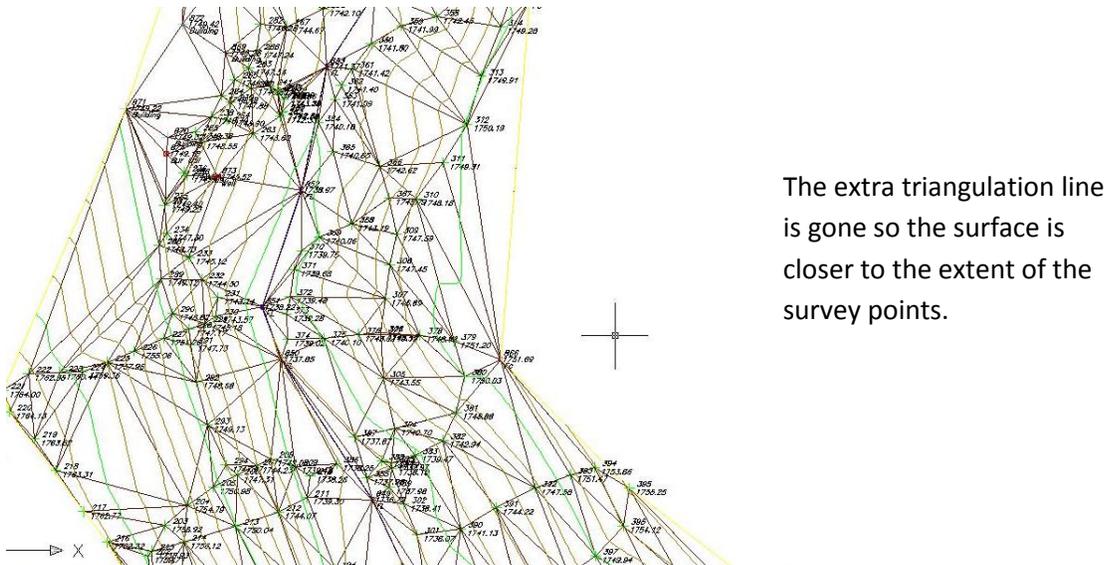


Figure 17: Delete Line edit after



Adding Contour Labels

The adding contour labels command is on the Annotate Ribbon and then Add Labels. Under Add Labels go to Surface and then Contour – Single. Follow the command prompts that ask you to Select a Surface (Ognd) and then Select a Contour Line (Select a contour line). Figure 19 shows contour labels placed on contour lines at elevations 1750 and 1760.

Figure 18: Add a single contour line label

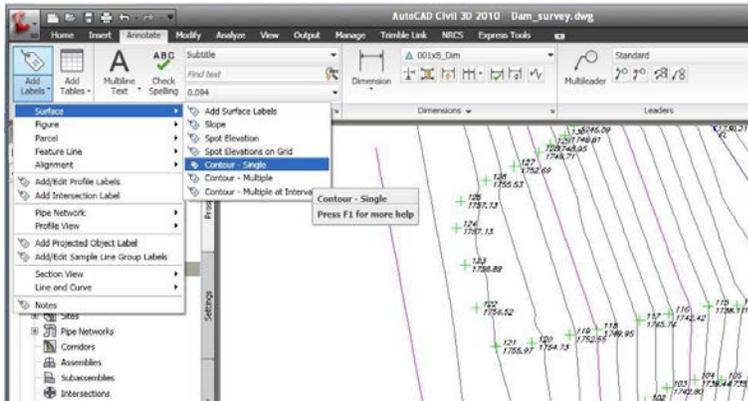


Figure 19: Labels for contour lines 1750 and 1760

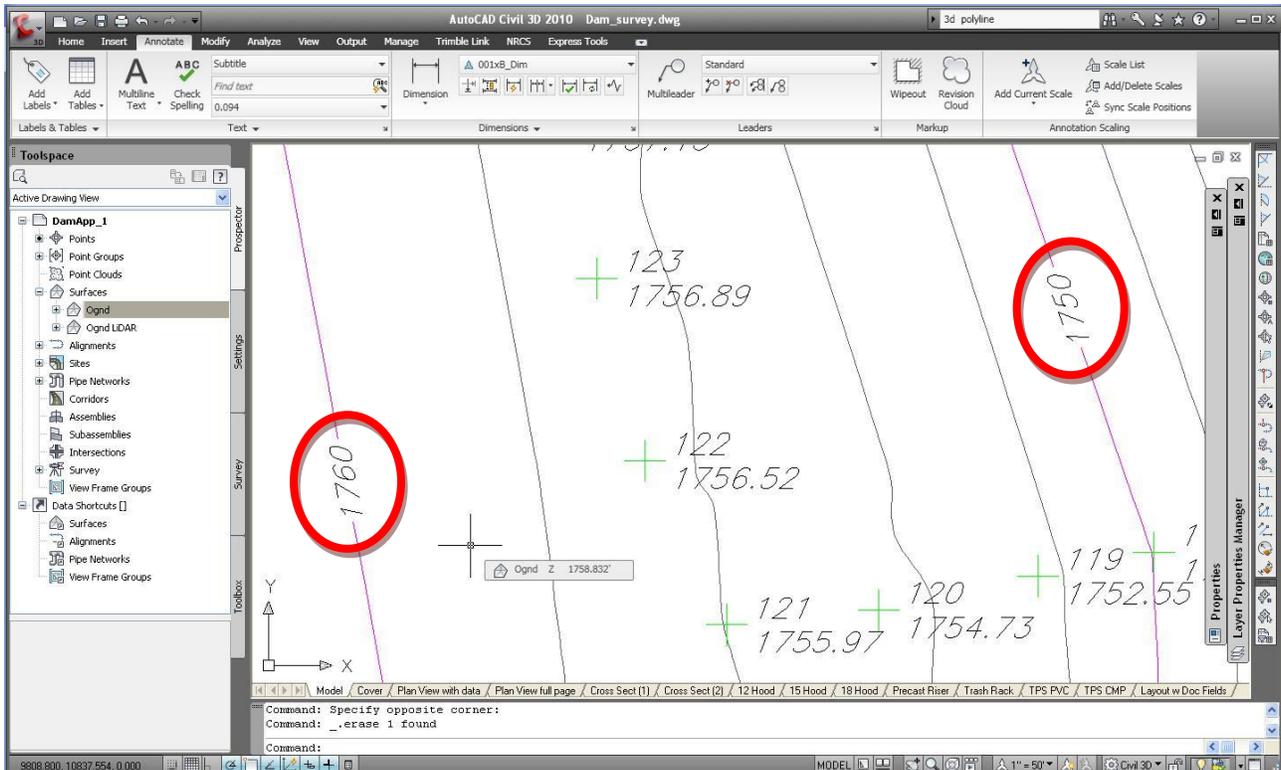


Table 1: NRCS Field Code for AutoCAD Civil 3D 2010

60D	60D NAIL	OB	OVERFLOW BOTTOM
AS	AUXILIARY SPILLWAY	OT	OVERFLOW TOP
BEG	BEGIN	PB	POWER BOX
BK	BREAK LINE #	PC	POINT OF CURVATURE
BLD	BUILDING	PIN	PIN #
BM	BENCHMARK #	PL	PROPERTY LINE
BORE	BORING	PP	POWER POLE
BORR	BORROW LIMIT	PVC	PVC PIPE
BT	BACK TOE	RB	RIGHT BANK #
BU	BURIED UTILITY	RCP	REINFORCED CONCRETE PIPE
BW	BOTTOM OF WALL	RECALL	RECALL
C3	3 POINTS OF CURVE	RS	ROAD SHOULDER
CE	CONCRETE EDGE	SEED	SEEDING AREA
CL	CENTERLINE	SMP	SMOOTH METAL PIPE
CLOSE	CLOSE	SPIKE	SPIKE #
CLR	CLEARING LIMIT	SR	STRUCTURE RIDGE
CMP	CMP PIPE	ST	STRUCTURE TOE
CONT	CONTINUE	START	START
CP	CONTROL POINT #	TB	TELEPHONE BOX
CR	CENTERLINE ROAD	TBM	TEMP BENCHMARK #
CV	CULVERT	TC	CONIFEROUS TREE
DA	DRAINAGE AREA	TD	DECIDUOUS TREE
DIV	DIVERSION	TER	TERRACE RIDGE
ED	EDGE DITCH	TI	TILE INLET
EDGE	EDGE	TO	TILE OUTLET
END	END	TOE	TOE
ER	EDGE ROAD	TOP	TOP
EW	EDGE WATER	TP	TURNING POINT #
FC	FENCE #	TR	TERRACE RIDGE
FCCOR	FENCE CORNER	TT	TERRACE TOE
FCTEE	FENCE TEE	TTI	TERRACE TILE INLET
FL	FLOW LINE #	TW	TOP OF WALL
FLJCT	FLOW JUNCTION	WALL	WALL
FLOOR	FLOOR	WE	WATERWAY EDGE
FTG	FOOTING	WELL	WELL
G	GROUND	WF	WATERWAY FLOW LINE
GB	GRAIN BIN	WL	WATER LINE
HUB	HUB #	WORK	WORK LIMIT
INSTR	INSTRUMENT #	WT	WELL TOP
IP	INSTRUMENT #	WW	WATERWAY
LB	LEFT BANK #	X	FENCE
LOT	LOT	XC	FENCE CORNER
M	MISCELLANEOUS	XT	FENCE TEE