CI2824 - AutoCAD® Civil 3D® for Construction Quantification on Transportation Projects

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About the speaker

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Autodesk Applications Engineer, Transportation (June 2011 – present)

Wisconsin DOT (1987 - 2011)

- Design and Construction Project Manager
- Methods Development Engineer (1998 – 2011)
- Led teams that selected the last two Design software at WisDOT
  - CAiCE and Civil 3D
- Led Civil 3D implementation at WisDOT
- Participated on or led many teams to improve process or set standards

Class Summary

- Are you using AutoCAD Civil 3D software on a transportation project and still struggling to solve construction earthwork problems? If you fall under either one of these categories, consider attending this class:
  - 1) you have struggled with bridging the gap between the old cross-section methods in CAiCE™ Visual® Transportation software or AutoCAD® Land Desktop software and the new methods in Civil 3D
  - 2) you are convinced that Civil 3D cannot handle the cross section solutions and therefore cannot replace the old software already mentioned.
- In this class, we will use review using Civil 3D as a complete construction quantification tool. We will cover strategizing for success; editing surfaces; editing sections; creating Autodesk® Quantity Takeoff criteria that will work for your situation, creating material quantities; adding earthwork exceptions; and reporting earthwork to Microsoft® Excel®.

Learning Objectives

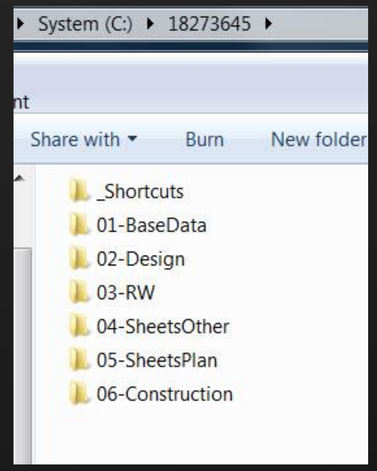
At the end of this class, you will be able to:

- Set Civil 3D Construction projects up for success
- Get the data in
- Edit Section Surfaces in Civil 3D
- Understand how to replicate Section based edits using Surfaces
- Create Earthwork and export to Excel

Set Civil 3D Construction projects up for success

Project folder structure

- Use a organizational Project Folder structure
- Create with the Data Shortcuts project
- Establish Project naming standards
- Why? We most likely will not have ‘one Drawing File projects’
- Make it part of the workflow
- Train it in



File naming and folder placement

- Establish rough standards
- Allow flexibility
- Make it part of the workflow
- Train it in

Set Civil 3D Construction projects up for success

Object naming and management

- Establish rough standards
- Establish workflows for
- Make it part of the workflow
- Train it in

Drawing templates

- Establish best ideas up front
- Templates and other Standards are a living thing

The goal: anyone that understands an organizations Project, Naming and Data Management standards should be able to pick up any project at any given time. They should know where the files/data are and understand what the files/data are. They should be able to work with that project with minimal review time.

Set Civil 3D Construction projects up for success

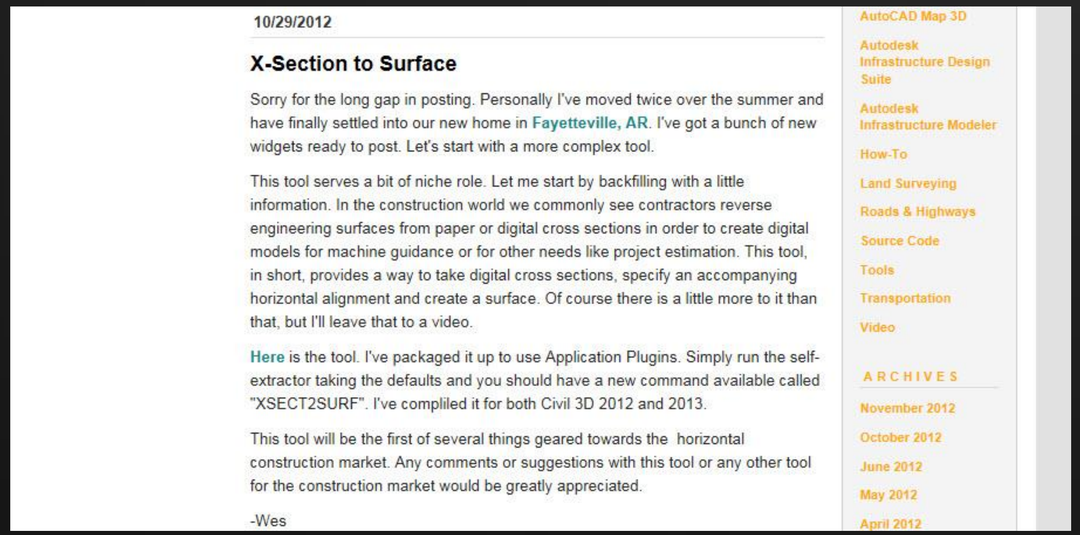
The Bottom line? Construction is no different than Design, or Survey:

- How well we Manage our projects, folders, data and standards is directly proportional to the success of our implementation and user experience.
- Design this all into the workflow and train the workflow so the end users have to teach themselves another way.
- Don’t reinvent the wheel…borrow ideas from other Organizations as your problems have probably been looked at before.
- Keep an open mind. Don’t expect the solutions to look exactly like your old workflow.
- That said, don’t expect every specific task to be easier than it was before. Look at the entire workflow…separate the tree’s from the forest.

Get the data in - Xsect2Surf Tool

Xsect2Surf Tool – created by Wes Newman to create surfaces when all we have is a plan

Download from the Talking Transportation blog http://autodesk.typepad.com/transportation/



10/29/2012

X-Section to Surface

Sorry for the long gap in posting. Personally I've moved twice over the summer and have finally settled into our new home in **Fayetteville, AR**. I've got a bunch of new widgets ready to post. Let's start with a more complex tool.

This tool serves a bit of niche role. Let me start by backfilling with a little information. In the construction world we commonly see contractors reverse engineering surfaces from paper or digital cross sections in order to create digital models for machine guidance or for other needs like project estimation. This tool, in short, provides a way to take digital cross sections, specify an accompanying horizontal alignment and create a surface. Of course there is a little more to it than that, but I'll leave that to a video.

Here is the tool. I've packaged it up to use Application Plugins. Simply run the self-extractor taking the defaults and you should have a new command available called "XSECT2SURF". I've compliled it for both Civil 3D 2012 and 2013.

This tool will be the first of several things geared towards the horizontal construction market. Any comments or suggestions with this tool or any other tool for the construction market would be greatly appreciated.

-Wes

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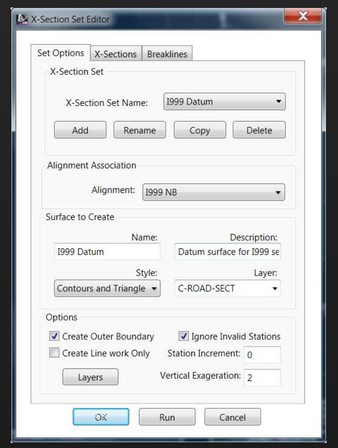
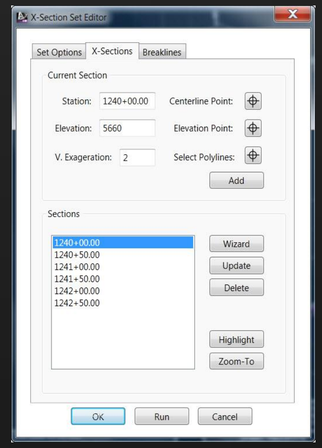
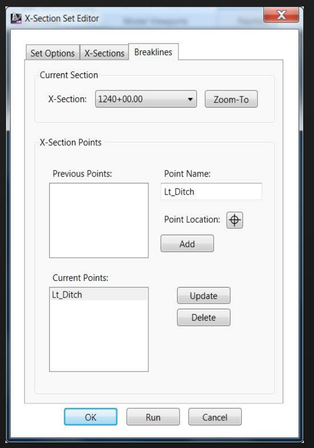
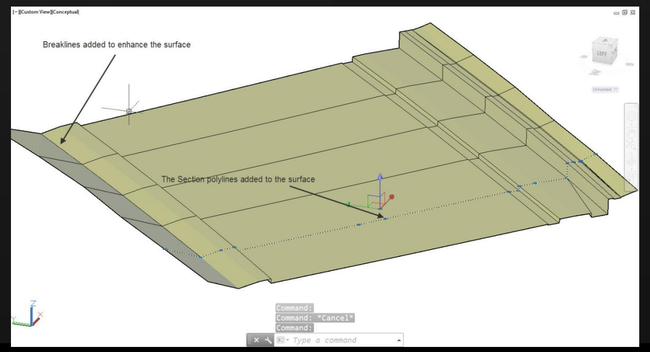
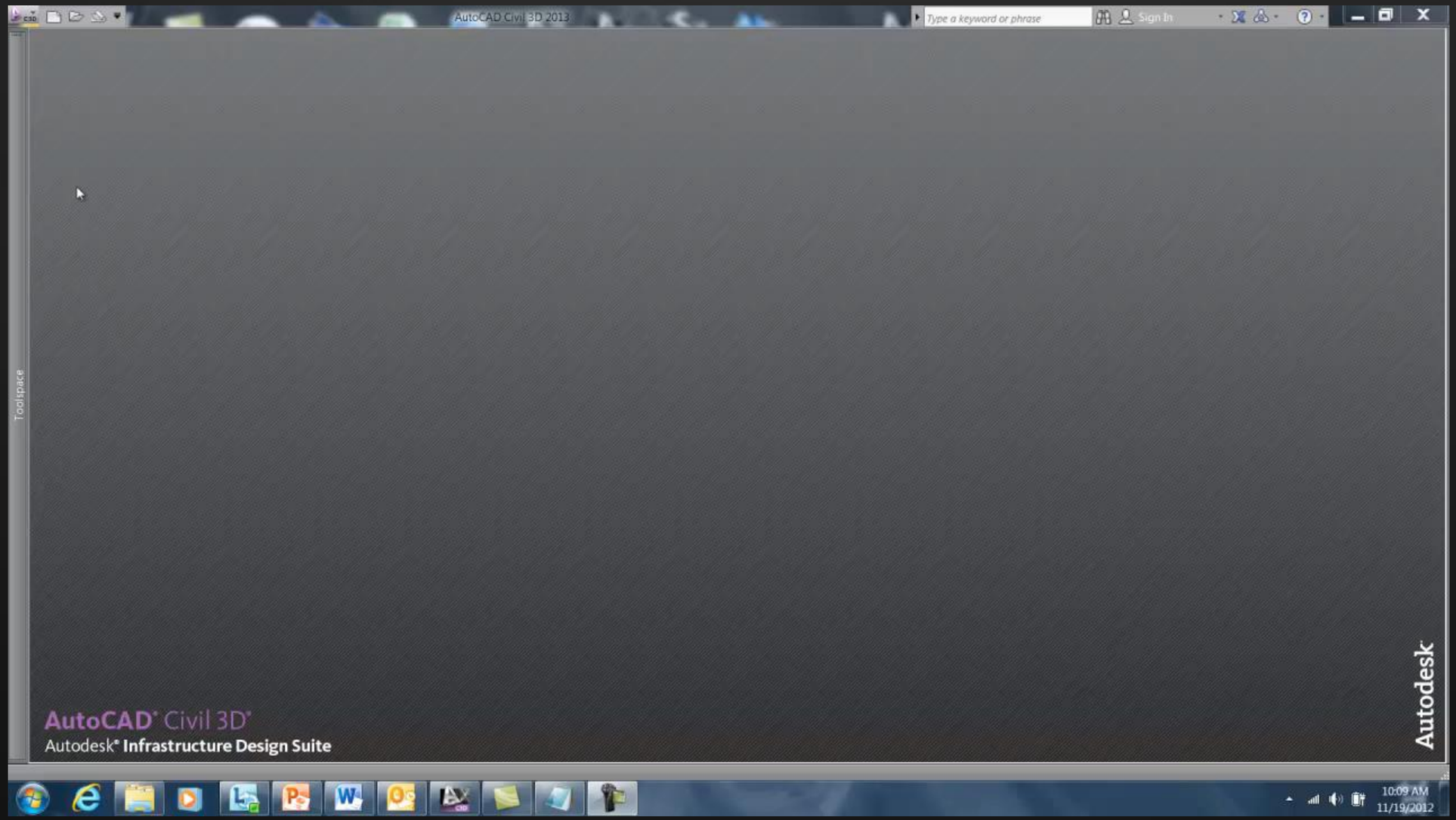








Example 1 - Xsect2Surf Tool



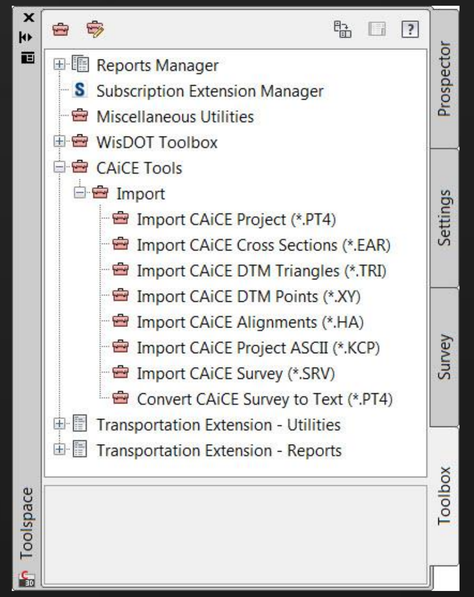
Get the data in – from CAiCE data

CAiCE extension is downloadable from the Subscription site

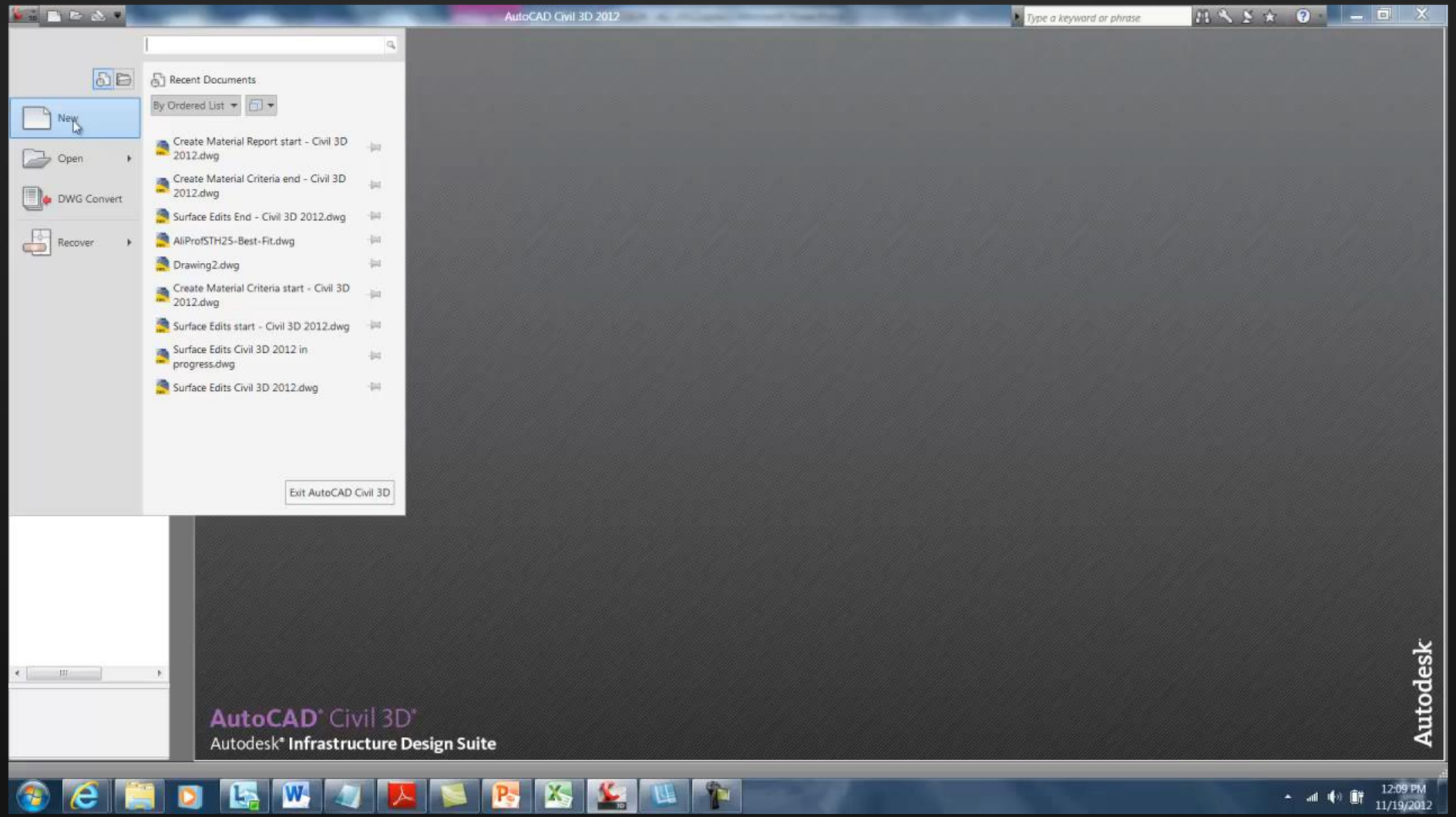
http://subscription.autodesk.com/

CAiCE extension is only available for 2012 at this time

Allows direct import from many CAiCE formats



Example 2 – CAiCE data import



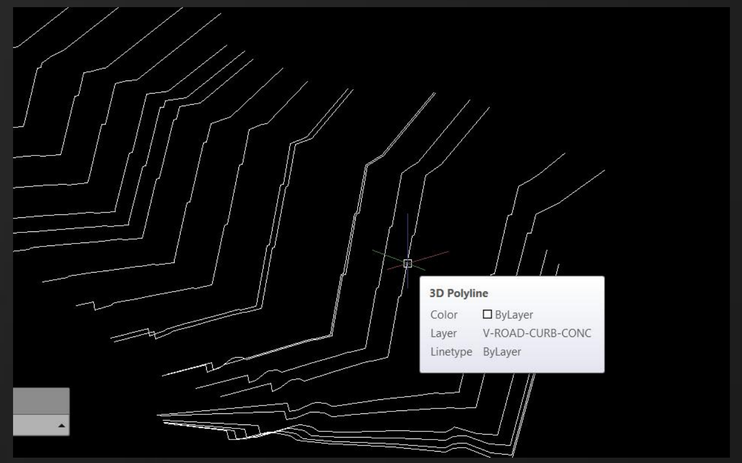
Get the data in (continued) – Section Surfaces

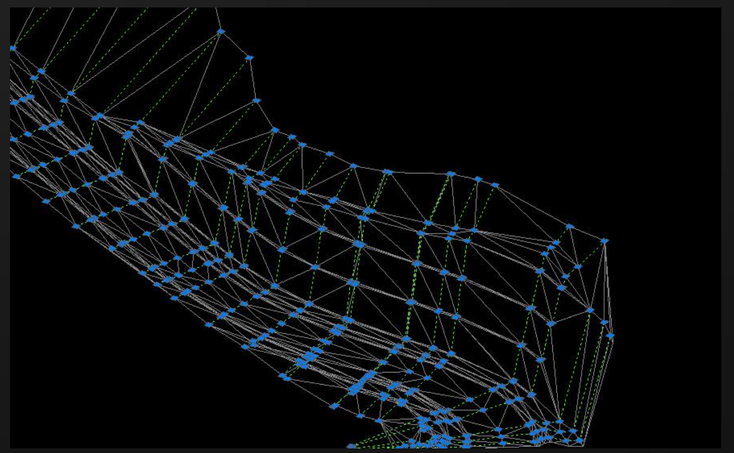
A Section Surface is a Surface that is created from 3D Polylines that represent the Sections

The Xsect2Surf is an example of a tool that creates Section Surfaces

Section Surfaces allow us to do Section like edits with Surface data

Section Surfaces are as accurate as Cross Sections when we create volumes as long as our Design and Construction sections are on the same stations



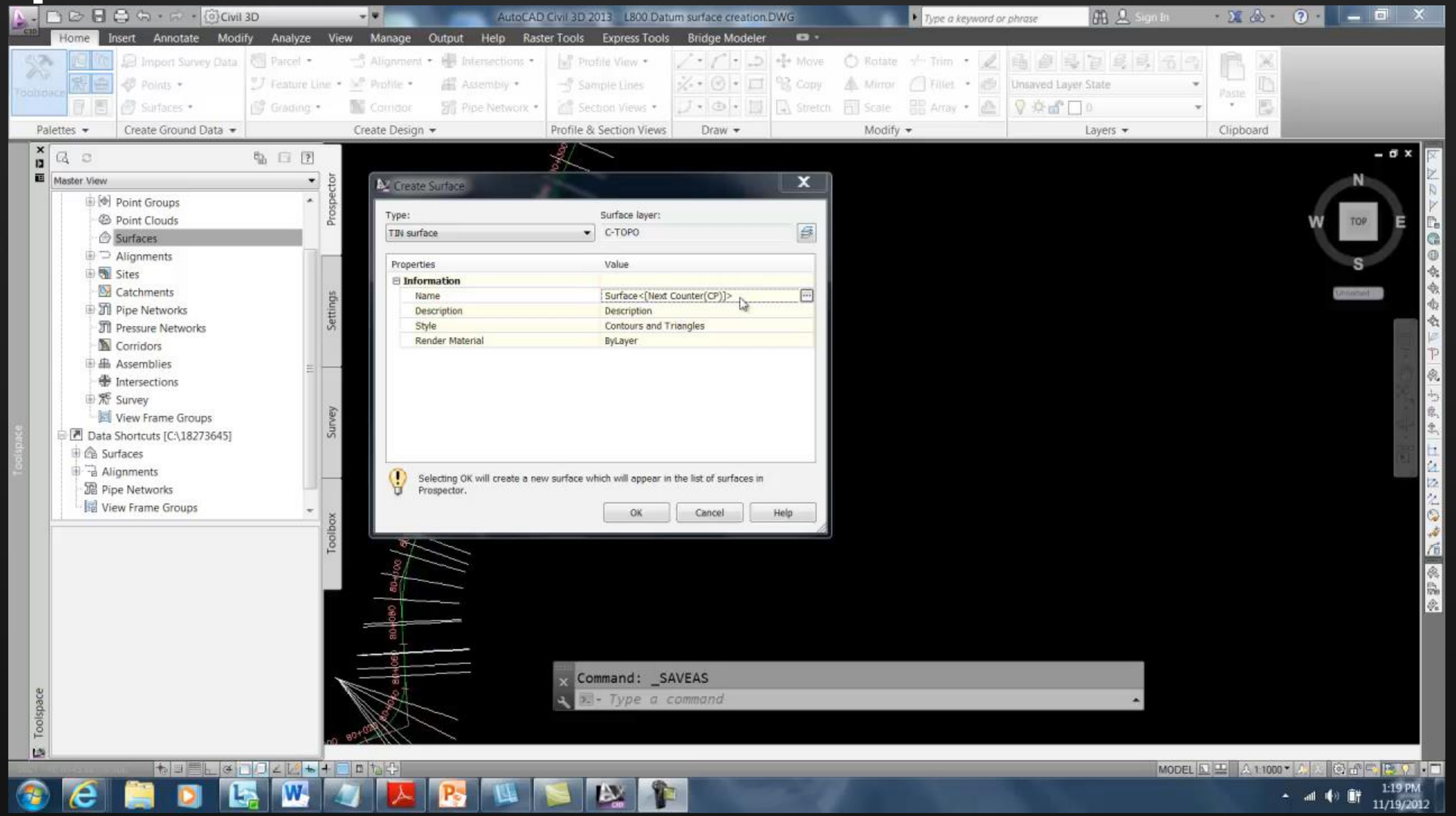


Get the data in (continued) – Section Surfaces

We can create Section Surfaces with a little work

- Station Offset Elevation File loaded to Civil 3D using Points→Create Points from Alignment→Import from File
- Export the Civil 3D points to a PNEZD .csv format
- Edit the PNEZD .csv format to include Figure codes in the Description
- Import PNEZD file to the Survey Database and place the Figures in the DWG
- Select and Explode the Survey Figures (creates Polylines)
- Create a Surface and Add the Polylines to the Surface as Breaklines

Example 2 – Section Surfaces



Edit Section Surfaces in Civil 3D

We may make statements regarding planned or future development efforts for our existing or new products and services. These statements are not intended to be a promise or guarantee of future availability of products, services or features but merely reflect our current plans and based on factors currently known to us. These planned and future development efforts may change without notice. Purchasing decisions should not be made based upon reliance on these statements.

These statements are being made as of 11/27/2012 and we assume no obligation to update these forward-looking statements to reflect events that occur or circumstances that exist or change after the date on which they were made. If this presentation is reviewed after 11/27/2012, these statements may no longer contain current or accurate information.

Replicate Section based edits using Surfaces

Surface Edits - Extend

- Create Feature lines at extend limits
- Use Grading Objects to extend to the Target Surface
- Paste the Grading Surface into the Surface to Extend

OR

- Grip Edit Section lines in Section Surfaces – be careful as you are editing in 3D
- Surface created from Section Lines updates as Breaklines are updated

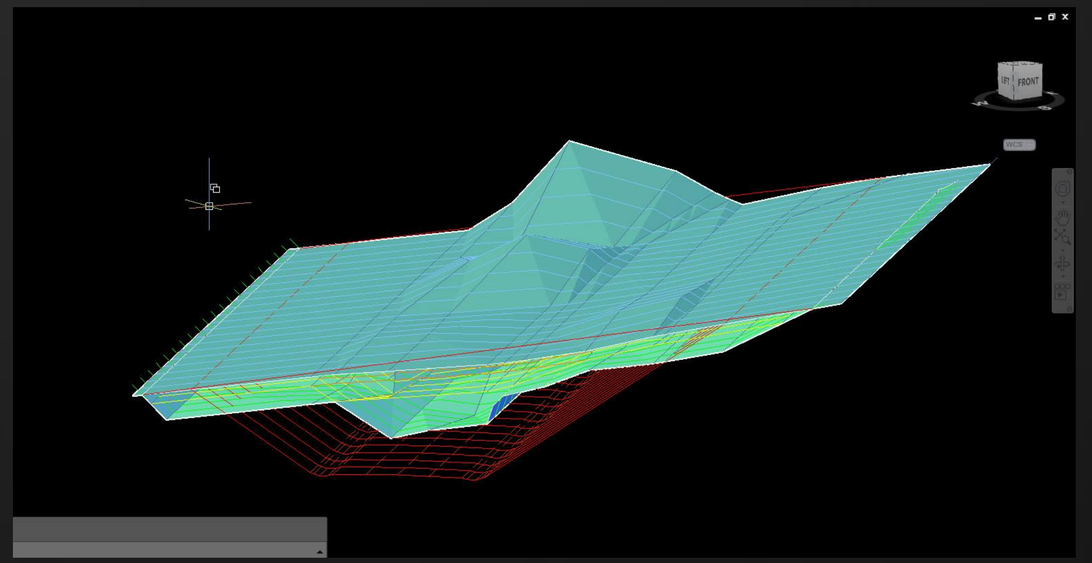
Replicate Section based edits using Surfaces

Surface Edits – Trim

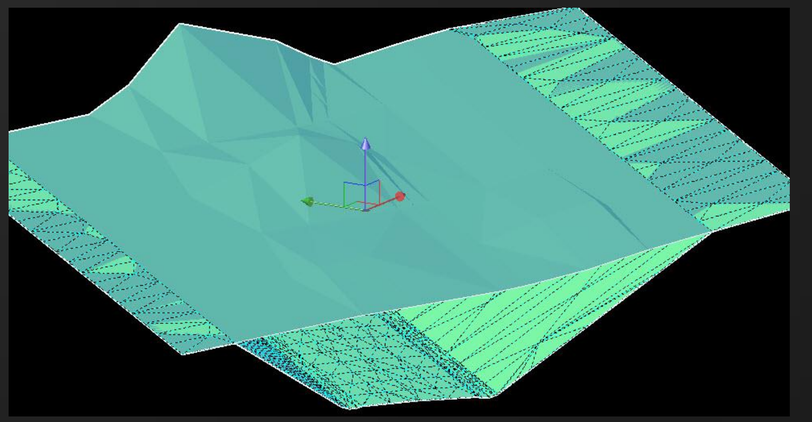
- Create a polygon that represents the trim limits
- Add the polygon to the Surface as an outside Boundary

OR

- Grip Edit Section lines in Section Surfaces – be careful as you are editing in 3D
- Surface created from Section Lines updates as Breaklines are updated



Replicate Section based edits using Surfaces

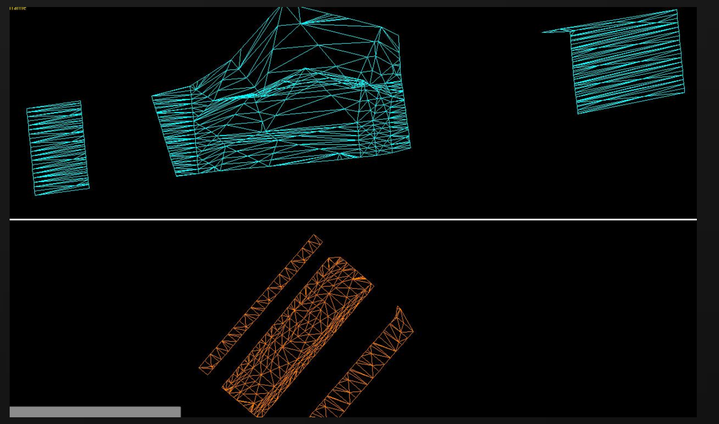


Surface Edits – Combine

- Create new Surface
- Paste Passive Surface into new Surface
- Paste Dominant Surface into new Surface – dominant surface rules

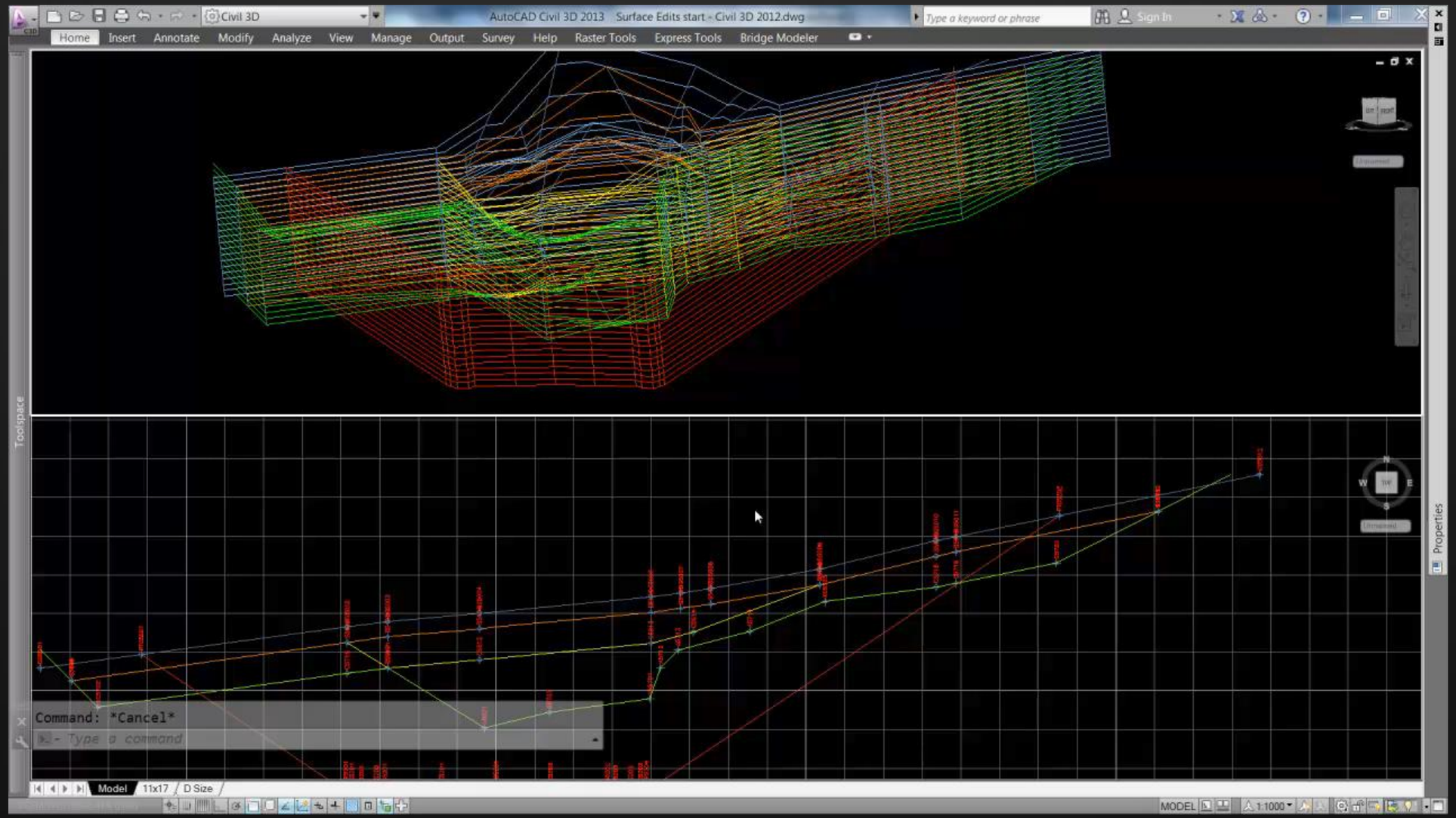
We can get very detailed with our Surface Combinations using features such as:

- Use a Surface as a Boundary within another Surface
- Creating Cropped Surfaces and Pasting into a larger combined Surface
- Using a large Hide Boundary and multiple smaller Show Boundaries (Islands)
- Maximum Triangle Length to help define Surface Islands



Minimum Distance between Surfaces has a cool feature that saves Zero difference Polylines (think Trim surface)

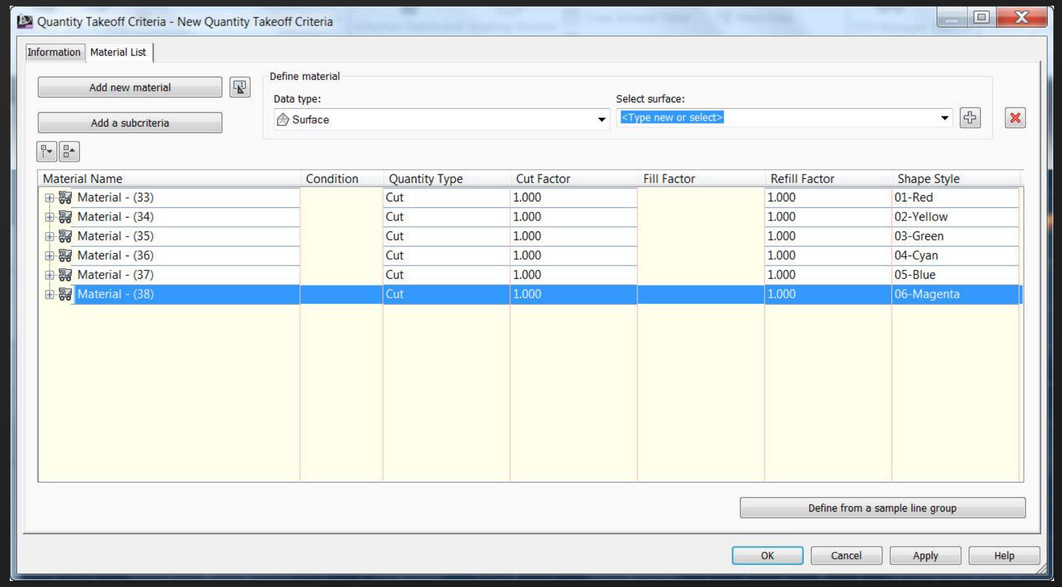
Example 4 – Surface Edits

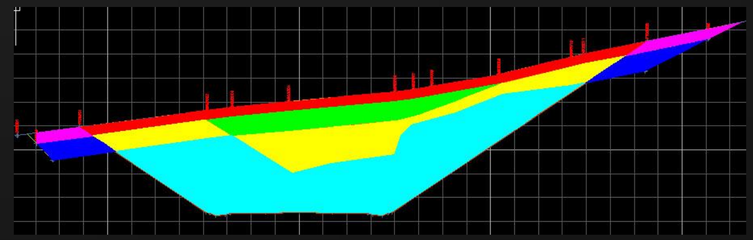


Create Earthwork and export to Excel

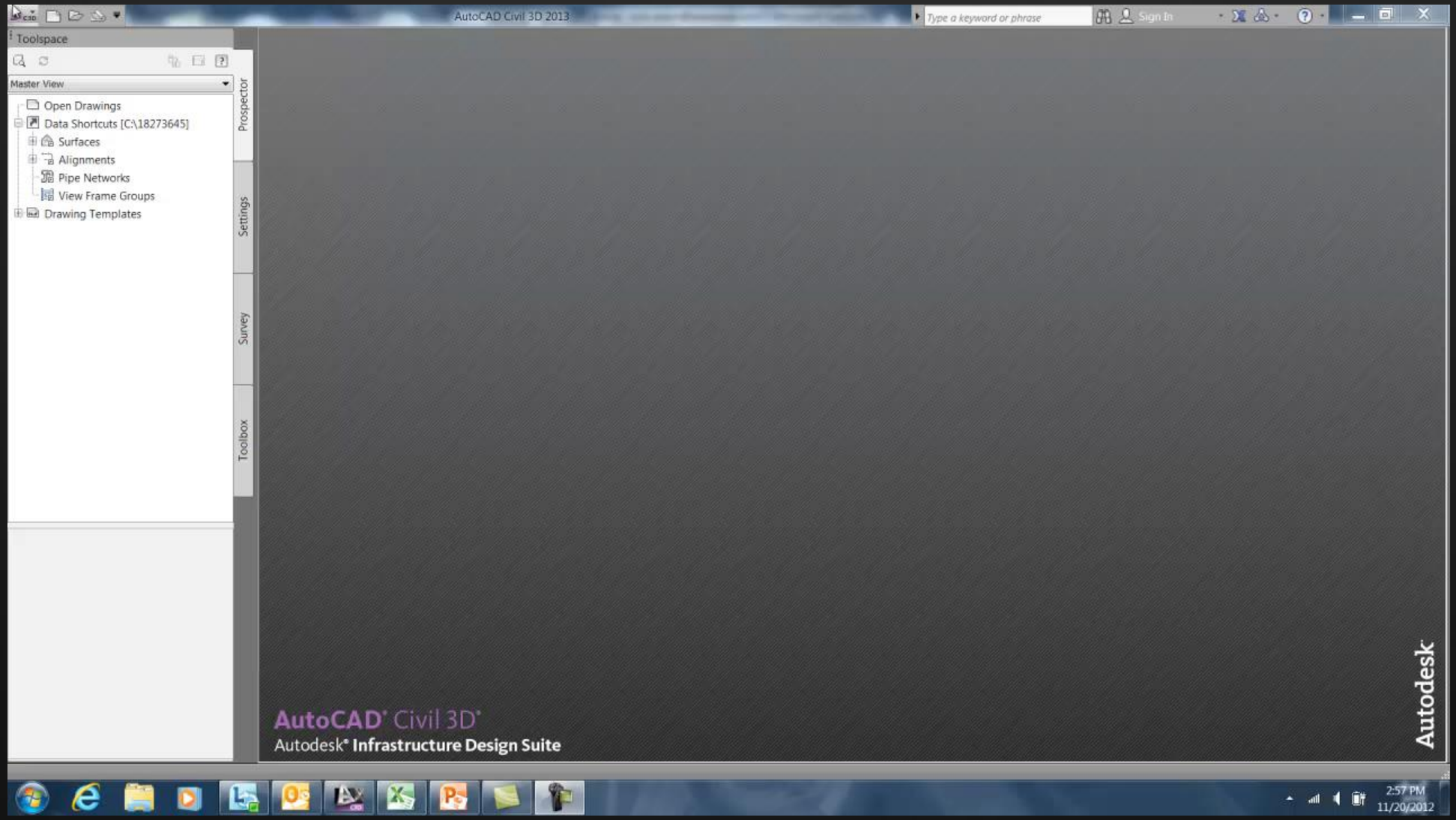
Custom QTO Material Criteria

- Create from Sample Line Group
- Use Visual cues to help define Materials
- Update the QTO Materials and Styles
- Apply changes





Example 5 – Create the QTO Criteria



Create Earthwork and export to Excel

Material Report to Excel

- Create the Material Report
- Use the provided XSL file
- Save the HTML output to a text file
- Import the text file into Excel

Earthwork reportMaterial Report for Excel												
Alignment: L100A1												
Sample Line Group: SLG-1												
Start Sta: 0+00.010												
End Sta: 0+99.990												
Station:	0+00.010	Stripping	57.95	Type B	112.46	Type C	48.22	Type A	240.04	NA Omit	42.06	NA Omit	0
Station:	0+05.010	Stripping	62.99	Type B	115.73	Type C	52.23	Type A	233.53	NA Omit	28.86	NA Omit	0
Station:	0+10.000	Stripping	68.89	Type B	120.26	Type C	55.4	Type A	225.95	NA Omit	28.87	NA Omit	0
Station:	0+15.000	Stripping	75.67	Type B	125.81	Type C	57.74	Type A	217.53	NA Omit	29.13	NA Omit	0
Station:	0+20.000	Stripping	83.3	Type B	131.43	Type C	59.24	Type A	209.23	NA Omit	30.57	NA Omit	0
Station:	0+25.000	Stripping	75.65	Type B	125.8	Type C	57.74	Type A	217.49	NA Omit	29.14	NA Omit	0
Station:	0+30.000	Stripping	68.86	Type B	120.22	Type C	55.4	Type A	225.86	NA Omit	37.33	NA Omit	0
Station:	0+35.000	Stripping	62.94	Type B	115.65	Type C	52.23	Type A	233.4	NA Omit	37.37	NA Omit	0
Station:	0+40.000	Stripping	57.89	Type B	112.36	Type C	48.22	Type A	239.82	NA Omit	35.6	NA Omit	0
Station:	0+45.000	Stripping	61.99	Type B	117.63	Type C	61.97	Type A	236.65	NA Omit	34.36	NA Omit	0
Station:	0+50.000	Stripping	64.8	Type B	122.68	Type C	74.91	Type A	234.05	NA Omit	41.3	NA Omit	0
Station:	0+55.000	Stripping	66.3	Type B	128.41	Type C	87.04	Type A	231.11	NA Omit	41.27	NA Omit	0
Station:	0+60.000	Stripping	66.5	Type B	134.97	Type C	98.36	Type A	227.68	NA Omit	41.24	NA Omit	0
Station:	0+65.000	Stripping	66.31	Type B	128.43	Type C	87.04	Type A	231.2	NA Omit	41.24	NA Omit	0
Station:	0+70.000	Stripping	64.82	Type B	122.72	Type C	74.91	Type A	234.19	NA Omit	32.84	NA Omit	0
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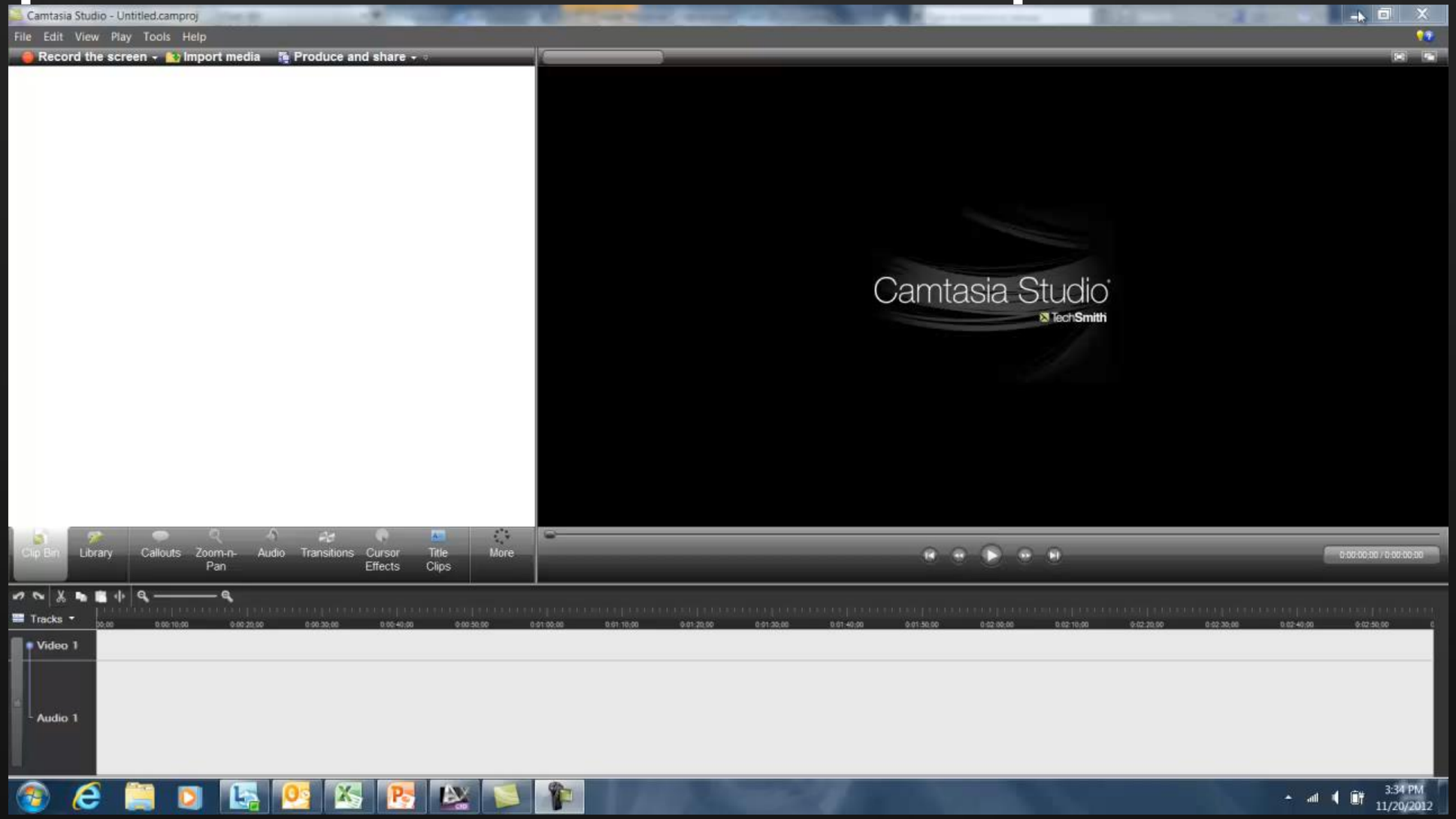
Station:	0+95.000	Stripping	104.72	Type B	118.84	Type C	153.14	Type A	188.38	NA Omit	57.48	NA Omit	0
Station:	0+99.990	Stripping	127.07	Type B	122.78	Type C	177.9	Type A	173.48	NA Omit	43.98	NA Omit	0

Example 6 - Create Earthwork and export to Excel



Summary

Set Civil 3D Construction projects up for success

Get the data in

Edit Section Surfaces in Civil 3D

Understand how to replicate Section based edits using Surfaces

Create Earthwork and export to Excel

Questions?

Thank you!