



# Civil 3D Interoperability: Making the Infrastructure Suite work for you

Wendy Lim – Autodesk

## CV5226

This class will present tips and tricks on how to get the most out of Civil 3D by exchanging files between Map 3D, InfraWorks and 3DS Max Design. You will learn how to convert legacy 2D as built pipes networks into 3D, visualize the integration of existing pipes network with proposed pipes in InfraWorks, create 3D roundabout using Vehicle Tracking and use Autodesk Civil View to export Civil 3D roundabout data into Autodesk 3ds Max Design.

## Learning Objectives

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

- Convert multiple polylines to Civil 3D pipes using Map 3D
- Integrate Civil 3D models into InfraWorks
- Integrate roundabout design using Vehicle Tracking
- Use Civil View for 3DS Max Design and create simple animation

## About the Speaker

**Wendy Lim** is a Product Support Specialist for Autodesk. Based in Singapore, she addresses and drives resolutions of complex technical issues including support requests, defects and knowledge base for Civil 3D, InfraWorks, Map 3D and AutoCAD. She has 12 years of experience both in the engineering and Autodesk channel, spending 2 years as Support Specialist for Autodesk Infrastructure design product line and 10 years as a Civil Engineer. Wendy has worked on projects mostly entailing designs of infrastructure comprising drainage, water supply, flood mapping, residential grading and roadways in Malaysia, UAE and Qatar.

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## Acknowledgements

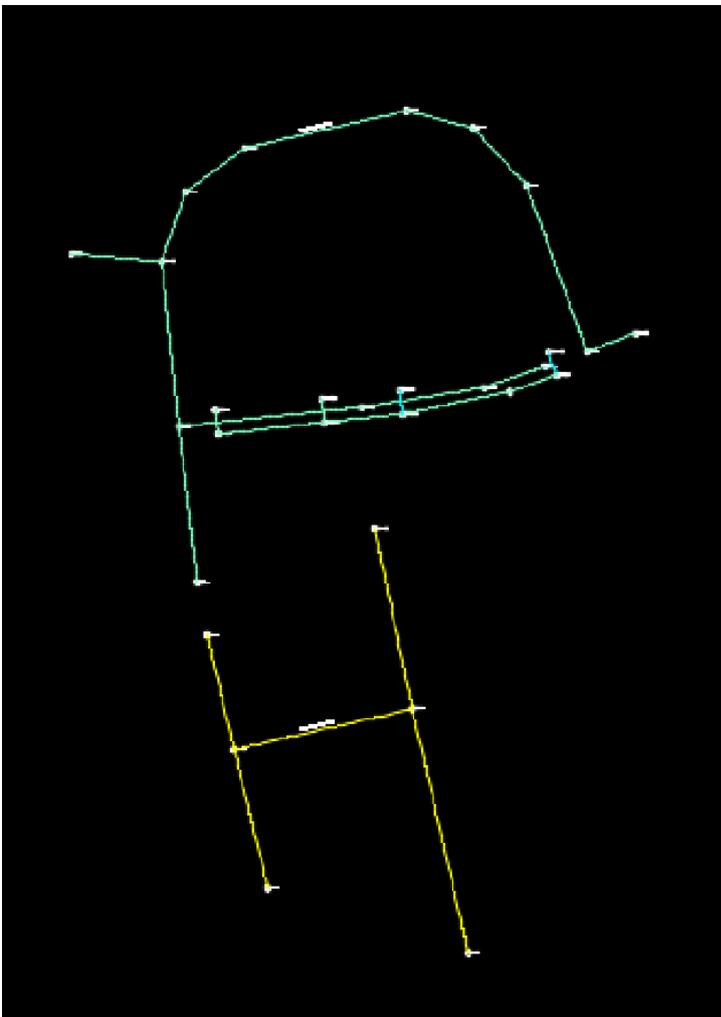
Special thanks to Eric Chappell and Louisa Holland for graciously granted me the permission to use some of the drawings which they painstakingly produced from the Mastering Civil3D 2013 book. Next, I would like to thank Dean Petersen from Australia, whom has provided me countless tricks and guidance and also taking his time to proof read my materials.

## Objective

In this class you will learn tips and tricks on how to get the best out of the Infrastructure Suite by bringing data from Civil3D to Map 3D, Vehicle Tracking, 3DS Max Design and InfraWorks 360. My intention is to share with you Civil 3D interoperability between these products. The data that will be used for this class will be divided into 2 parts, in the first part, I will focus on working with Civil 3D, Map 3D and InfraWorks and part 2 will focus on creating roundabouts using Vehicle Tracking in Civil 3D and 3DS Max design.

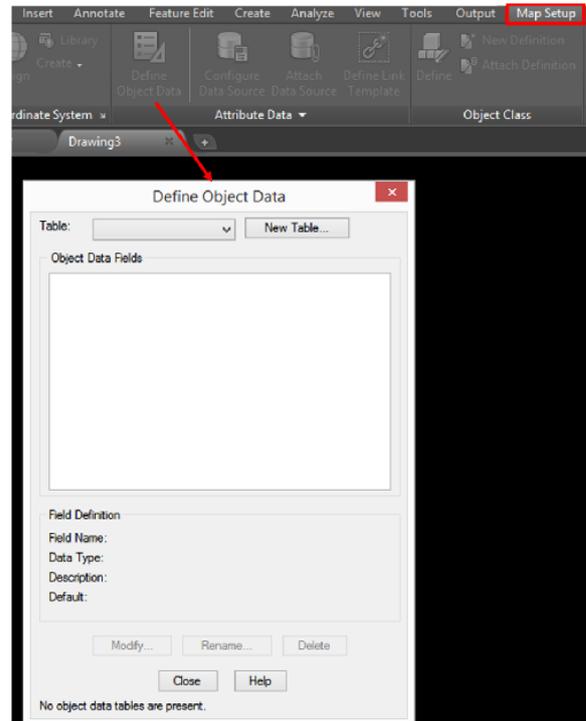
### Part 1: Working with Civil 3D, Map 3D and InfraWorks 360

Assuming you have legacy 2D utilities drawing in particular pipe networks and you would like to convert them to 3D pipe networks using Civil3D.



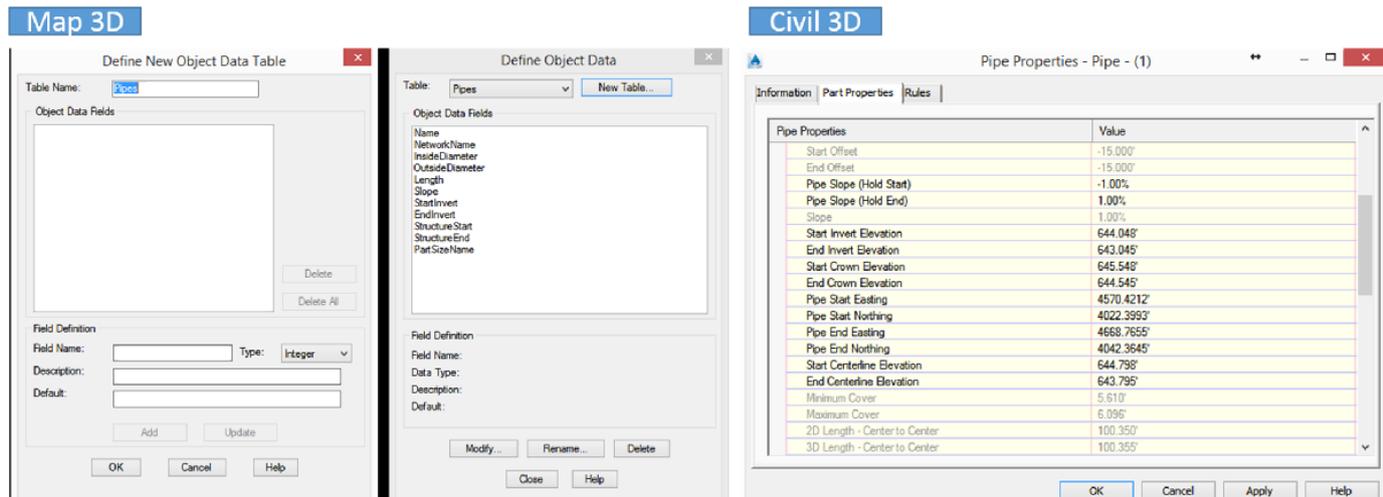
**Object Data**

We will start with Mapping pipes properties using Object Data in Map 3D. First, go to Map Setup Ribbon and pick on Define Object Data and then click on New Table..give it a name This Table will represent a typical parameters of a pipe, so we will give our Table the name “Pipe”.



Define Object Data

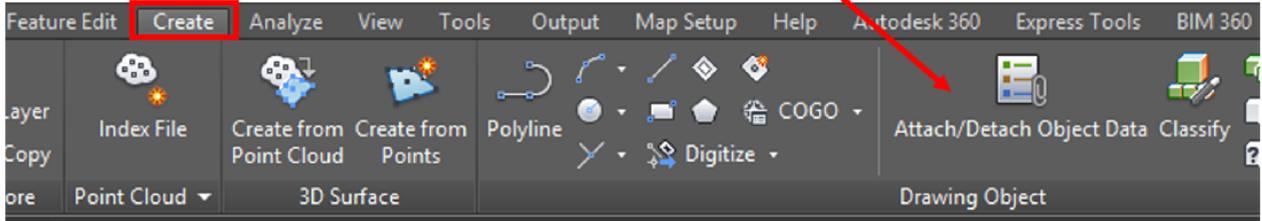
Tips: When adding new Field, try to give a name that’s similar to the Pipe Properties in Civil 3D. This is helpful during Mapping of the Fields where you can specify the pipe feature classes to be imported, and assign the corresponding AutoCAD Civil 3D properties.



Once you’ve created the Object Data for Pipes, repeat this for Structures.

Next, you can start attaching the Object Data to the Pipes and Structures.

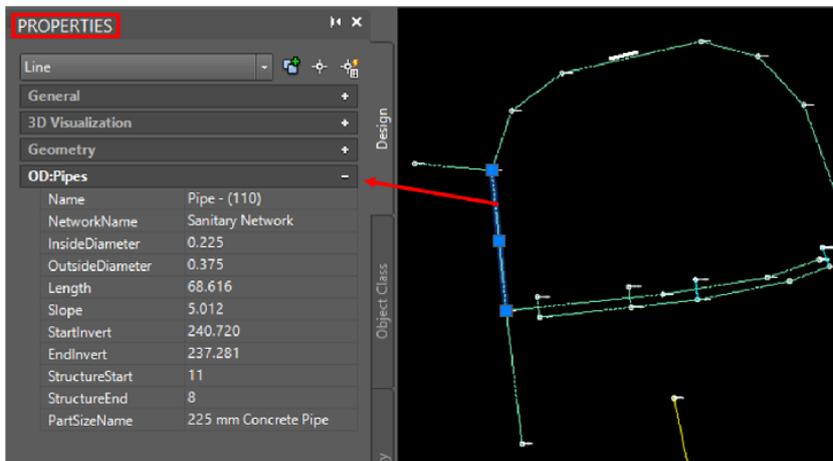
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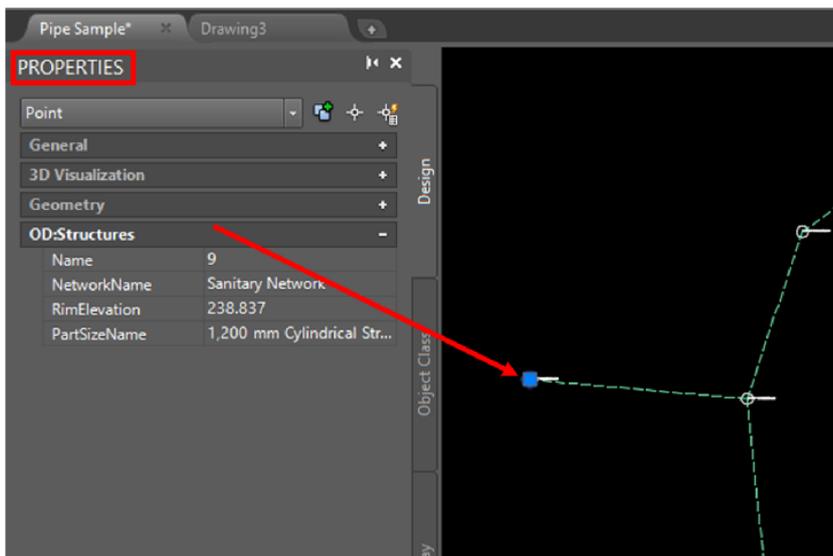
Let's start by attaching Pipes Object Data to Pipes and followed by Structures.

Hint: you can isolate the Layer which shows only the pipes and attach the Pipes Object Data to all the pipes.

We can then start assigning or modifying the properties of the pipes and structures.

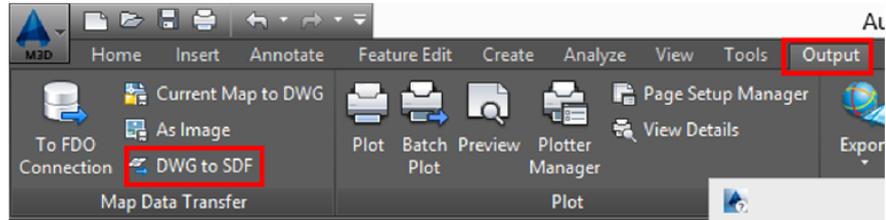


The completed drawing with Object Data attached can be found in the CV5226-Data folder under DWGs, titled *Map3D Pipe.dwg*.



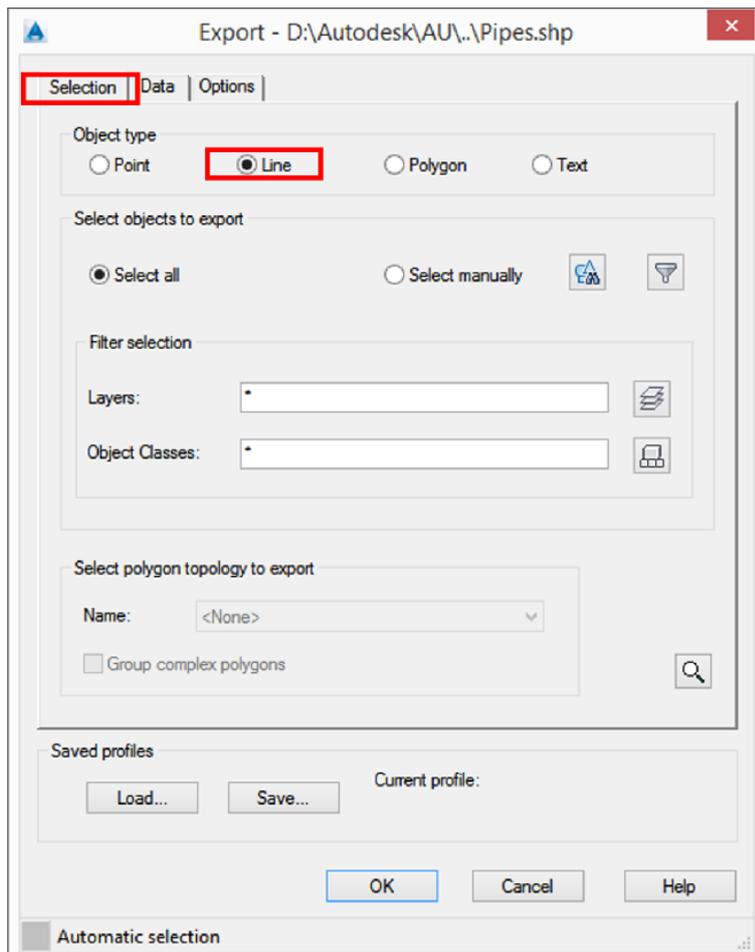
**Export data to SHP**

Now we have all the Object Data attached to the pipes and structures, we can export them as a SHP file to be used in Civil 3D. In the Planning And Analysis Workspace, click Output tab ► Map Data Transfer panel ►

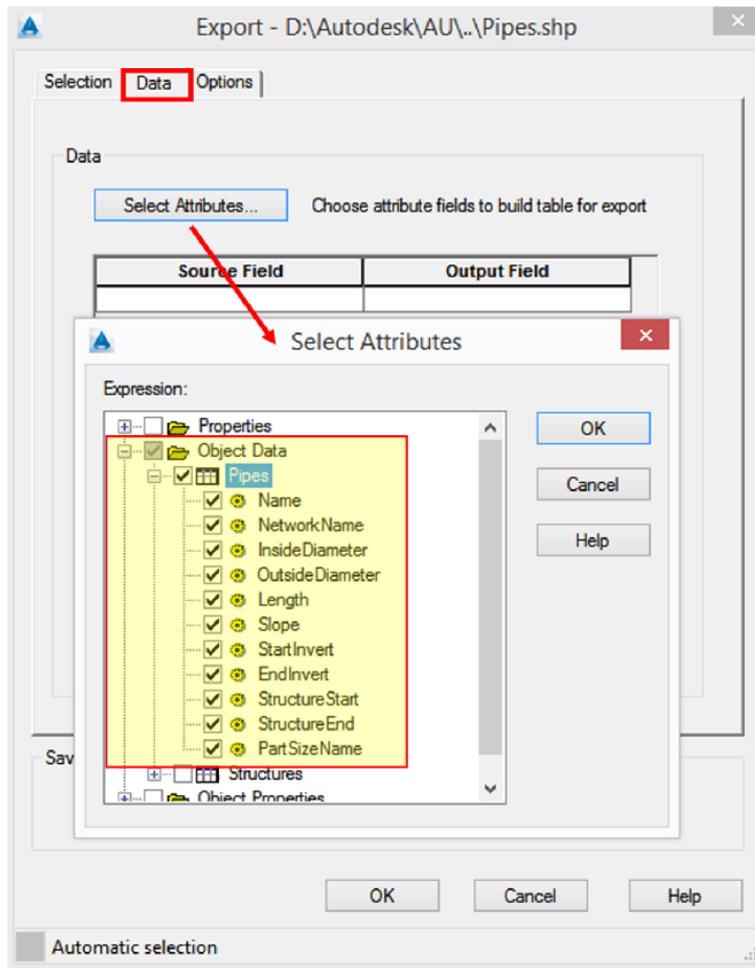


In the Export Location dialog box, select the ESRI Shapefile format and a location for the exported files. Click OK.

In the Export dialog box, specify Line as the object to export.



On the Data tab, click Select Attributes and select the Pipes Object data to export with the objects.



Repeat the same steps for Structures but instead of Line, choose Point for Object type in the Selection tab.

You should get the following message if the export has been successful.

```
Command: MAPEXPORT
"18 object(s) of 18 selected, exported in 0 sec(s).
Command: MAPEXPORT
"20 object(s) of 20 selected, exported in 0 sec(s).
```

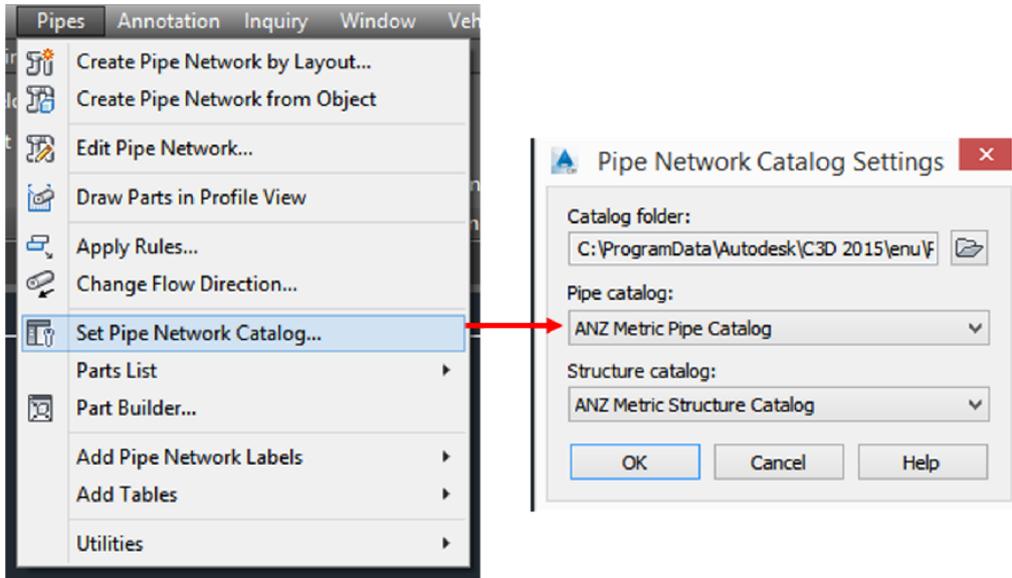
You can also find the exported shp files for both pipes and structures under the CV5226-Data>SHP folder.

### ***Import GIS data using Civil 3D***

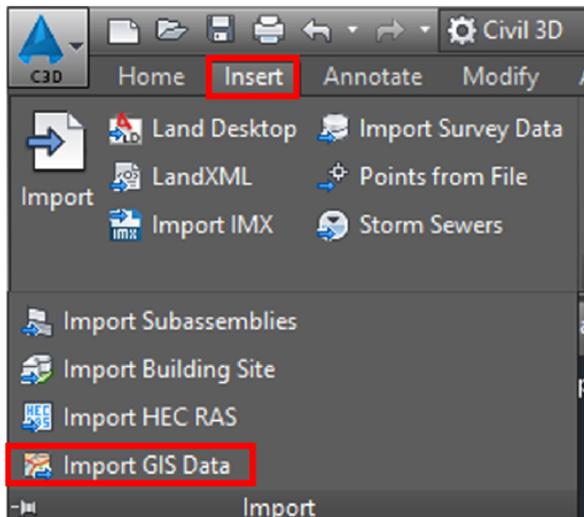
Now we are ready to import the SHP files and convert them to multiple pipes in Civil 3D automatically.

Before we begin, do make sure that you've selected the correct template and Pipe Network Catalog. For example, if you prefer to use the *\_AutoCAD Civil 3D (Metric) NCS.dwt* template, make sure you set the Pipe Network Catalog to Metric.

In this class, I will use the *\_AutoCAD Civil3D 2015 ANZ Design\_ANZ.dwt* template. I will therefore set the Pipe Network Catalog to ANZ Metric.



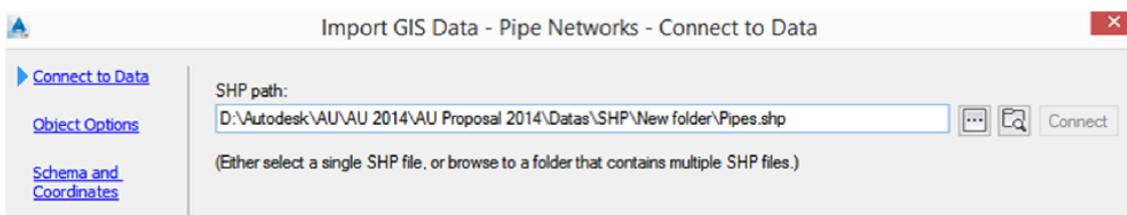
Once these settings have been set, go to Insert Ribbon tab, Import panel and select Import GIS Data.



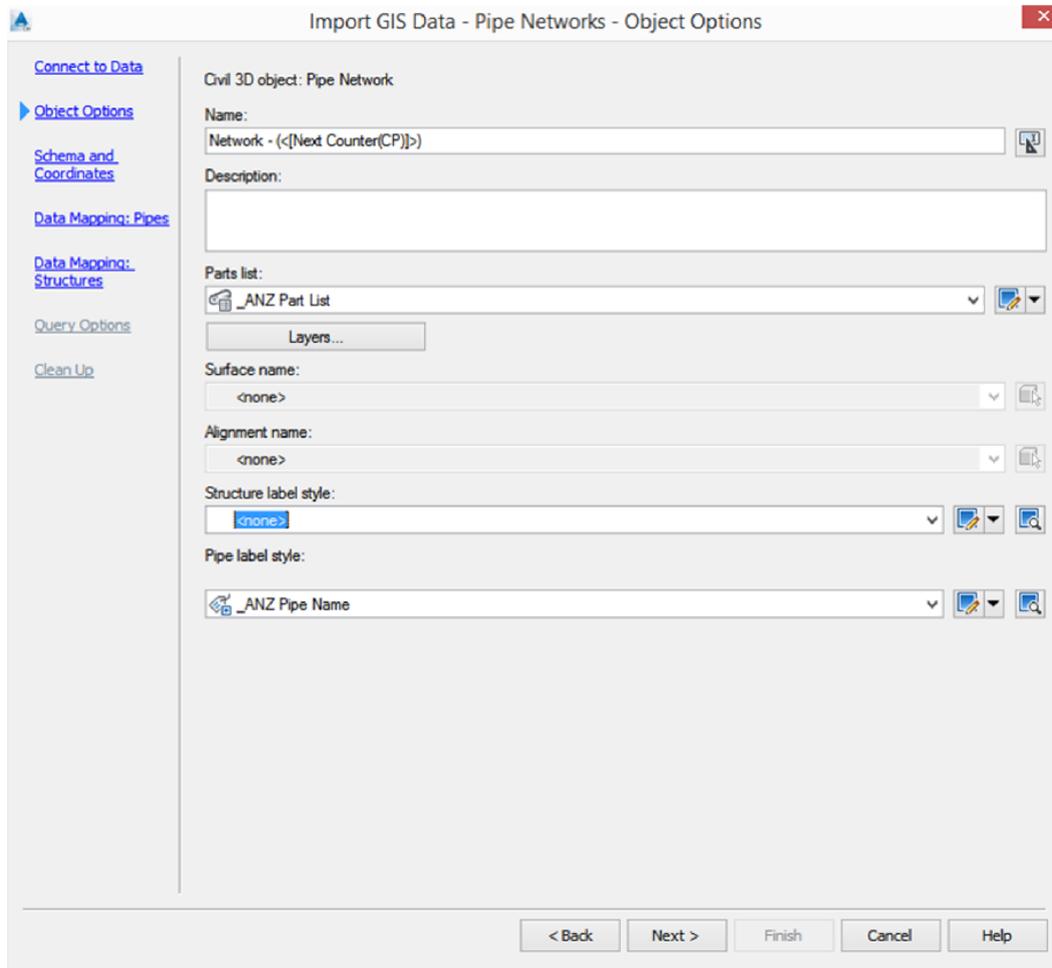
We will select a single SHP file, browse to the location where the Pipes.SHP have been saved. Then click Connect.

For SHP Path, you can

1. : Select a single SHP file.
2. : Browse to a directory that contains multiple SHP files.

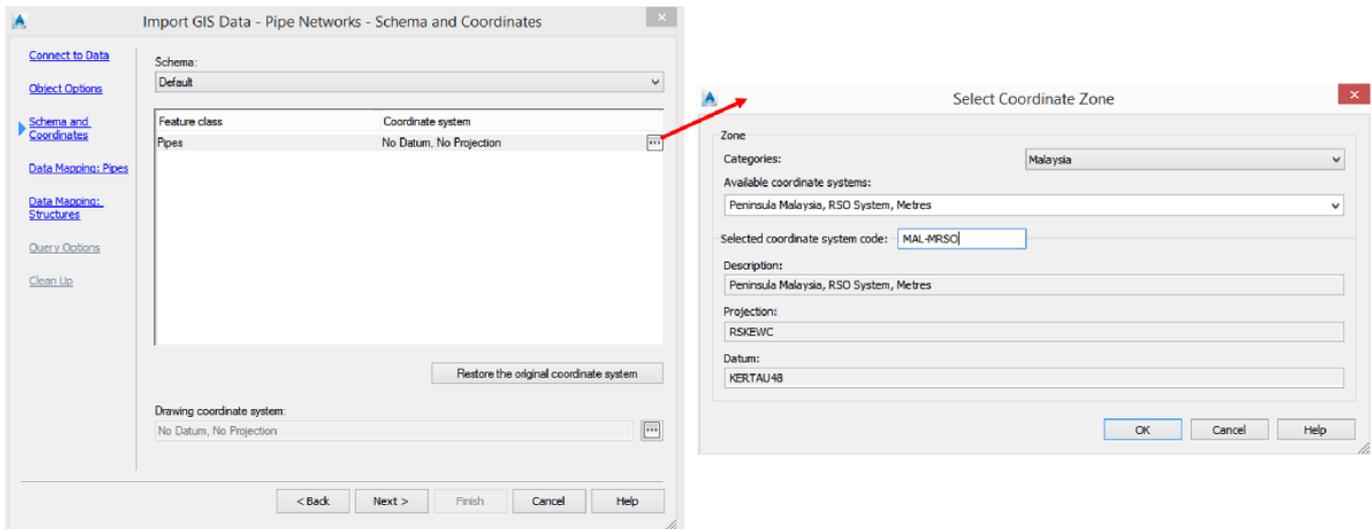


In the Object Options Page (Import GIS Data Wizard), give the Network a name, select \_ANZ Part List (if you have chosen the Metric template, make sure to pick Standard from the list).

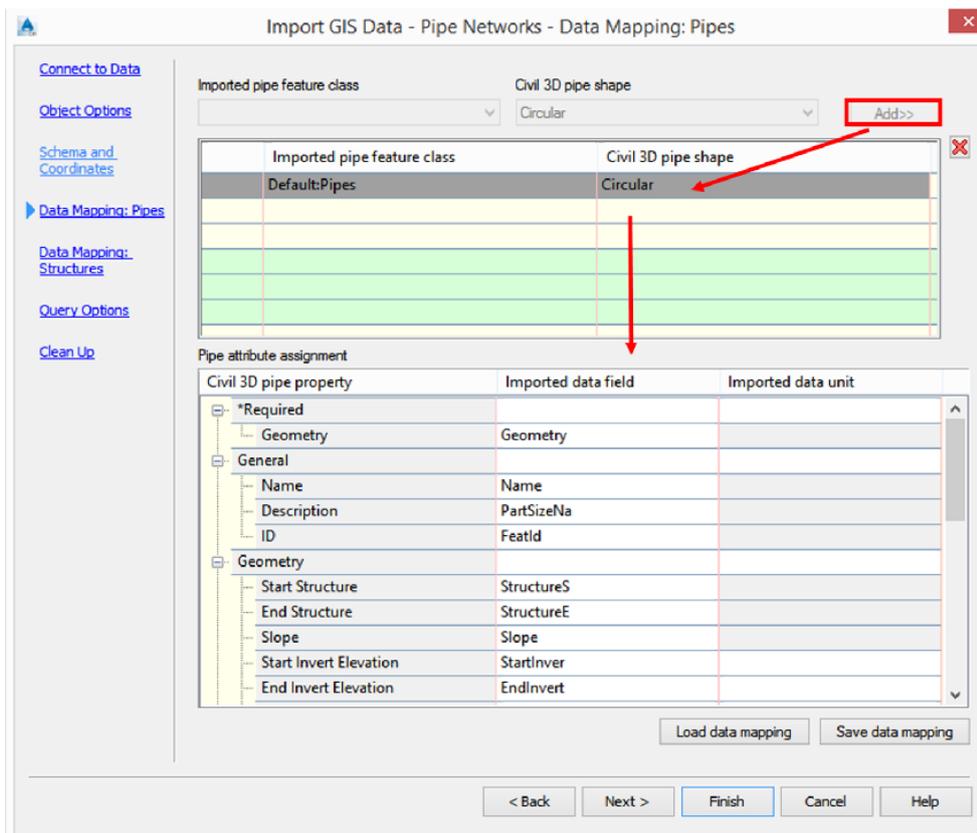


For Schema and Coordinates, please select MAL-MRSO as the system code.

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Next, we can start Mapping imported pipe feature from the SHP file with Civil 3D pipe properties.



*Load Data Mapping: Loads a saved data mapping file, which overwrites the contents of the Pipe Attribute Assignment table. (This has been saved as PipeDataMapping.xml, you can use this file to apply the mapping automatically)*

*Save Data Mapping: Saves the current data field and data unit combinations for later use.*

On the Data Mapping: Structures page, it will be greyed out as we haven't connect to the Structures SHP file. Click next to the Query Options Page. This page gives you the option to filter the imported GIS data to a specified area in the current drawing. We will imports all GIS data with no filter.

On the Clean Up Page, it allows you to specify the cleanup options for disconnected pipes and structures.

**Snap Pipe and Structure Tolerance**

Specifies the tolerance value for snapping the end of a disconnected pipe to the nearest structure. If the end point of a disconnected pipe is less than or equal to the tolerance distance from a structure, the pipe will be connected to the structure automatically.

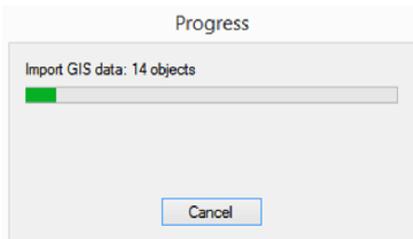
**Discard Unlinked Pipes**

Specifies that disconnected pipes are not imported.

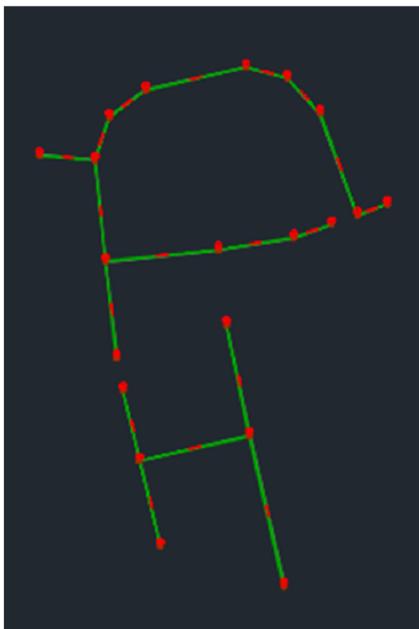
**Discard Unlinked Structures**

Specifies that disconnected structures are not imported.

Click Finish to complete the Import process.

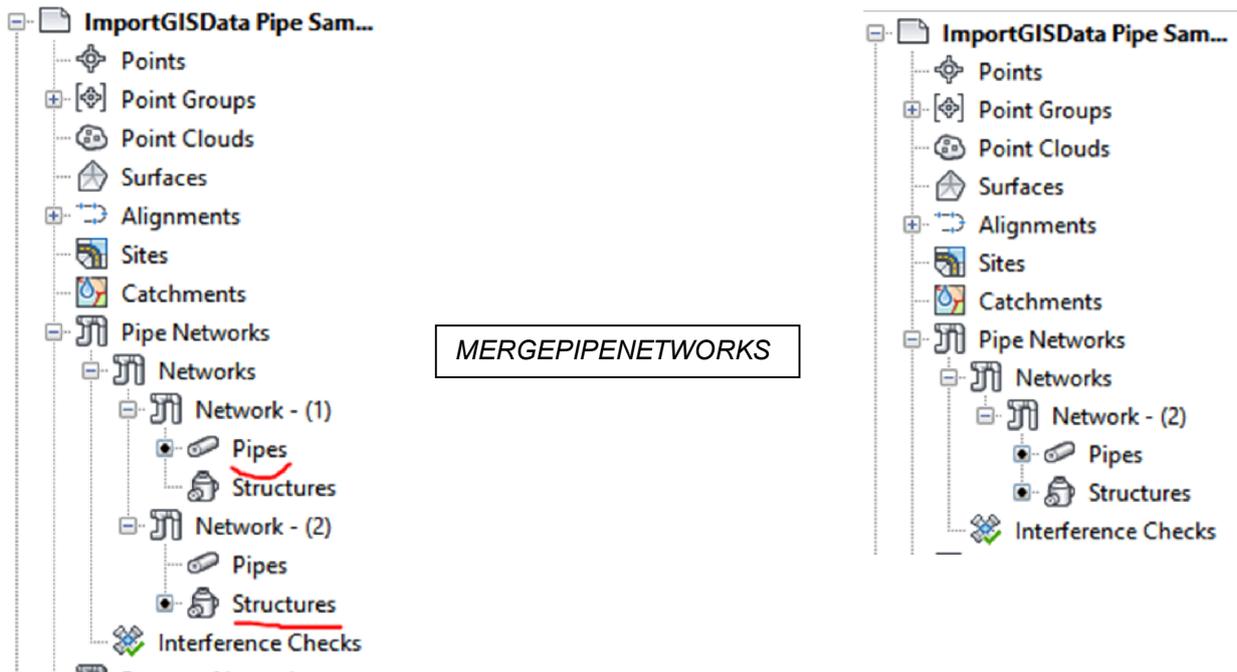


Then, repeat the whole process for Structures

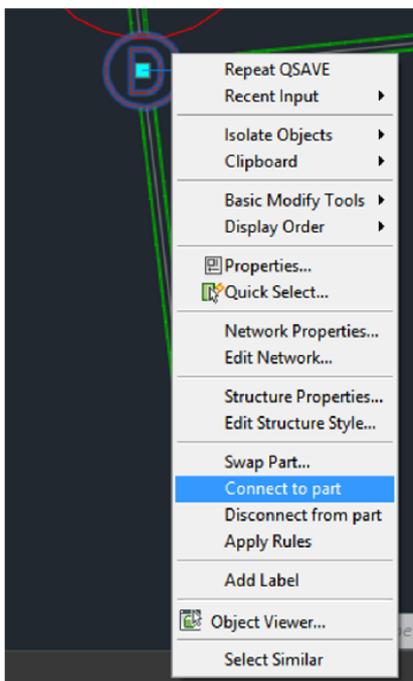


***Final touchup for Imported Pipes and Structures***

You will noticed that there will be 2 Pipe Networks.

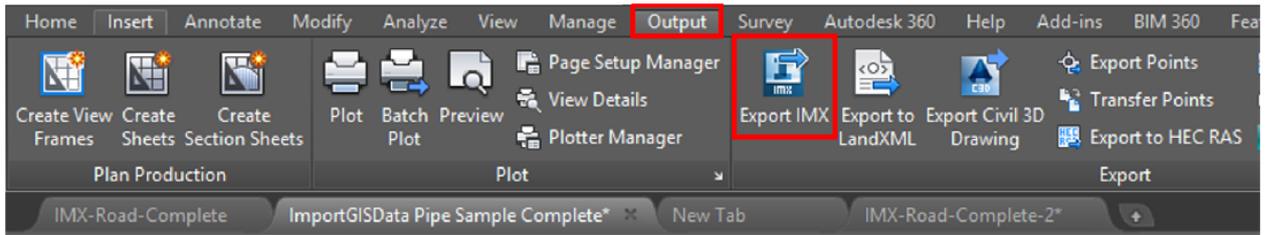


Now that you have both the pipe networks merged, there is only 1 final task which is to connect the structures to the pipes and there you have it, you have completed the task of converting multiple lines and points to pipe network.

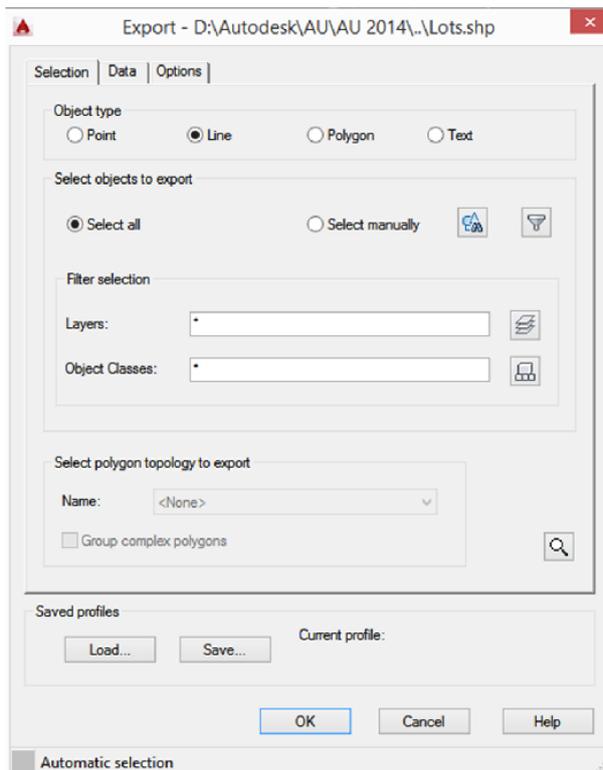


### ***Exporting pipe network to InfraWorks***

Pipes and structures are exported to the IMX file as pipes and pipe connectors. Once you have completed converted the multiple line to Pipe network, save the drawing. Go to Output ribbon tab, Export panel and click on Export IMX.



We will also export the Parcel lines to InfraWorks as SHP. To do that, in Civil 3D, enter MAPEXPORT in the command line. In the Export Location display box, give it a name and Under the Files of Type, select ESRI Shape file (\*.shp).

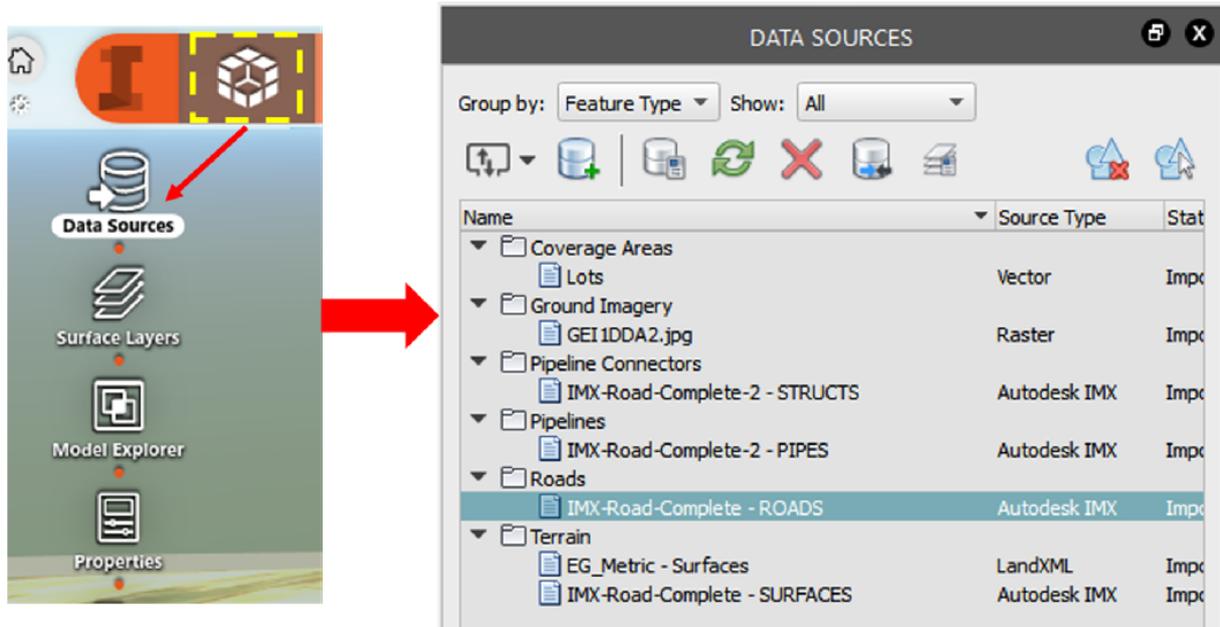


Pick Line under Object type and click OK. We are now ready to bring in data from Civil3D to InfraWorks.

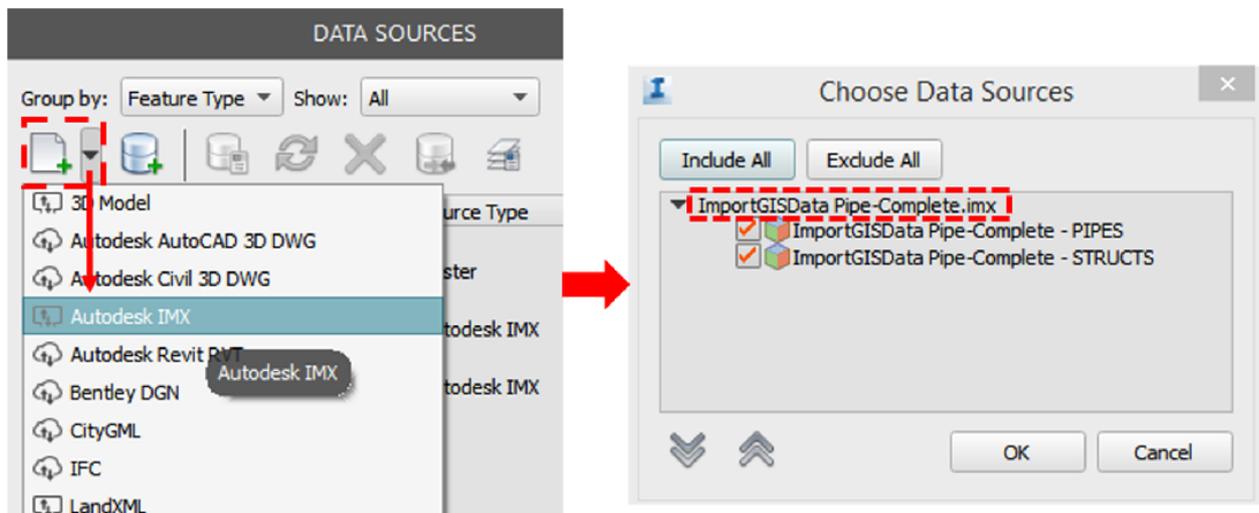
Import GIS Data completed both for Pipes and Structures. The completed drawing can be found in CV5226-Data\DWGs\ImportGISData Pipe-Complete.dwg

### ***Bringing data to InfraWorks***

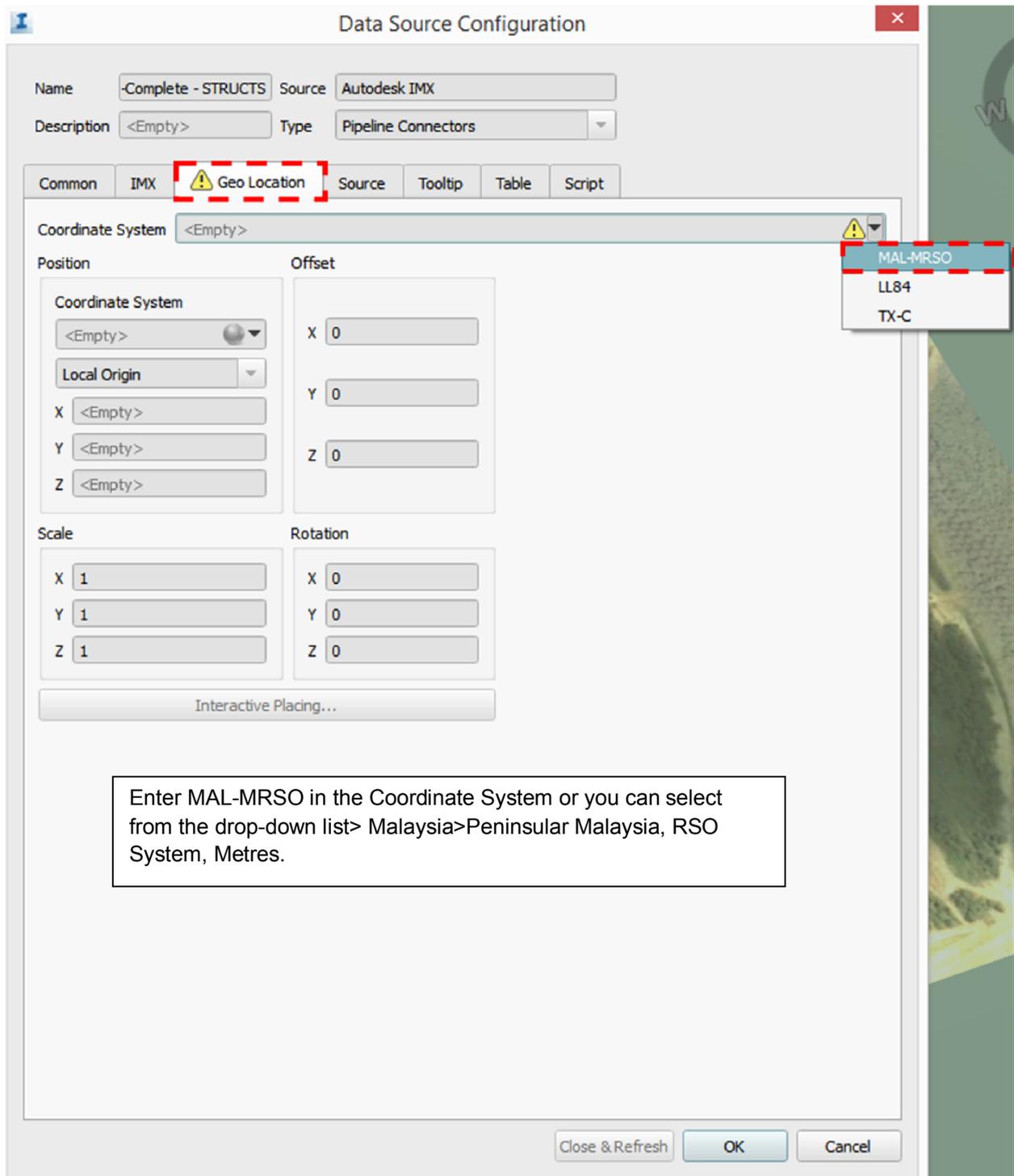
In InfraWorks 360, click on the InfraWorks Home icon (big orange circle with the letter I). Once you click the InfraWorks Home icon, there will be a toolbar which expand to the right and you will have other icons appearing. Click on Create and manage your model. It will bring up a vertical toolbar, click on Data Sources. A Data Sources window panel will appear on the right where you can manage different sources of data.



Let's open an existing InfraWorks (*AU-Pipes.sqlite*) model which already has roads and terrain imported. Then we will bring in the pipes and parcels which we exported as IMX into InfraWorks. In the Data Source panel, expand the Add File Data Source menu, click on Autodesk IMX and browse to *\\CV5226-Data\WV360\ImportGISData Pipe-Complete.imx*.



Both Pipes and Structs data will automatically be checked, click OK. You will notice that both the Pipes and Structures are not visible yet because you will need to configure the data source by providing the coordinate system so that the data ends up in the correct location spatially. You can double-click on the Pipes data source to configure.

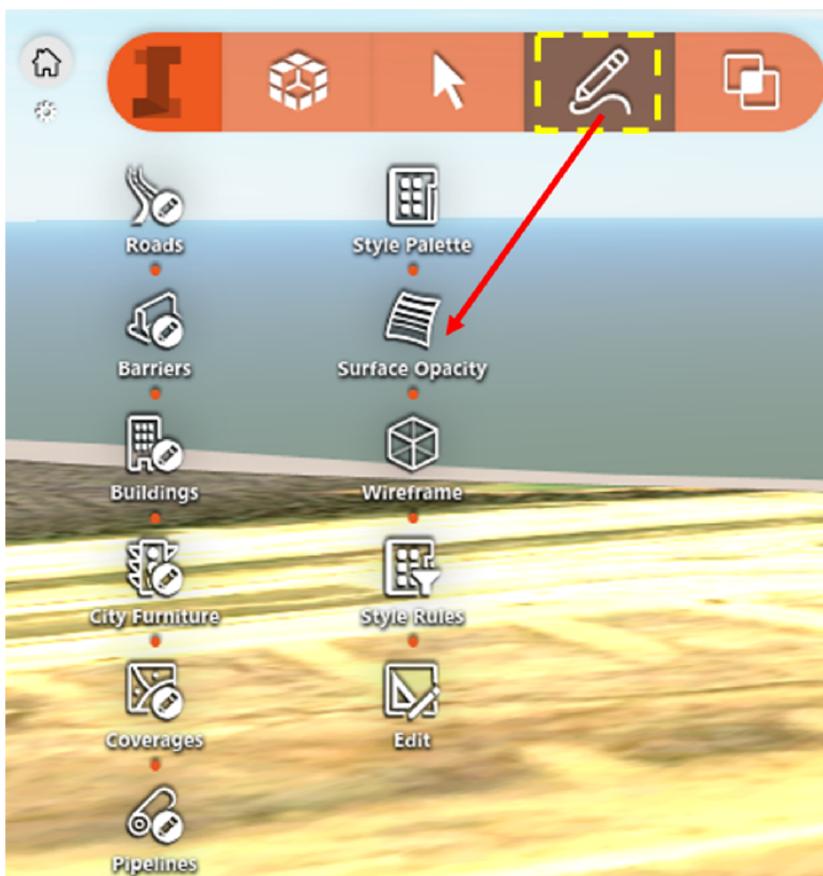


Repeat the same for Pipeline Connectors or structures. Since the pipes and structures underground, you may not see it in the model, make sure to toggle the Surface Opacity. Surface Opacity makes the surface more transparent or opaque. Making the surface transparent allows you to view features below the terrain.

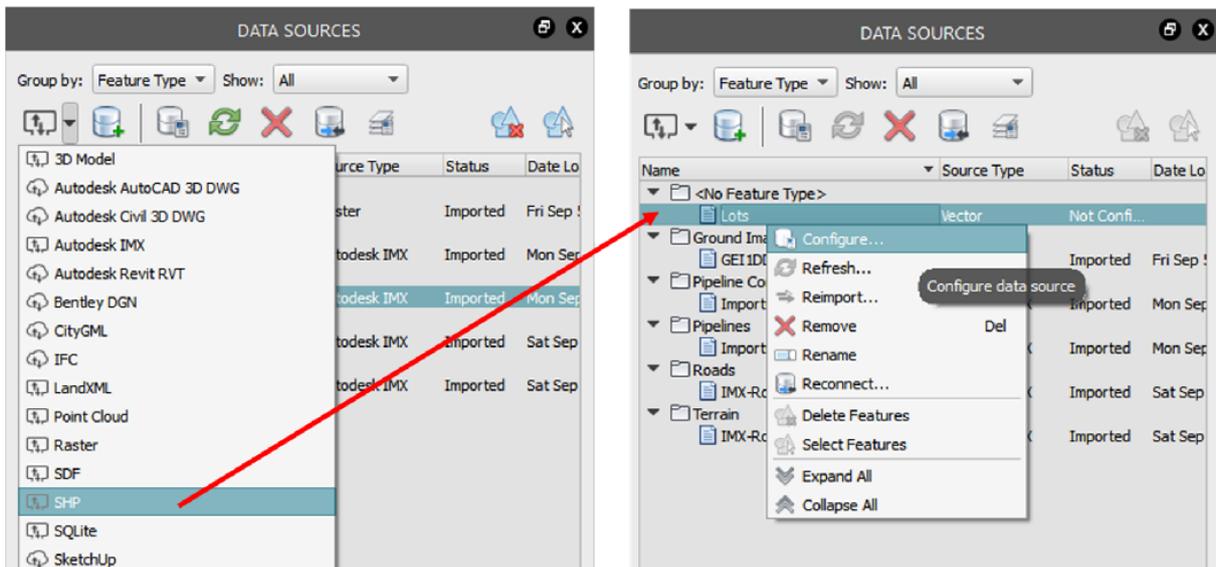
- Click    to display the Visual Effects panel.
- Use the slider to adjust Surface Opacity.

Move the slider all the way to the left to make the surface completely transparent; move it all the way to the right to make the surface completely opaque.

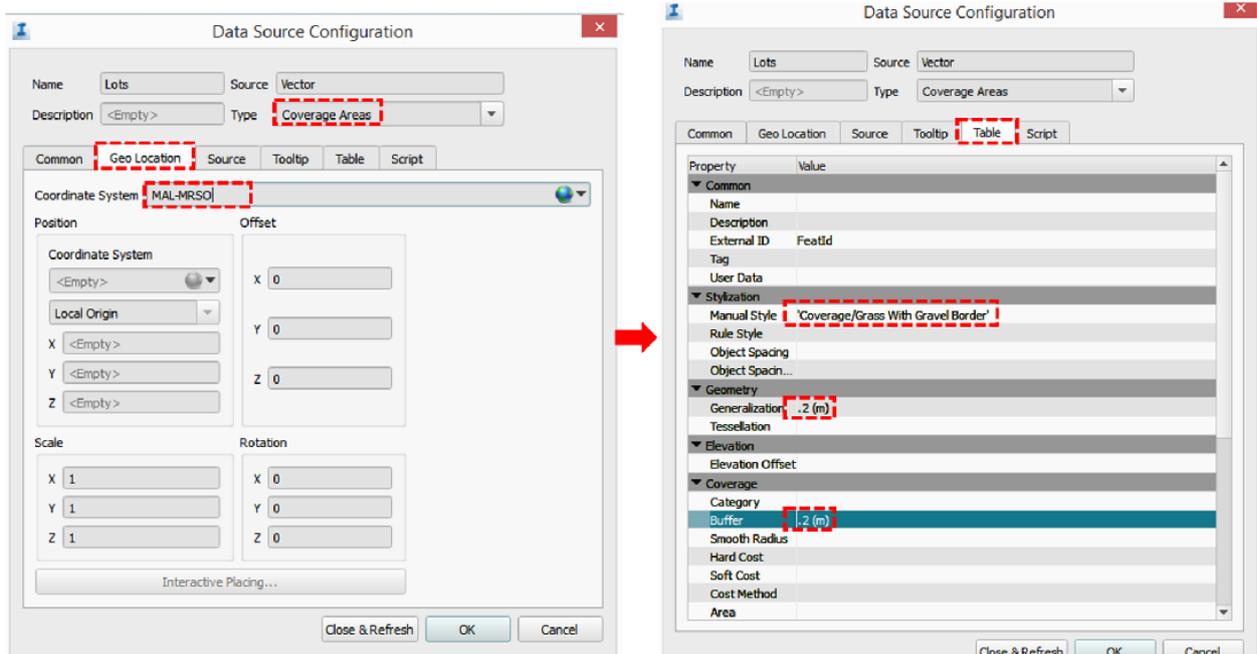
Alternatively, you can click on the InfraWorks home icon, click on the Create conceptual design features which will bring up a set of vertical toolbar, pick Surface Opacity. This option allows you to toggle surface opacity between 50% and 100%.

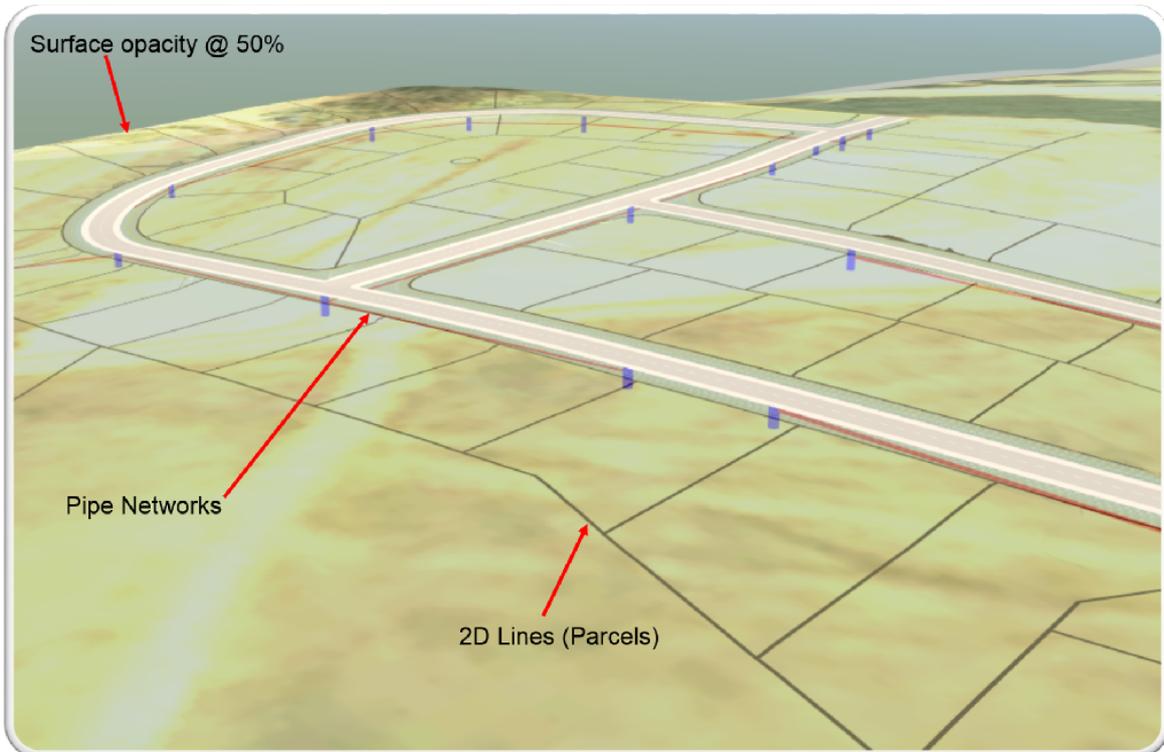


Next, we will bring in the parcel 2D lines which we have exported earlier. In the Data Source panel, expand the Add File Data Source menu, click on Autodesk IMX and browse to `\\CV5226-Data\\SHP\\Lots.shx`. Right-click on Lots and click on Configure...



In the Data Source Configuration window, select Coverage Areas under Type. Under Geo Location tab, enter MAL-MRSO in the Coordinate System. Then, go to Table tab, under Stylization>Manual Style, Click  to open the Style Chooser and select 'Coverage/Grass With Gravel Border'. Set 0.2 m for Geometry>Generalization and Cover>Buffer



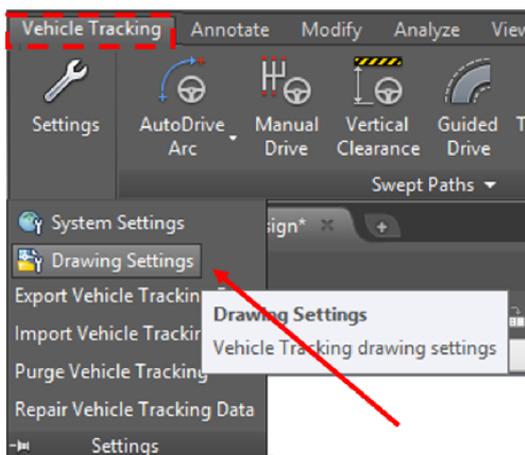


## Part 2: Working with Civil 3D, Vehicle Tracking and 3DS Max Design using Civil View

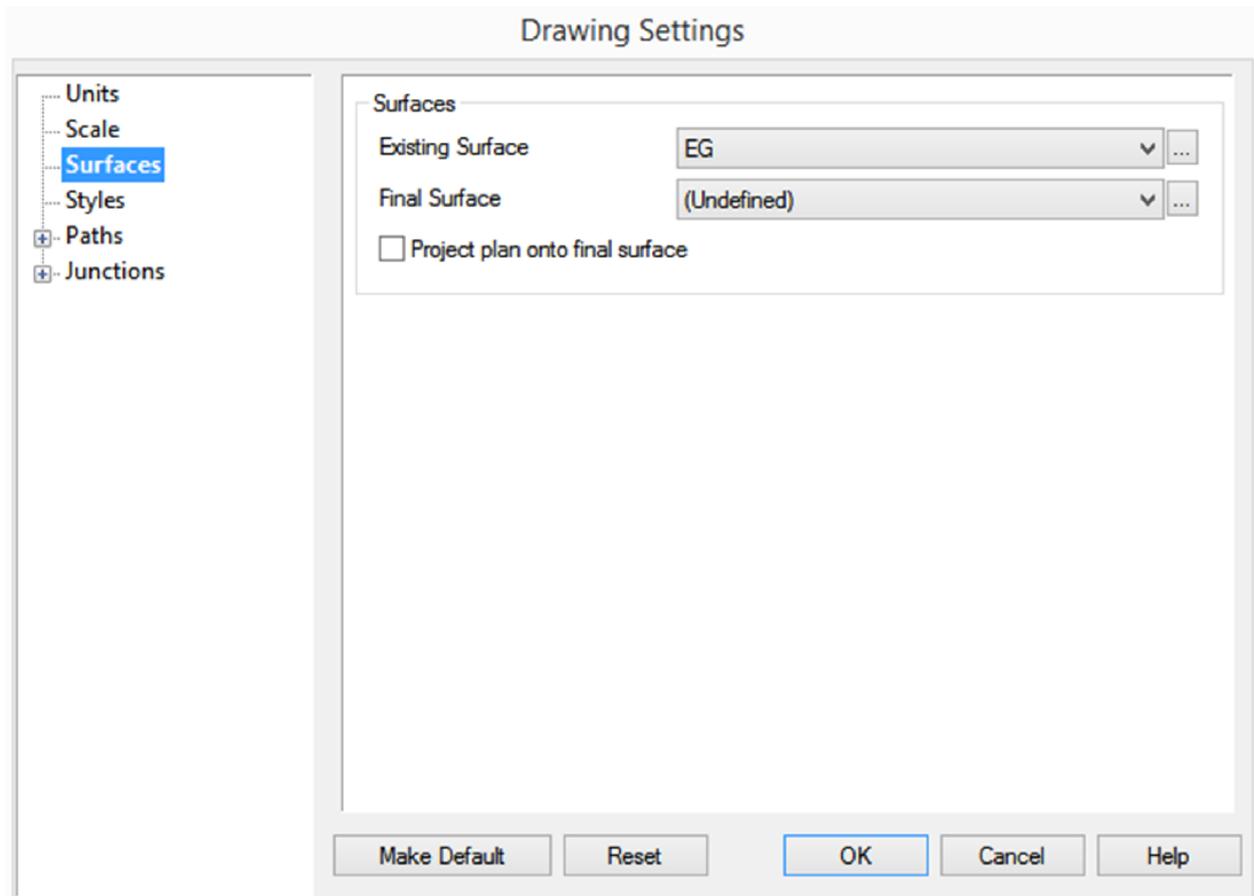
### *Vehicle Tracking Drawing Settings*

Modelling 3D Roundabout in Civil 3D has definitely come a long way. In the past, we used the Intersection wizard and made some tweaks here and there in order to get a decent roundabout. Those were still great tools but with Vehicle Tracking, you practically can create 3D roundabout on the FLY...

Before we get started, let's take a look at the Drawing Settings.



Review the Units and scale settings, in this class I will pick all SI base units. Next, under Surfaces, pick EG as Existing Surface and leave Final Surface as [Undefined].



We will accept the default settings for Styles and Paths.

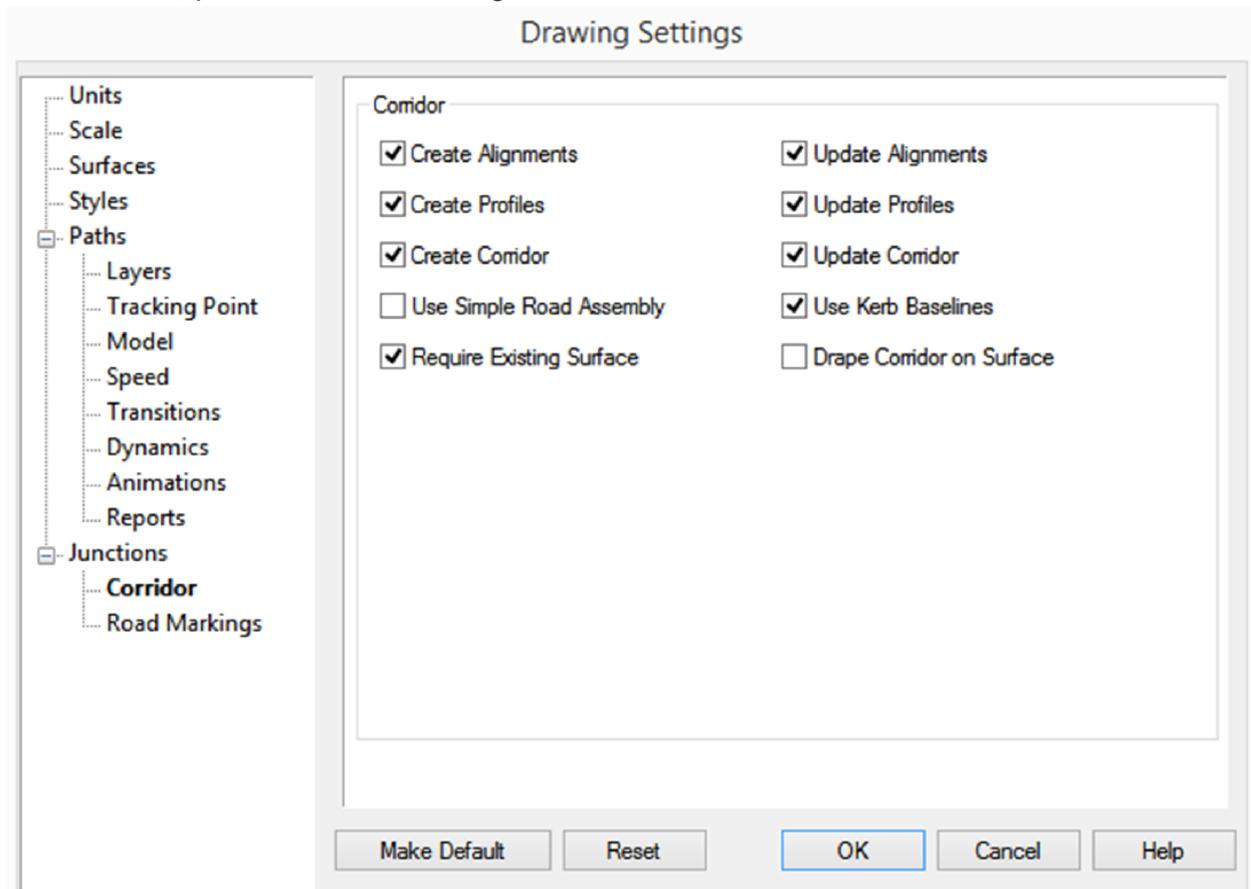
Under Junctions, the options given in the page control how much of the 3D model Vehicle Tracking creates and updates.

1. Tick **Create Alignments** to create horizontal alignments in your CAD system.
2. Tick **Update Alignments** if you want Autodesk® Vehicle Tracking to update the alignments automatically when the geometry changes. This option is only available if Autodesk® Vehicle Tracking created the original alignments, i.e. if **Create Alignments** is ticked.
3. Tick **Create Profiles** to create vertical profiles along the horizontal alignments.
4. Tick **Update Profiles** if you want Autodesk® Vehicle Tracking to update the profiles automatically when the geometry changes. This option is only available if Autodesk® Vehicle Tracking created the original profiles, i.e. if **Create Profiles** is ticked.
5. Tick **Create Corridor** to create a 3D corridor model using default assemblies.
6. Tick **Update Corridor** if you want Autodesk® Vehicle Tracking to update the corridor automatically when the geometry changes. This option is only available if Autodesk® Vehicle Tracking created the original corridor, i.e. if **Create Corridor** is ticked.
7. By default the corridor is built using simple assemblies consisting of just a road surface with no kerbs. This is the case when **Use Simple Road Assembly** is ticked. These assemblies are based upon the Civil 3D **Primary Road Through Intersection** assembly with right and left subassemblies renamed to offside and nearside in accordance with your driving convention.

Un-tick **Use Simple Road Assembly** to use more complex assemblies for the entry and exit roads. These assemblies are based upon the Civil 3D **Primary Road Part Section – Daylight Right** (or Left) again with right and left renamed to offside and nearside in accordance with your driving convention.

- By default the assemblies are inserted on the crown lines and targeted to the nearside kerb and centreline alignments. However under some circumstances it may be desirable to insert them on the nearside kerb alignment. Switch between them with the **Use Kerb Baselines** checkbox.
- Normally you will probably want to construct the 3D model with calculated profiles; this is the default. To drape the corridor on the surface tick **Drape Corridor on Surface**. With this option enabled, the assemblies take their levels from the original surface profiles rather than the calculated profiles.

For this class, please tick the following:

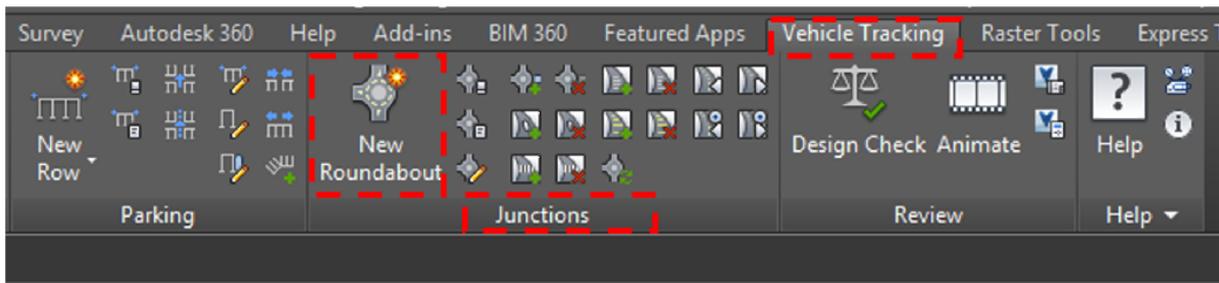


Accept the default setting for Road Markings.

If you want to make changes to these settings, you can still do it even after your roundabout has been created.

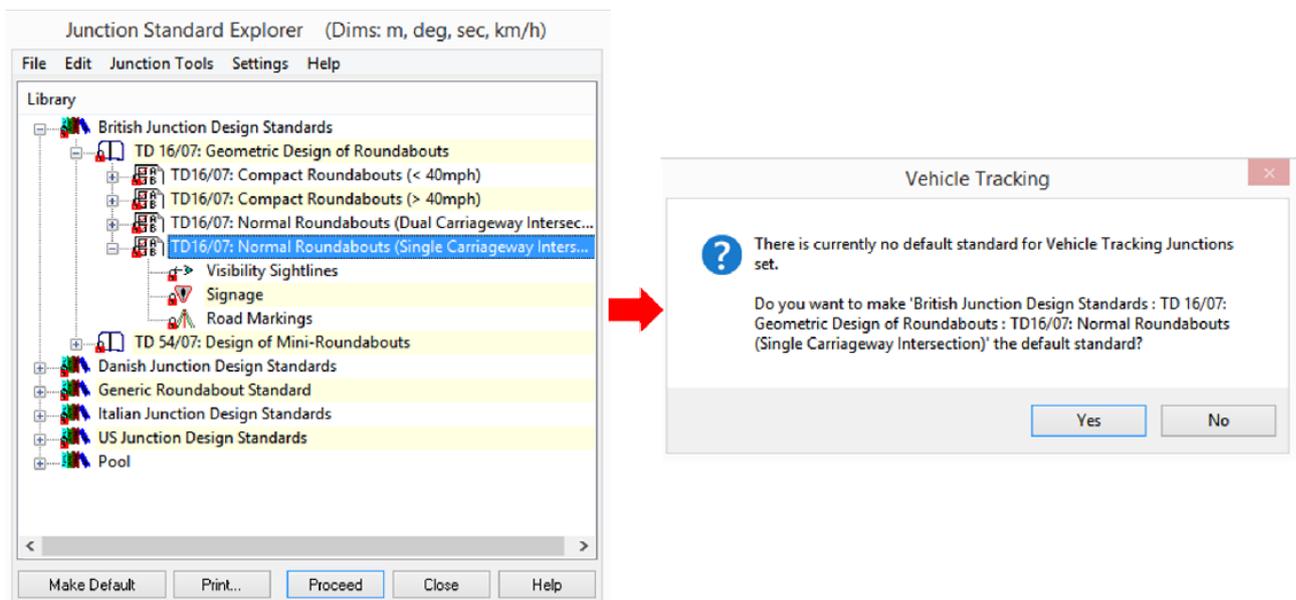
### ***Placing a new Roundabout***

Let's get started by opening an existing drawing from this location: ...\\CV5226-Data\\DWGs\\AU2014-Roundabout Design.dwg. In this drawing, I've already pre-defined the alignments which we will use as the target alignments. To place a new roundabout, go to Vehicle Tracking Ribbon tab, Junctions Panel >New Roundabout



A number of libraries are provided with the program and these may be used as the basis for your own company libraries. Whatever they relate to, libraries are grouped by nationality so, for example, the UK parking standards are held within a library file called UK\_xxx.ATP, where xxx is the most recent version of Autodesk® Vehicle Tracking that can read it, e.g. UK\_890.ATP.

In this class, we will pick TD16/07: Normal Roundabouts (Single Carriageway Intersection), then click Proceed. You will be prompted if you want to make 'British Junction Design Standards' as the default standard, click No.



The first step is to add a road to a roundabout, you will need to be able to pick the alignment. Give it a name, say MS-Roundabout, pick an appropriate Appearance for Draw Style. Under Surface, pick EG for Existing Surface but leave the Final Surface as [Undefined], click OK.

**New Junction**

**General**

Name: MS-Roundabout

Description:

Notes:

Calculate Levels:

**Appearance**

Draw Style: Dark Colours for Light Background

**Surface**

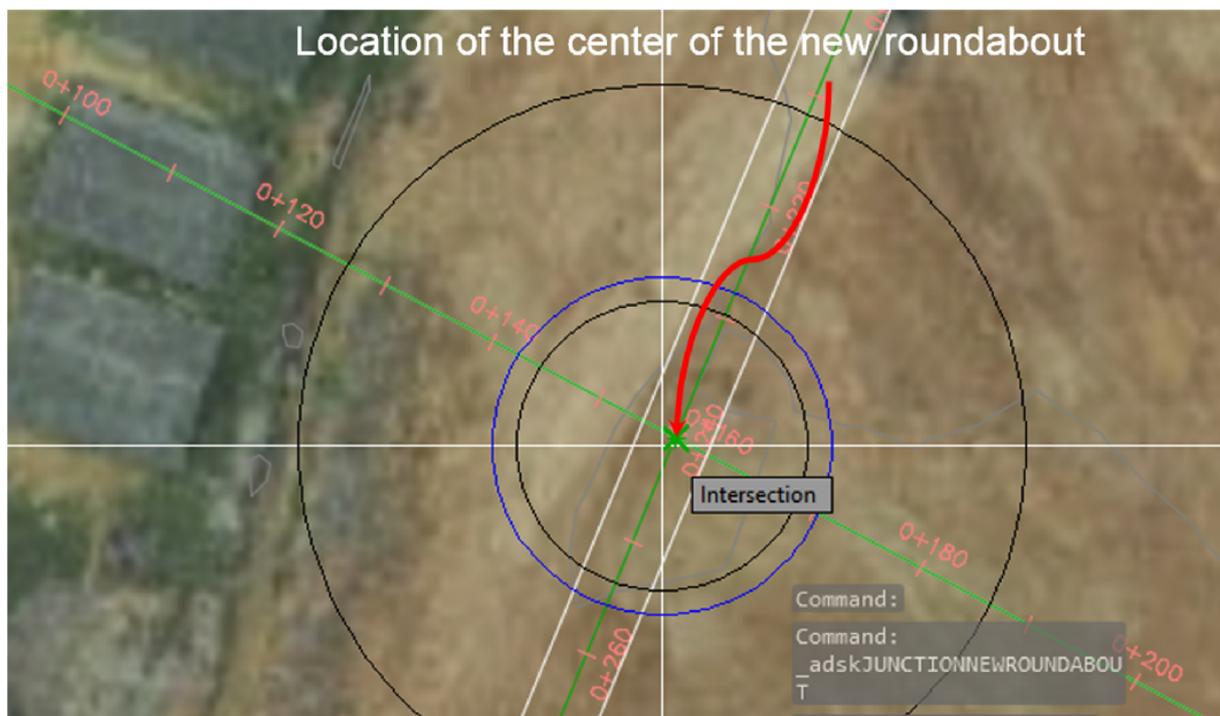
Existing Surface: EG

Final Surface: (Undefined)

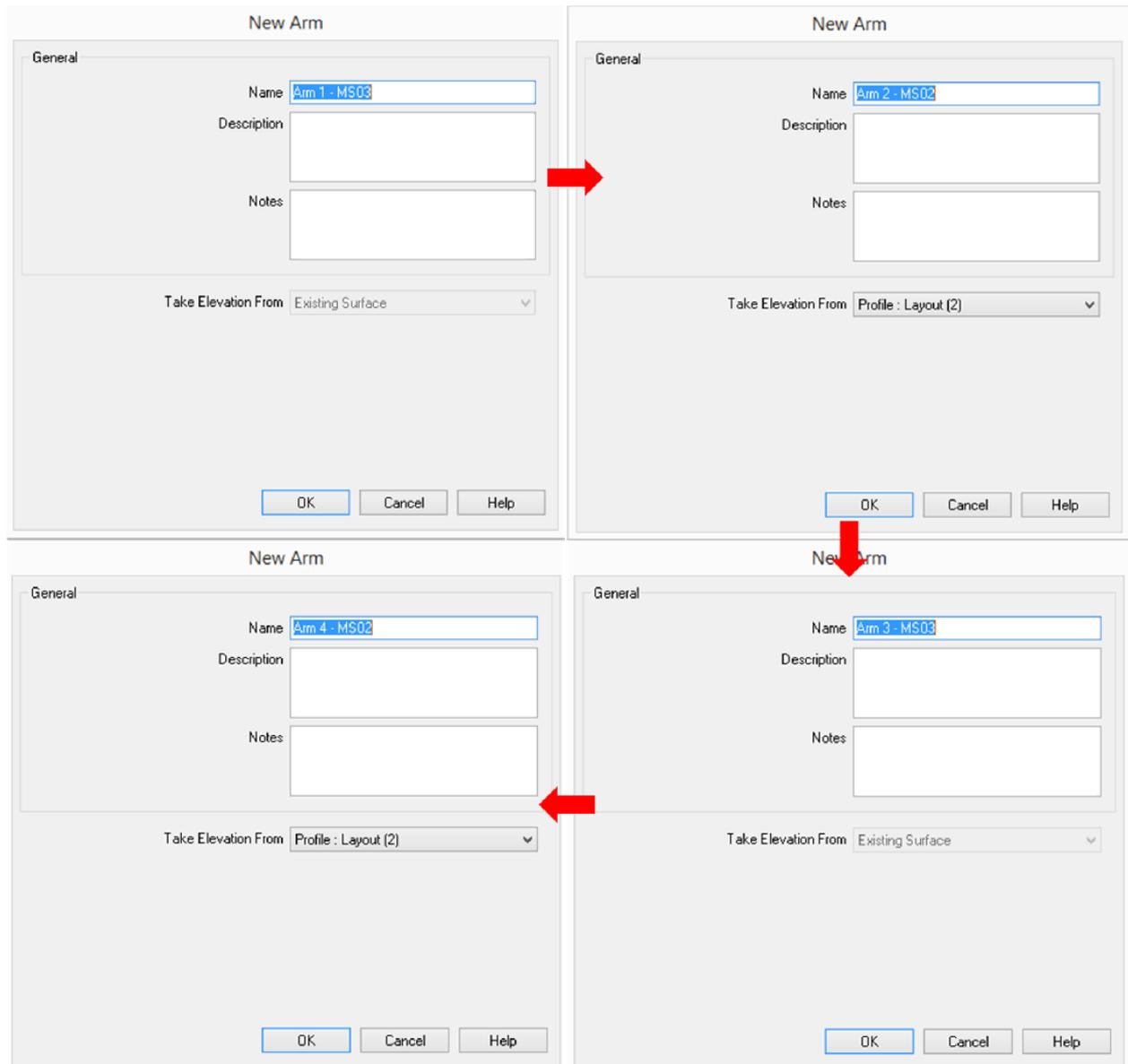
Project plan onto final surface:

OK Cancel Help

Next, you will be presented with a series of prompts. When prompted to 'Select the location of the center of the new roundabout' pick the intersection of the 2 alignments (MS02 and MS03).



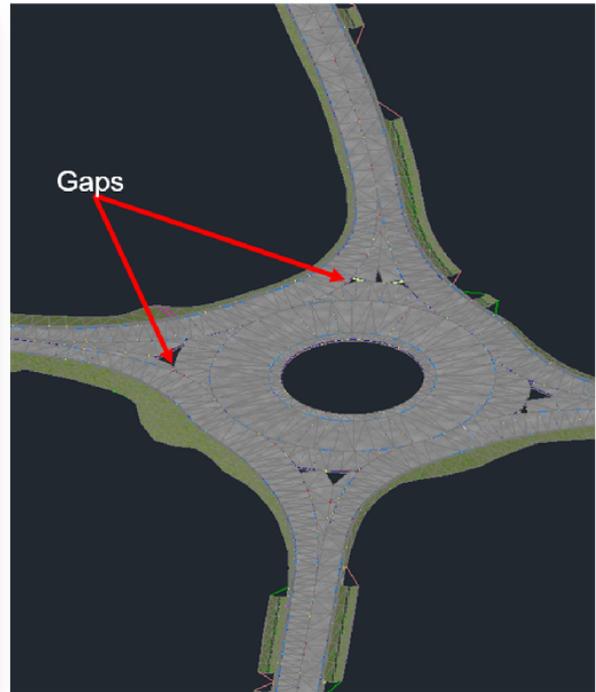
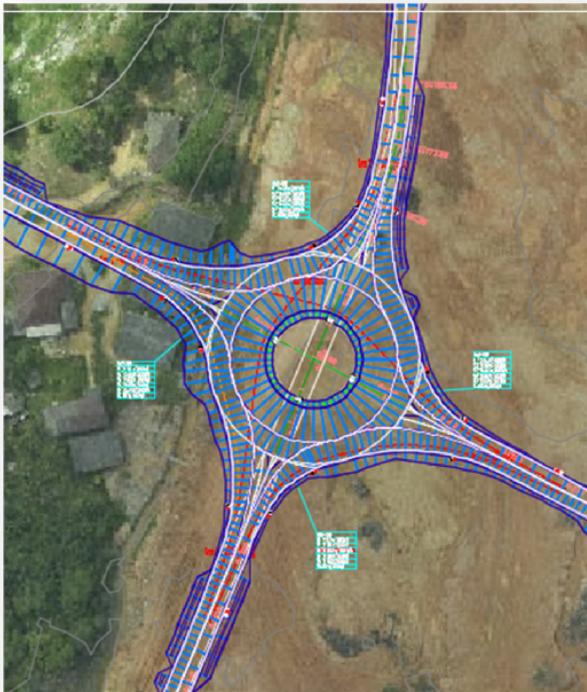
Next, follow the prompt to select the arms of the roundabout.



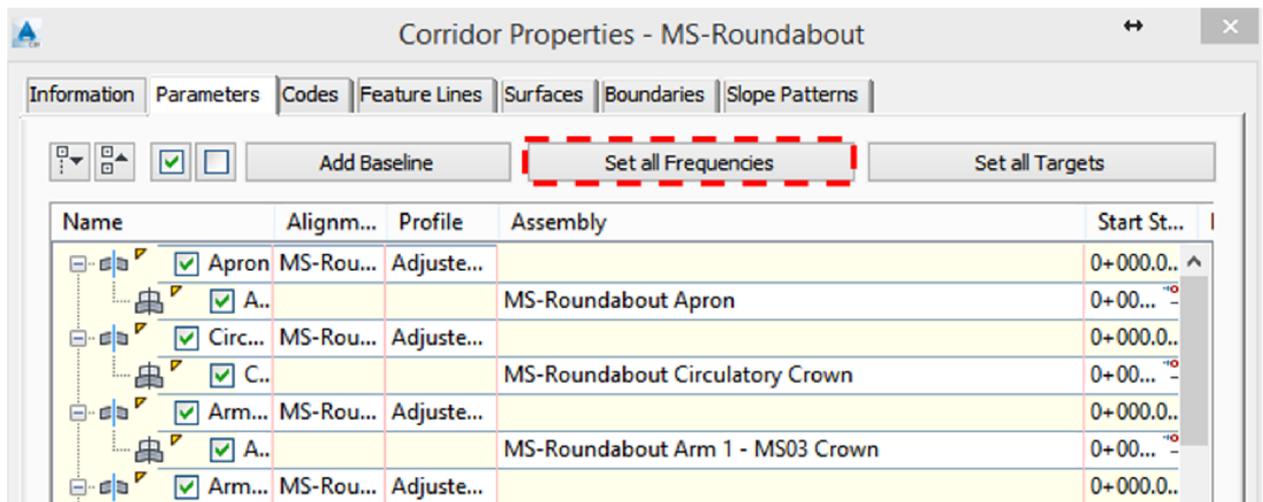
Once you finished selecting the arms, right-click on the screen and it will start to model the roundabout.

You will get a complete 3D roundabout with corridor, road markings and it also comes with Design Check.

**Roundabout retouch**



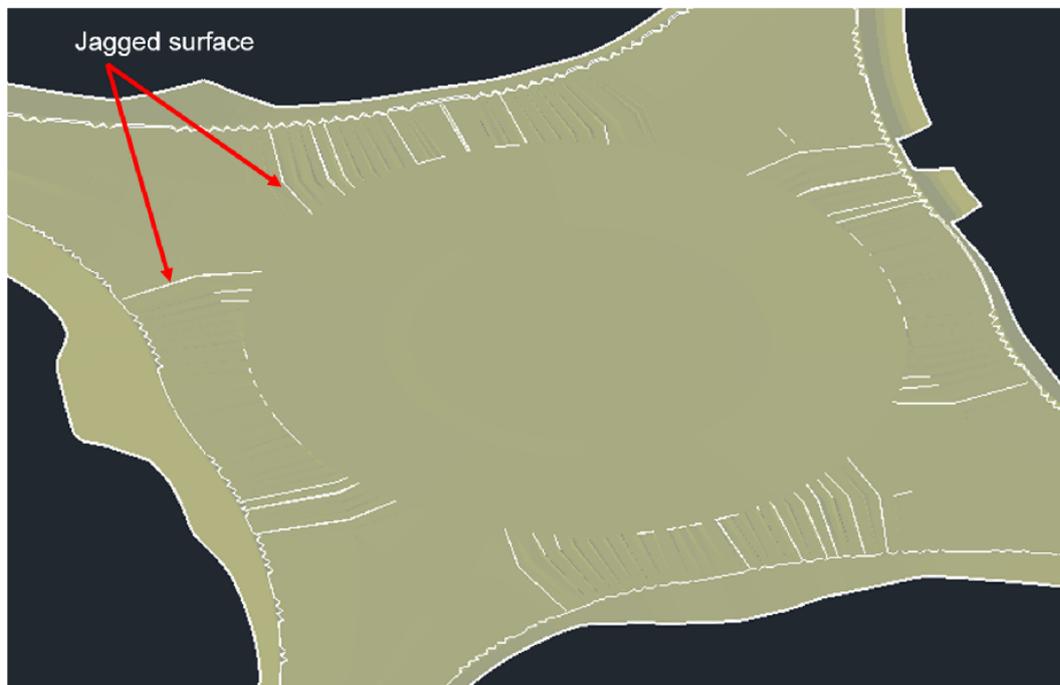
There is probably a few minor touchup before we export this to 3DS Max. You will notice that there is some gaps appearing in the corridor. To quickly get rid of them, right-click on MS-Roundabout corridor, and click on Properties. Go to Parameters tab, click on Set all Frequencies.



Under Offset Target, set both *At alignment geometry points* and *At offset target geometry points* to Yes.

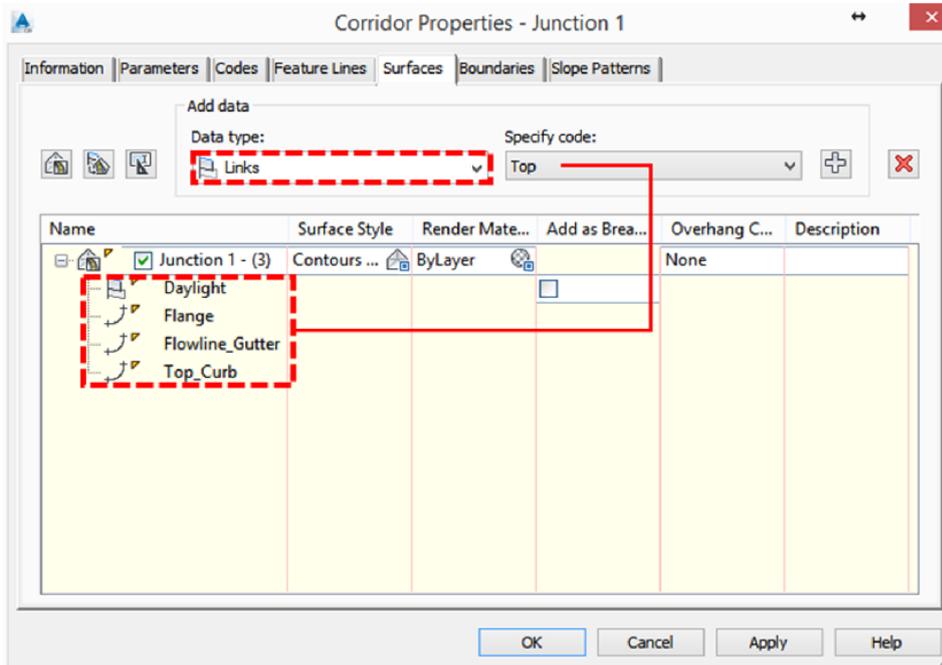
Property	Value
<b>Corridor Information</b>	
<b>Alignment</b>	
Along tangents	**Varies...**
Along curves	At an increment
Curve increment	**Varies...**
Mid-ordinate distance to define curvature	0.200m
Along spirals	20.000m
At alignment geometry points	<u>Yes</u>
At superelevation critical points	No
<b>Profile</b>	
Along profile curves	20.000m
At profile geometry points	No
At high/low points	Yes
<b>Offset Target</b>	
At offset target geometry points	<u>Yes</u>
Adjacent to offset target start/end	No
Along offset target curves	<None>
Curve increment	25.000m
Mid-ordinate distance to define curvature	0.200m

And finally, you will noticed that the corridor surface appears a little jagged ☹.

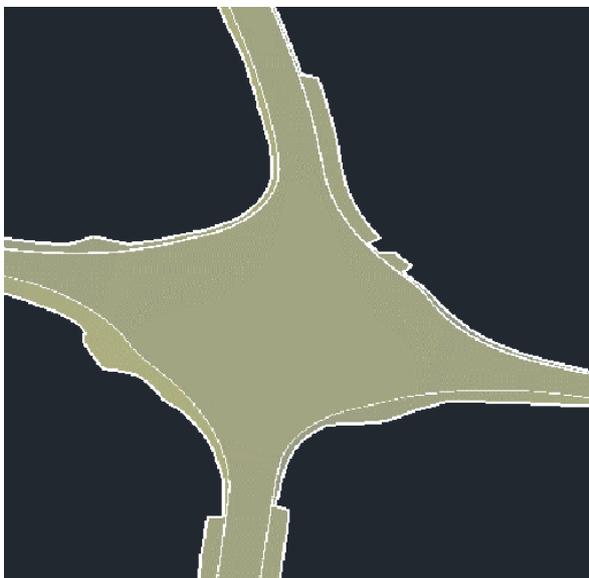


The trick to getting rid of the jagged lines is to use corridor feature line instead of links when defining the surface. You can easily do that by going into the Corridor properties>Surface tab, then do each of the following:

1. Data types: Select Feature lines
2. Specify code: Flange, Flowline\_Gutter, Top\_Curb and Daylight. (This depends on the subassembly you used for your corridor model.)

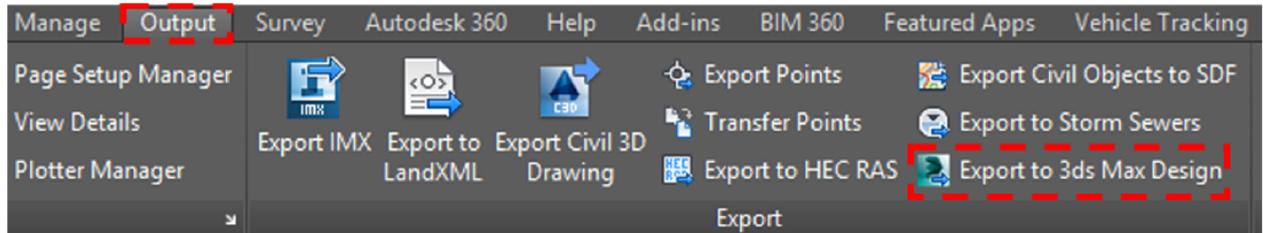


There you go, you will now have a pretty looking surface.

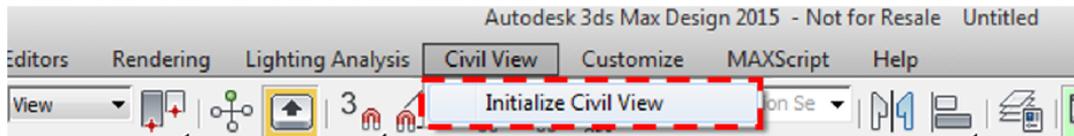


### 3DS Max and Civil View

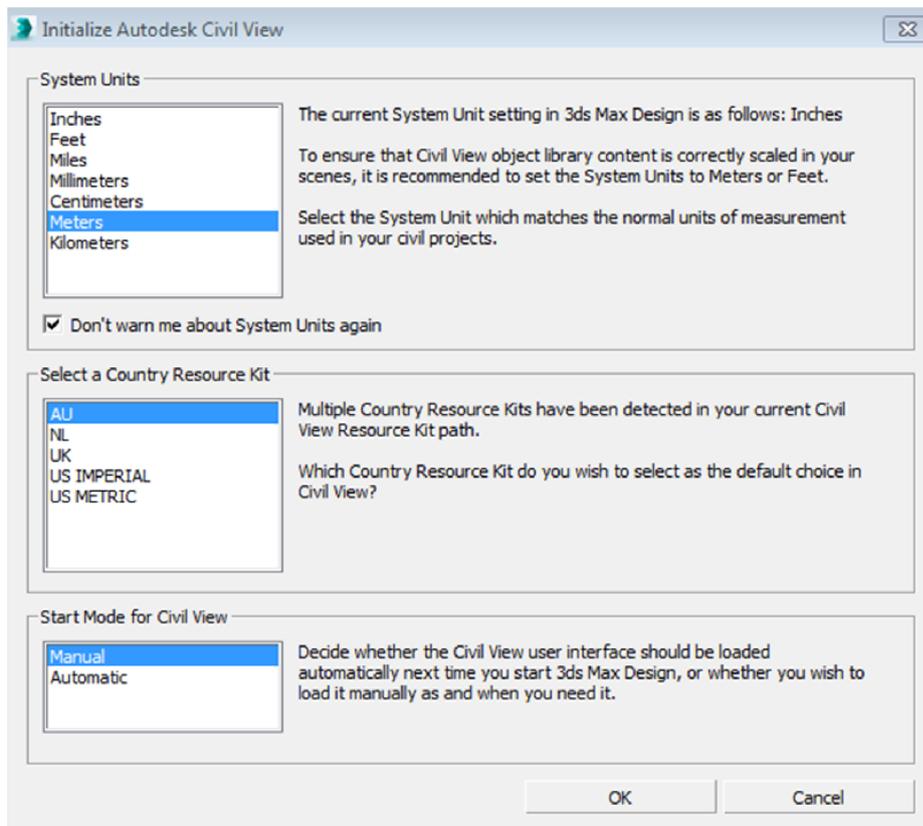
Please open *AU2014-Roundabout Design-Complete.dwg* from the ...CV5226-Data\DWGs folder. Go to Output Ribbon tab, Export panel and click on Export to 3ds Max Design.



In 3DS Max Design, go to Civil View tab and you will see Initialize Civil View if you are accessing this tab for the first time.



Once you click on Initialize Civil View, you will be presented with the Initialize Civil View display box. Under System Units, select Meters, for Country, pick AU and for Start Mode, Automatic.

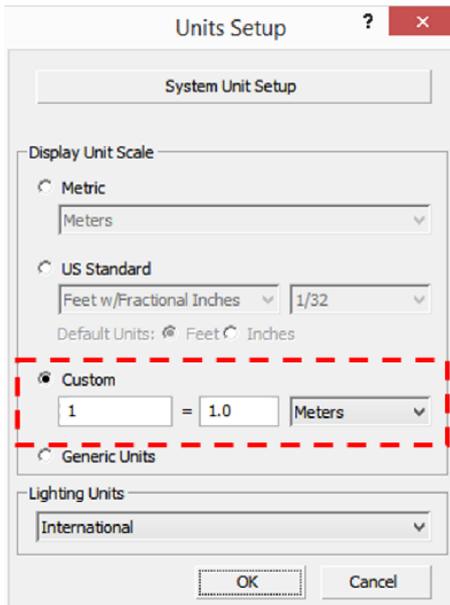


You may need to close and re-start 3DS Max in order to access the Civil View tab.

Before we import the vsp3d file which we exported from Civil 3D, we need to set the units correctly.

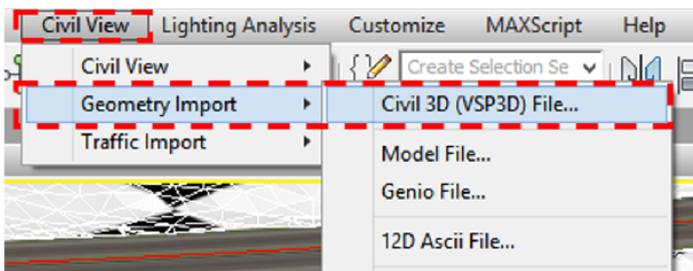
It is important to note the distinction between System and Display units. Display units only affect how geometry is displayed in the viewports. System units determine the actual scale of geometry. For example, if you import a DXF file (unitless) containing a 1 x 1 x 1 Box, 3ds Max could import the box's dimensions in inches or miles, depending on the System unit. This can have a significant impact on your scene, which is why it's important always to set up the system unit *before* you import or create geometry.

For this class, we will pick Custom and in the customer box, enter 1 = 1.0 Meters

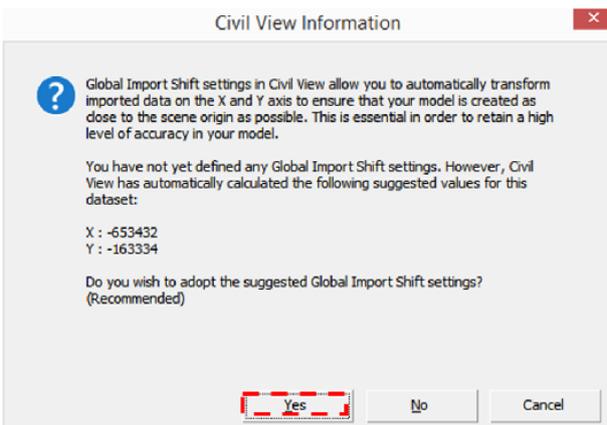
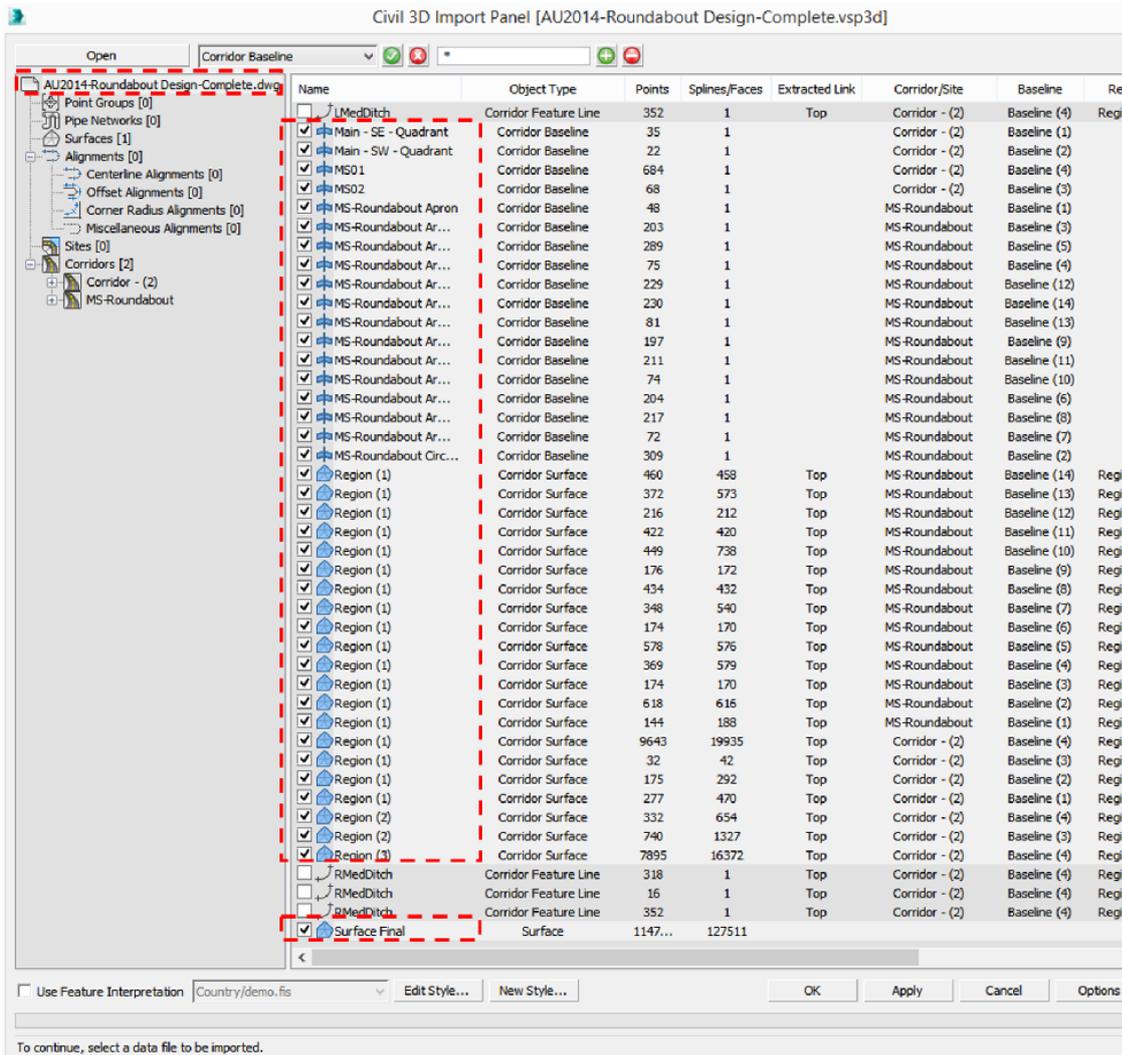


### Geometry Import from Civil 3D

Next, we go to Civil View tab>Geometry Import>Civil 3D (VSP3D).



In the Civil 3D Import Panel, click Open and browse to ...\\CV5226-Data\\Civil View\\AU2014-Roundabout Design-Complete.vsp3d, then pick all the Corridor Baseline, Corridor Surface and Surface. Click OK and Yes when prompted.



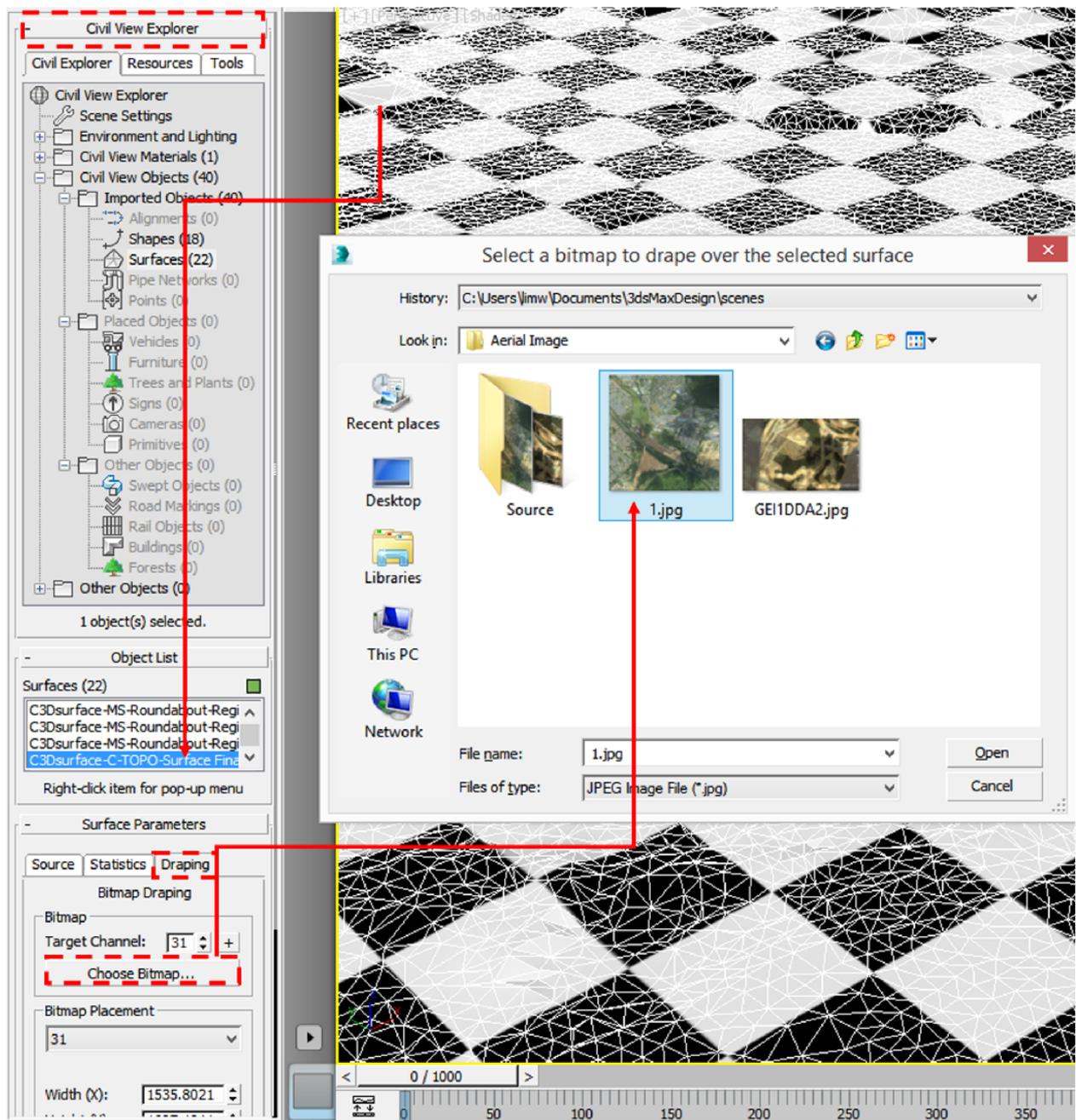
**Civil View Global Shift Values**

Civil-engineering data are often based on survey coordinates. These can be very large values that are not suitable for use in 3ds Max Design.

The Civil View *Global Shift Values* set up an XY shift that transforms imported geometry so it is close to the scene origin (0,0,0). This avoids the problem of large coordinates, which can slow down 3ds Max Design and reduce accuracy.

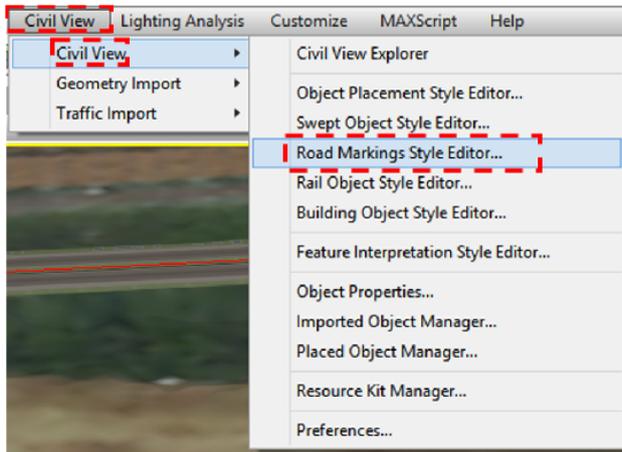
We will use a lot of the interface found in the Civil View Explorer as it provides an overview of the current state of a visualization, and direct access to the most commonly edited parameters of each object or other element in the scene. The Civil View Explorer can be accessed via Civil View menu > Civil View Explorer. You can dock the panel to the left.

Once the import is completed, we will drape the aerial image on the existing ground. To do this, activate/select the existing ground (imported as checkered black and white), and this will automatically be highlighted under the Object List>Surfaces. Under Surface Parameter, go to Draping tab and click on Choose Bitmap... Browse to ...CV5226-Data\Civil View\Aerial Image\1.jpg.

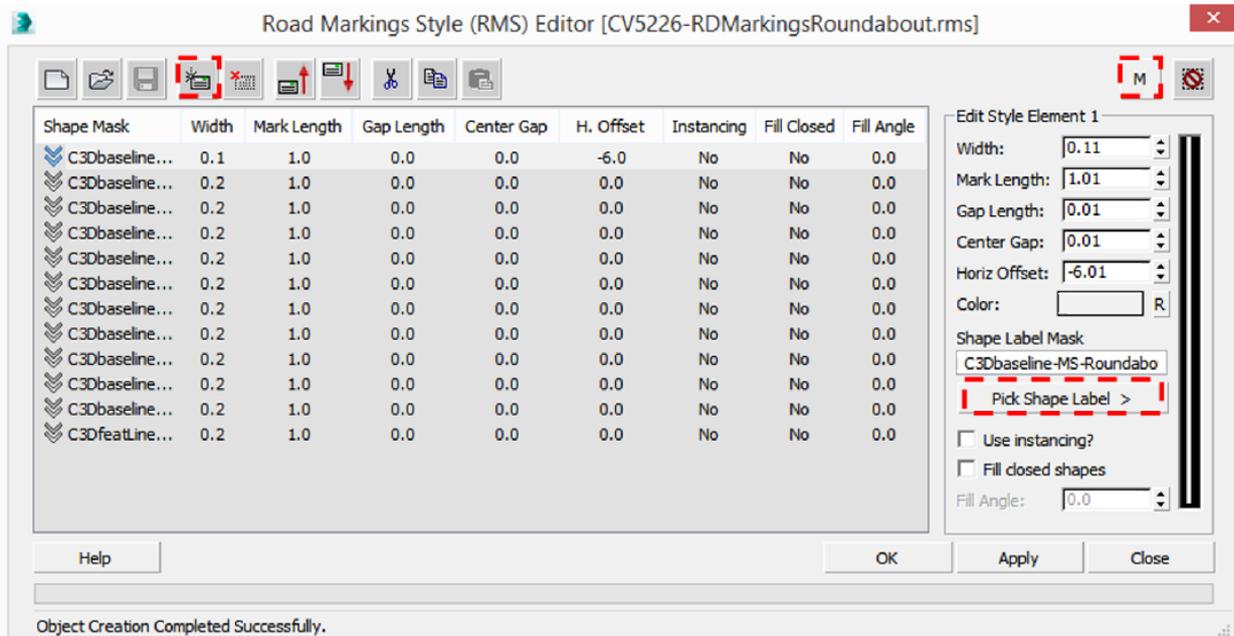


### Road markings and Object placement

Next, we can start placing road markings and objects like vehicle, street lamps, trees etc on the model to make it more realistic. We will start by placing the Road markings first. To do that, go to Civil View menu>Civil View>Road Markings Style Editor...



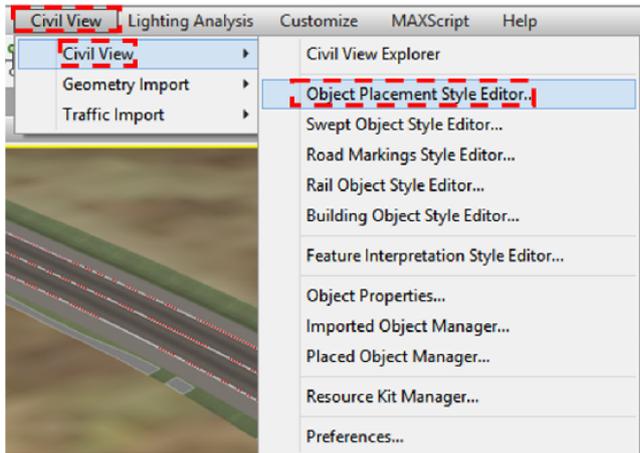
In the Road Marking Style Editor, click on  to add a new element to the current road marking style. Then, click on the  icon to allow for more than one road-marking object to be applied to each parent shape. Next, click on Pick Label Shape and then click in a viewport to pick a shape object.



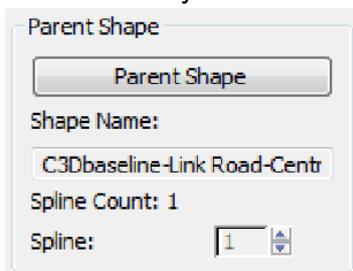
You can also click on  to open a previously created road marking style. I've saved it in ...\\CV5226-Data\Civil View\Road Marking Styles\CV5226-RDMarkingsRoundabout.rms

Click Apply and OK.

Next, we will place some cars and street lamps on the roundabout. You will need to bring up the Object Placement Style Editor... from Civil Menu>CivilView> Object Placement Style Editor...



In the Object Placement Style Editor, click  to add a new element to the current Object Placement Style. Under the Vehicle tab, select Cars and pick a model. Then click on



and then click one of the roundabout baseline as the shape object. Similarly, click on Parent Surface and select the surface close to the baseline you picked earlier. For Longitudinal Placement, pick Multiple (Regular Interval) and set the count to 20.

Set Animation Options to -60km/h.

For Lateral Placement, set Horiz Offset: to -1.75 and Rotation to 180.

See the parameters for Object Placement Style Editor for Random [Cars] below:

Object Placement Style (OPS) Editor

Object Definition	Int.	Rot.	H. Offset	V. Offset	Start (%)	End (%)	Speed
Random [Cars]	20.0	180	-1.75	0.0	0.0	100.0	-60.0
10m Double Column	20.0	180	0.0	0.0	0.0	100.0	0.0

**Parent Shape**

Parent Shape: [C3Dbaseline-MS-Roundabout]

Shape Name: [C3Dbaseline-MS-Roundabout]

Spline Count: 1

Spline: [1]

**Parent Surface**

Parent Surface: [C3Dsurface-MS-Roundabout]

Surface Name: [C3Dsurface-MS-Roundabout]

Face Count: 188

**Longitudinal Placement**

Place Single Object  
 Multiple (Regular Interval)  
 Multiple (Random Station)

Interval: [20.01]

Start Station: [0.01]

End Station: [205.45]

**Animation Options**

km/hr: [-60.0]

**Lateral Placement**

Horiz Offset: [-1.751]  
 Vert Offset: [0.01]  
 Crossfall: [0.0]  
 Rotation: [180] R

**Other Options**

Use random object(s) from the selected category  
 Display only bounding box

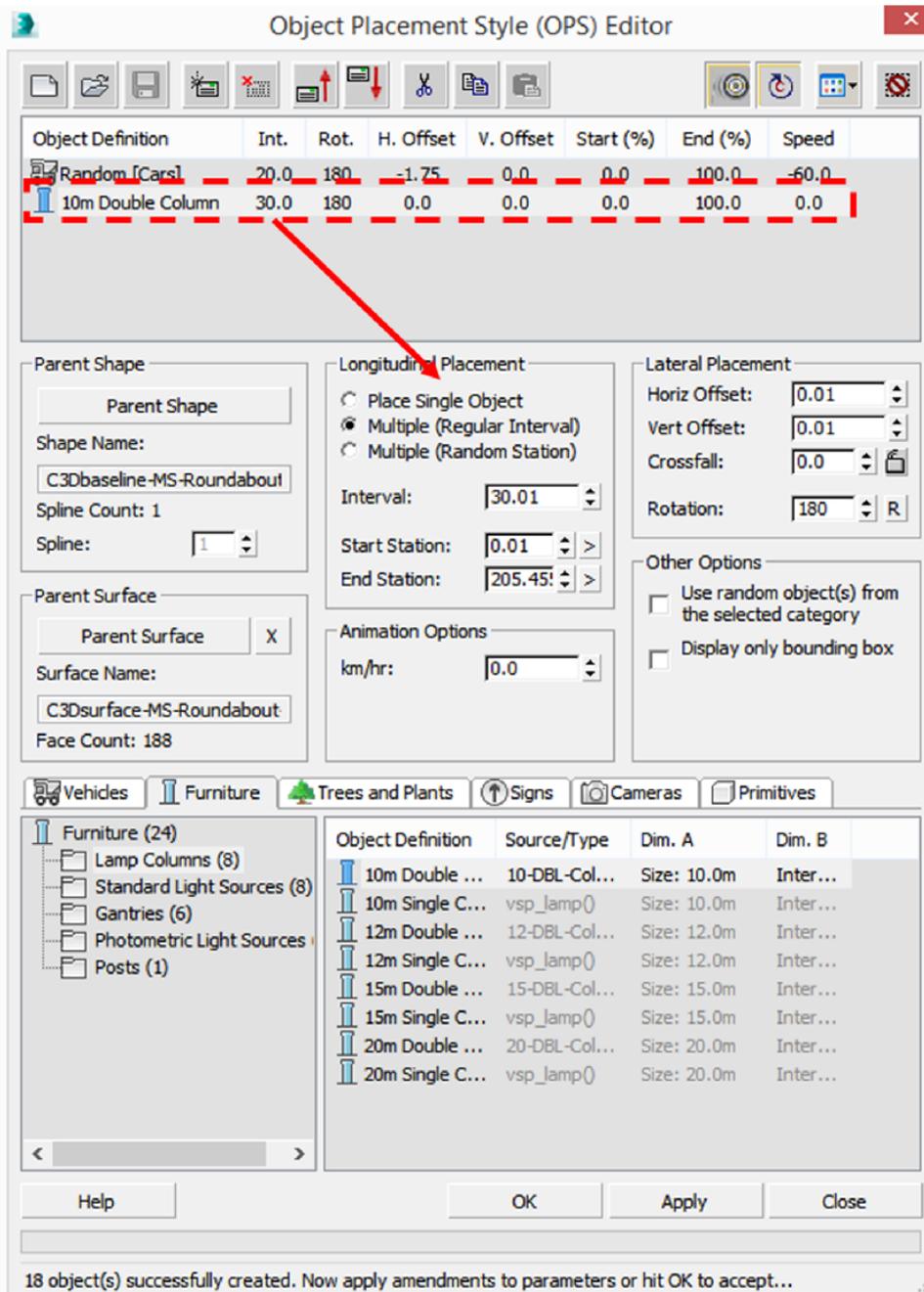
**Vehicles (35)**

Object Definition	Source/Type	Dim. A	Dim. B
Audi A3	AUDI_A3_...	Space: 15.0m	
BMW S1	BMW_S1_M...	Space: 15.0m	
Cadillac CTS	CADILLAC_...	Space: 15.0m	
Chevy Camaro	CHEVY_CA...	Space: 15.0m	
Dodge Charger	DODGE_CH...	Space: 15.0m	
Ford Mondeo...	MONDEO_S...	Space: 15.0m	
Honda Accord	ACCORD_C...	Space: 15.0m	
Honda Fit	HONDA FIT...	Space: 15.0m	
Mercedes C ...	MERCEDES...	Space: 15.0m	
Mini Cooper	MINI_COO...	Space: 20.0m	
Nissan 350Z	NISSAN 35...	Space: 15.0m	

Help OK Apply Close

18 object(s) successfully created. Now apply amendments to parameters or hit OK to accept...

Repeat the steps but instead of Vehicles, select Furniture>Lamp Column. See below:



Click Apply and OK. Repeat the same for the other baselines for the roundabout.

You can also open the Object Placement Styles from ...\\CV5226-Data\Civil View\Object Placement Styles\ CV5226-Vehicles and Lights-Arm 1-MS02ops.ops

There you have it, the finished roundabout.



To view the animation, just click play. The main animation controls are found at the bottom of the program window, between the status bar and the viewport navigation controls, along with the time controls for animation playback within viewports.

