

Streamline exchange of data between C3D, Revit & Infracore

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Designated Support Specialist





About the speaker

Lovekesh Kakkar

Lovekesh Kakkar is a Designated Support Specialist at Autodesk where he specializes in Civil 3D, InfraWorks and ReCap products. As a member of the Autodesk Enterprise Priority Support team, he supports global enterprise customers with proactive support services to help increase efficiency, reduce risk, and avoid issues before they occur. Prior to joining Autodesk, Lovekesh gained over 10 years experience in the civil infrastructure & GIS industry, working as a GIS Engineer for large consulting companies and Application Engineer/ BDM Techno-Sales for an Autodesk Platinum Partner & Autodesk Distributor. Lovekesh experience extends from GIS service industry to Technical sales & Business development work with a variety of software packages. He is an AutoCAD Civil 3D Certified Professional, ATC Certified Instructor and has previously spoken at Autodesk University-Kenya.

Safe harbor statement

During the course of this presentation, we may make statements regarding future events and/or statements regarding planned or future development efforts for our existing or new products and services. We wish to caution you that such statements reflect our current expectations, estimates and assumptions based on factors currently known to us and that actual events or results could differ materially. Also, these statements are not intended to be a promise or guarantee of future delivery of products, services or features but merely reflect our current plans, which may change. Purchasing decisions should not be made based upon reliance on these statements. The statements made in this presentation are being made as of the time and date of its live presentation. We do not assume any obligation to update any statements we make to reflect events that occur or circumstances that exist after the date of this presentation.

Streamline data sharing Civil 3D, Revit & InfraWorks

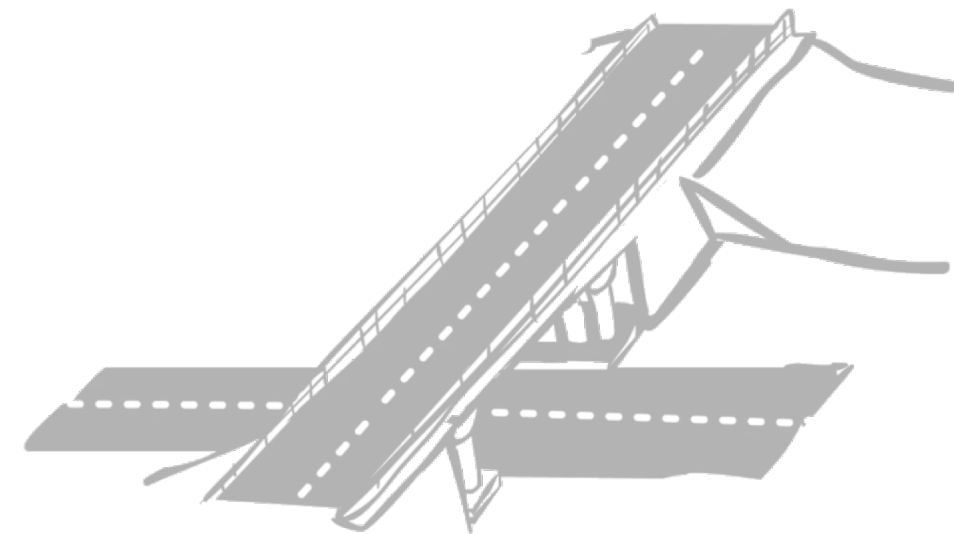
What you'll learn today

Coordinate System ?



- Coordinate System: What? Why? How?
- Understand Coordinate System for Products

Collaborate with Civil 3D



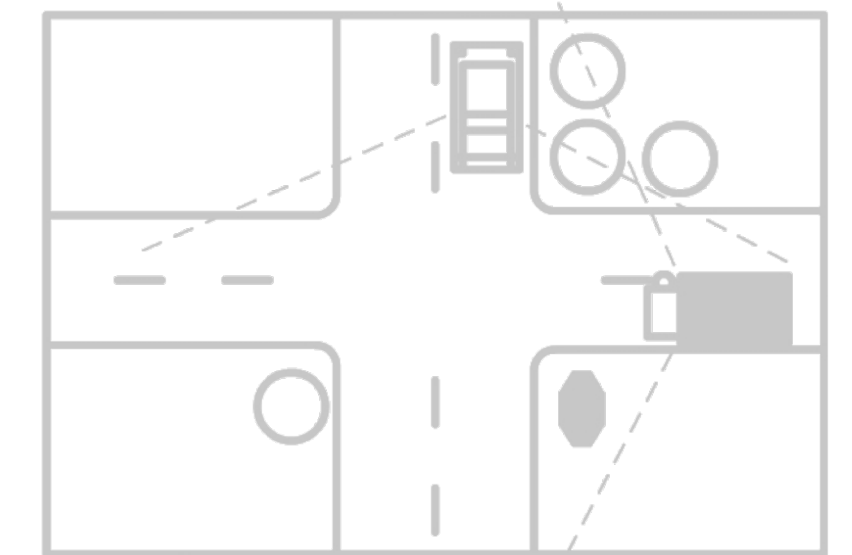
- Infraworks to Civil 3D
 - Revit to Civil 3D

Collaborate with Revit



- Workflows: Assign, Acquire, Publish Coordinates to Revit
- Prepare your Revit Model for exporting out

Collaborate with Infraworks



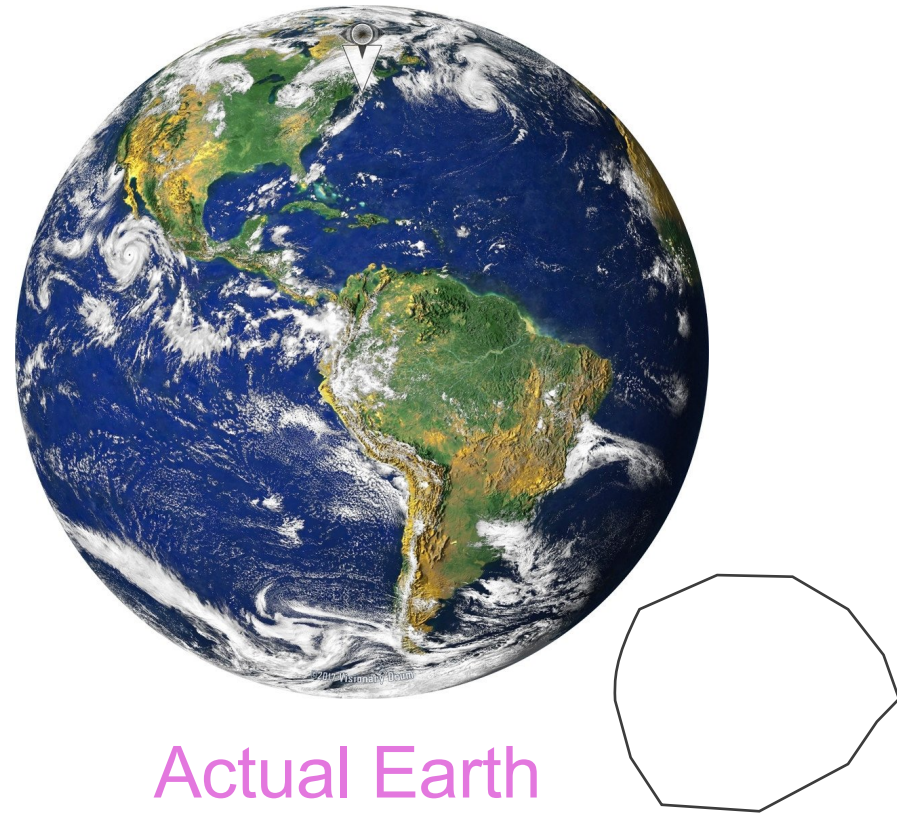
- Workflows: Revit, FBX, IFC & Civil 3D to Infraworks
- Prepare your Infraworks Model for exporting out

Coordinate System?

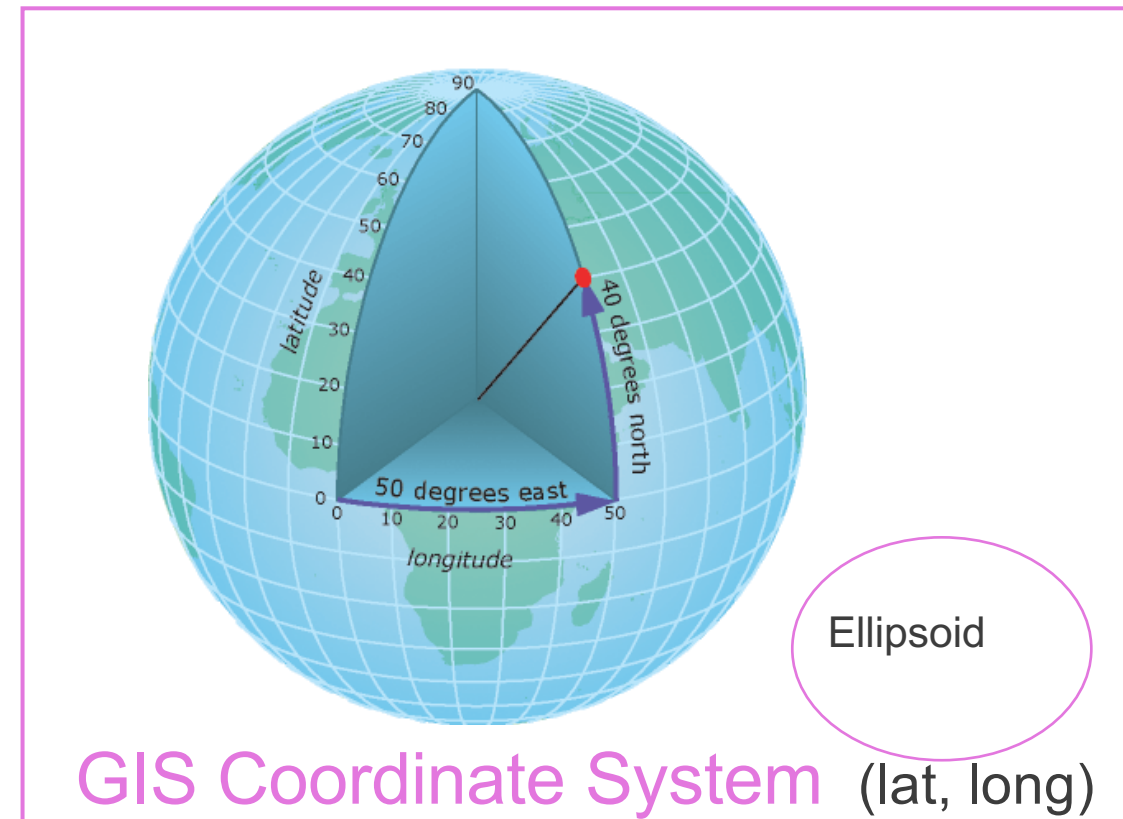
Coordinate System: What? Why? How?

Why we need a coordinate system?

Non circular/ellipsoidal undulated shape of Earth needs coordinate system !!

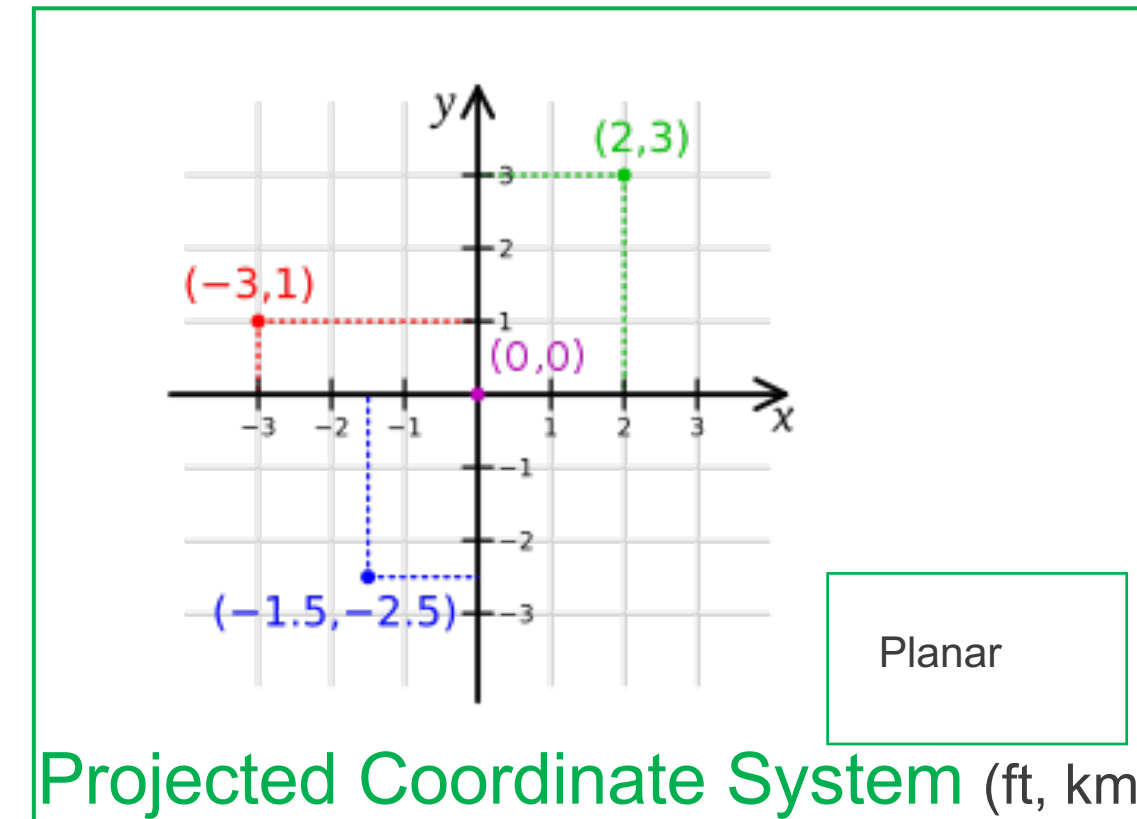


A very Lumpy object that has topography, bathymetry, Changing ocean height, etc..



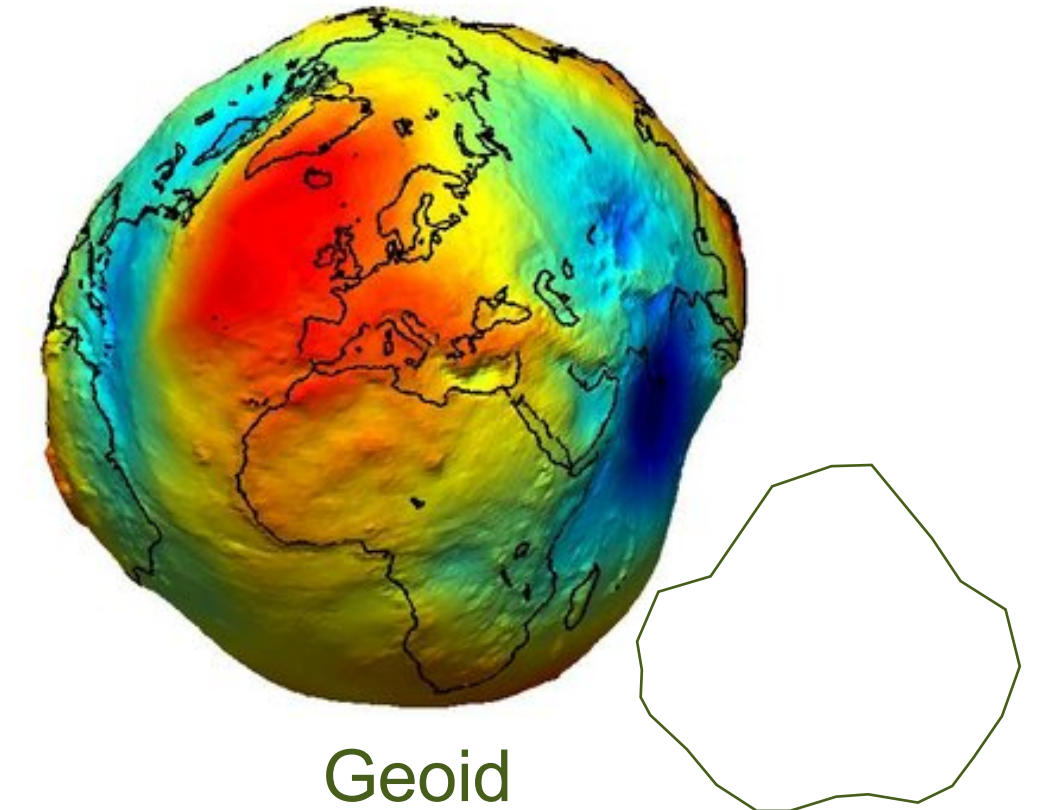
GIS Coordinate System (lat, long)

In geodesy, a reference ellipsoid is a mathematically defined surface that approximates the geoid, the truer figure of the Earth



Projected Coordinate System (ft, km)

Planner (cartesian) coordinates are the way of assigning a set of Coordinates to locations



Geoid

A less lumpy mathematical approximation of the earth

Datum:

There are many ellipsoids you can use to reference locations of the earth with latitude and longitude, these different **geographic coordinate systems** are called datums. Certain datums fit different parts of the lumpy earth better than others, so changing datums can make measurements more accurate depending on where you are

For nearly all basic mapping, however, there are three datums that are all you need to know; **WGS84**, **NAD 83** and **ITRF00**

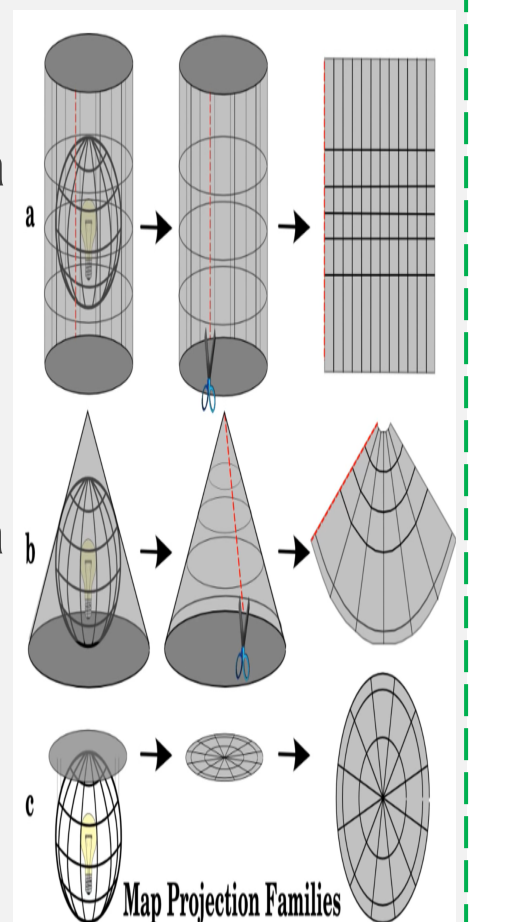


Projections:

The world is a three dimensional (3D) ellipsoid but almost all the media we work with is 2 dimensional (2D) and In order to transform these latitude and longitude (spherical) coordinates into meaningful units, the datum must be transferred to a planar (cartesian) coordinate system. There are many ways to do this, and these are called **projections**

There are three ways to transfer the curved surface of the ellipsoid to a flat plane, you can make **Cylindrical**, **Conic** or **Planar (azimuthal)**, projections

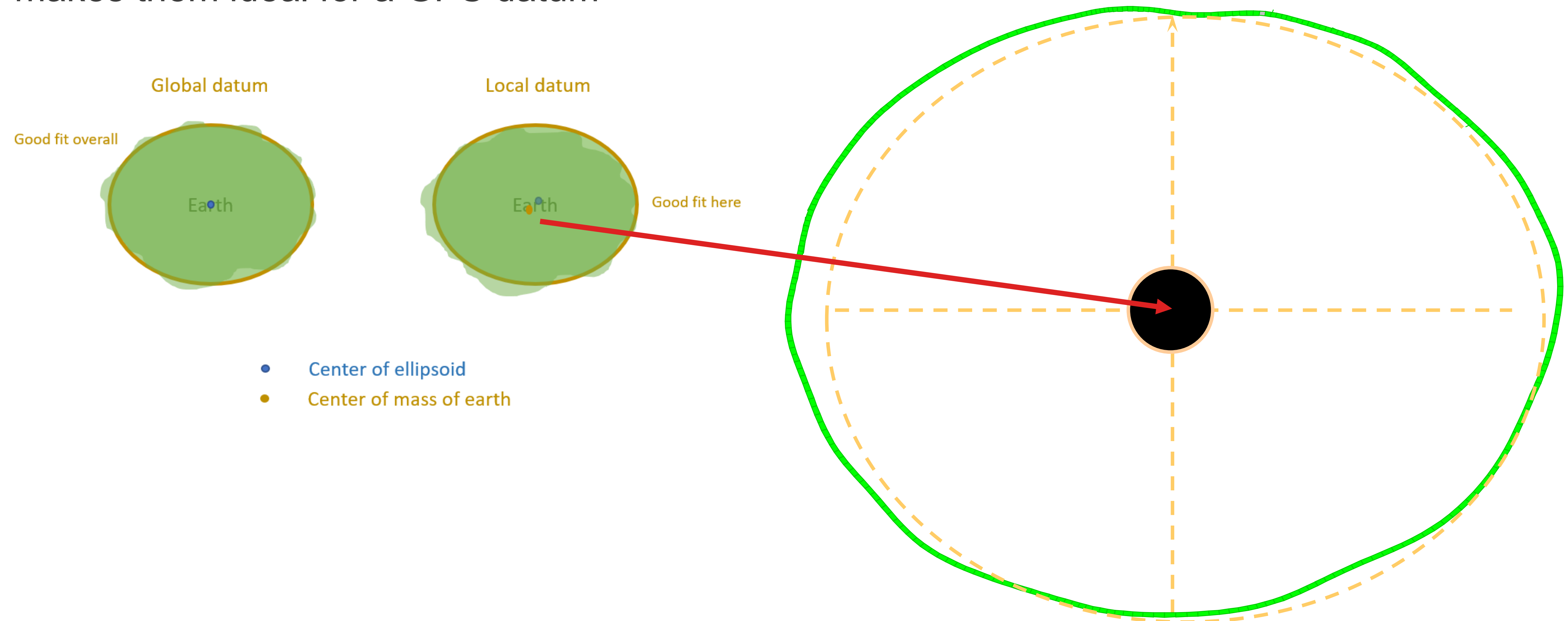
In order to make different measurements-distance, area, shape, or direction-you must choose the best projection for the job



Why WGS84 is the most common Datum ?

WGS84: WGS84 ellipsoid origin center of earth

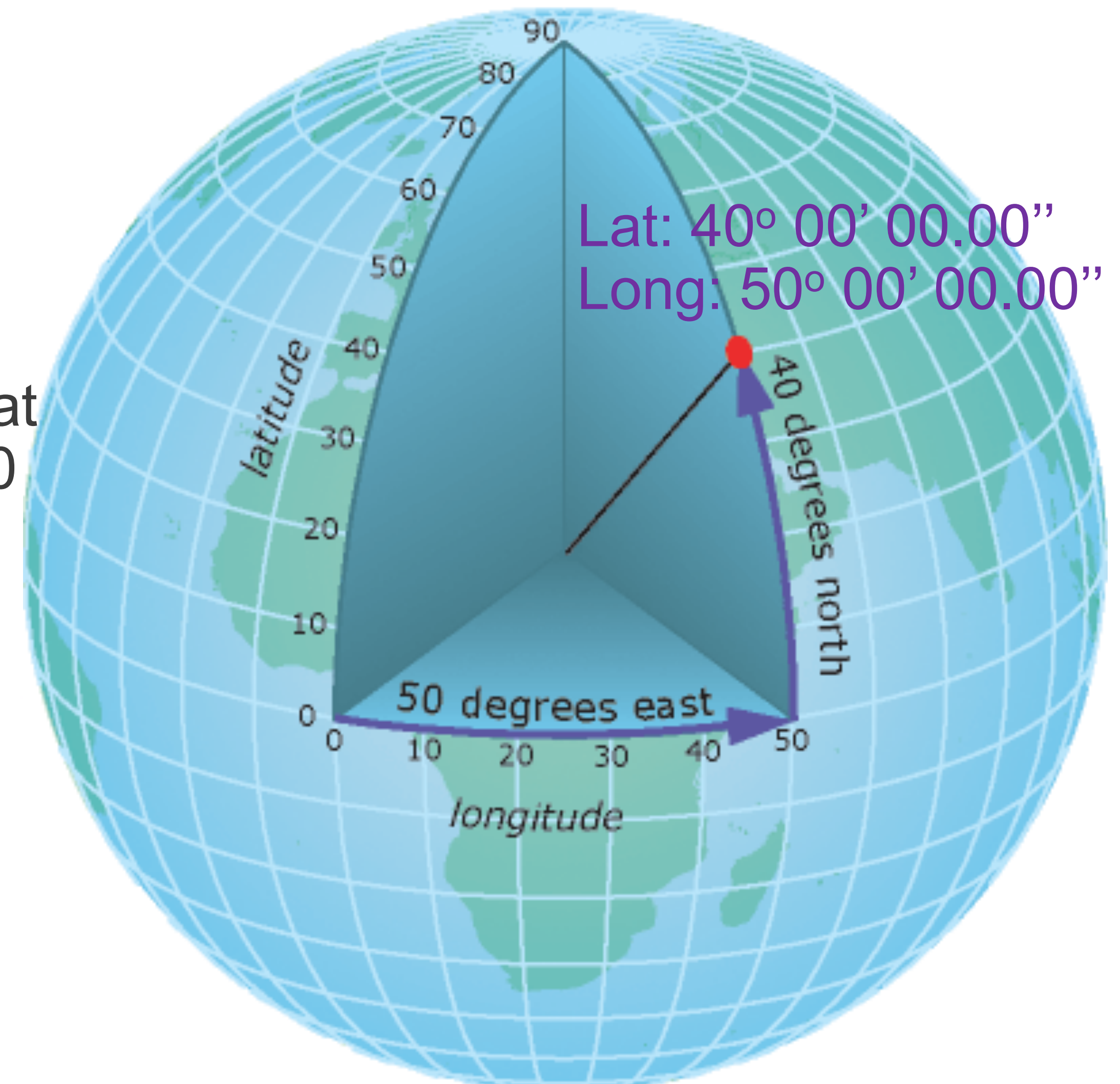
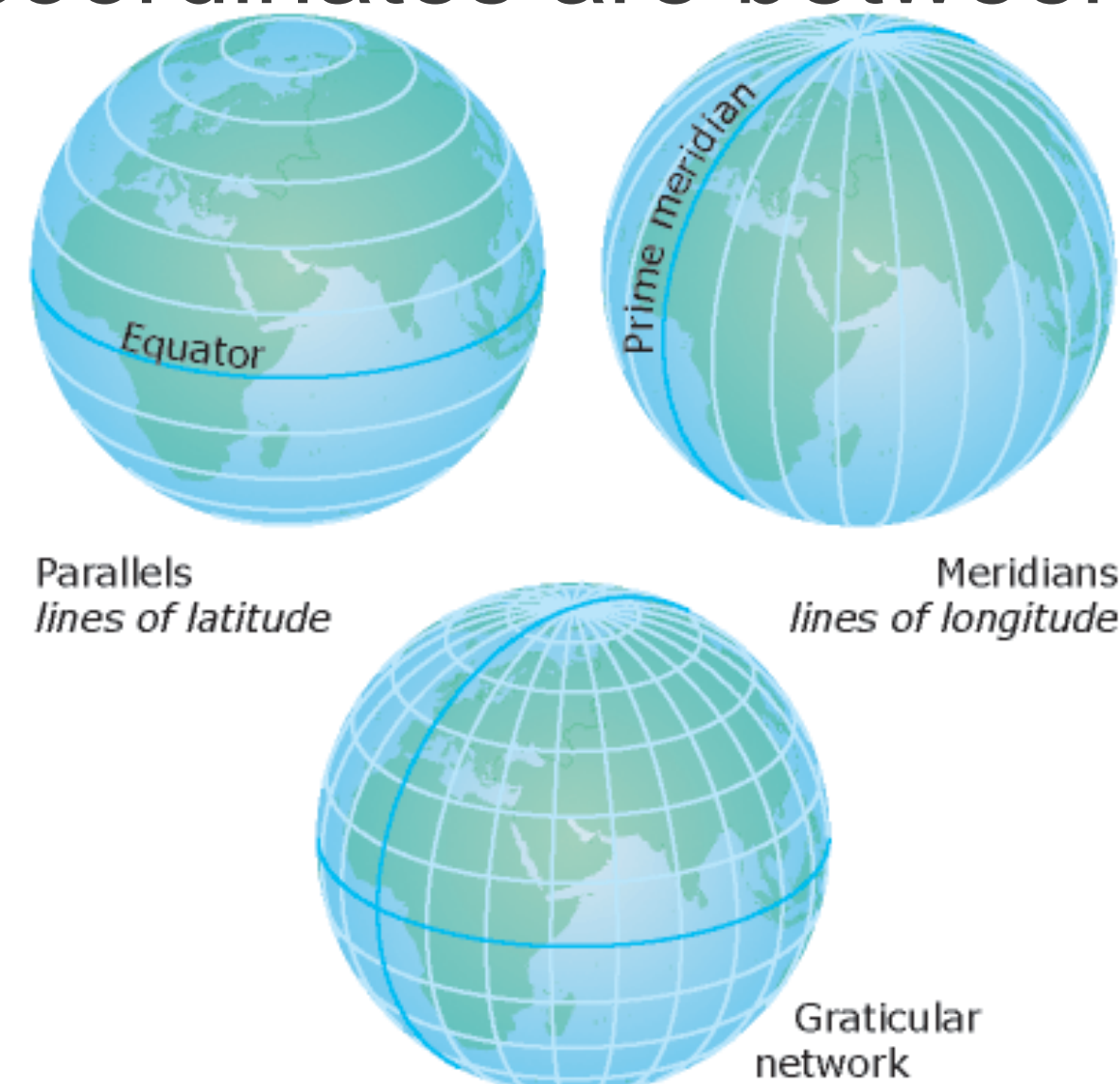
The origins of the [WGS84](#) and NAD83 ellipsoids are at the center of the earth's mass, which makes them ideal for a GPS datum



Latitude and Longitude

Spherical coordinate system of the globe can be expressed as Latitude & Longitude

- **Latitude** lines run east-west and are parallel to each other. If you go further north, latitude values increase. Finally, latitude values (Y-values) range between -90 and +90 degrees
- **Longitude** lines run north-south. They converge at the poles. And its X-coordinates are between -180 and +180 degrees



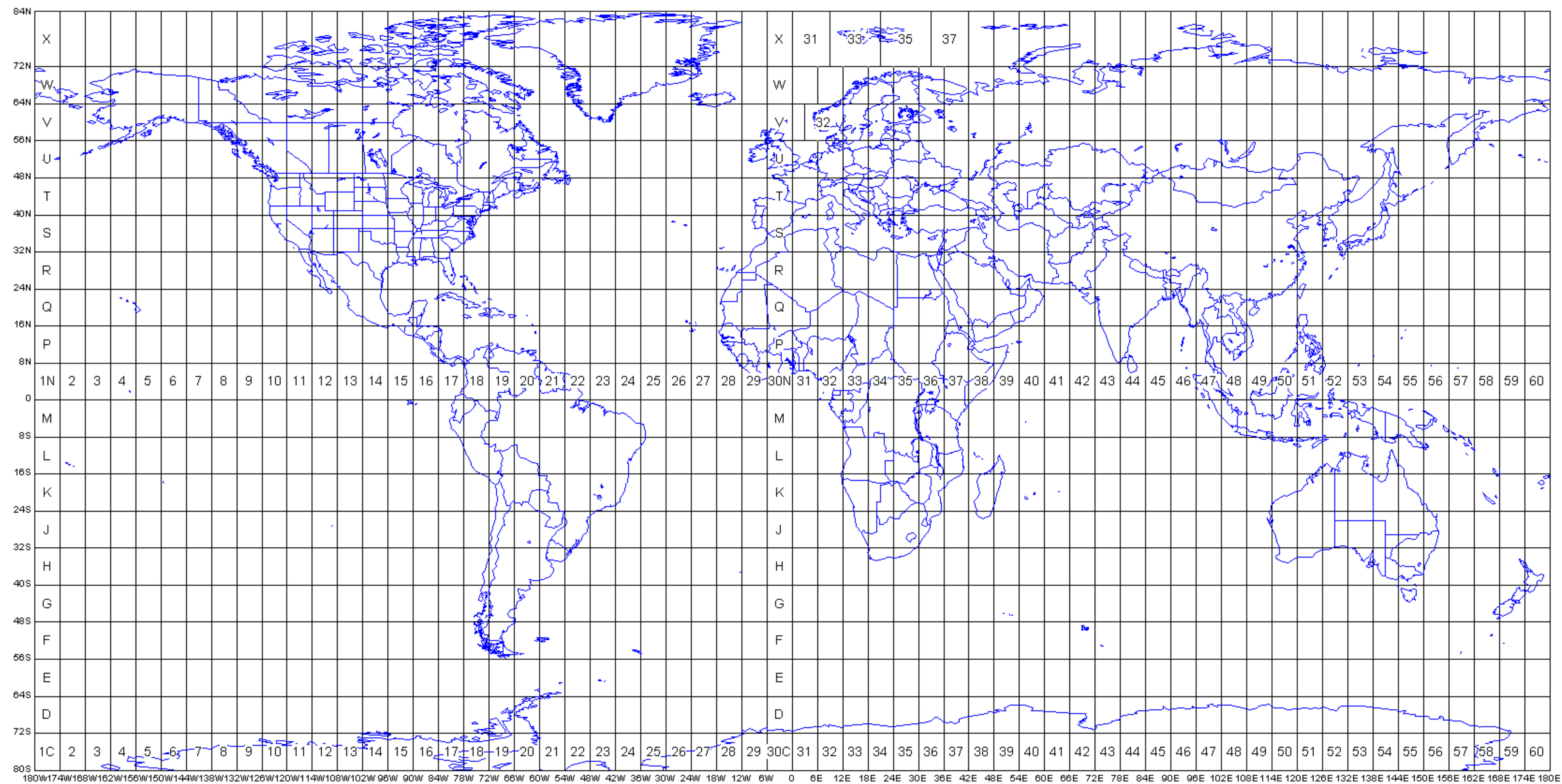
Why we need Projected coordinate system

The Coordinate system that is used to draw the earth on a flat map

- **GIS Coordinate System : LL84**
 - Reference/Datum : WGS84 (World Geodetic System of 1984, Spheroid)
 - Ellipsoid : WGS84 (World Geodetic System of 1984, GEM 10C)
 - Measurement Unit : Degree
 - Representation : Latitude-Longitude
- **Projected Coordinate System : UTM84-43N**
 - Projection : Universal Transverse Mercator System
 - Reference/Datum : WGS84 (World Geodetic System of 1984, Spheroid)
 - Ellipsoid : WGS84 (World Geodetic System of 1984, GEM 10C)
 - Measurement Unit : Meter
 - Representation : Latitude-Longitude

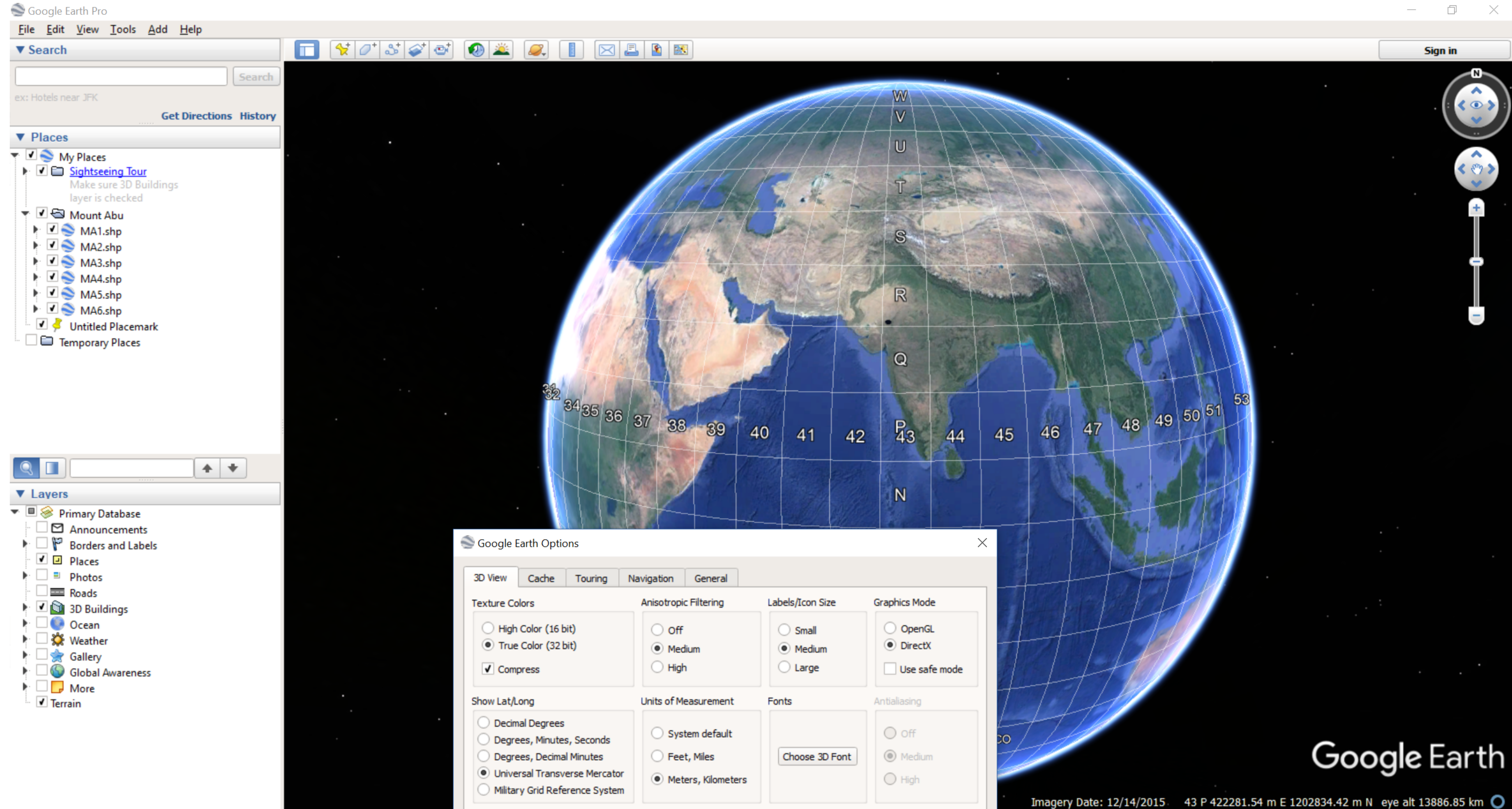
UTM Grid Zones of the World

Global view of UTM grids (notice – Distortion minimized in a N-S “Strip” ZONE)



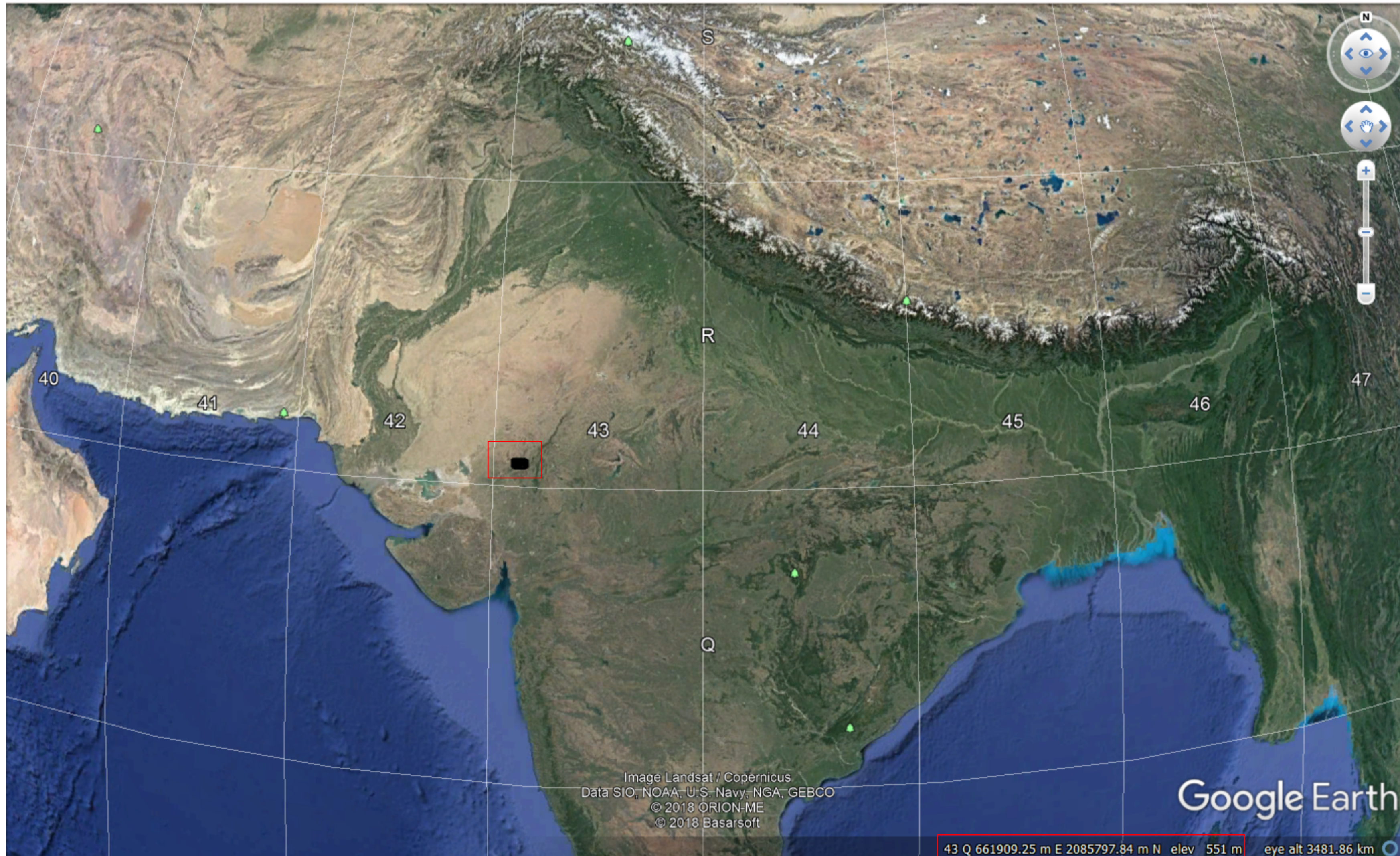
UTM Grid Zones of the World

How to find in which UTM projected coordinate system grid your site situated in?



UTM Grid Zones of the World

Site view from Lat long & UTM perspective



Coordinate System?

Understand Coordinate System by Products

Why it is Important to Understand the Difference

Linear & Vertical project has different requirement

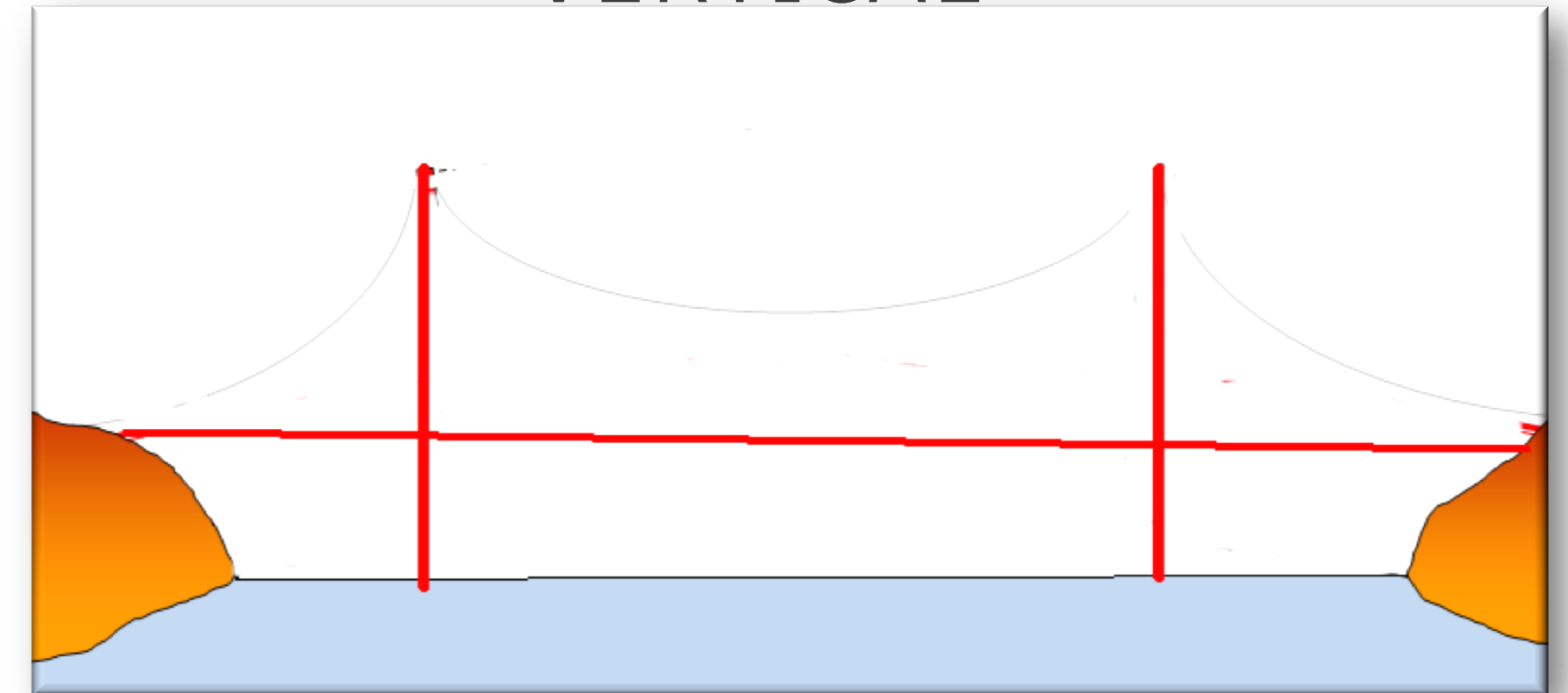
How it is located and built on Earth

- Length, area, and height of project
- Elevation on earth
- Location and orientation

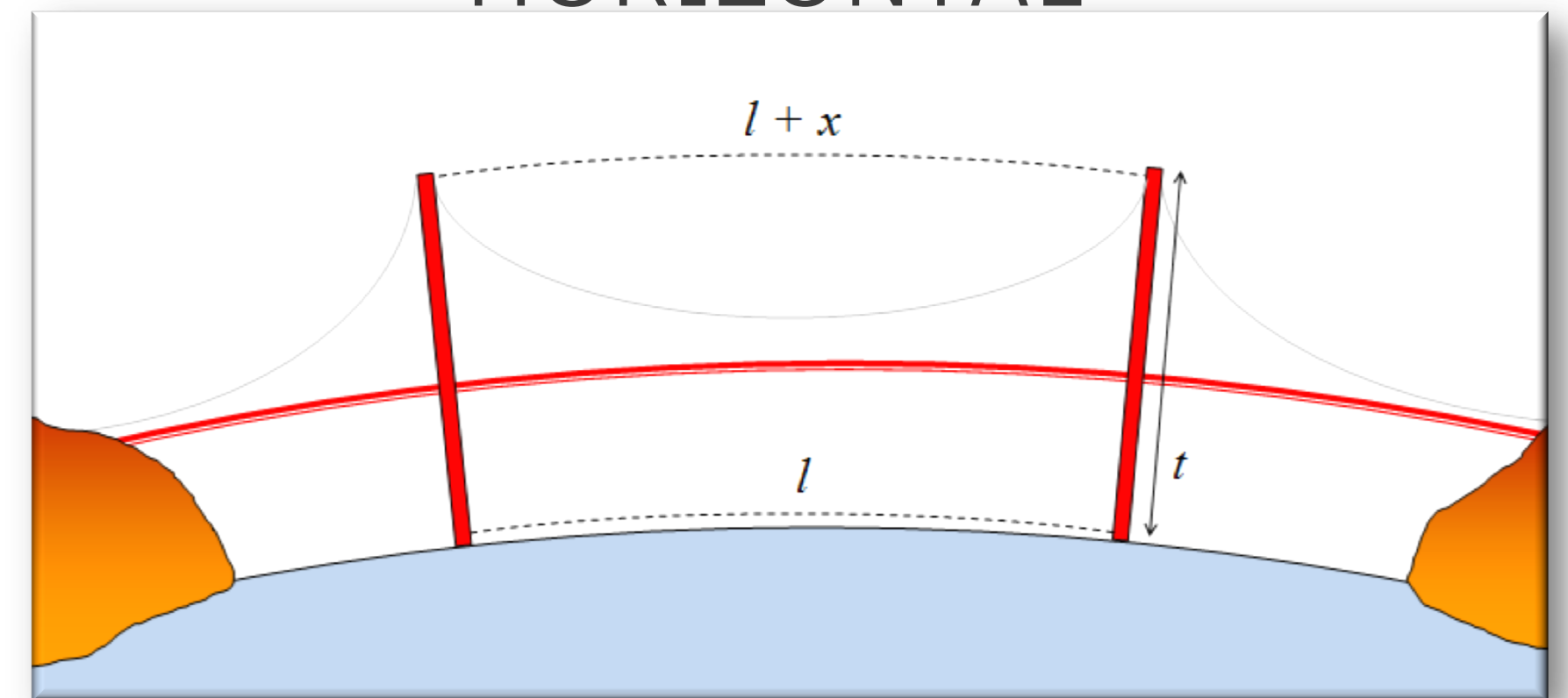
Design constraints

- Shape of Earth vs. flat design plane
- Local vs. assumed coordinate systems
- Double vs. single precision applications
- Orthogonal vs. meandering

VERTICAL



HORIZONTAL



Important to Understand the Difference in Applications

Linear & Vertical project has different requirement

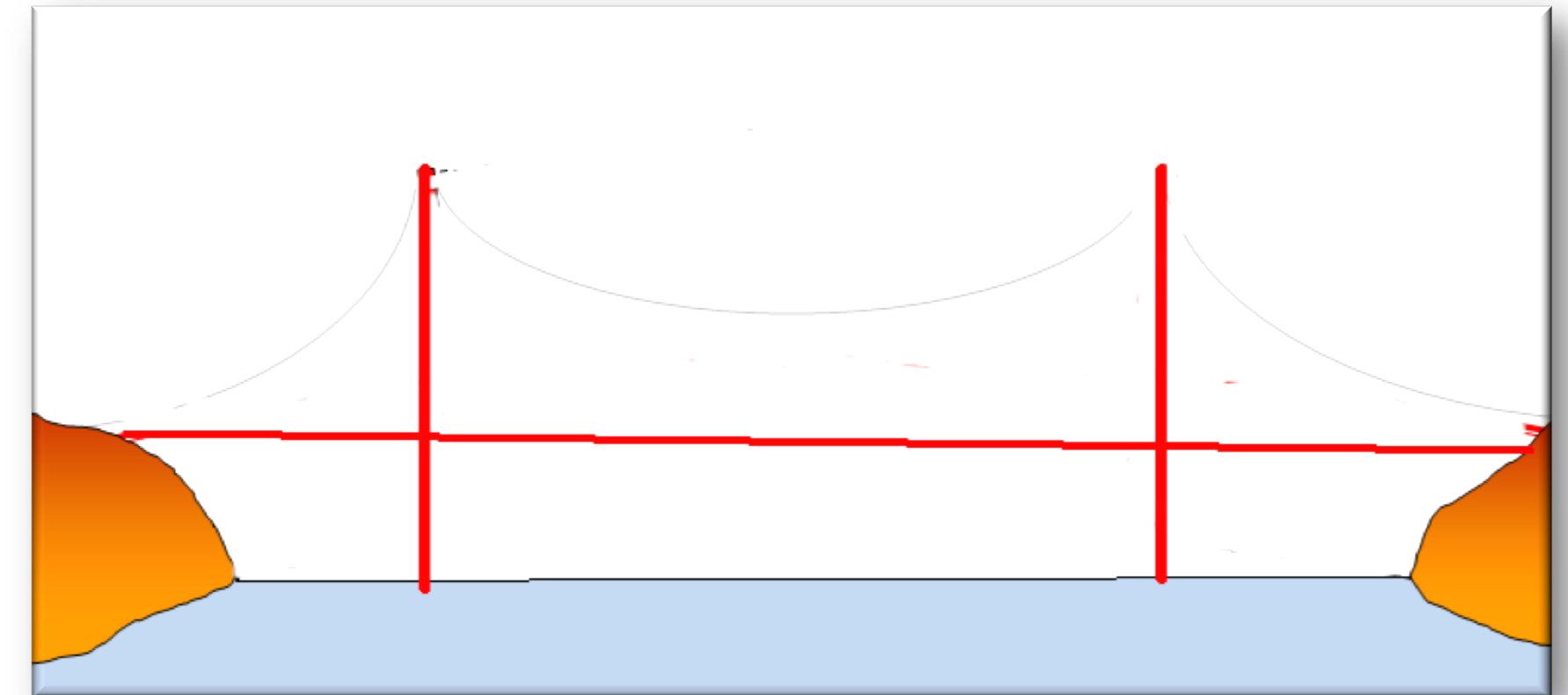
Design Authoring Applications

- Revit – Vertical Projects
- Civil 3D – Horizontal Projects
- Infraworks - Both

Design Review and Federation Applications

- Navisworks Manage for clash functions
- Infraworks
- Visualization

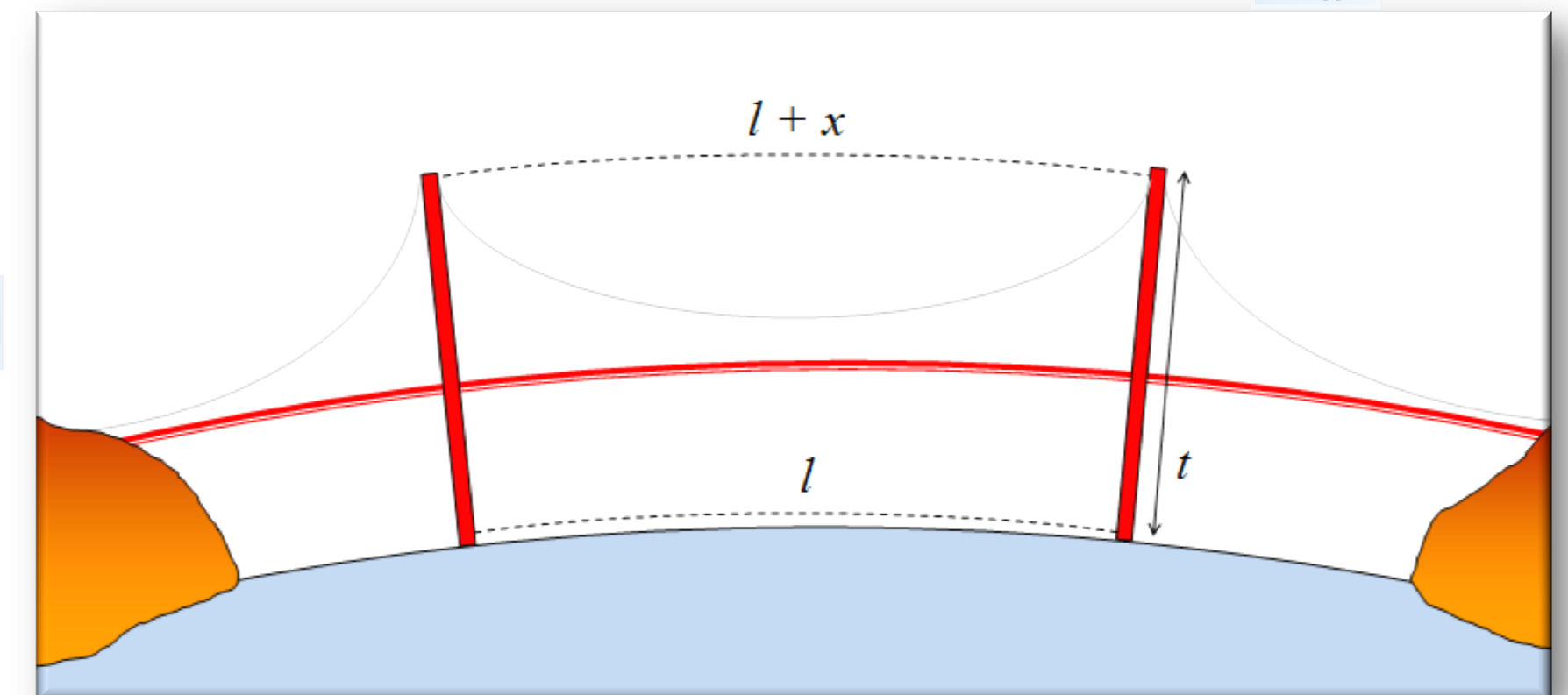
VERTICAL = Revit **R**



N

HORIZONTAL = Civil 3D **A**
C3D

I



Being geospatially aware as your product may not be!

All because of precisions

Geospatial coordinate values are long & not all Autodesk products are geospatially aware:

Single-precision

☒ 3DS Max

☒ Revit

☒ Inventor

Double-precision

AutoCAD

Civil 3D

InfraWorks

ReCap

Navisworks

Single Precision Numbers - 9 Significant Digits

.123456789 12,345.6789 12,345,678.9



The diagram shows three single-precision numbers: .123456789, 12,345.6789, and 12,345,678.9. Each number has an arrow pointing to its first digit, and a horizontal line with three upward-pointing arrows at the end of each number, indicating that each number has 9 significant digits.

Double Precision Numbers - 15 Significant Digits

.123456789876543 1,234,567,898.76543 12,345,678,987,654.3

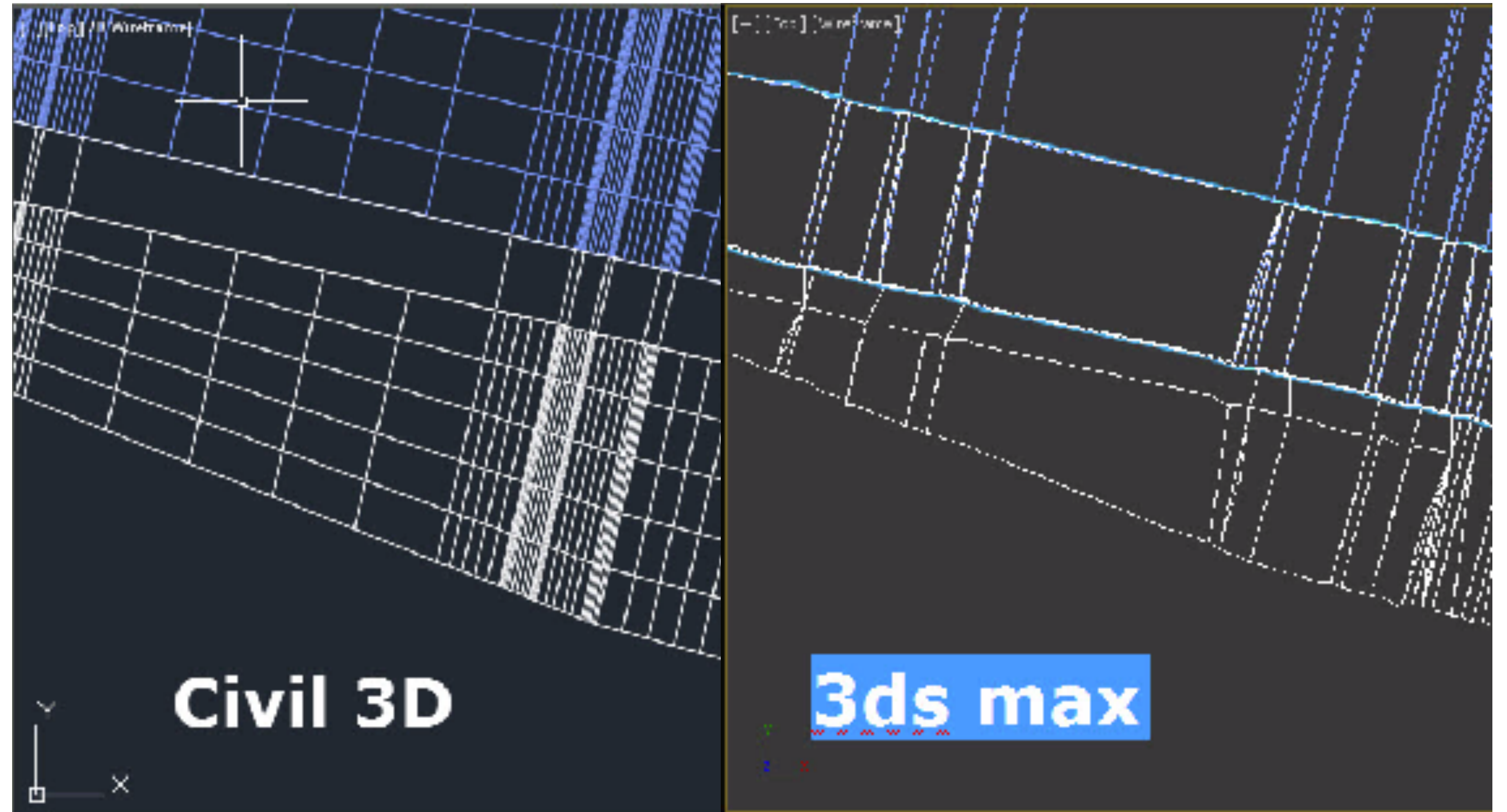


The diagram shows three double-precision numbers: .123456789876543, 1,234,567,898.76543, and 12,345,678,987,654.3. Each number has an arrow pointing to its first digit, and a horizontal line with three upward-pointing arrows at the end of each number, indicating that each number has 15 significant digits.

Degradation of Data

All because of precisions

- There are pitfalls associated with the exchange of data between single and double precision coordinate system, specifically the degradation of your dataset
- This example occurs when direct import of a double precision dataset into a single precision product
- This demonstrates very succinctly what can happen to your data if not translated in a double precision environment first



Streamline data sharing Civil 3D, Revit & InfraWorks

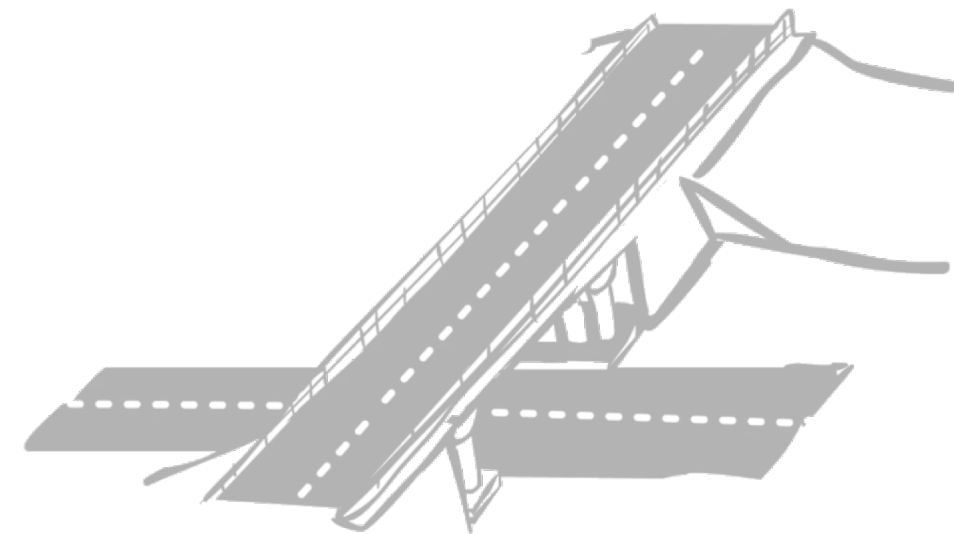
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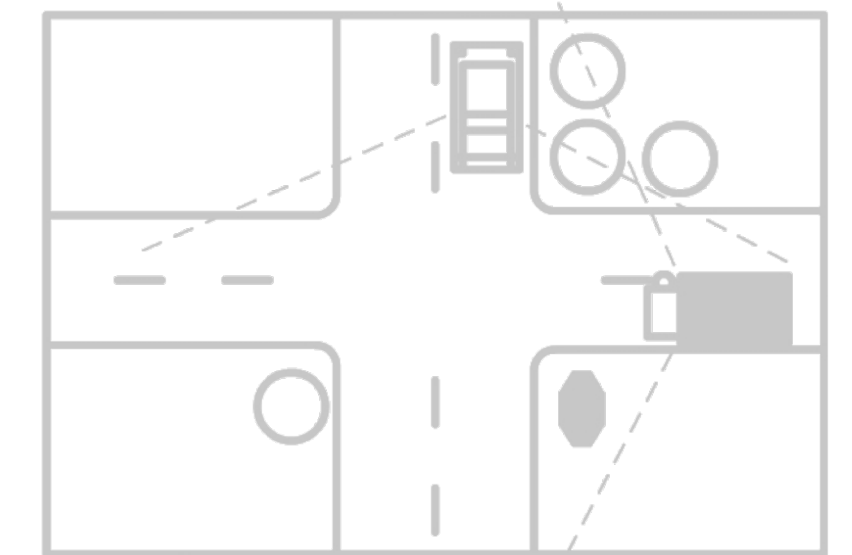
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 - Revit to Civil 3D

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- Workflows: Assign, Acquire, Publish Coordinates to Revit
- Prepare your Revit Model for exporting out

Collaborate with Infraworks



- Workflows: Revit, FBX, IFC & Civil 3D to Infraworks
- Prepare your Infraworks Model for exporting out

Collaborate with Civil 3D

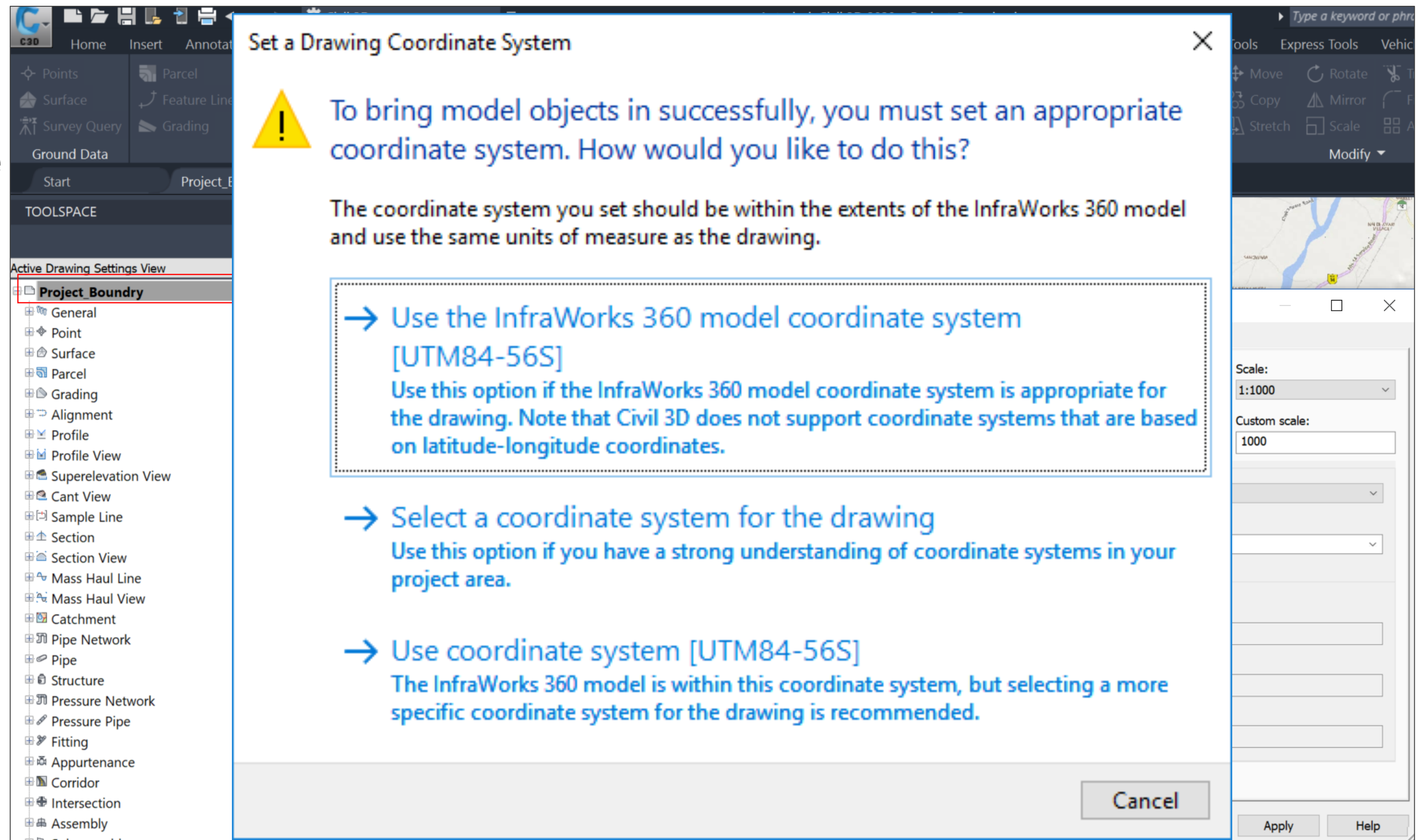
Workflows: Infraworks to Civil 3D

Workflow - Import data from Infraworks to Civil 3D

When importing IMX/*.Sqlite, set Coordinate system first!

For a visual verification of the Coordinate System...

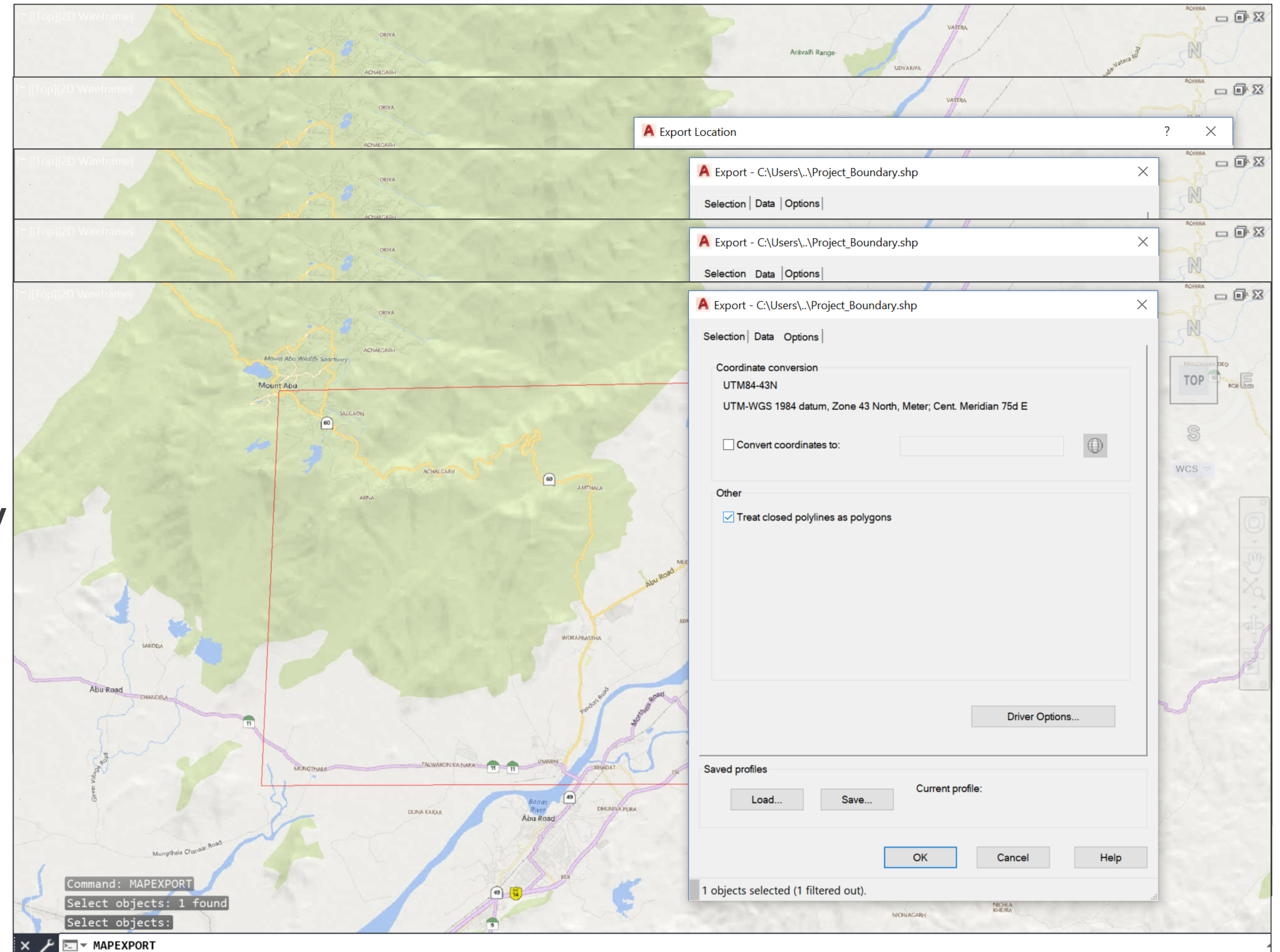
- In ToolSpace, select the settings tab and right click the DWG name. Select edit drawing settings
- In the Units and Zone tab of the Drawing Settings dialog box, you will need to make sure the correct Coordinate System is set up
- Later apply same Coordinate System when importing AIW* Model



Workflow - Import data from Infraworks to Civil 3D

Export project boundary as *.shp/*.sdf (Optional)

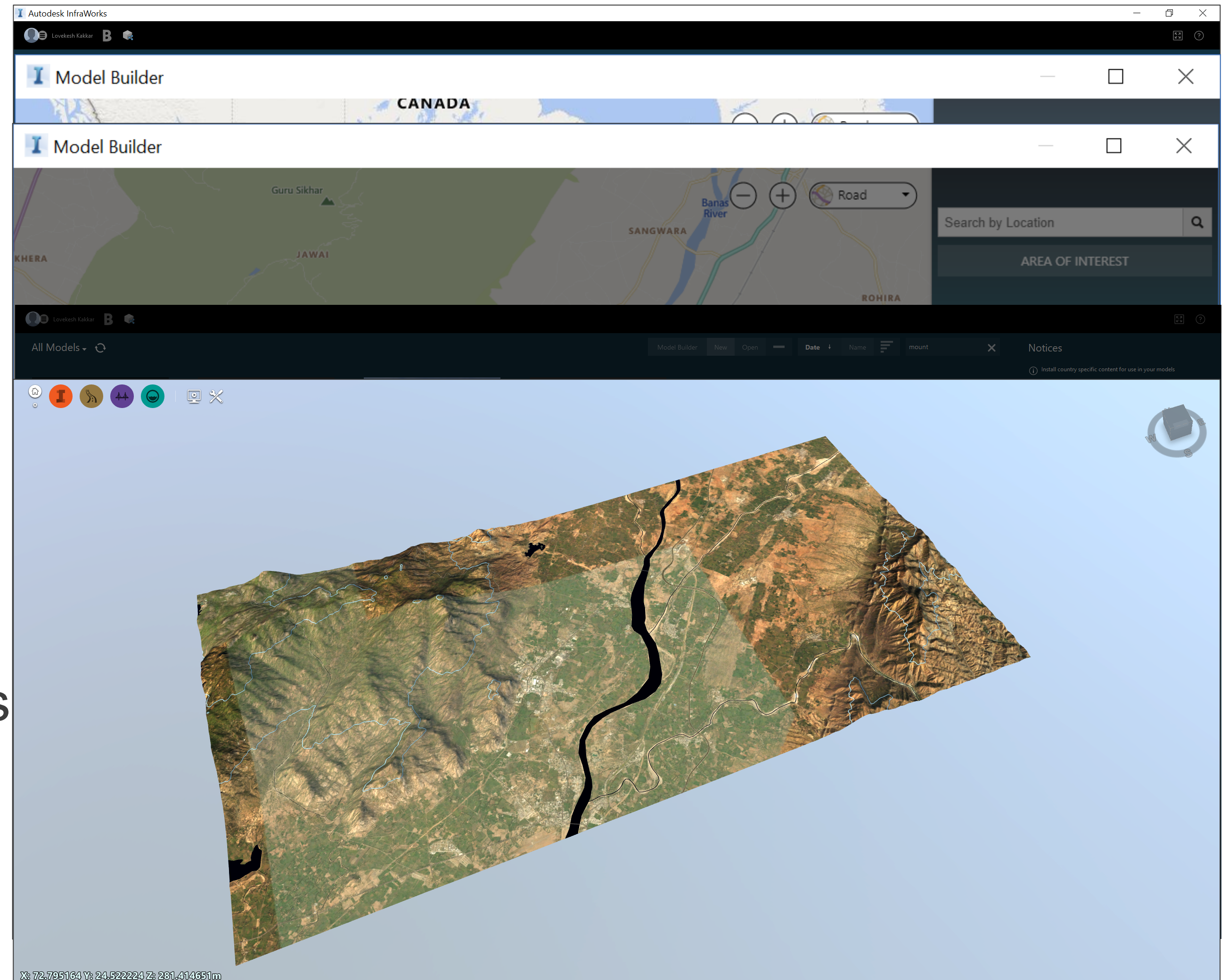
- Open “Project_Boundary.dwg” & use command: “mapexport” to export the project boundary as shp/sdf format
- Window>Section>Pick polyline from the window and select the geometry by selection or layer
- Window>Data>Select Attribute (If any)
- Window>Options>check the “Treat closed polyline as polygons” so that this geometry will be treated as polygon not polyline, Click OK
- Area must be less than 200sqkm



Workflow - Import data from Infraworks to Civil 3D

Use model Builder to create Infraworks model

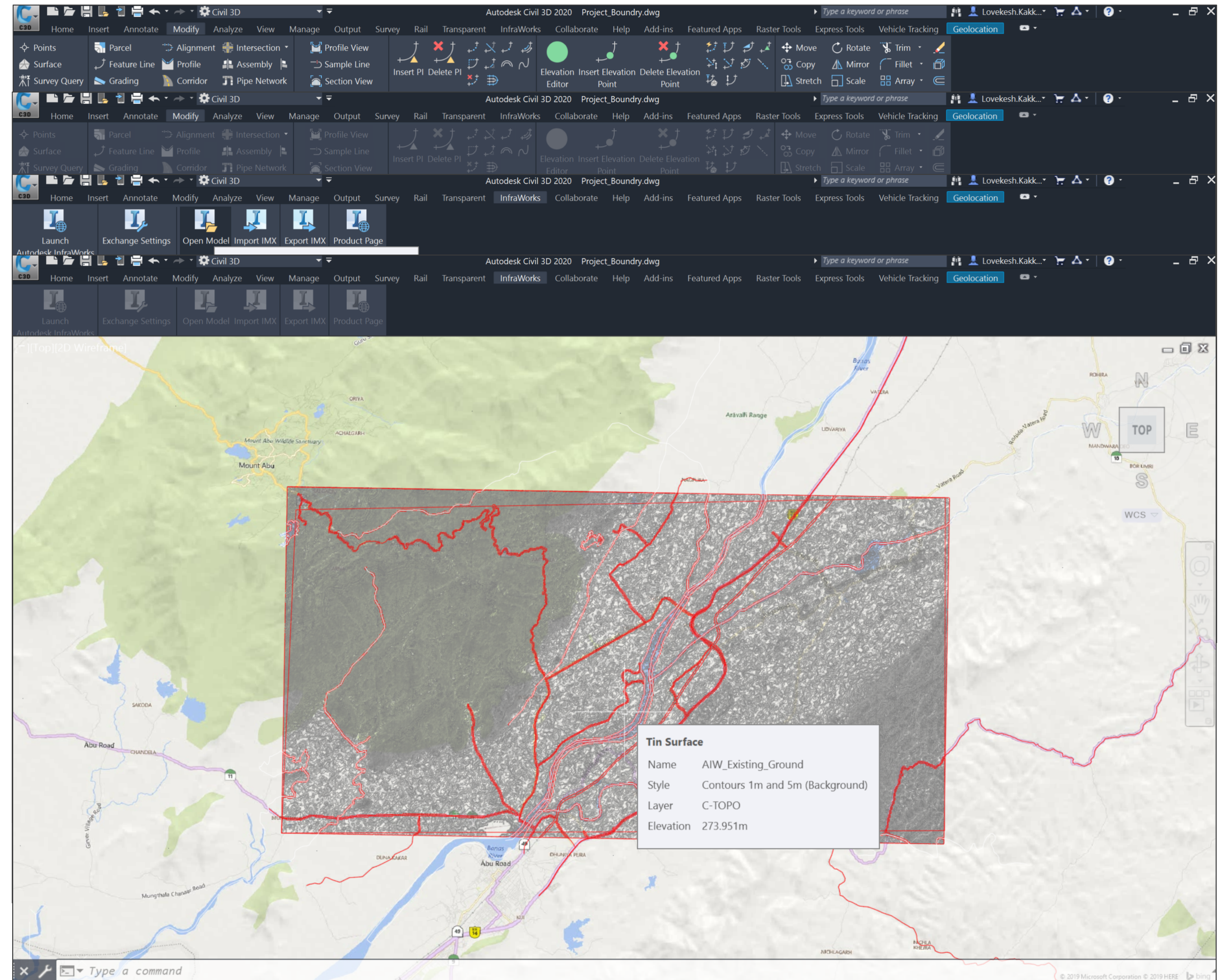
- Open Model Builder & Click on “Import a polygon to select an AOI” > Select the “Project_Boundary *.shp & *.Prj” (Or Type “Mount Abu”>Search)
- Make sure the area of project boundary is less than 200sq. km
- Give model name “Mount_Abu_Project” & click>create Model
- Once the model is downloaded you will receive an email notification
- Choose: Where would you like to store this model? BIM 360 or local drive



Workflow - Import data from Infraworks to Civil 3D

Import AIW Model in to Civil 3D

- Check if the projected coordinate system is applied in “Project_Boundary.dwg”
- Close Infraworks software & open Infraworks model from Civil 3D
“Infraworks Tab” and browse your model from “Documents\Autodesk InfraWorks Models\Autodesk 360\xxxxx” path
- Import the “Extents of InfraWorks model” or “Area Of Interest”
- Create/Configure the layers and other necessary settings from the “Object Settings” & “OK” > “Open Model”
- You may import using IMX format



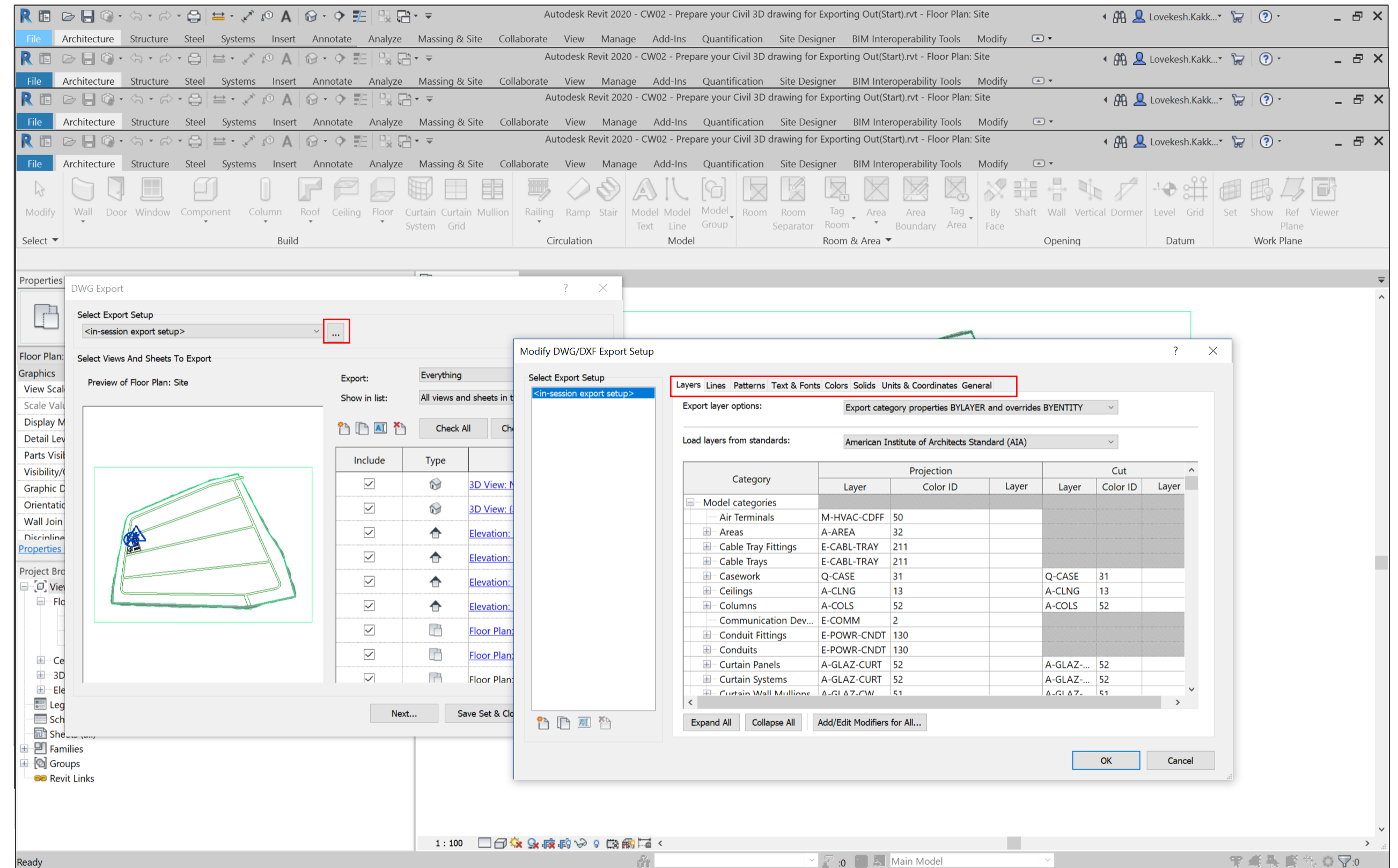
Collaborate with Civil 3D

Workflows: Revit to Civil 3D

Workflow - Import Data from Revit to Civil 3D

You can save setup settings to use in other Revit projects

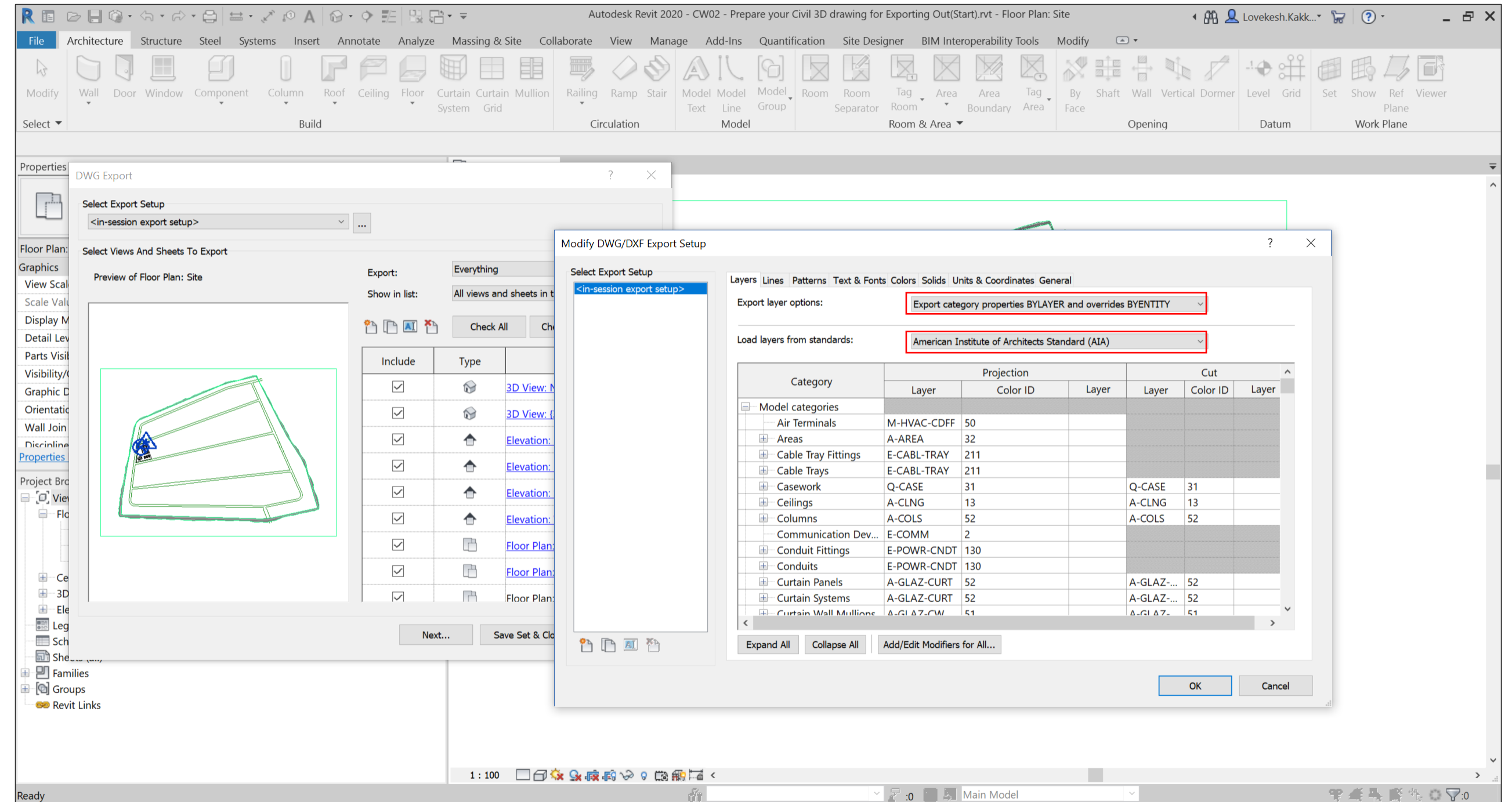
- File>Export>CAD Formats>DWG
- Create a new Set to add the views, Which you want to export
- Check all or desire views to export as drawings
- And to Modify Export Setup, Click > ExportSetup, ... (Disabled entities from Visibility Graphics won't appear here)
- You can also choose desire options from tabs like Layers, Lines, Color, etc



Workflow - Import Data from Revit to Civil 3D

You can save setup settings to use in other Revit projects

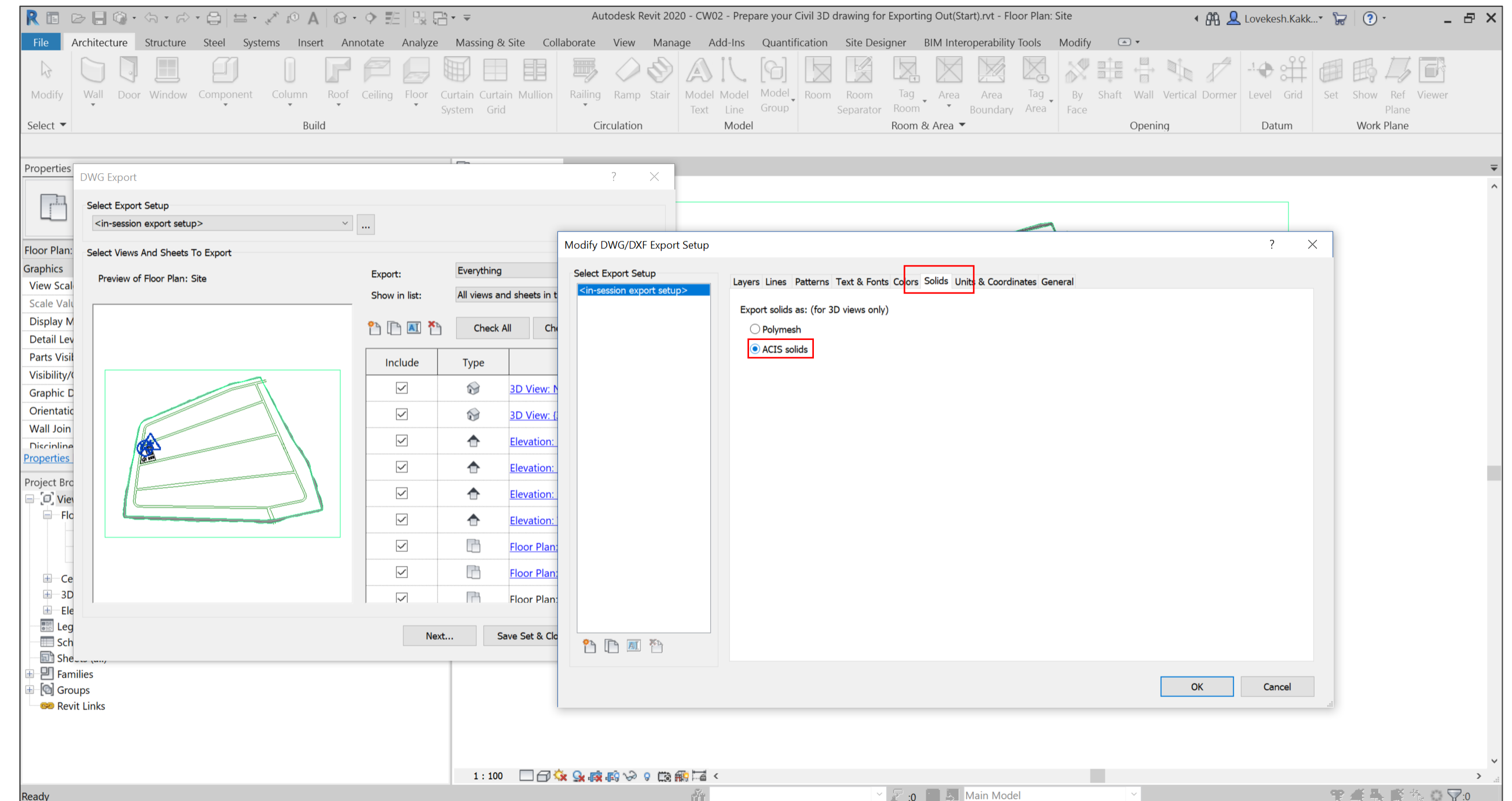
- Tab > Layer > Choose: Export Layer options
- Tab > Layer > Choose: Load layers from Standards



Workflow - Import Data from Revit to Civil 3D

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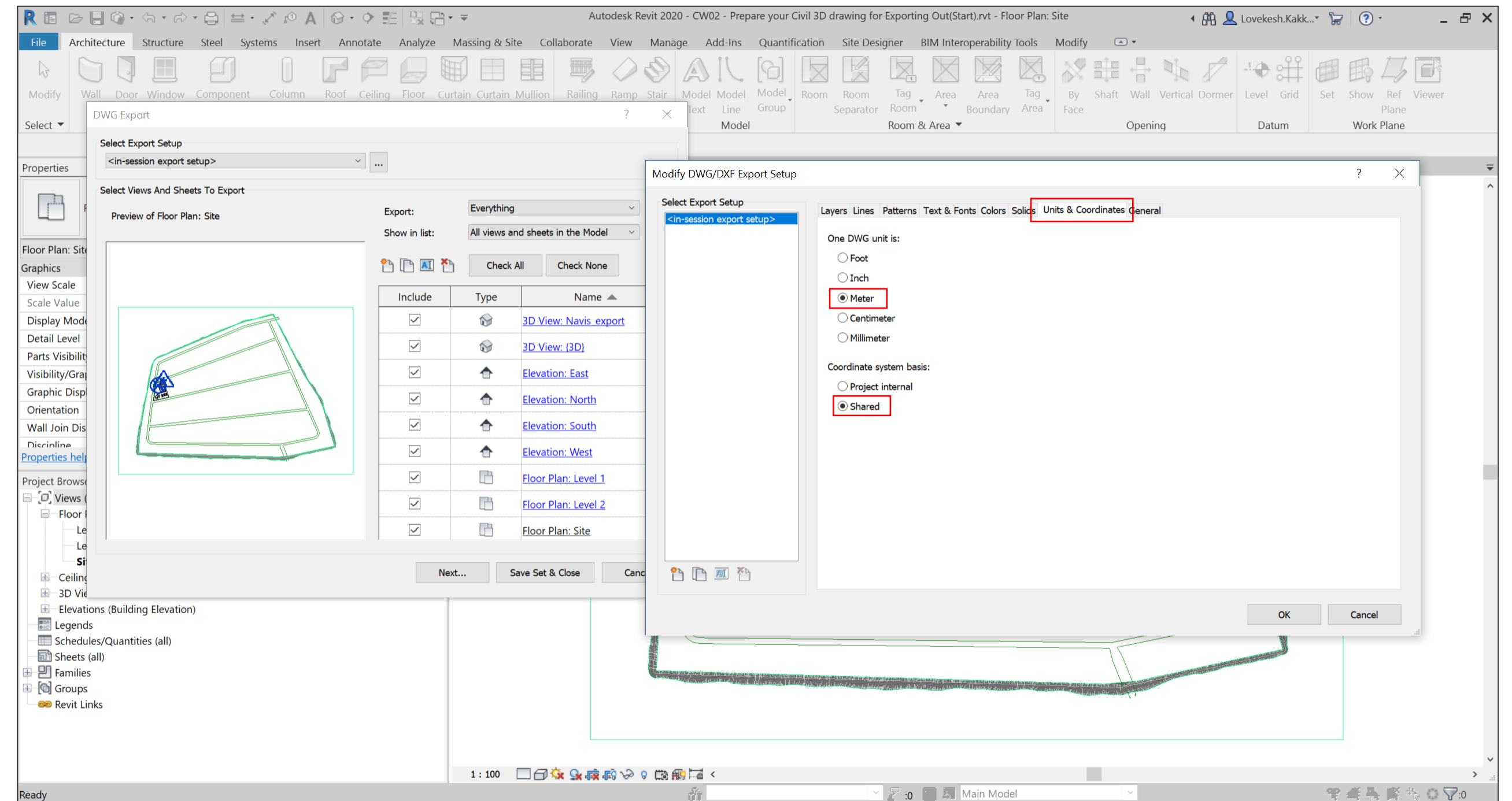
- Tab > Solid > Choose: ACIS solids



Workflow - Import Data from Revit to Civil 3D

You can save setup settings to use in other Revit projects

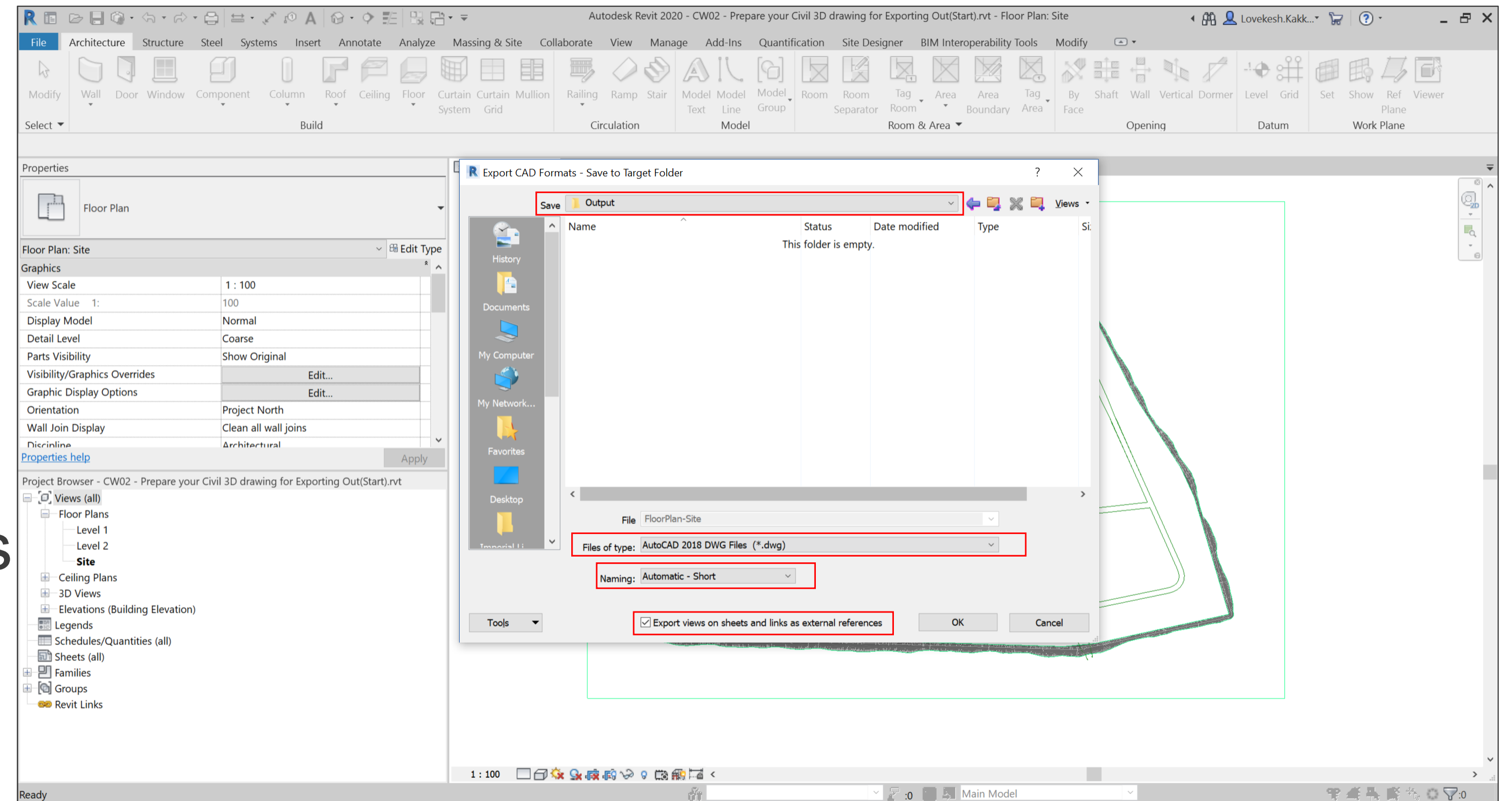
- Tab > Units & Coordinates > Choose > Meter & Shared CS
- Click OK & Next/Save set and close



Workflow - Import Data from Revit to Civil 3D

You can save setup settings to use in other Revit projects

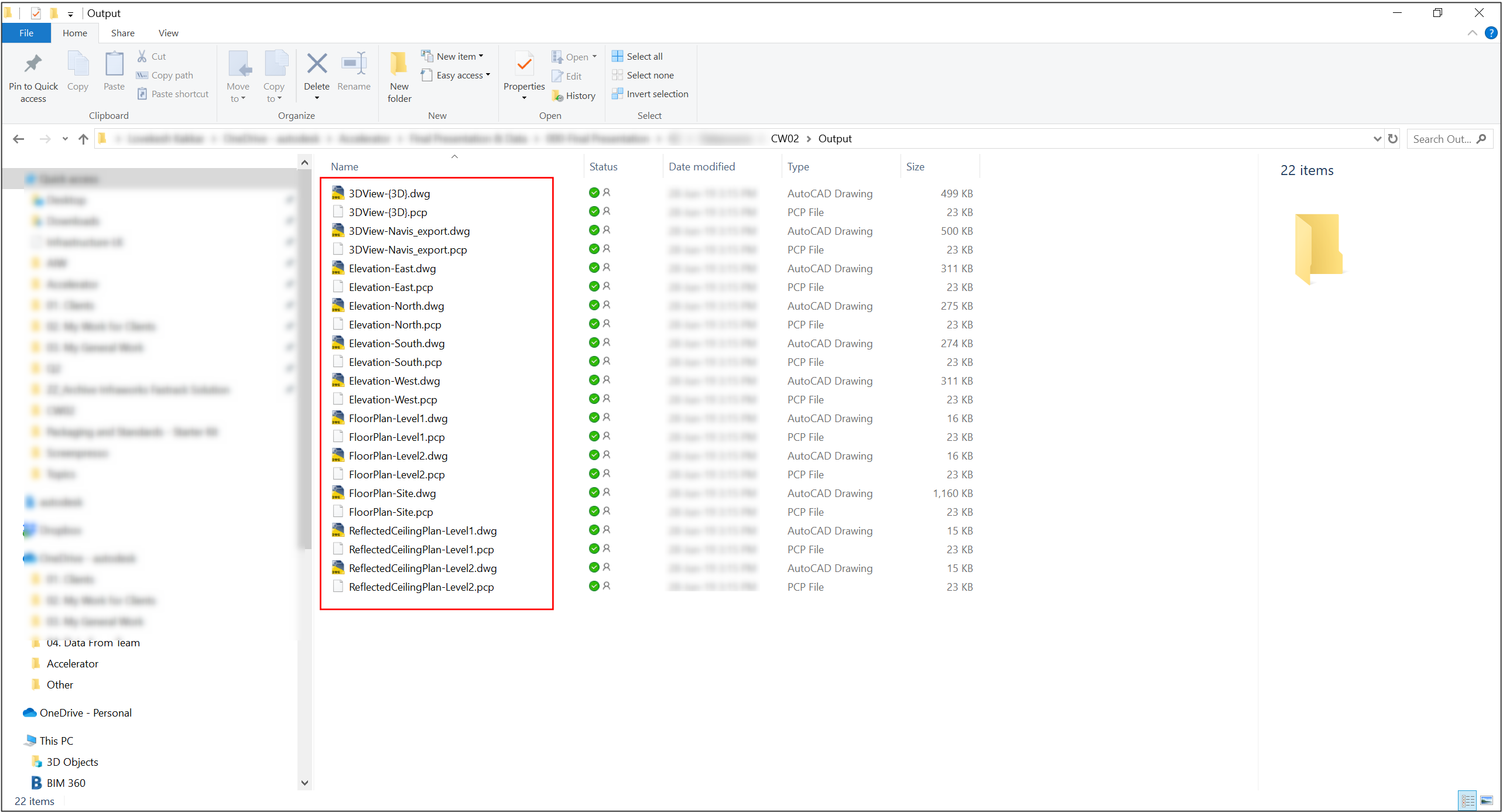
- Choose > Output folder location
- Choose > AutoCAD Drawing Version
- Choose > Short name / Long suffix is also available to choose for naming
- Tick > Export views on sheet and links as external references



Workflow - Import Data from Revit to Civil 3D

You can save setup settings to use in other Revit projects

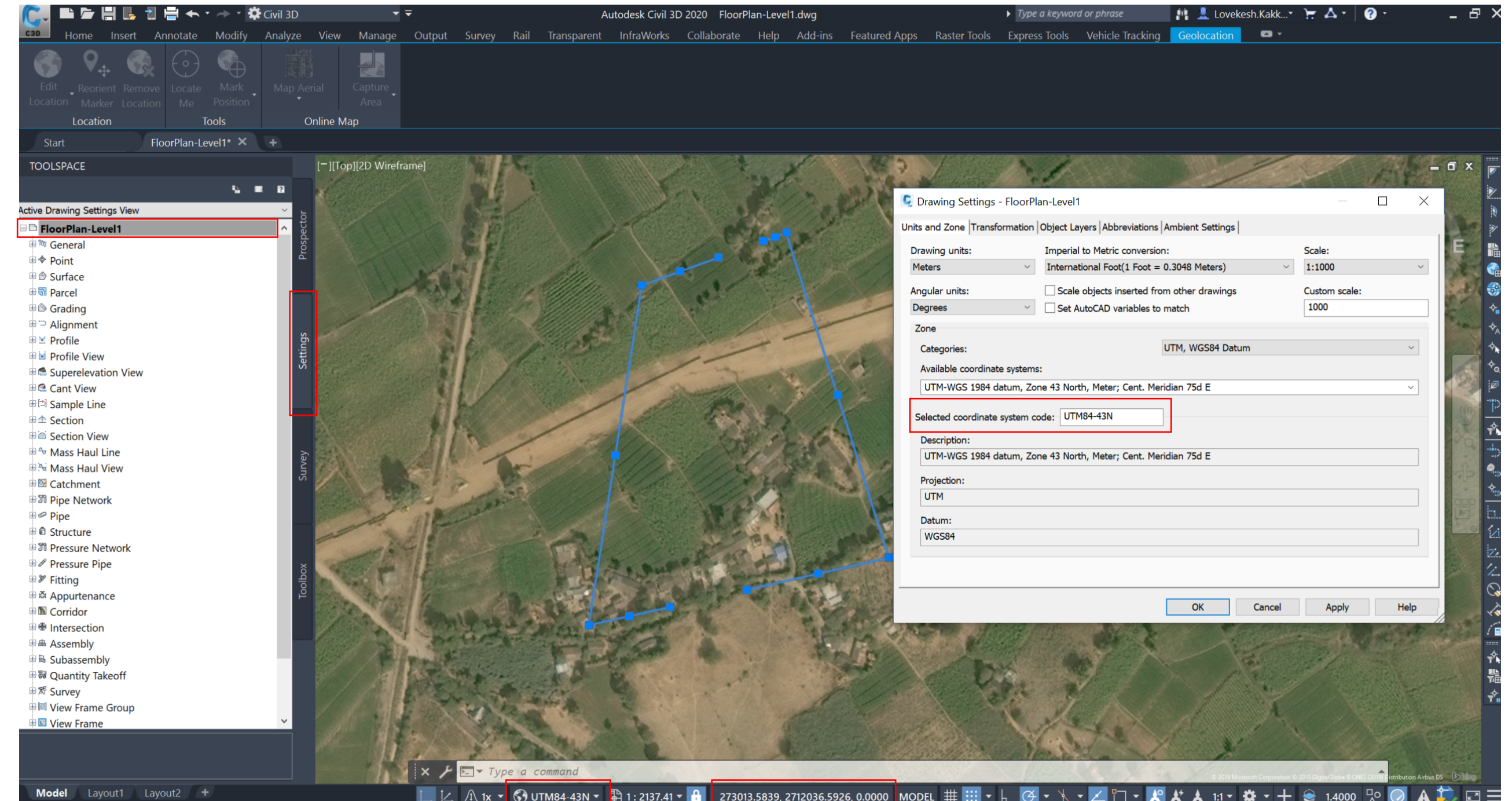
All the sheets are now stored in to the desire folder location



Workflow - Import Data from Revit to Civil 3D

You can save setup settings to use in other Revit projects

Open Drawing file in AutoCAD



Streamline data sharing Civil 3D, Revit & InfraWorks

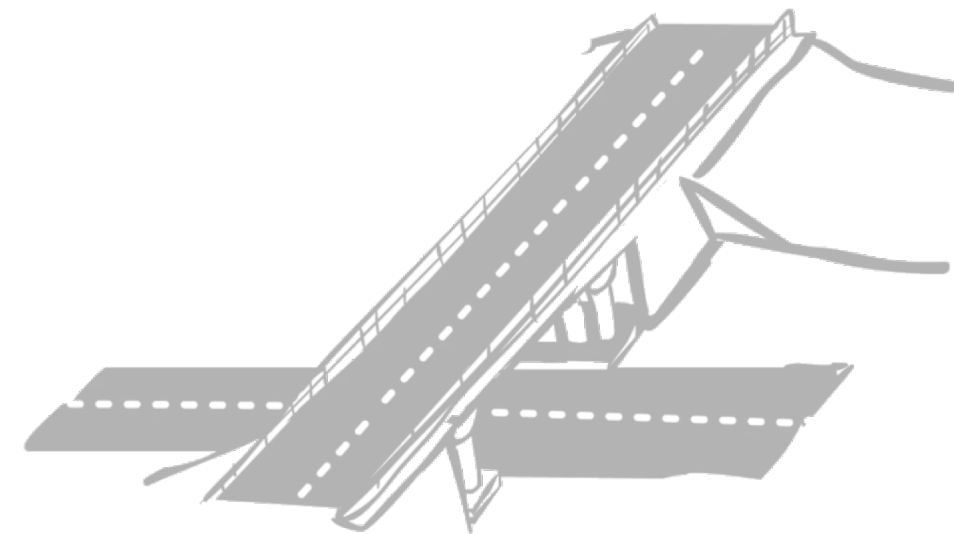
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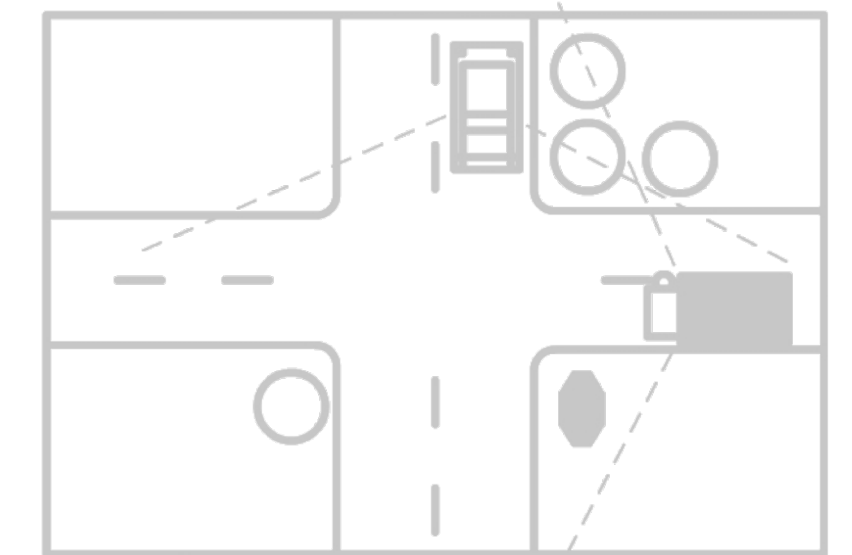
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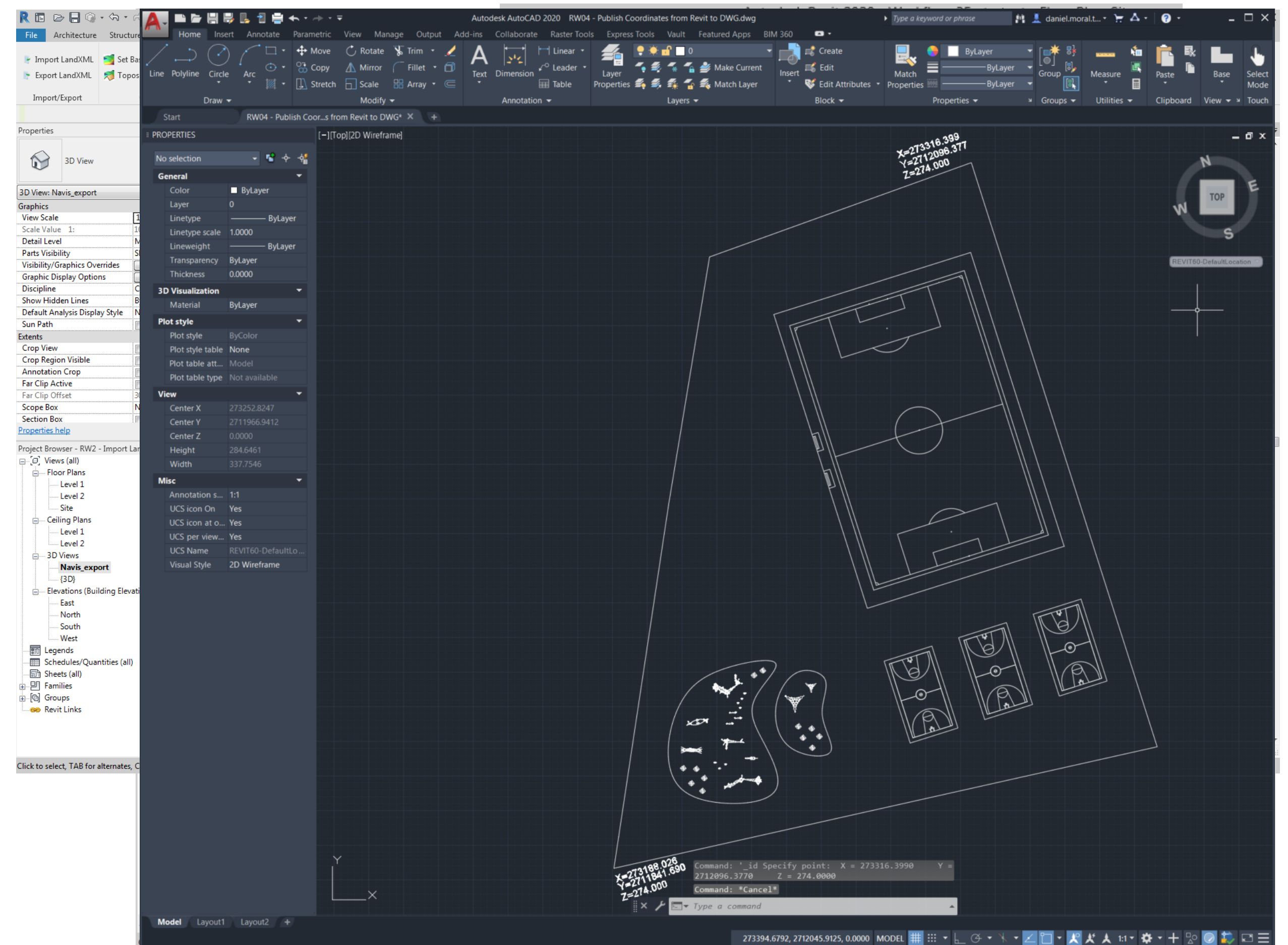


- Workflows: Revit, FBX, IFC & Civil 3D to Infraworks
- Prepare your Infraworks Model for exporting out

Revit Workflows

Interoperability between Revit and other products

- RW01 - Assign Coordinates in Revit (With/Without CAD Drawing)
- RW02 - Import LandXML Using Site Designer
- RW03 - Acquire coordinates
- RW04 - Publish coordinate from Revit to DWG



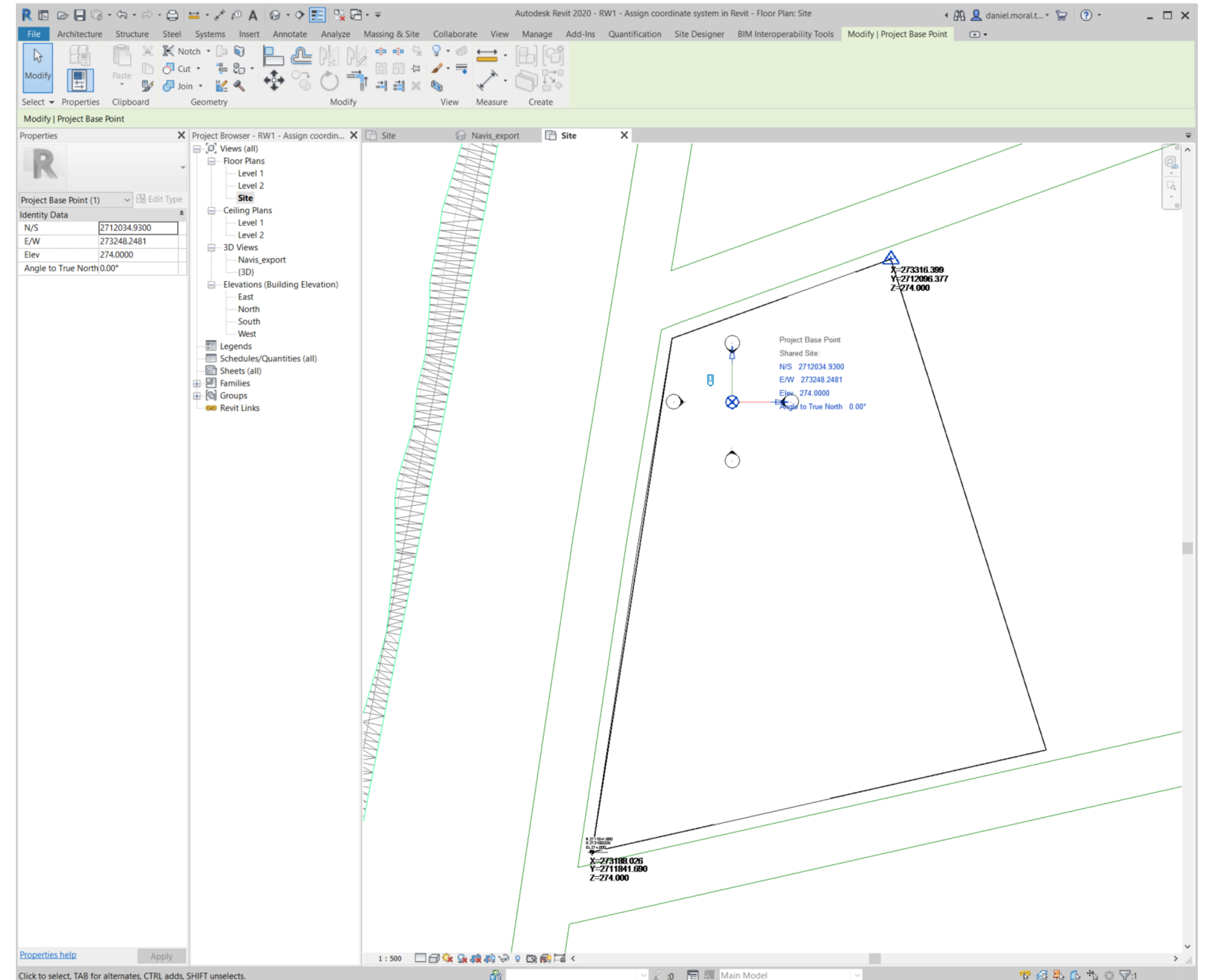
Collaborate with Revit

(RW01):
Assign Coordinates in Revit (With/Without CAD Drawing)

Assign Coordinates in Revit

Survey point is the key!

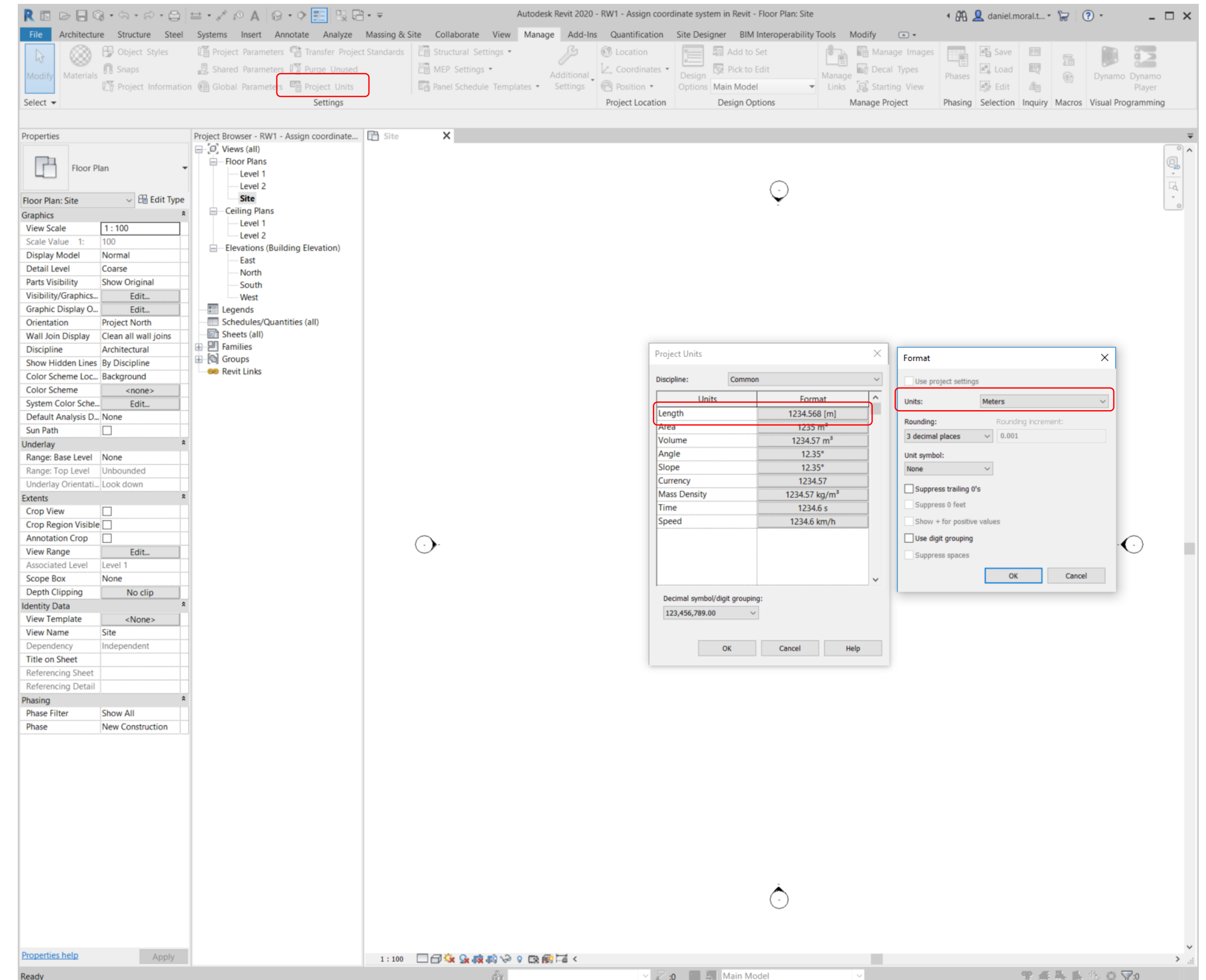
- Define the survey point coordinates values to match a known point in the physical world
- Use survey point coordinates from the civil engineer, or determine the coordinates of a known location, such as a geodetic survey marker or benchmark or the intersection of 2 property lines
- Project base point will automatically be updated to establish a reference for measuring distances and positioning objects within the context of the model



Assign Coordinates in Revit

Make sure you are using the correct units!

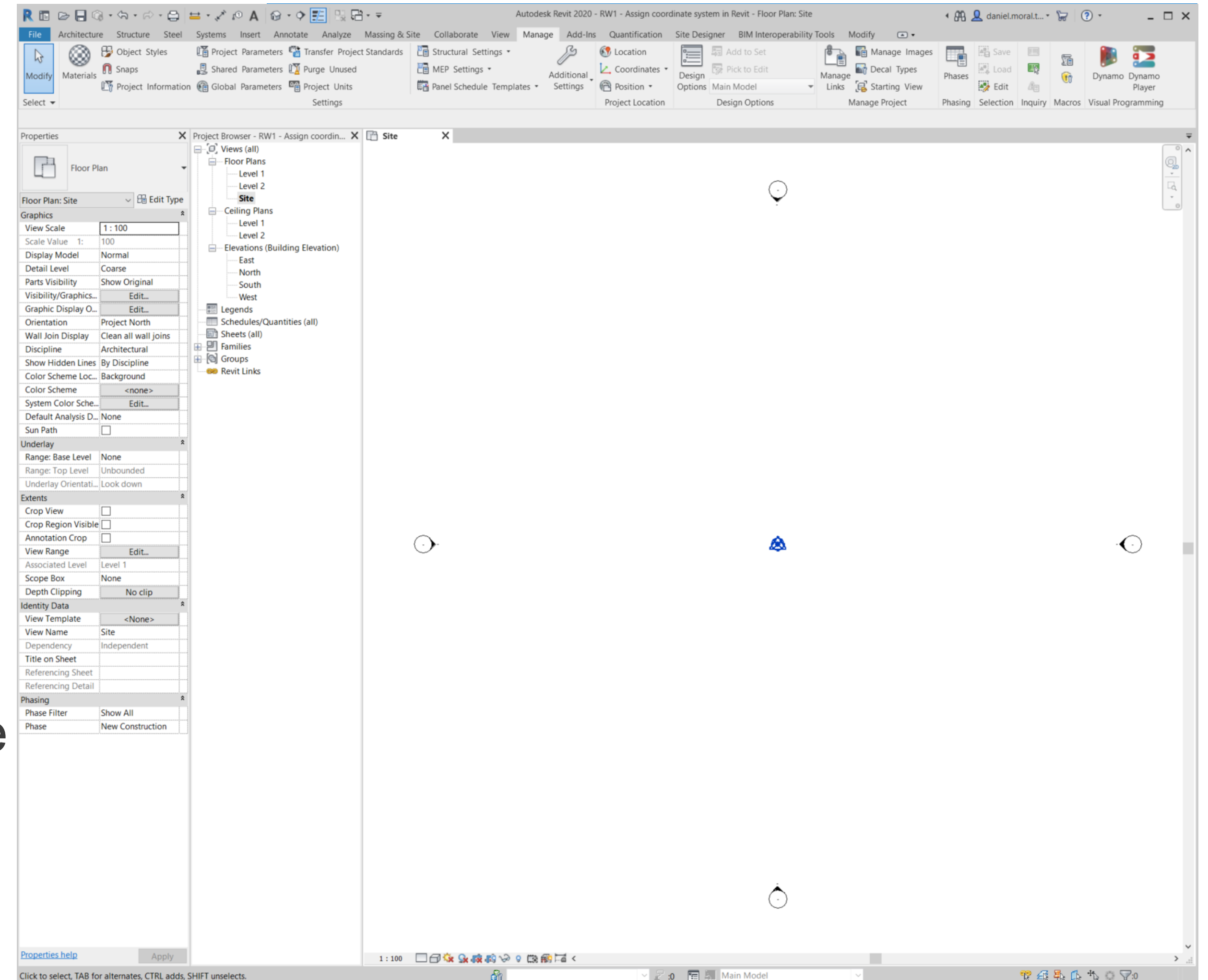
- As civil engineers work with specific units, you may want to consider to change the units in your Revit project in order to be aligned with them (Manage tab > Settings > Projects Units)



Assign Coordinates in Revit

Display the survey point

- Go to any floor plan
(Site plan recommended)
- Open “Visibility and Graphic Display” dialog
- Display survey point 
- Display project base point (optional) 
- Revit internal origin, Project Base Point and Survey Point are at the starting of a project all situated in the same place (0,0,0)

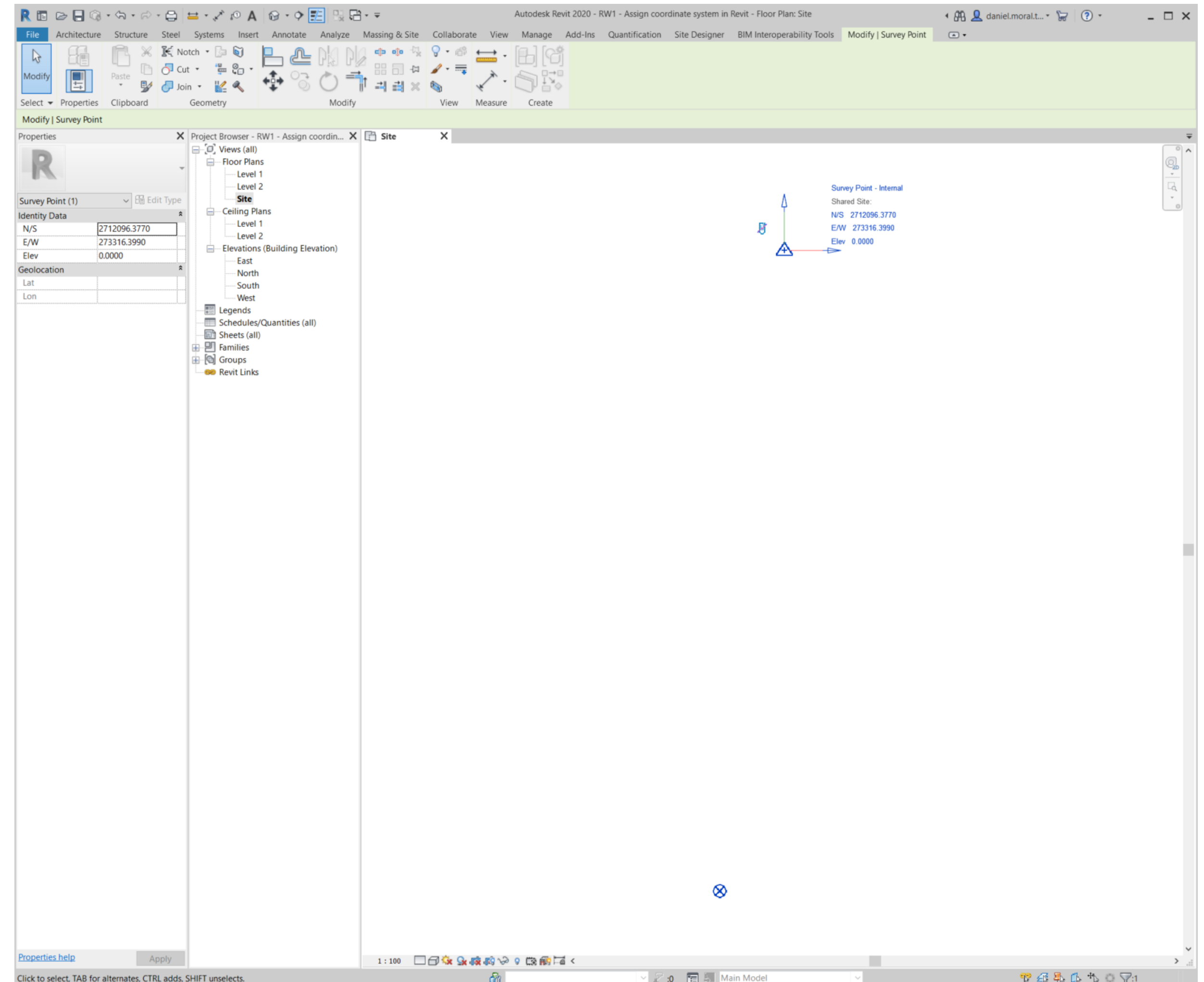


Assign Coordinates in Revit

Define real world coordinates to the survey point (N/S and E/W)

- Unclip survey point in order to define the right coordinate values 
- Define N/S (northing) and E/W (easting) values of a desired location
- N/S=Y, E/W=X, Elev=Z
- Survey point will move to a new position. Do not worry about the current position of the survey point in the floor plan

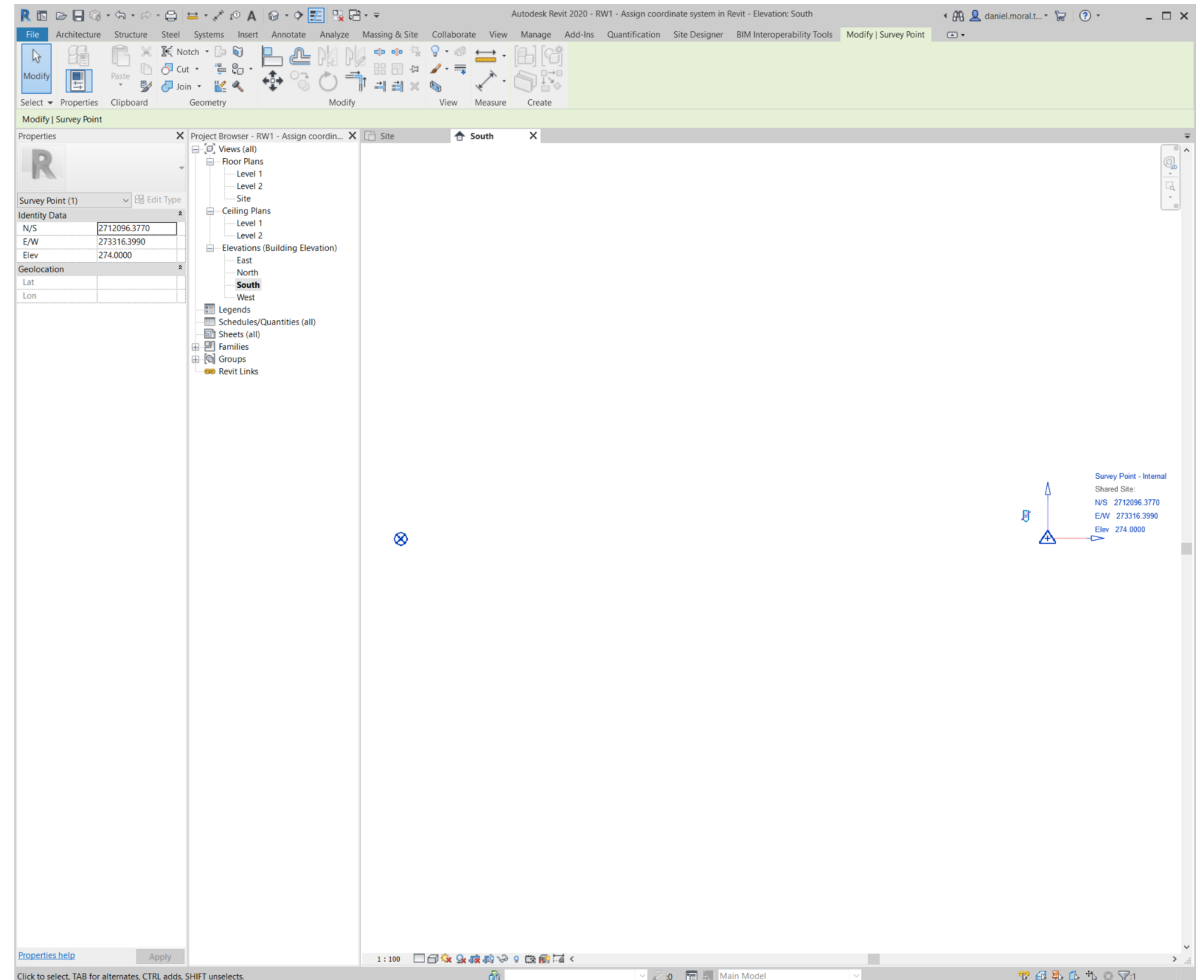
N/S=2712096.377 m, E/W=273316.399 m
Elev=274.000 m



Assign Coordinates in Revit

Define real world coordinates to the survey point (Elevation)

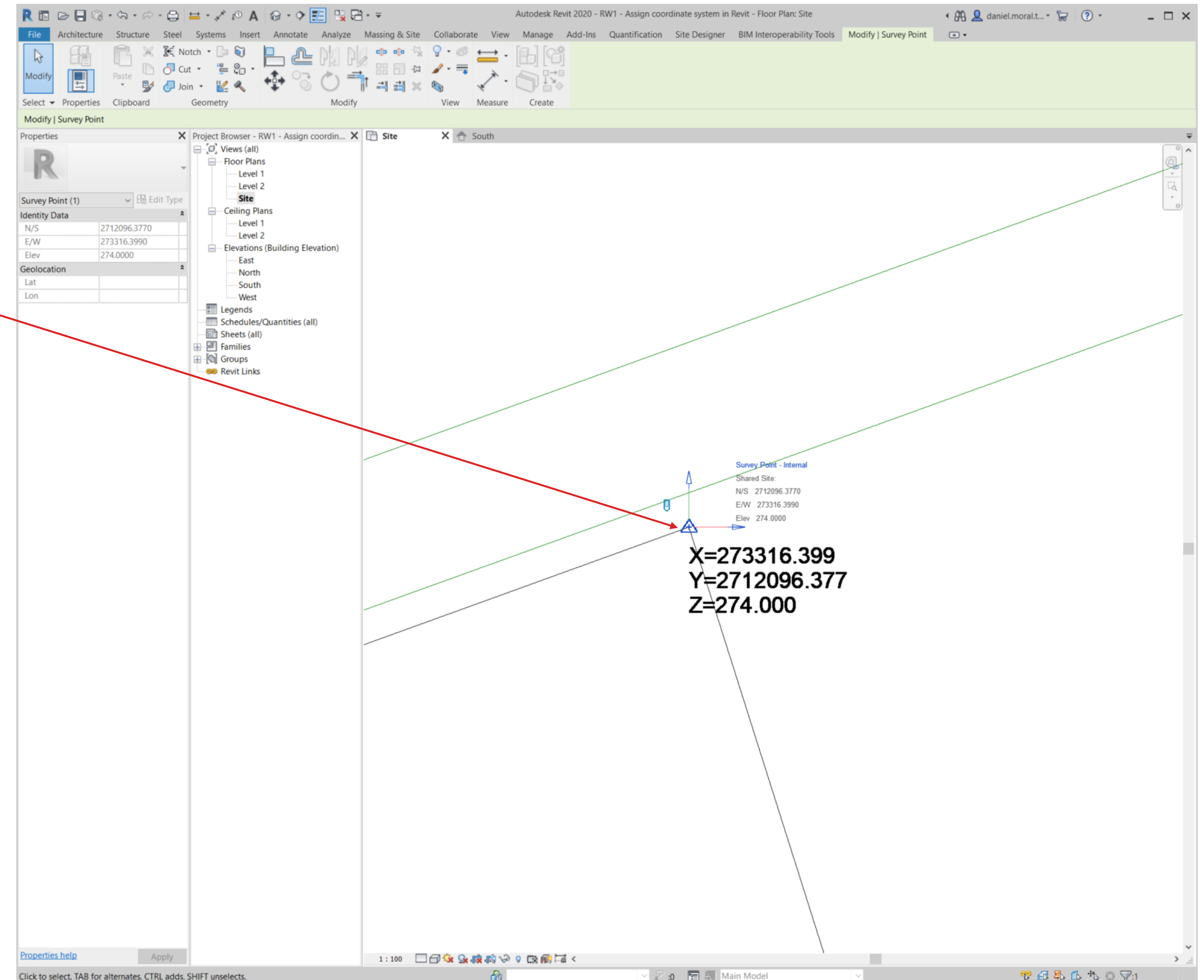
- Display survey point (and project base point) in an elevation view
- Define elevation value (survey point is still unclipped)
- Moving an unclipped survey point moves only the survey point relative to the shared coordinate and the project coordinate systems:
 - Project coordinates do not change for the model elements
 - Shared coordinates do not change for the model elements
 - Only the shared coordinates of the survey point itself change



Assign Coordinates in Revit

Place the survey point at the desired location (N/S and E/W)

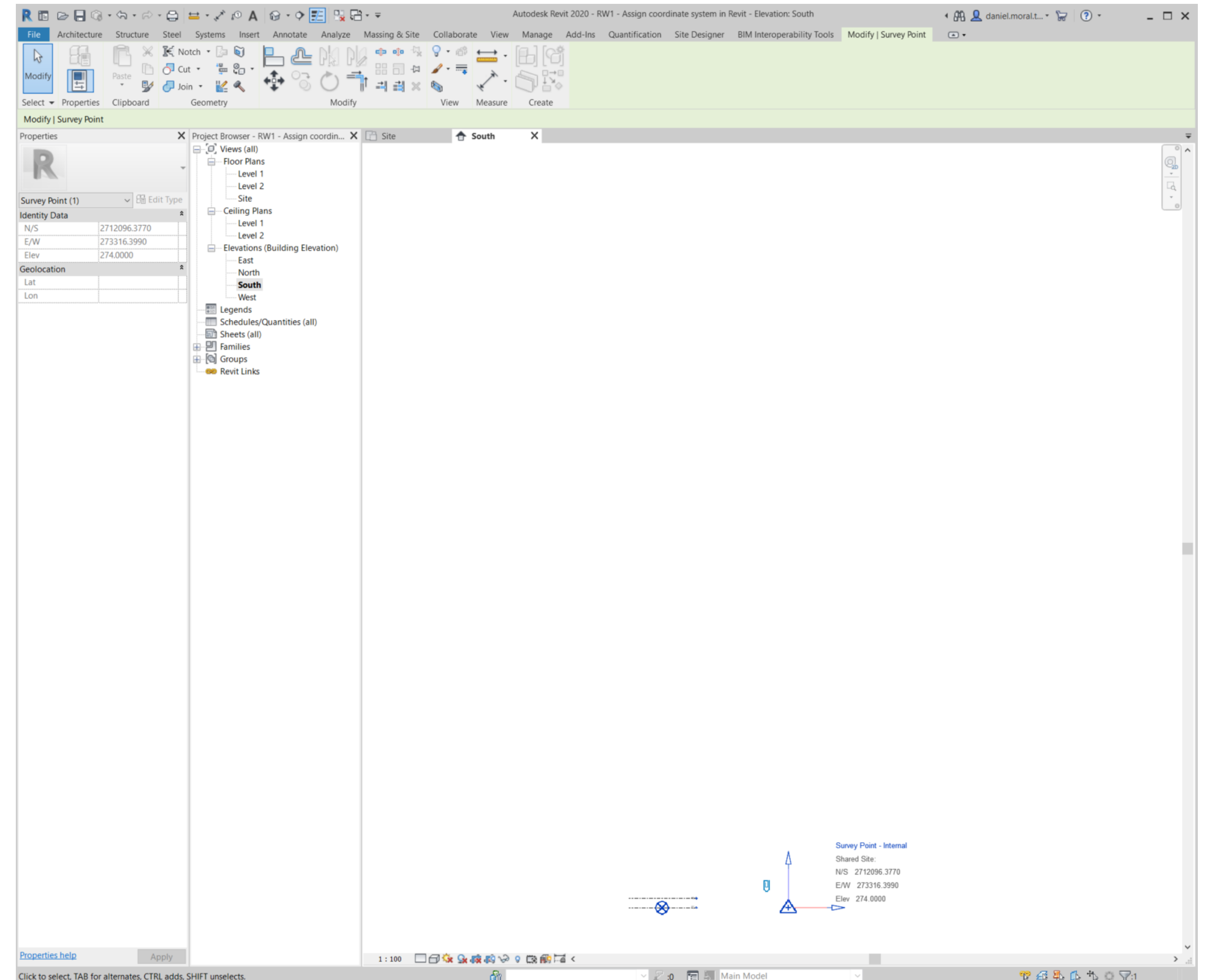
- Clip survey point 
- Move the survey point to the desired location (provided by civil engineer) in a floor plan matching with the values we just defined
- N/S (northing), E/W (easting), and elevation values have not changed



Assign Coordinates in Revit

Place the survey point at the desired elevation

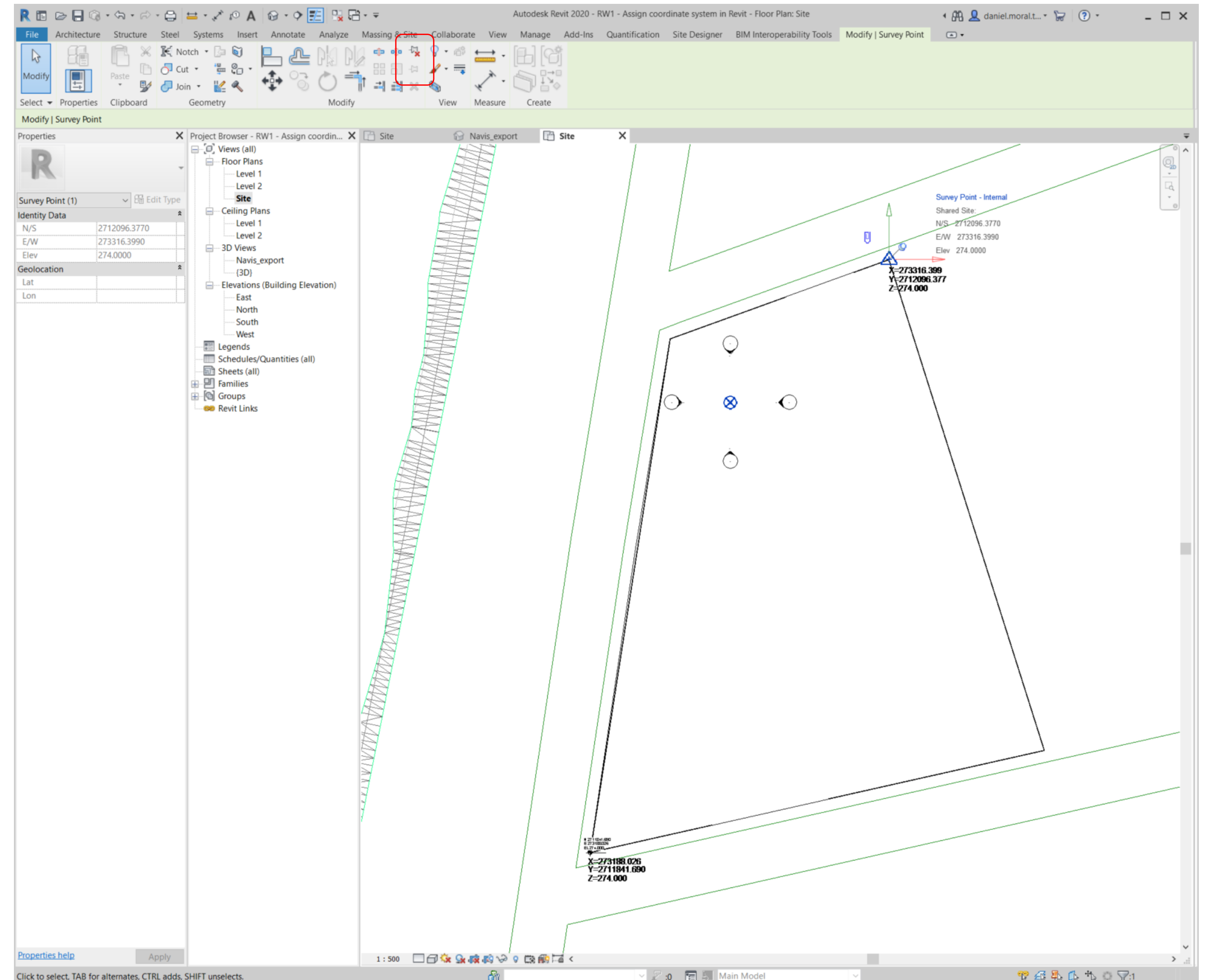
- Move the survey point to the desired elevation in an elevation or section view matching with the value we just defined (survey point is still clipped)
- N/S (northing), E/W (easting), and elevation values have not changed
- Moving a clipped survey point repositions the shared coordinate system relative to the model geometry and the project coordinate system:
 - Project coordinates do not change for the model elements
 - Shared coordinates change for the model elements



Assign Coordinates in Revit

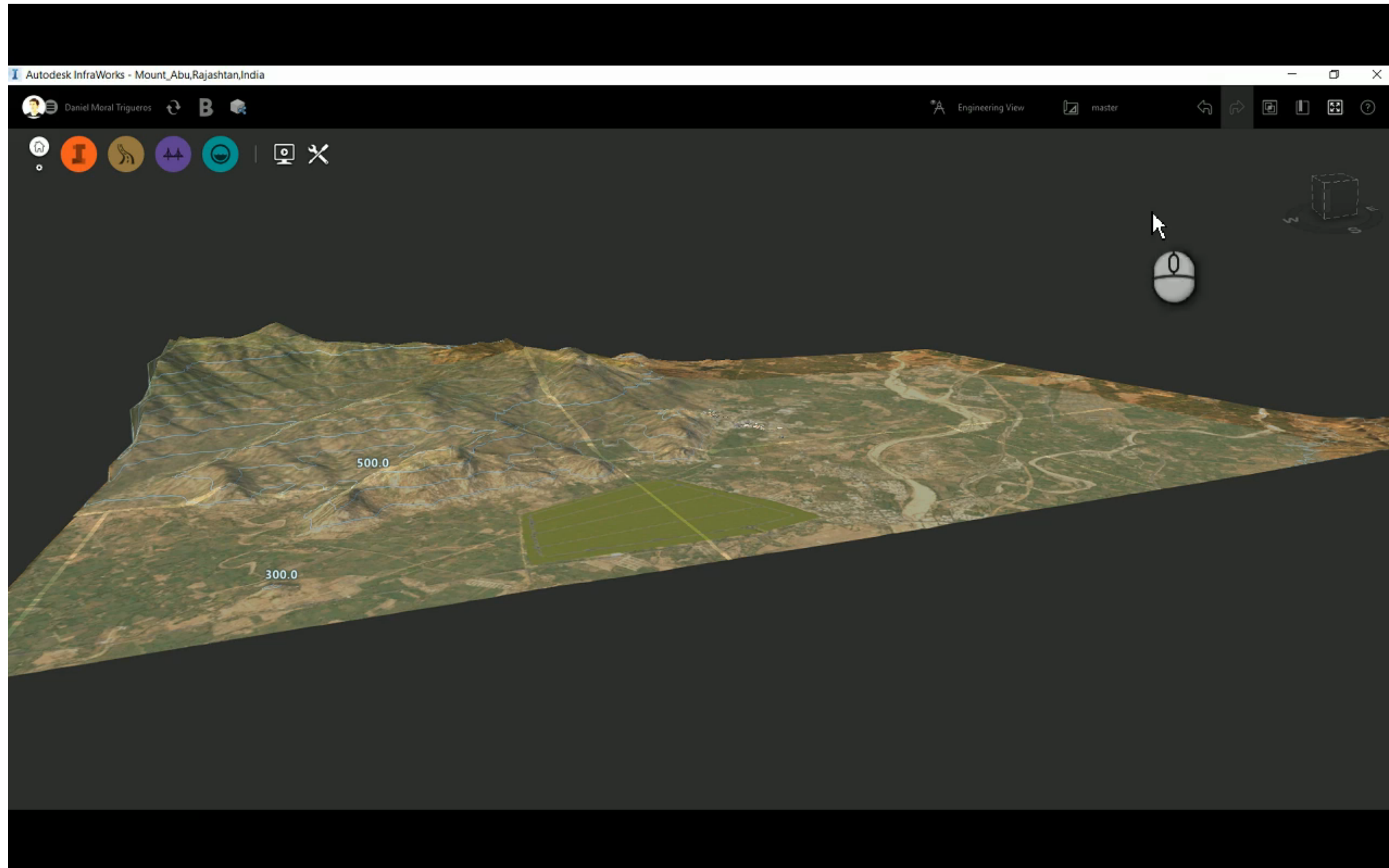
Check it & Pin it!

- Check different spots coordinates of known geographical points to make sure the workflow was correctly done (Annotate tab > Dimensions panel > Spot Coordinate)
- Pin it (optional) to ensure that the Survey Point does not move inadvertently (Modify tab > Modify panel > Pin) 📌
- Create a 3D view and name it with "navis" prefix as InfraWorks looks for a Revit view with this name to import first. In this view you can control the elements transferred turning off the categories that are not needed



Assign Coordinates in Revit

Video – Assign projected coordinates in Revit model to the Survey Point



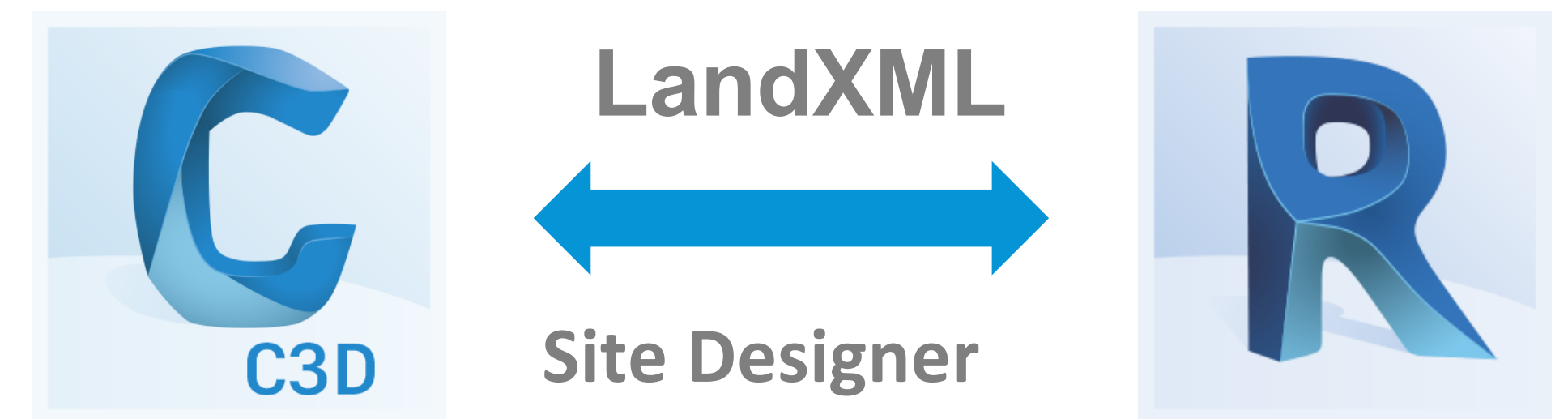
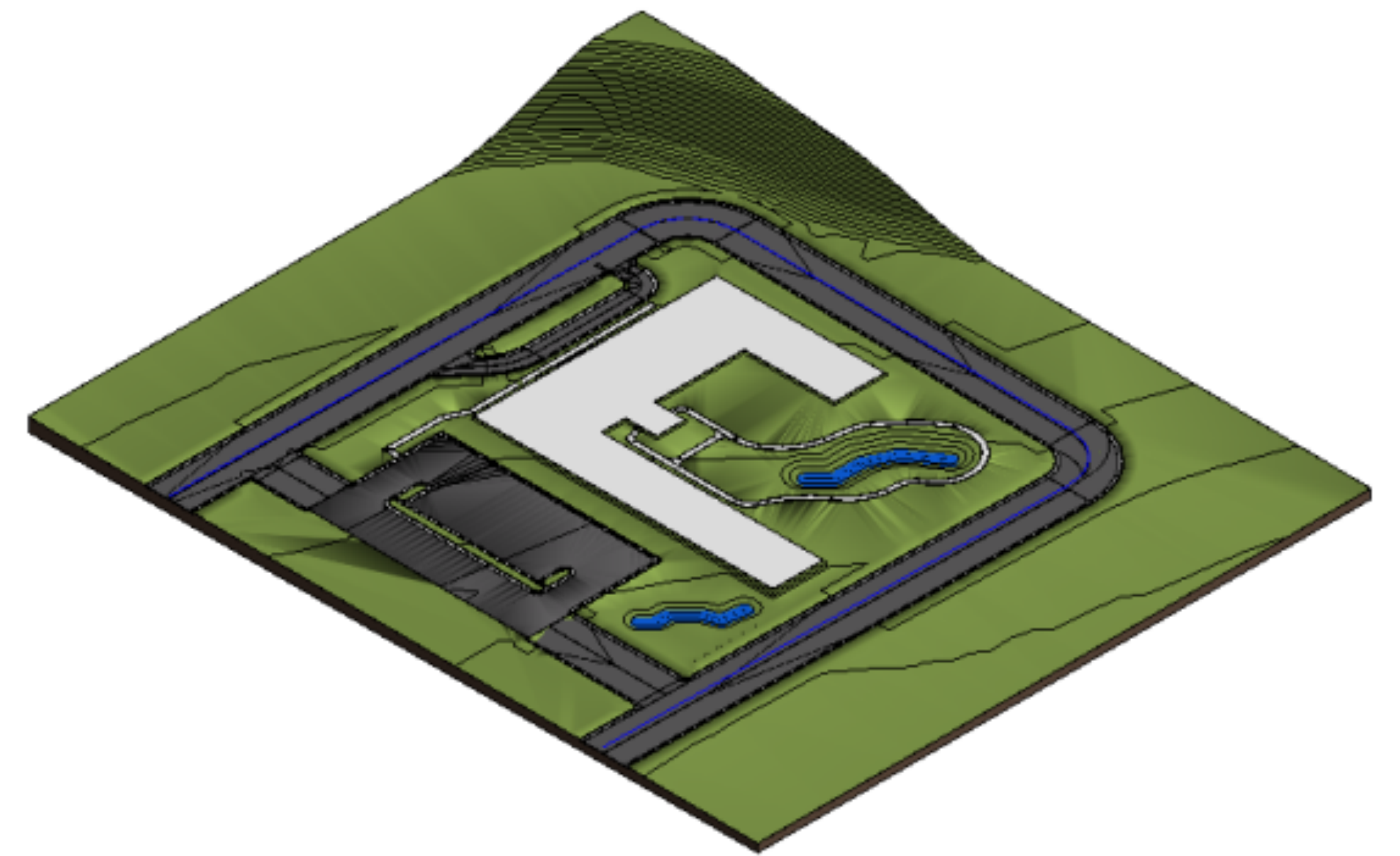
Collaborate with Revit

(RW02):
Import LandXML Using Site Designer

Import LandXML Using Site Designer

Overview

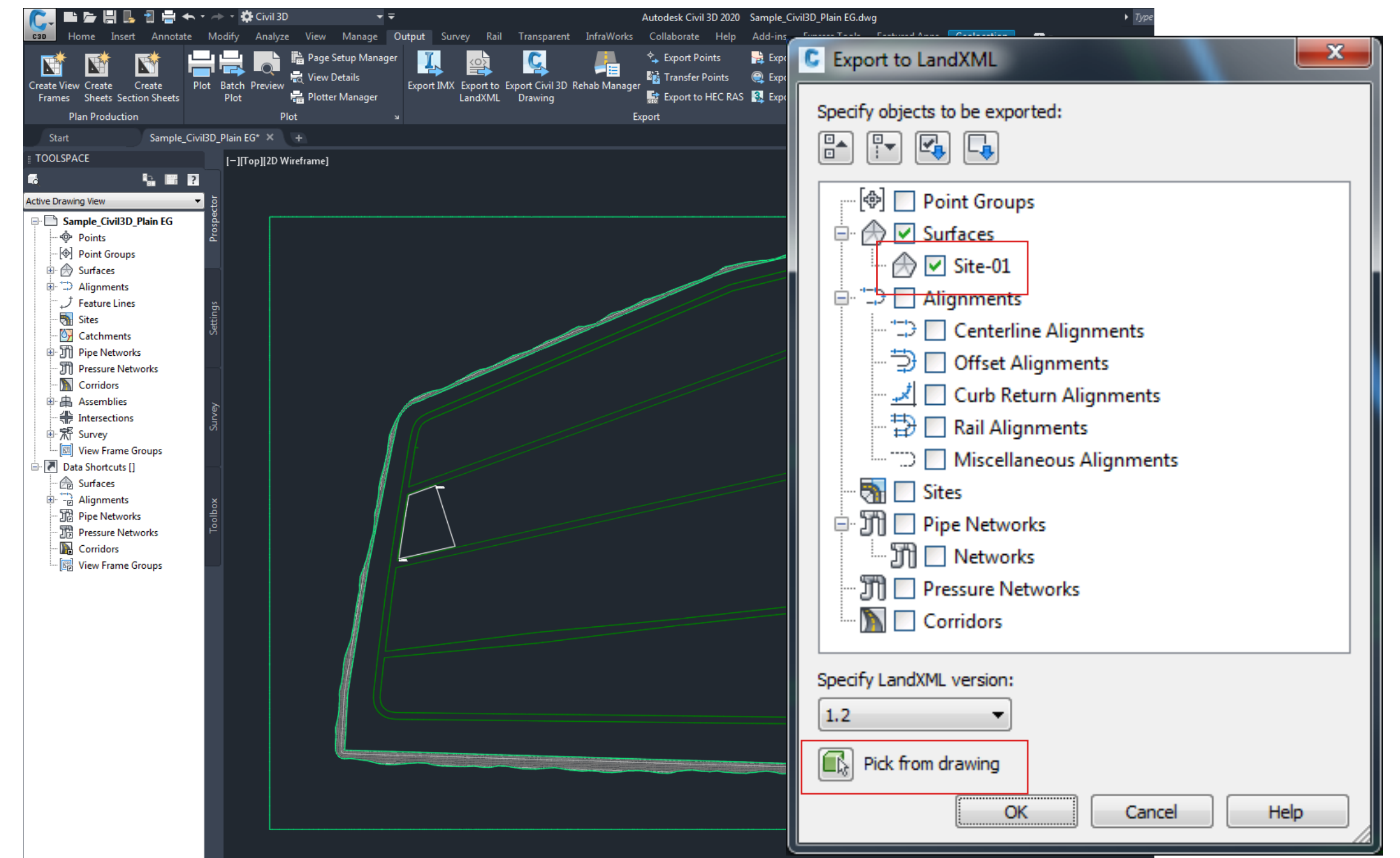
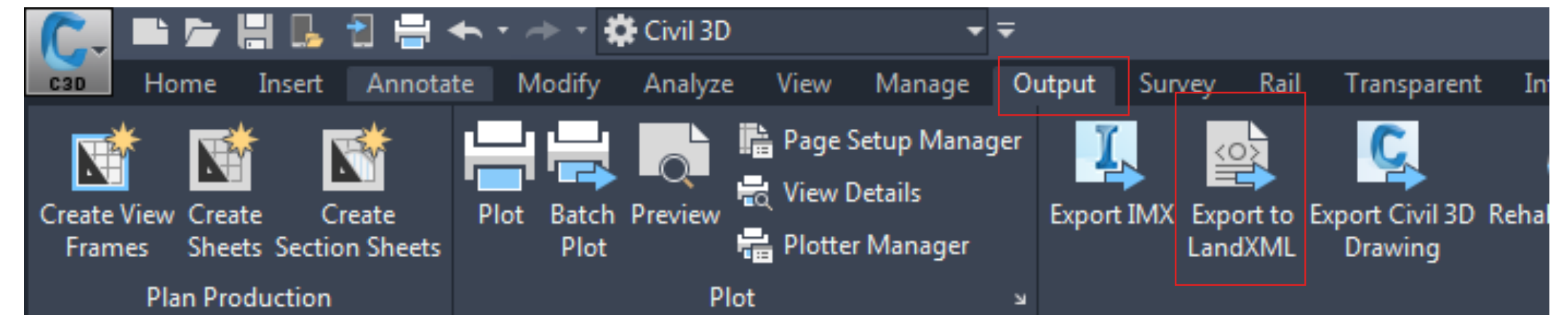
- You can share a site model between Revit and AutoCAD Civil 3D through LandXML files
- LandXML is co-developed by Autodesk
- Revit supports imported XML, using Site Designer
- Site Designer for Revit® is an extension (add-in) for the Revit software. It is available to Autodesk subscribers of a supported Revit product or suite
- For this workflow you will need:
 - Civil 3D
 - Revit
 - Revit add-in Site Designer



Import LandXML Using Site Designer

What to do in Civil 3D

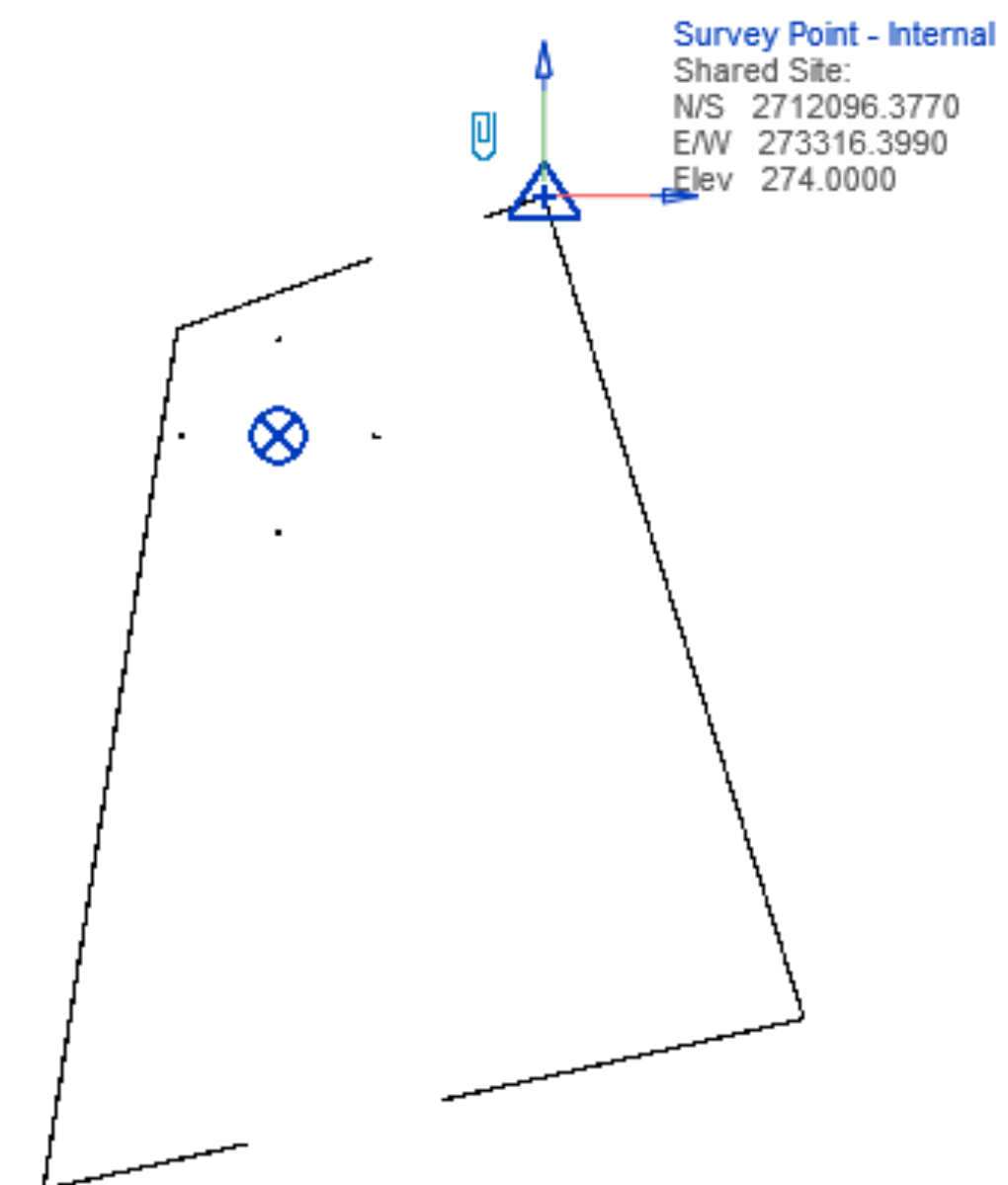
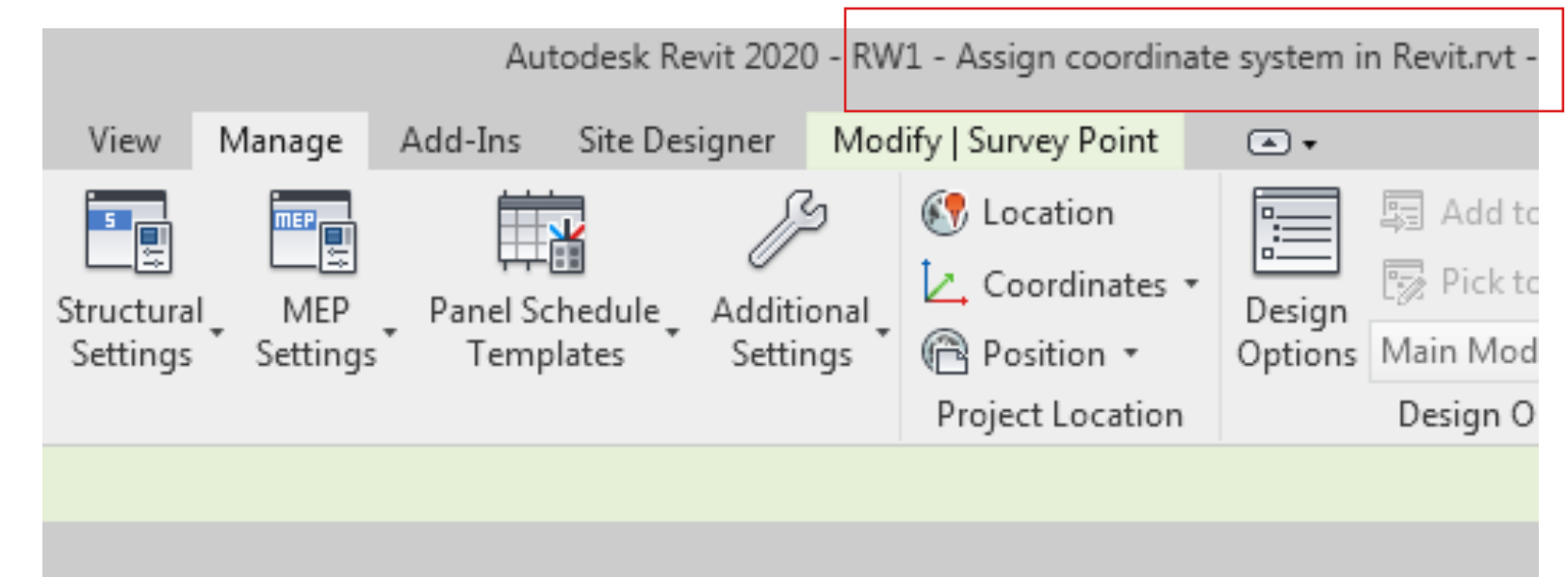
- The LandXML import and export functionality is based on the LandXML schema. Autodesk Civil 3D supports the following LandXML schema versions:
 - LandXML-1.0, 1.1, 1.2
- Export a LandXML topography using following steps:
 - Output tab > Export to LandXML
 - Check or uncheck the boxes to filter the data that you want to export
 - Use Pick from drawing tool to select data manually
 - Specify the LandXML schema version



Import LandXML Using Site Designer

Assign coordinate system into Revit

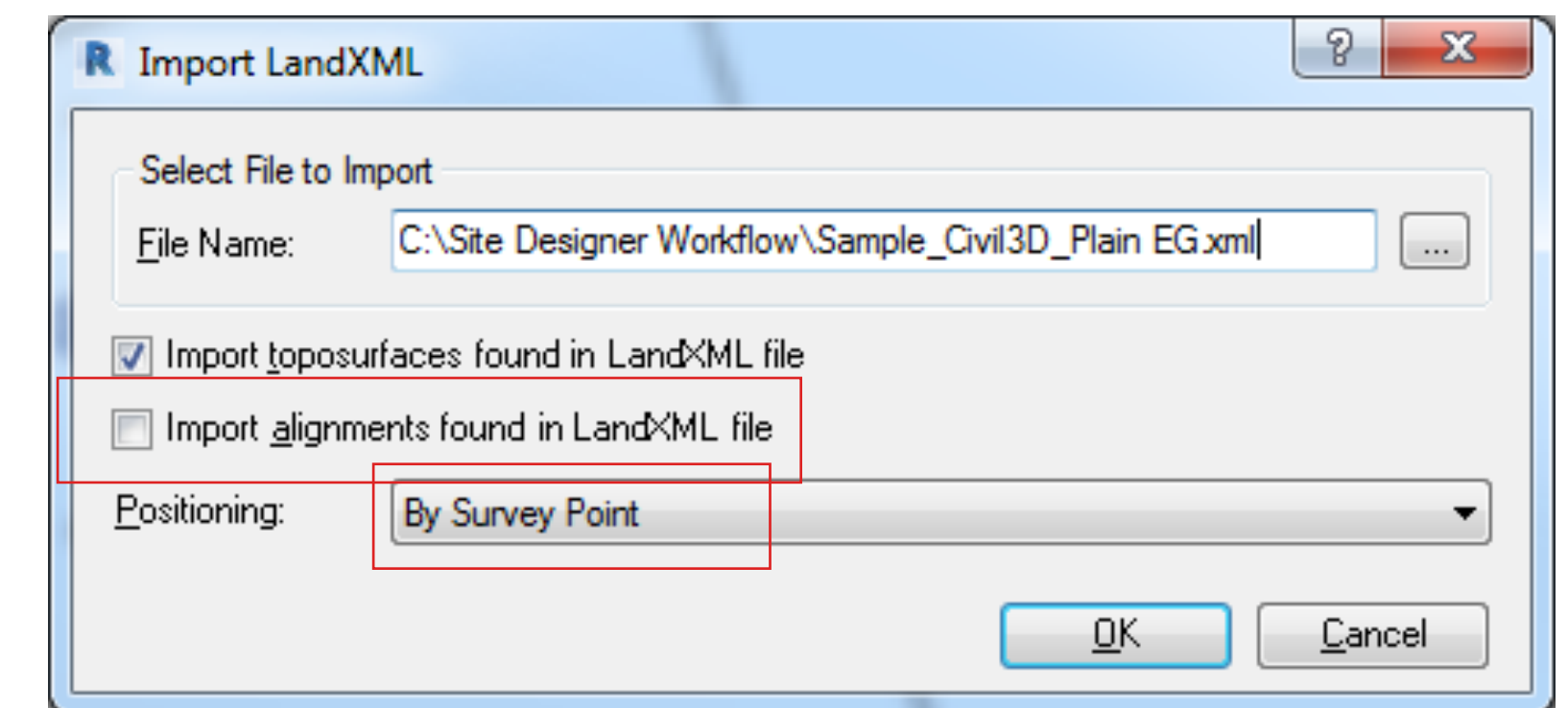
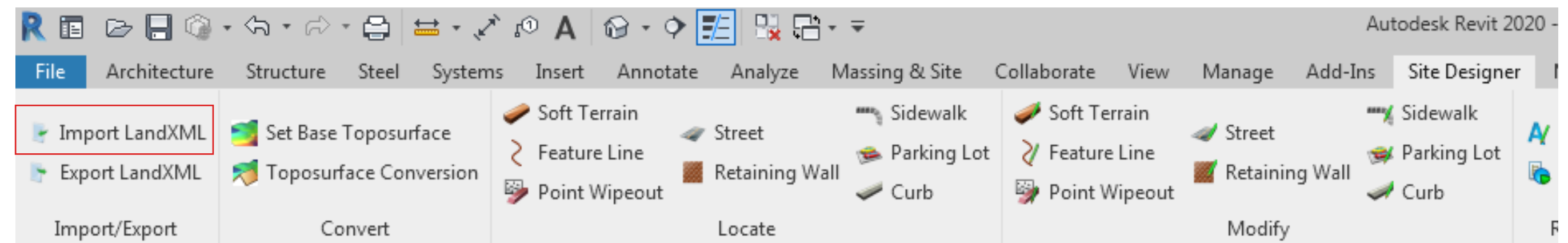
- Before you import LandXML file into Revit you need to assign coordinate system into your Revit model
- The workflow “Assign coordinate system into Revit” is covered by the workflow RW01 of this accelerator
- In order to understand how the geo-referenced coordinates can be applied in Revit, we strongly recommend to watch workflow RW01 materials
- Finally, for the import of LandXML you can use the Revit file from RW01 which is already prepared and contains the assigned geo-referenced coordinate system, aligned with the Civil 3D model



Import LandXML Using Site Designer

How to import LandXML toposurface in Revit

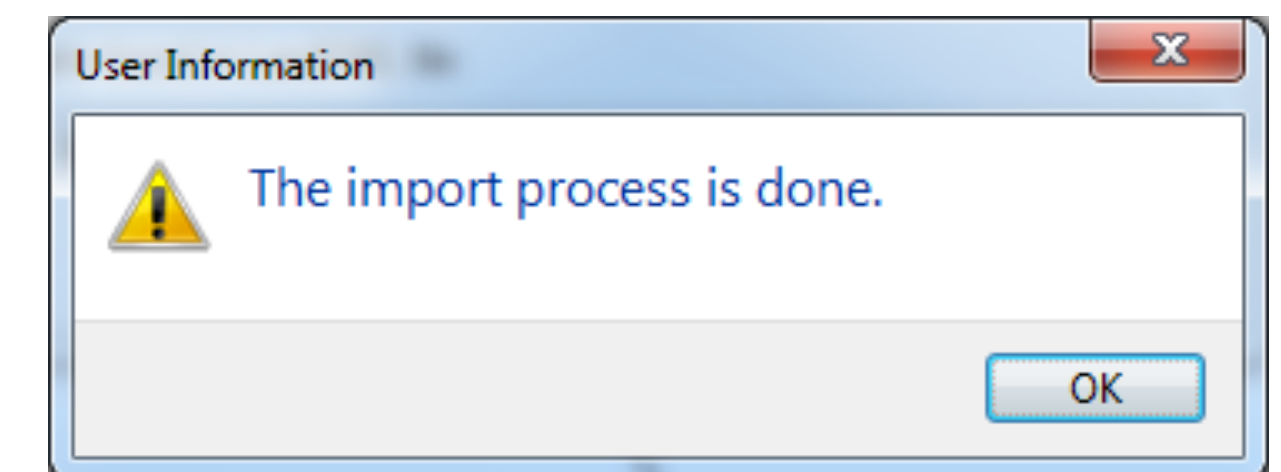
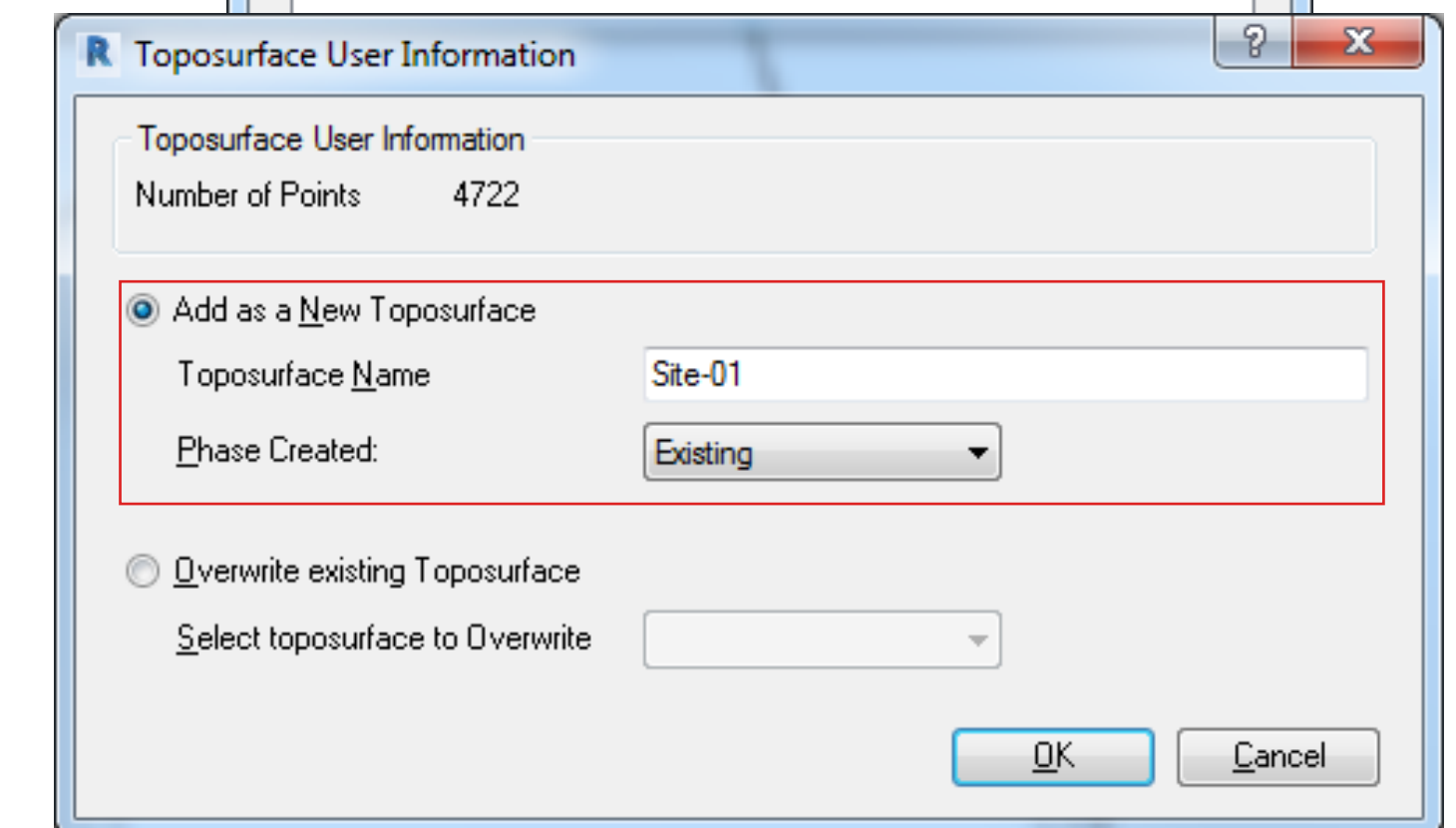
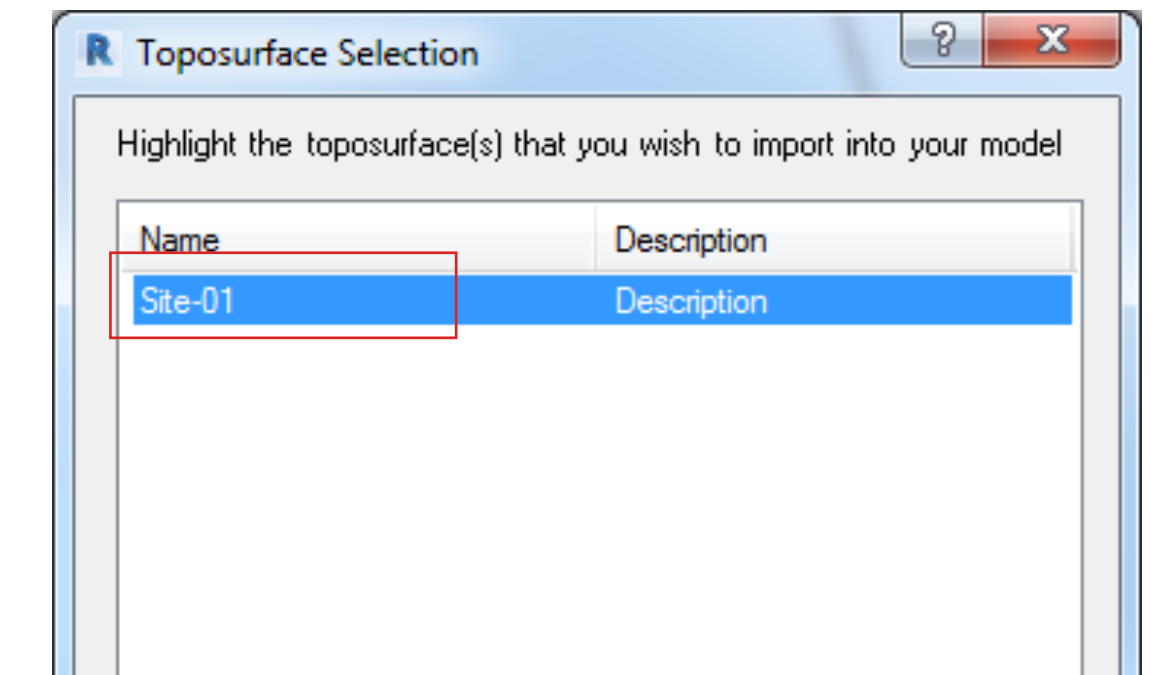
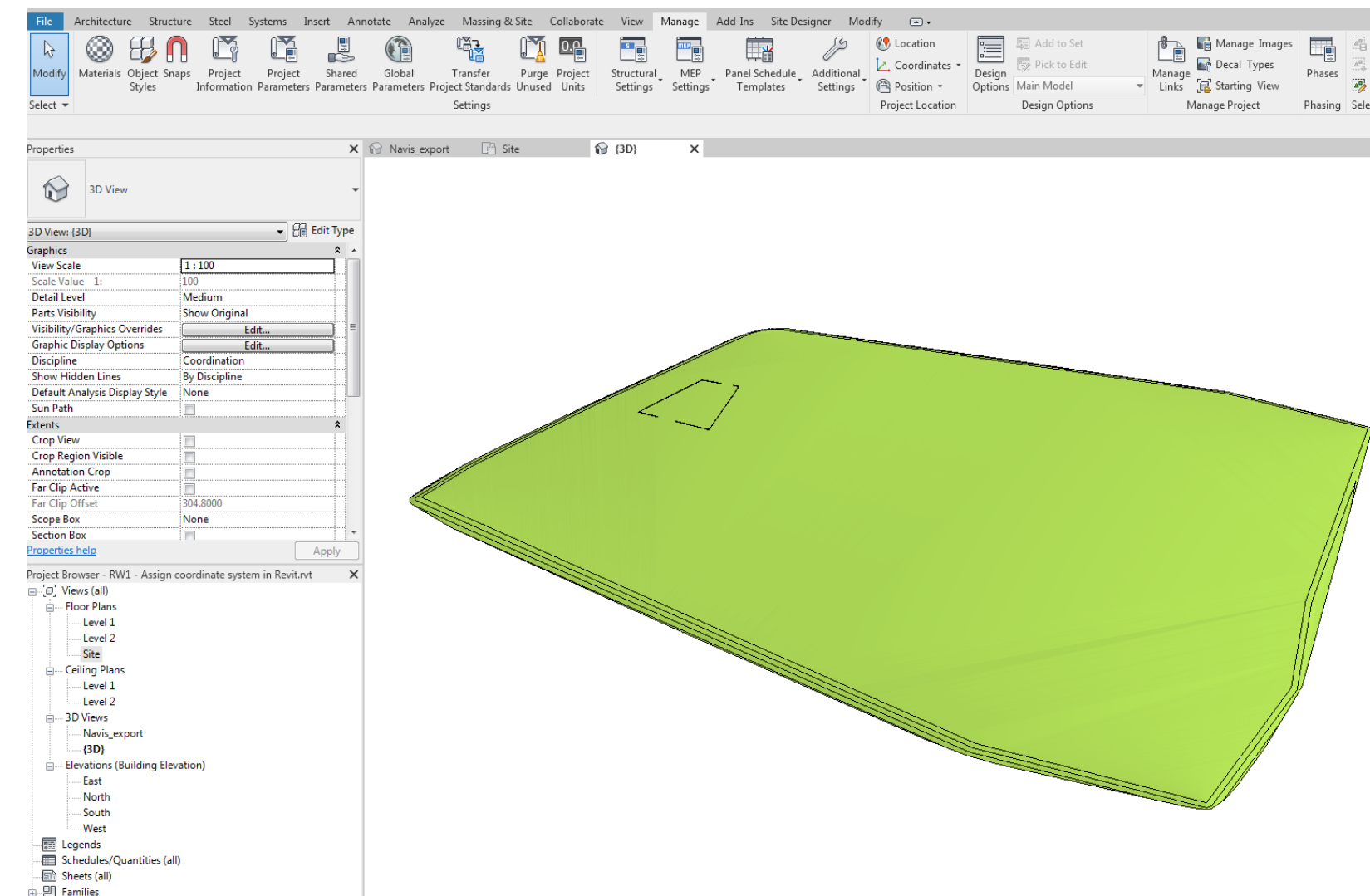
- Start Revit and open the prepared file
- Tab > Site Designer
- Click on Import LandXML
- Select the LandXML file to import
- Uncheck the “Import alignments found in LandXML file”, unless you exported alignments with your Civil 3D LandXML file
- Set Positioning to “By Survey Point”
- Then click OK



Import LandXML Using Site Designer

How to import LandXML toposurface in Revit

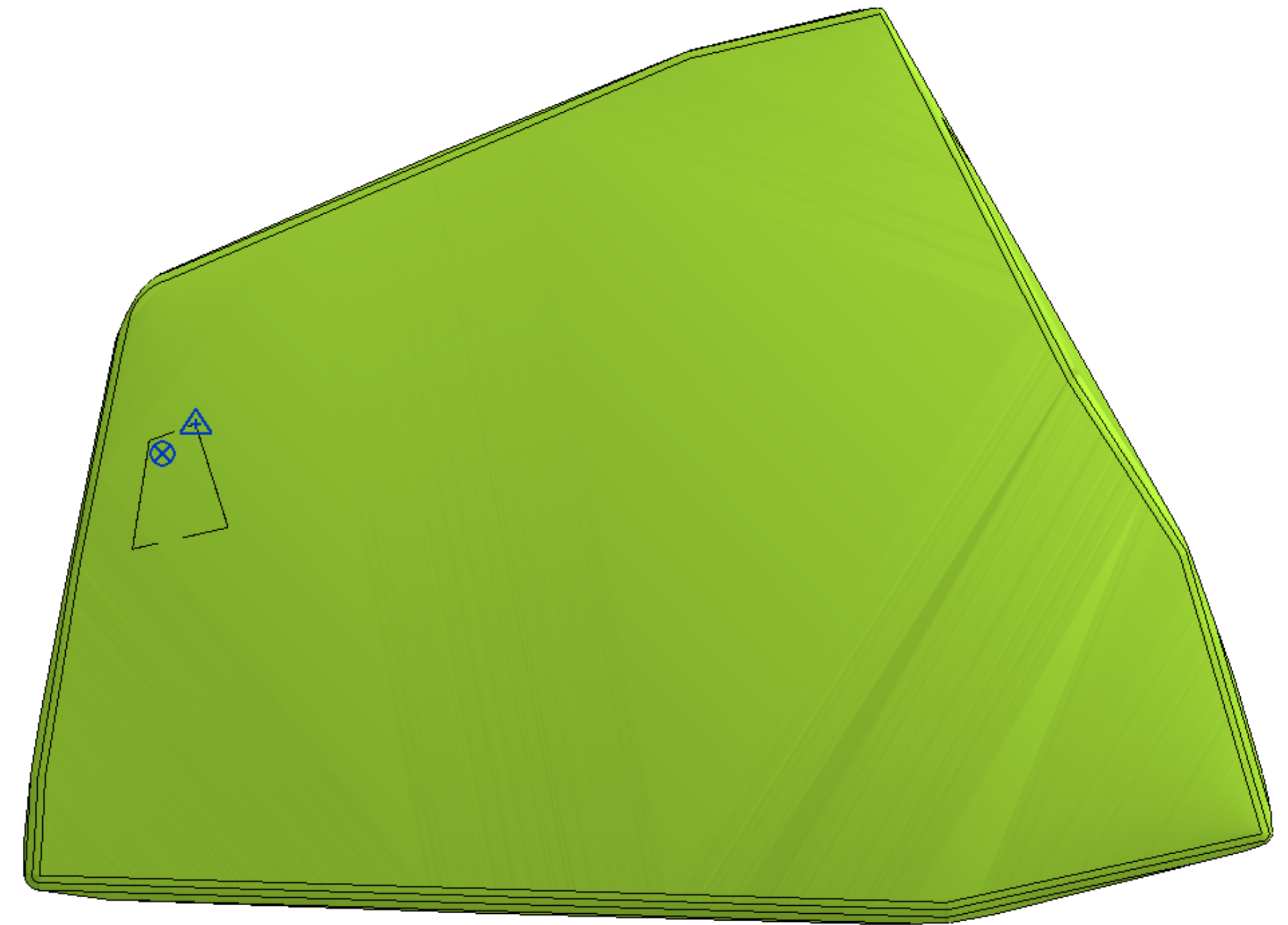
- Select the toposurface you need to import, if the LandXML contains more than one
- Rename the toposurface if needed
- Assign the toposurface to a specific project phase
- Import the toposurface



Import LandXML Using Site Designer

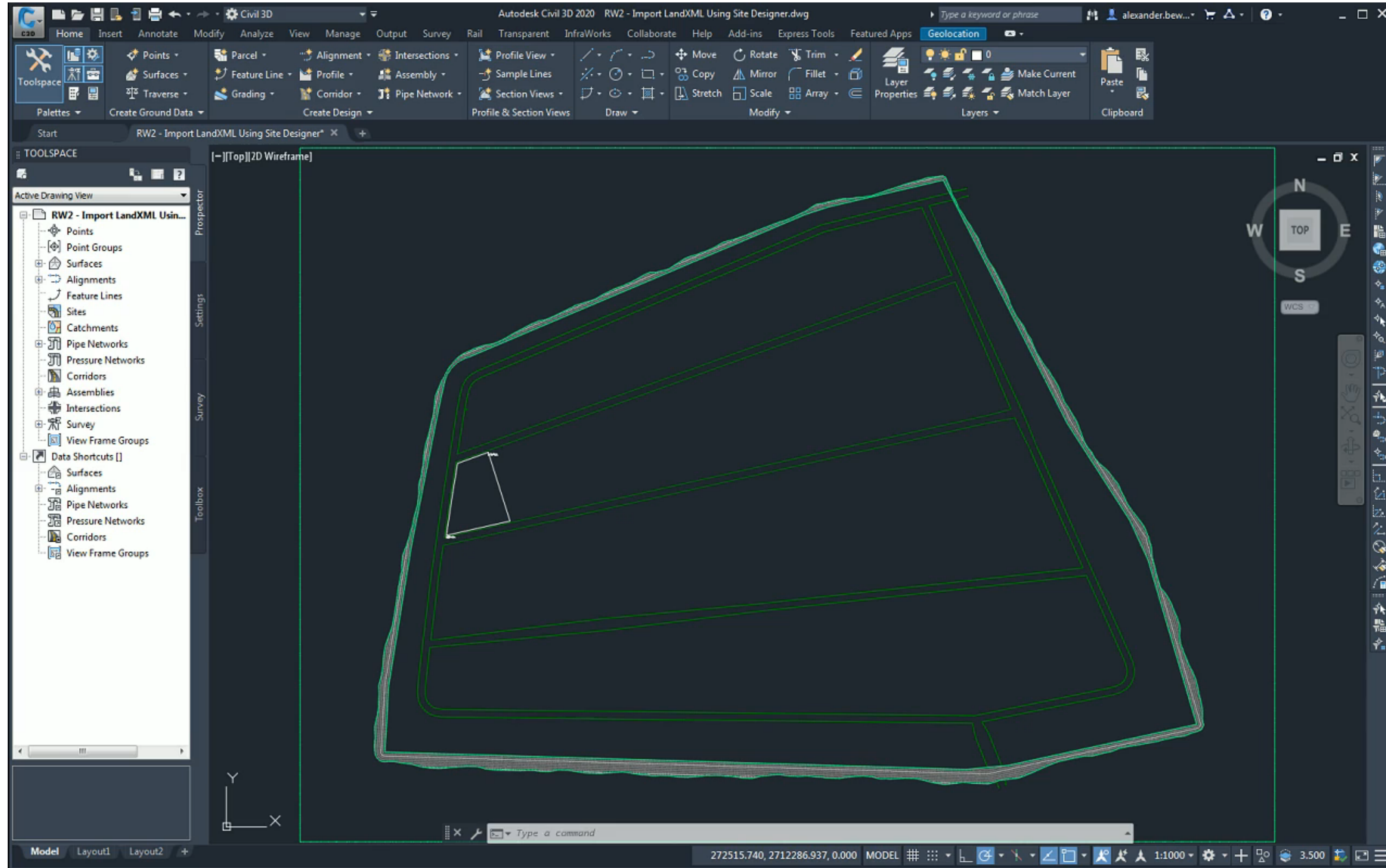
How to import LandXML toposurface in Revit

- Open the view > Floor Plan > Site
- The toposurface should be located at the correct position
- Note: when importing topography via LandXML, Revit retriangulates the toposurface and it could create less accurate surface, so make sure to double-check the final result



Import LandXML Using Site Designer

Video – Import a LandXML toposurface in Revit



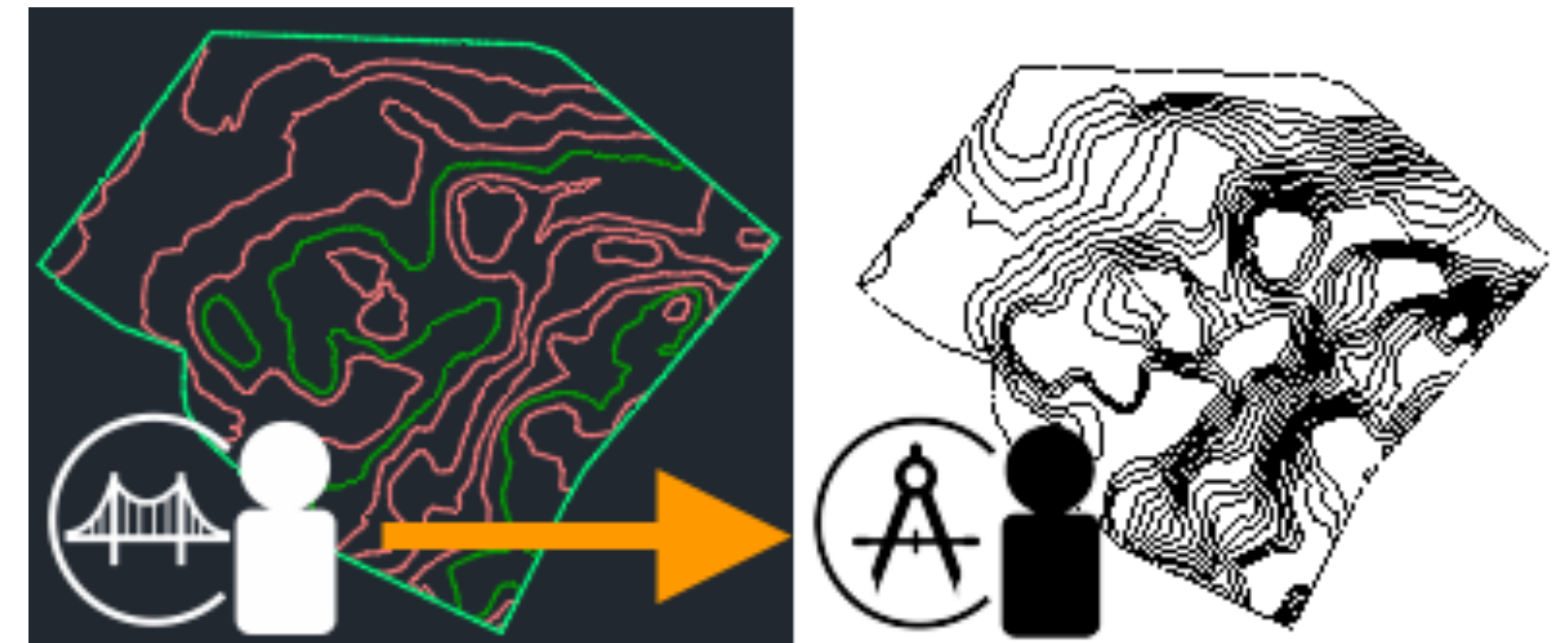
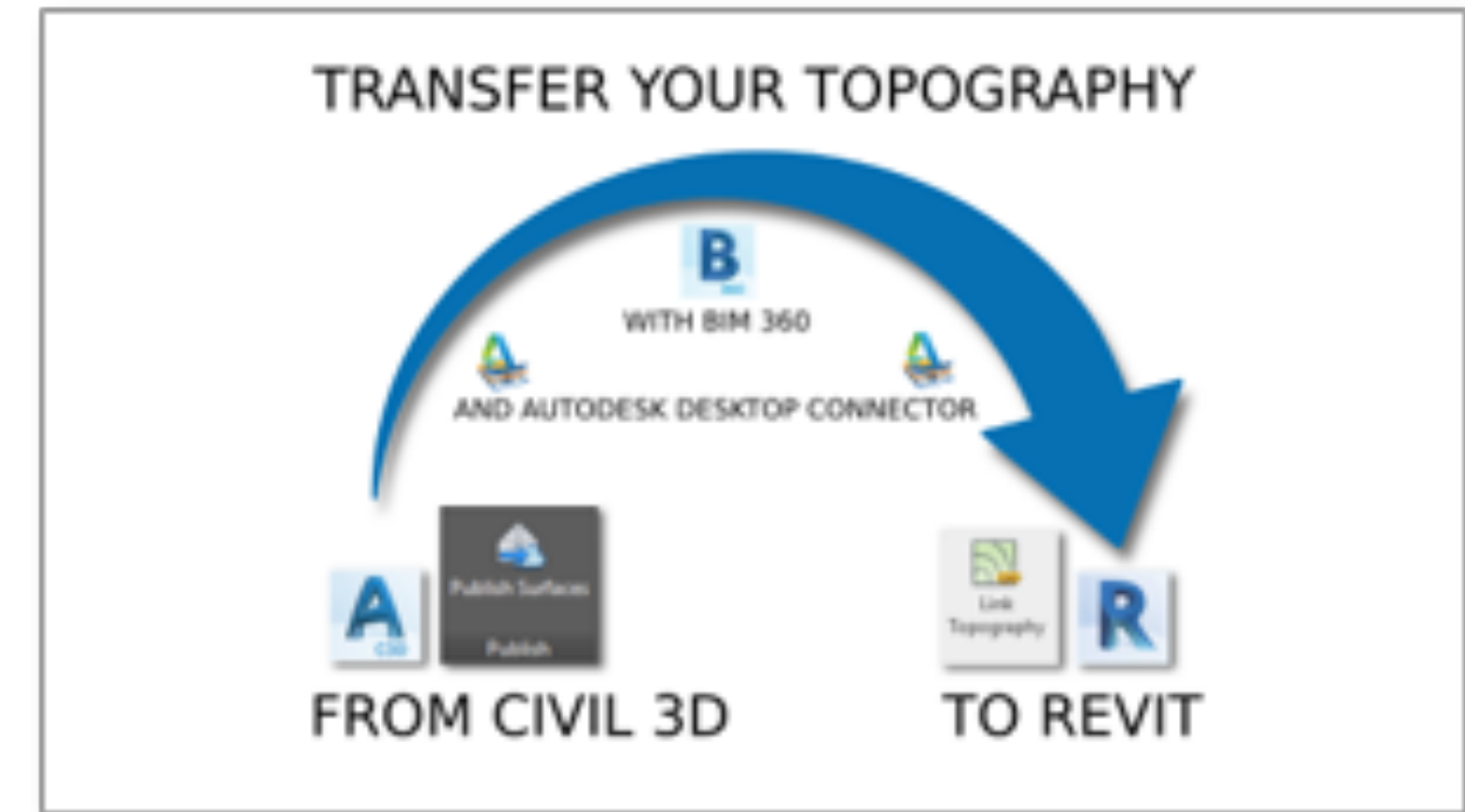
Collaborate with Revit

(RW03):
Acquire Coordinates

Link Civil 3D Topography in Revit

Civil 3D to Revit

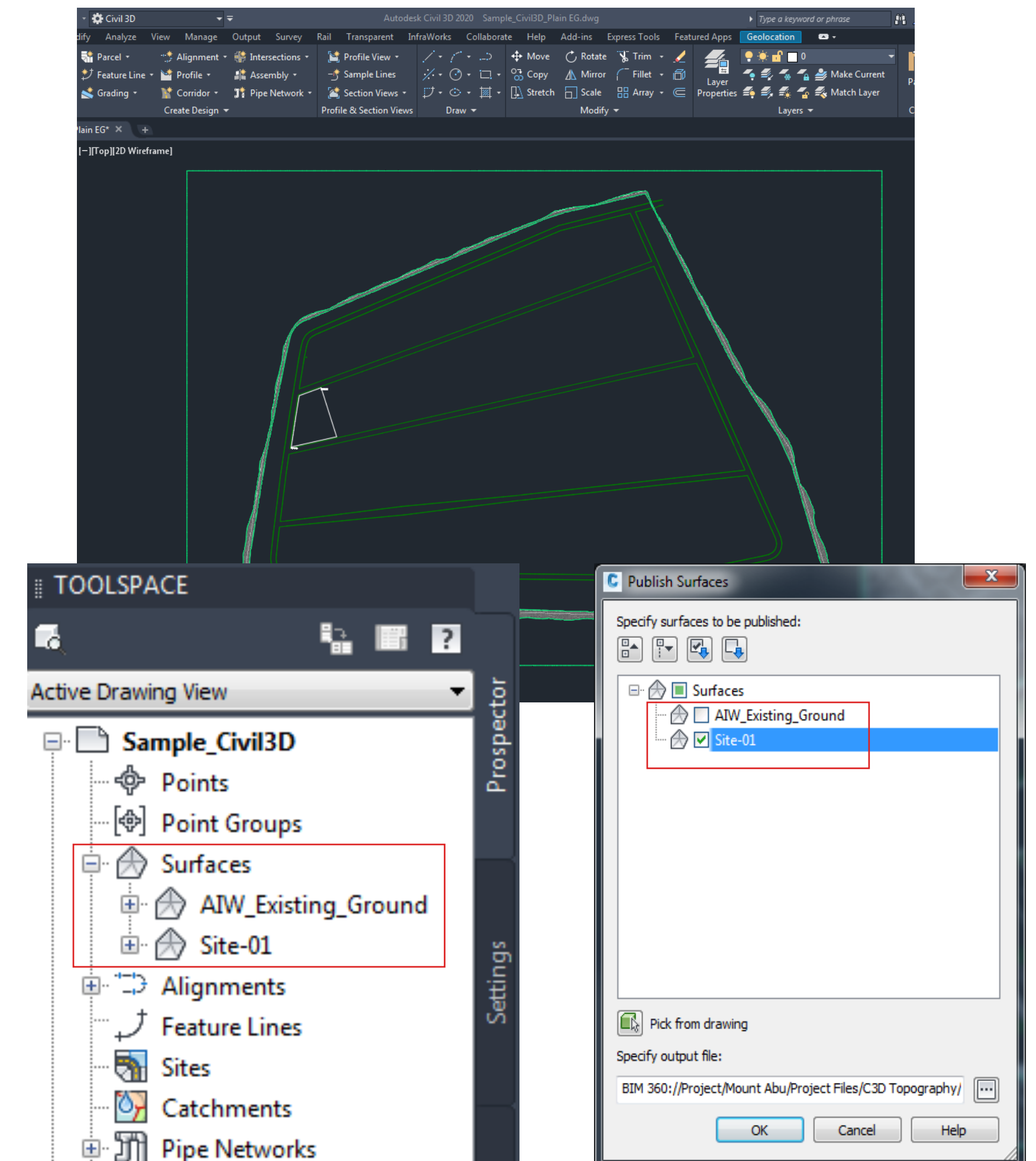
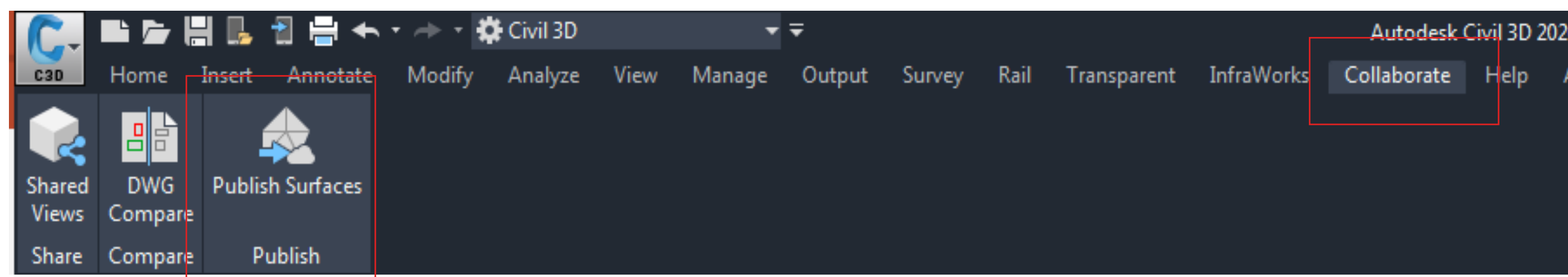
- To streamline the process of developing, using, and sharing topography data for a project, Revit supports interoperability workflows with Civil 3D
- When a civil engineer creates topography data for a project and you want to reference it for a building model, you can link the topography to Revit
- For this workflow you need following products/services:
 - Civil 3D
 - BIM 360 Docs
 - Autodesk Desktop Connector
 - Revit



Link Civil 3D Topography in Revit

The civil engineer uses Civil 3D to do the following:

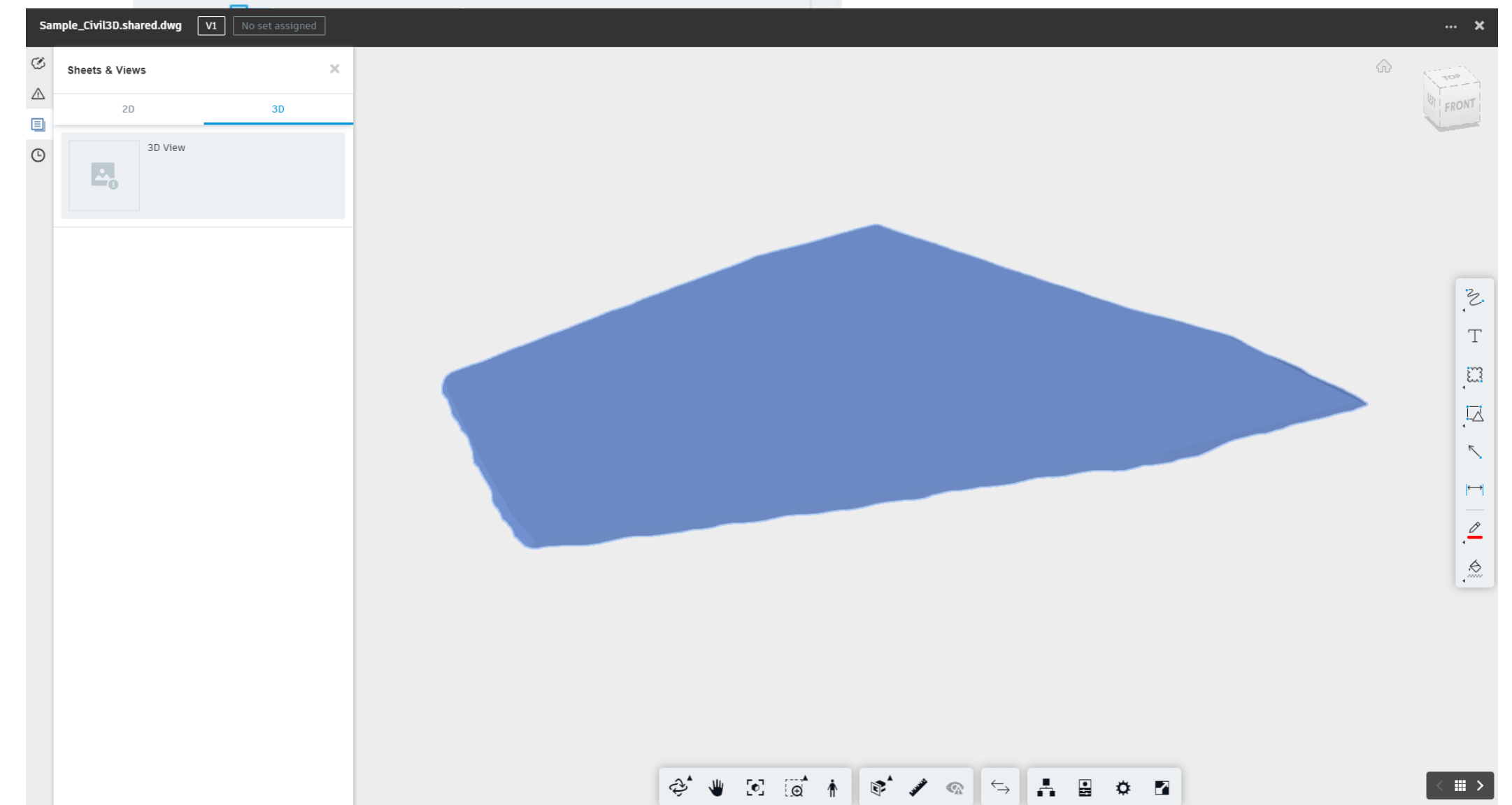
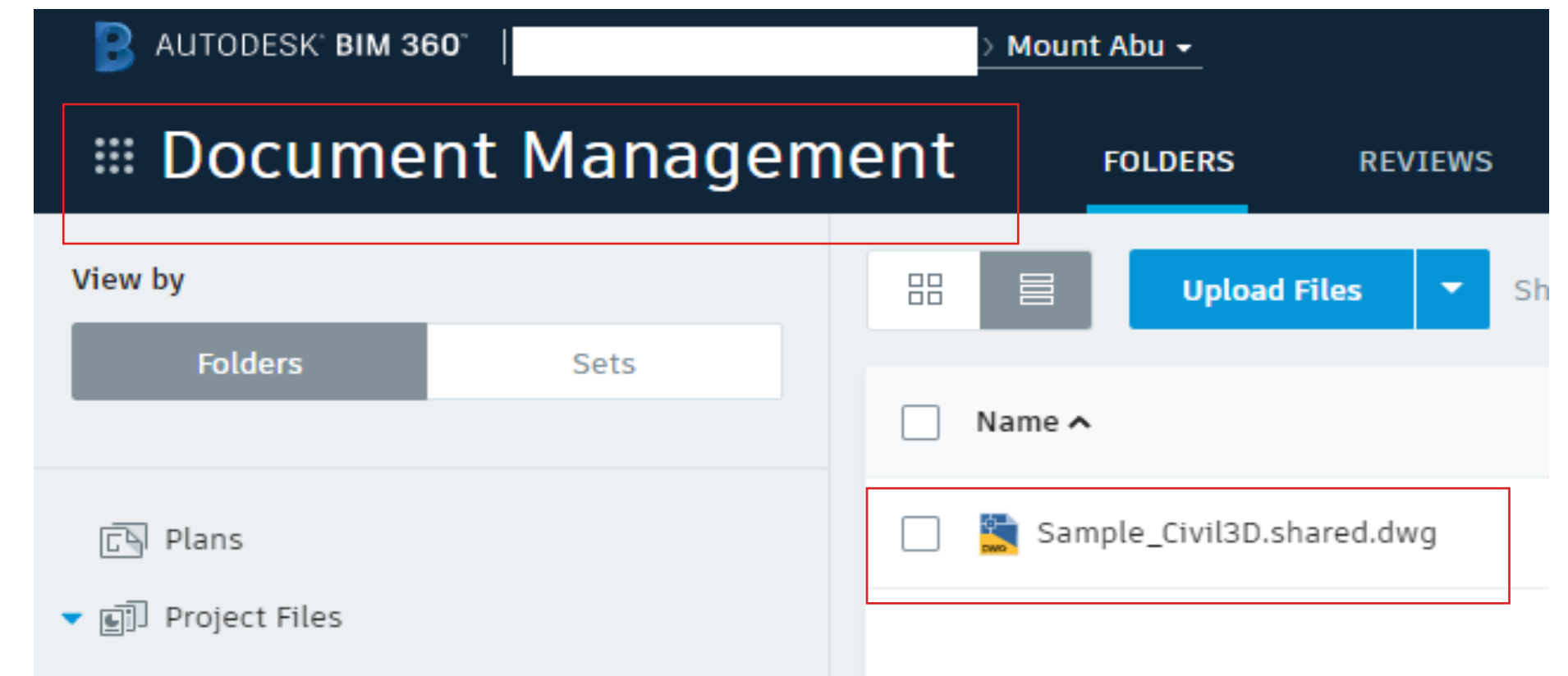
- Develop the topography
- Publish surfaces to a BIM 360 project:
 - Open the drawing with required topography
 - Collaborate tab > Publish surfaces
 - Select a surface to export
 - Specify the output file
 - Publish the existing surface for further use in Revit or BIM 360



Link Civil 3D Topography in Revit

What to do in BIM360 Docs

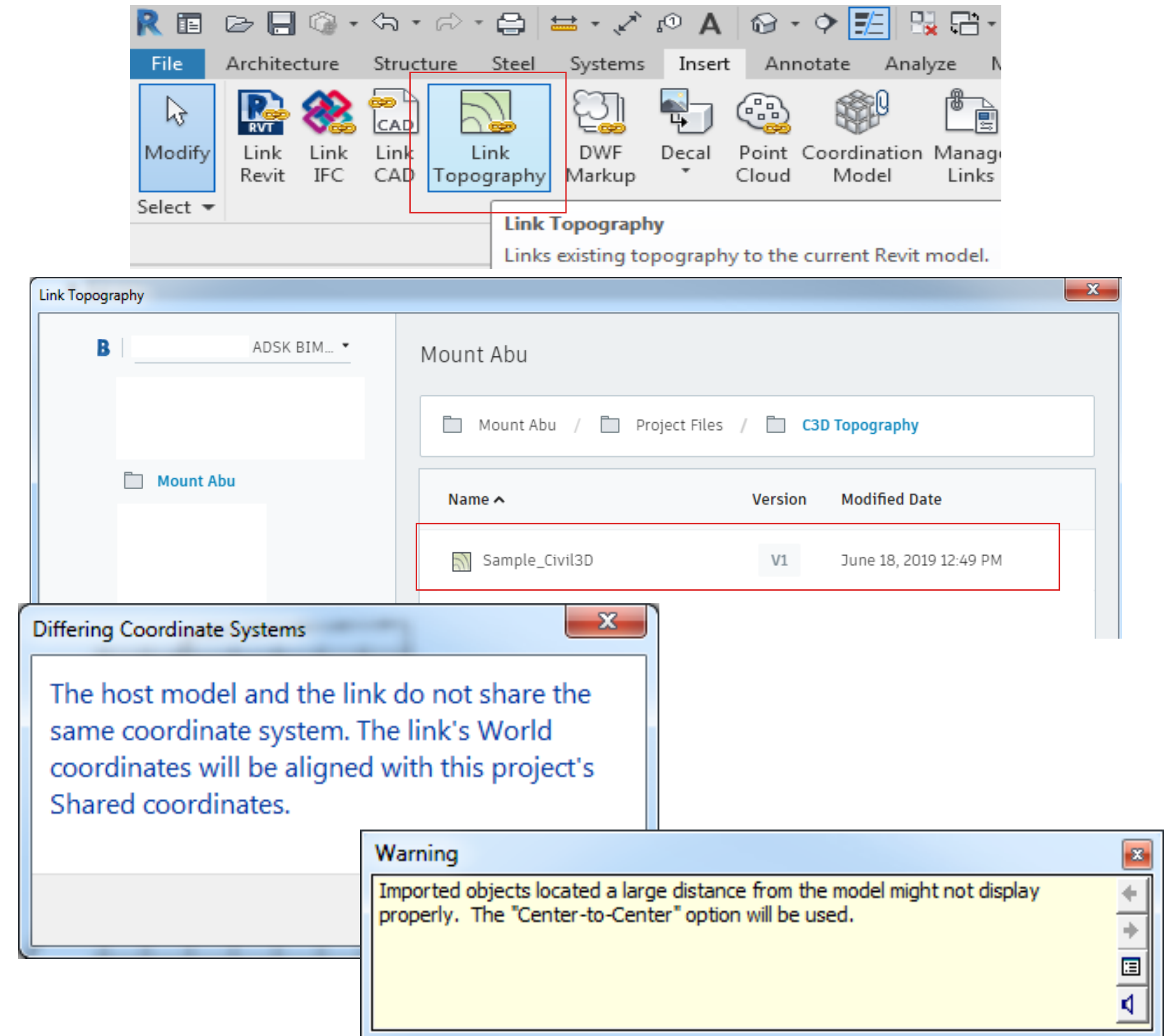
- Open your BIM 360 project & open the Document Management module
- Open the directory with the published topography
- Open the shared DWG file
- As for all documents in BIM 360 you can:
 - Create mark-ups
 - View properties
 - Compare different versions
 - Section 3D drawing/model
 - Etc...



Link Civil 3D Topography in Revit

What to do in Revit

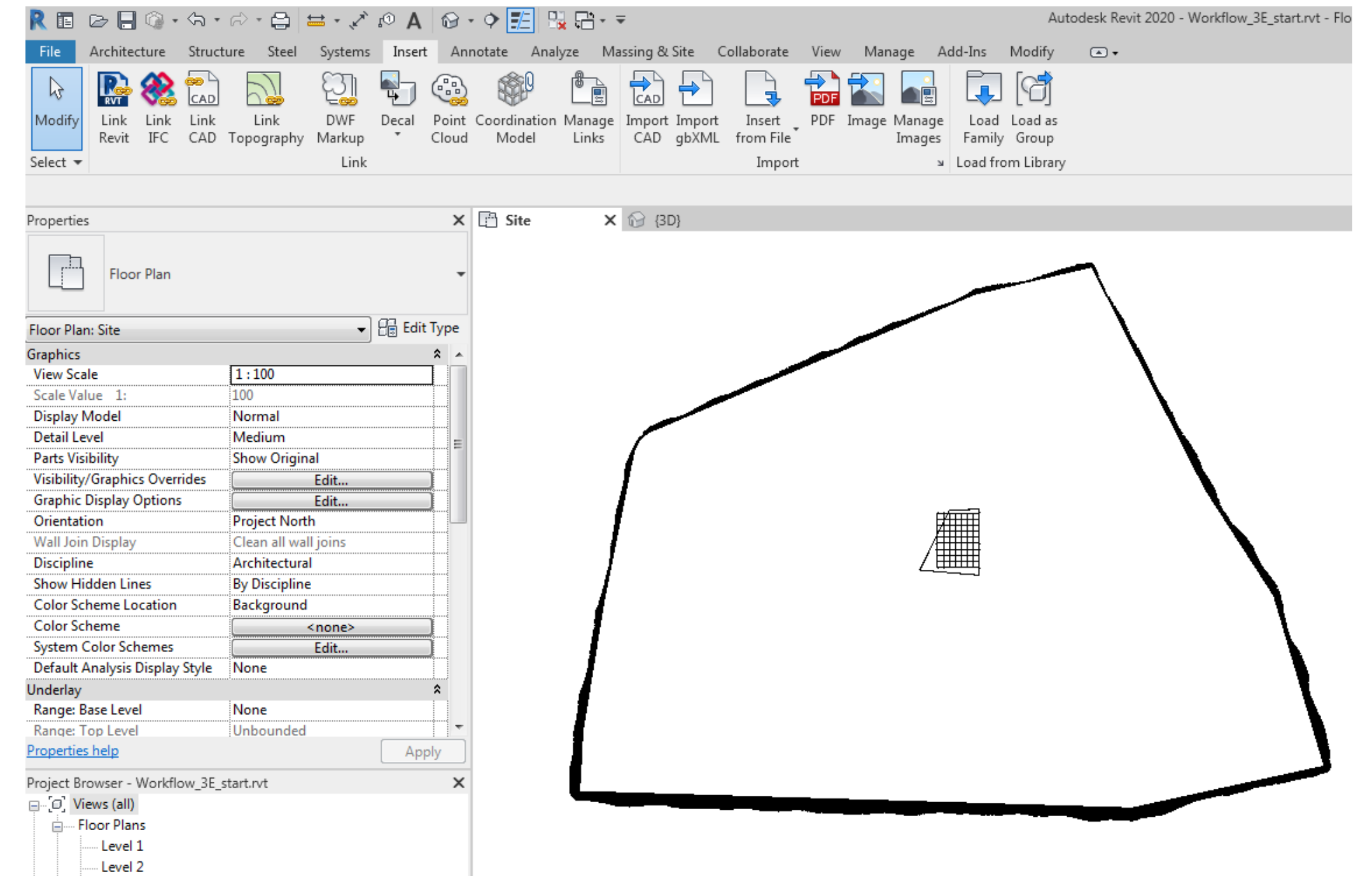
- Start Revit and go to the Insert tab
- Link > Link Topography
- Pick up the topography in BIM 360 project
- Link the chosen topography
- Close the Differing Coordinate Systems warning, Revit will assign the coordinates automatically, usually using “Center-to-Center”
- Important - For the other workflows do not insert/link CAD drawing or Revit model "By Shared Coordinates" when linking first time!



Link Civil 3D Topography in Revit

Acquire the coordinates from Civil 3D topography or a DWG

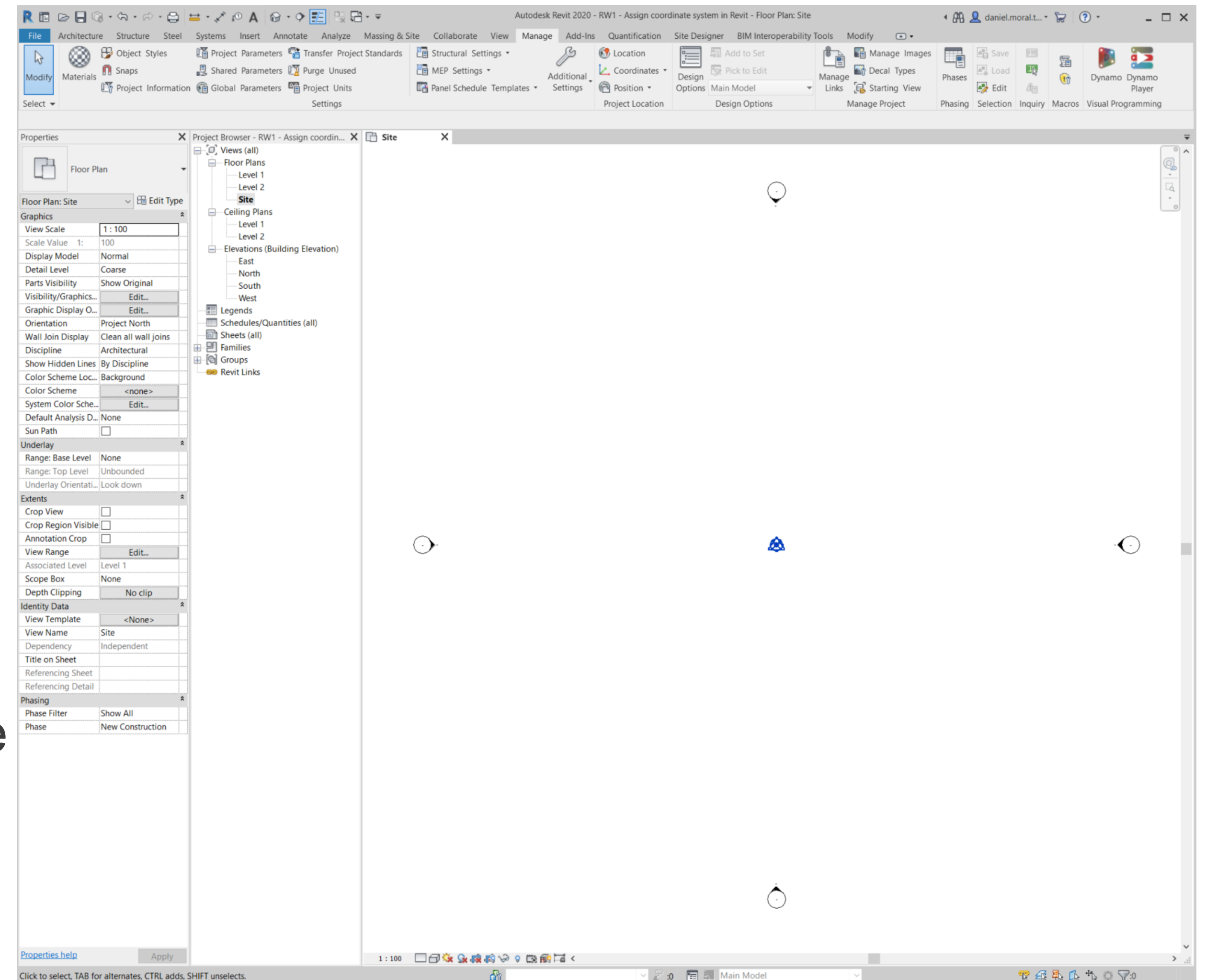
- Following steps showing acquiring coordinates are valid for any C3D topography (via BIM360) or DWG files
- When you want to link a Civil 3D DWG file directly, make sure to set the PROXYGRAPHICS=1 in Civil 3D
- Go to a Floor Plan (Site Plan recommended)
- Zoom All
- Now you can see the linked topography



Assign Coordinates in Revit

Display the survey point

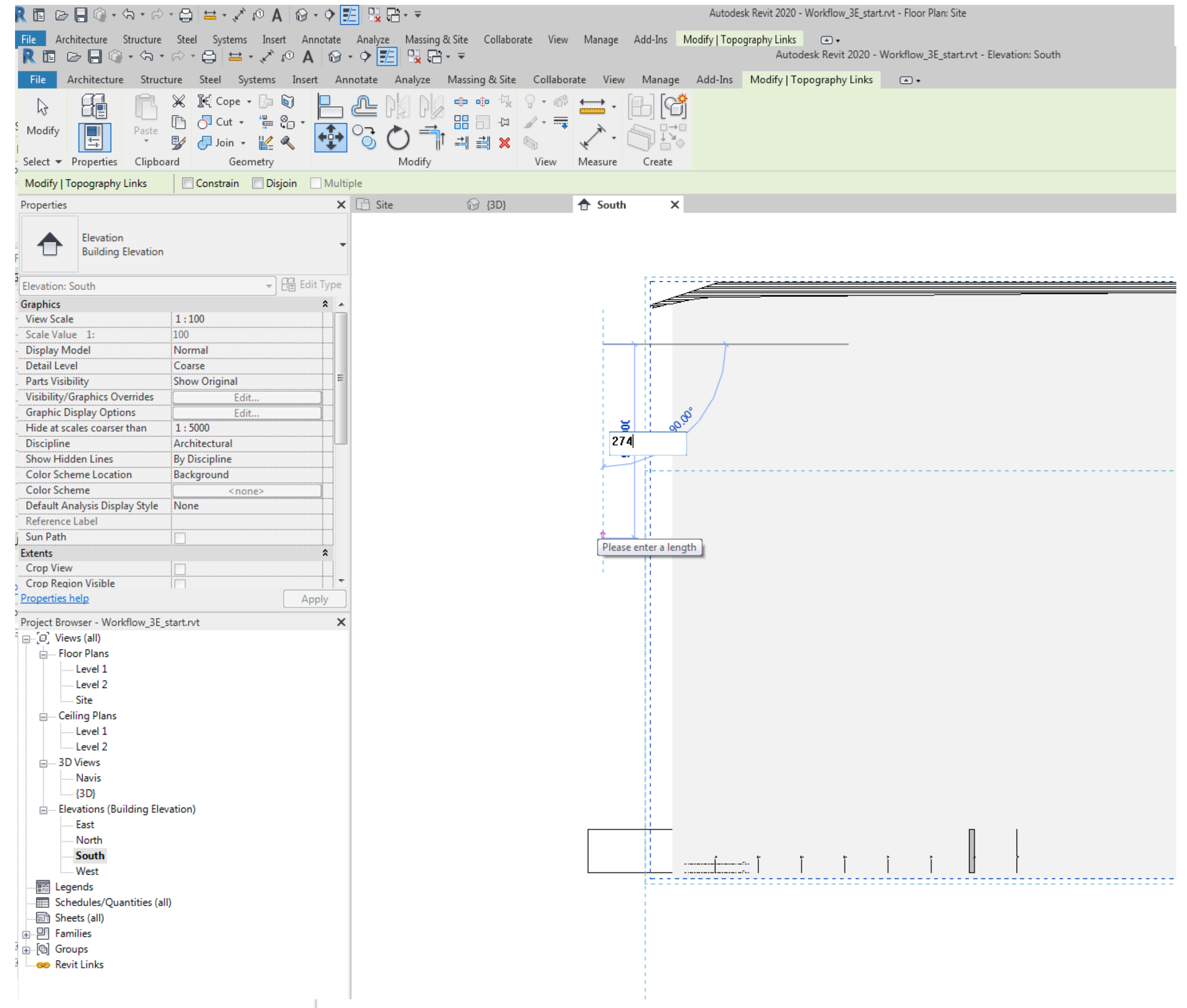
- Go to any floor plan
(site plan recommended)
- Open “Visibility and Graphic Display” dialog
- Display survey point 
- Display project base point (optional) 
- Revit internal origin, project base point and survey point are at the starting of a project all situated in the same place (0,0,0)



Link Civil 3D Topography in Revit

Moving topography

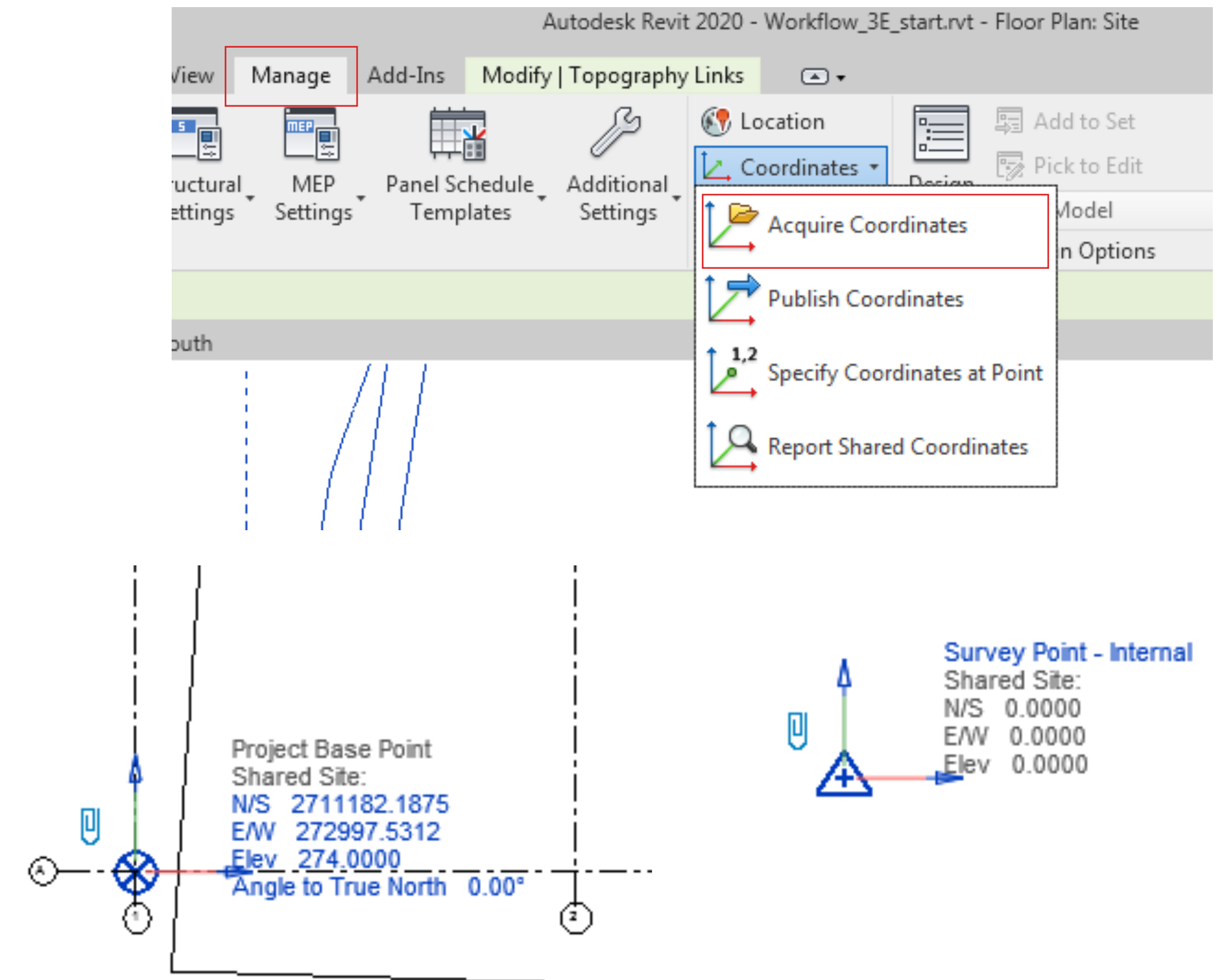
- Drag or Move the linked topography to the desired location (the corner of a property line, etc.) in a Floor Plan
- Drag or Move the linked topography to the desired location (the corner of a property line, etc.) in Elevation or Section



Link Civil 3D Topography in Revit

Acquire coordinates from a linked file

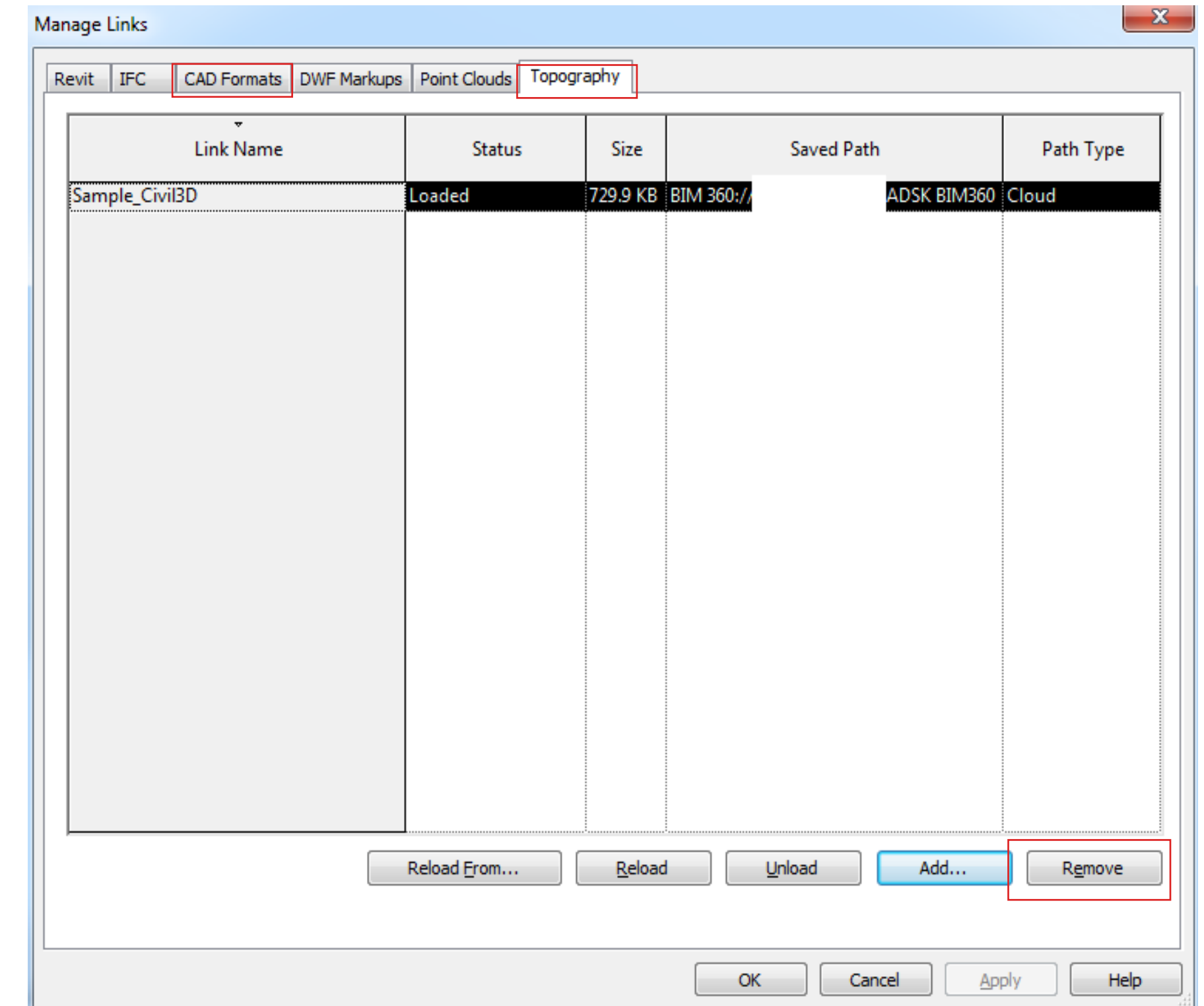
- After you positioned the linked topography/DWG at the desired location, we can start with acquiring coordinates
- Go to Manage > Project Location > Coordinates > Acquire Coordinates
- Select the linked file
- Now the coordinates from the linked file are acquired
- Select the Project Base Point and check the modified coordinate values
- The Survey Point should still be at 0,0,0



Link Civil 3D Topography in Revit

Removing the link

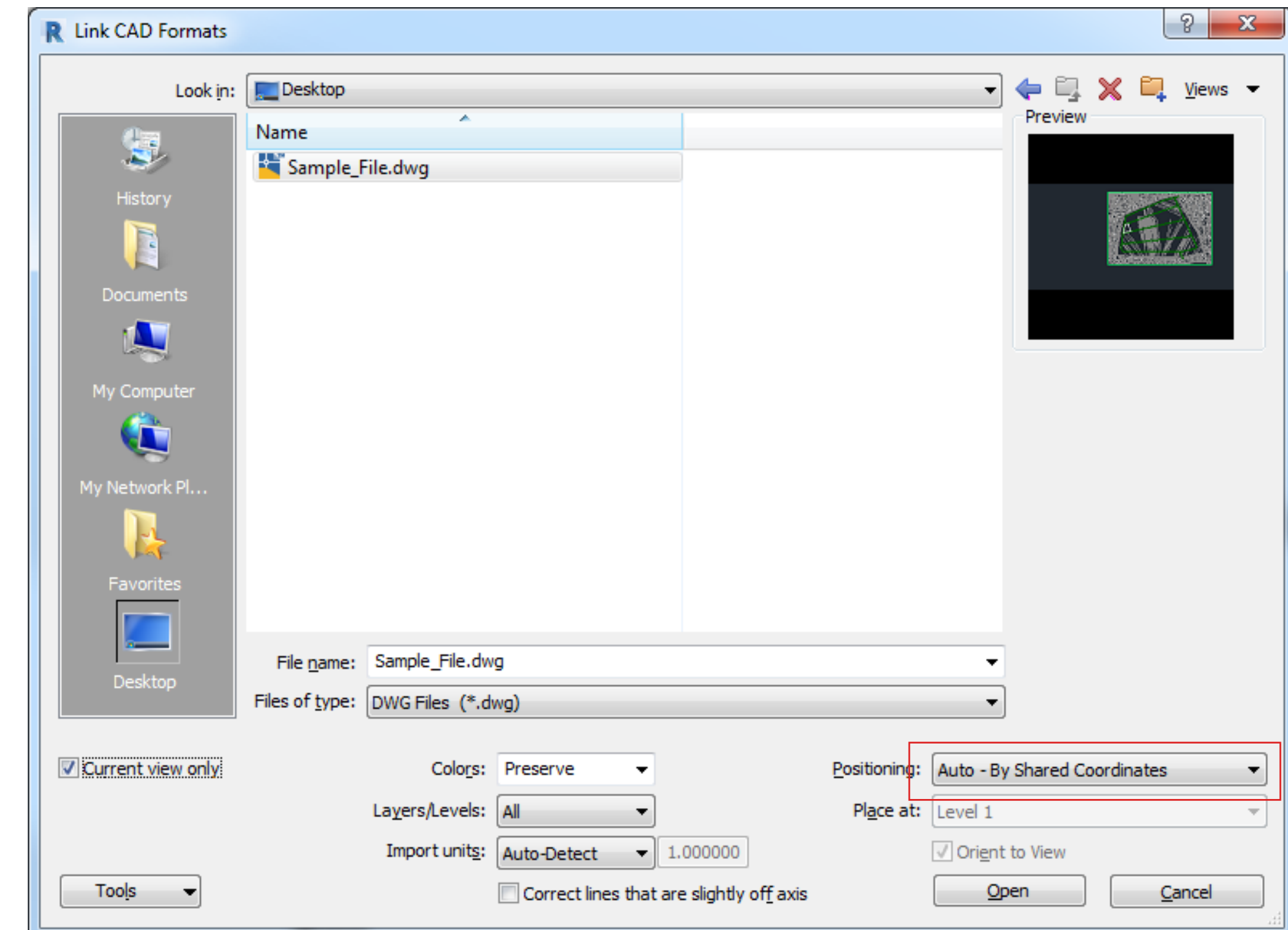
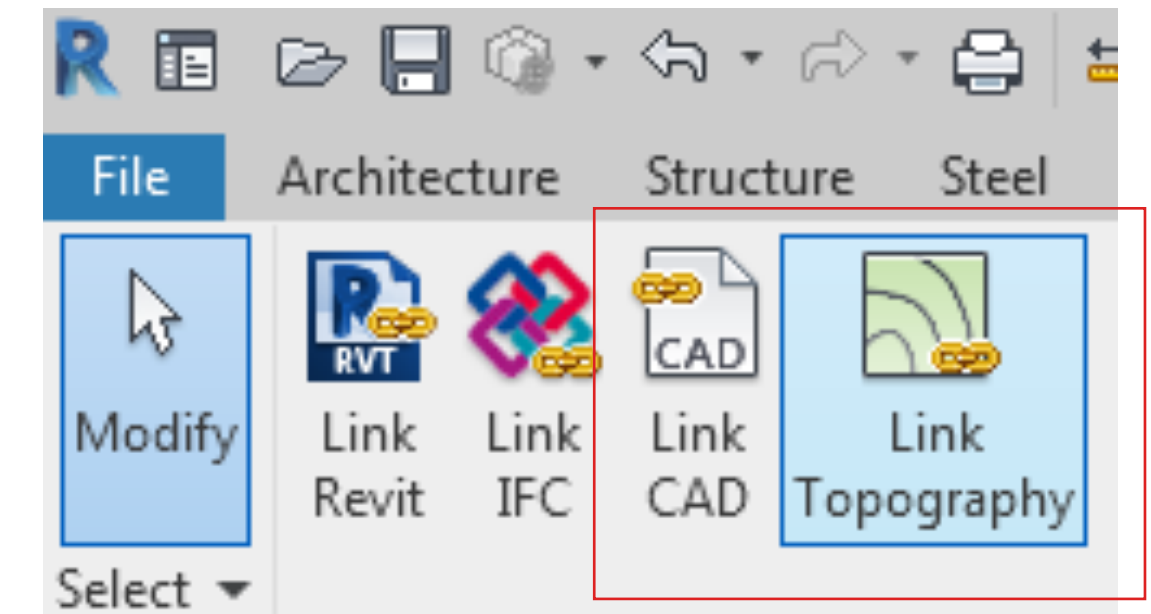
- In order to control the successful acquiring of coordinates, remove the linked topography/DWG and re-link it:
 - Manage > Manage Links > Topography/CAD Formats
 - Select the linked file and remove it
- This step is not only for checking, it is necessary for the DWG in order to get the file linked by newly created Shared Coordinates



Link Civil 3D Topography in Revit

Re-linking by Shared Coordinates

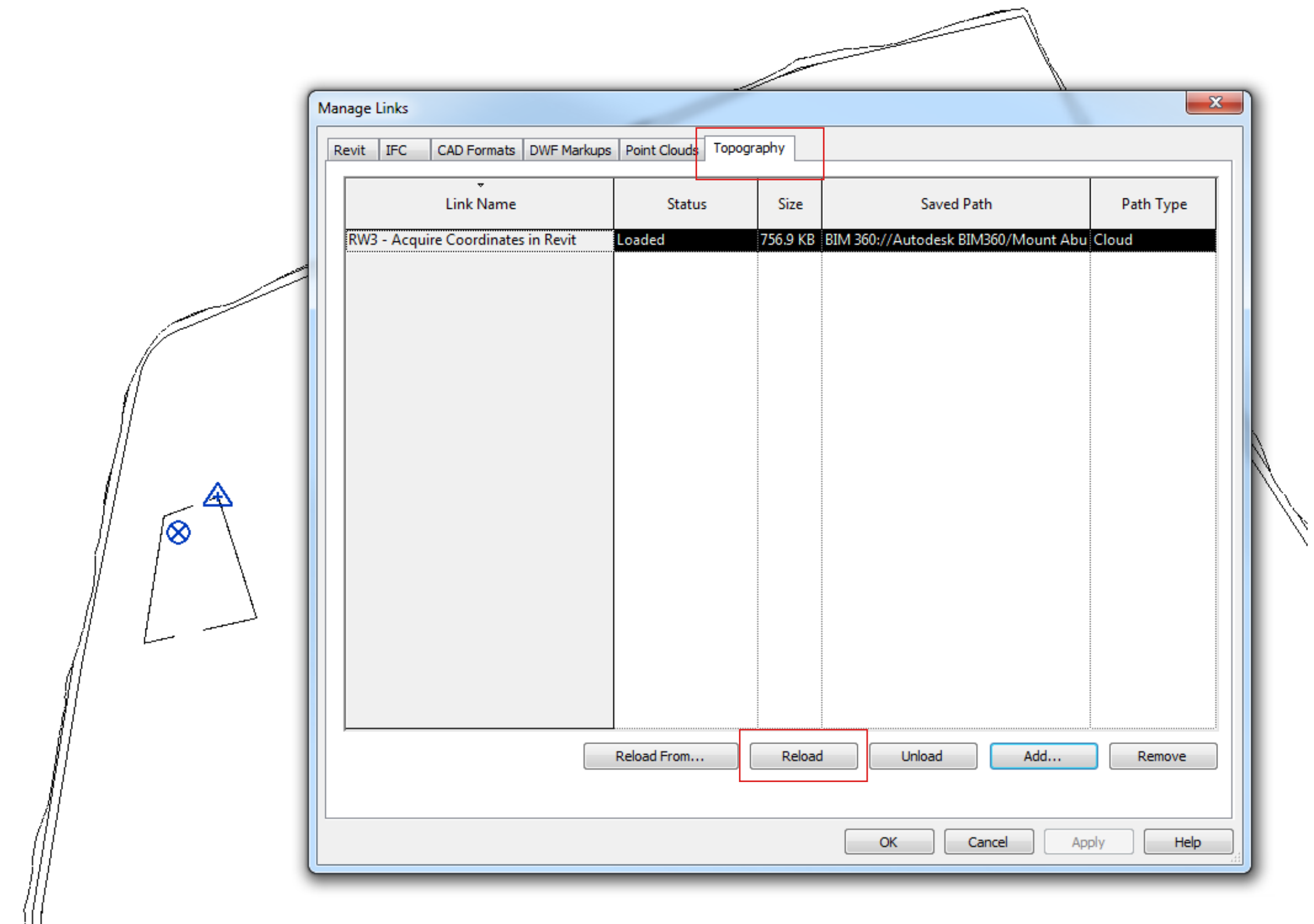
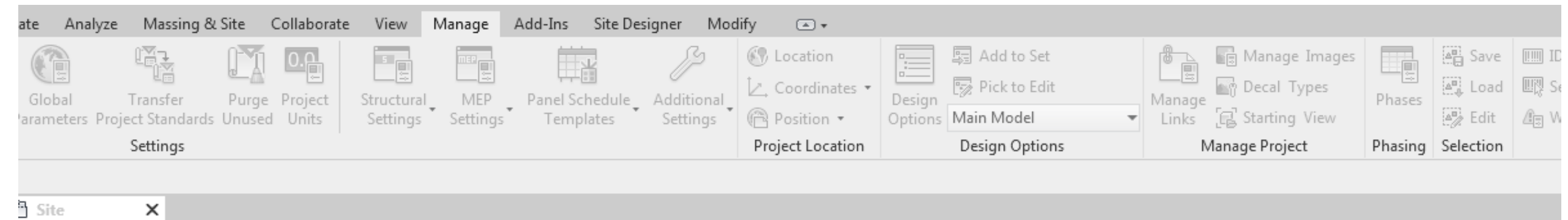
- Now re-link the topography/DWG
- For the topography the linking will be handled automatically by Revit
- For the DWG use the option “Auto – by Shared Coordinates”
- Finally the re-linked file should appear at the correct location, specified in the previous steps without any manual adjusting



Link Civil 3D Topography in Revit

Reloading a new version of topography

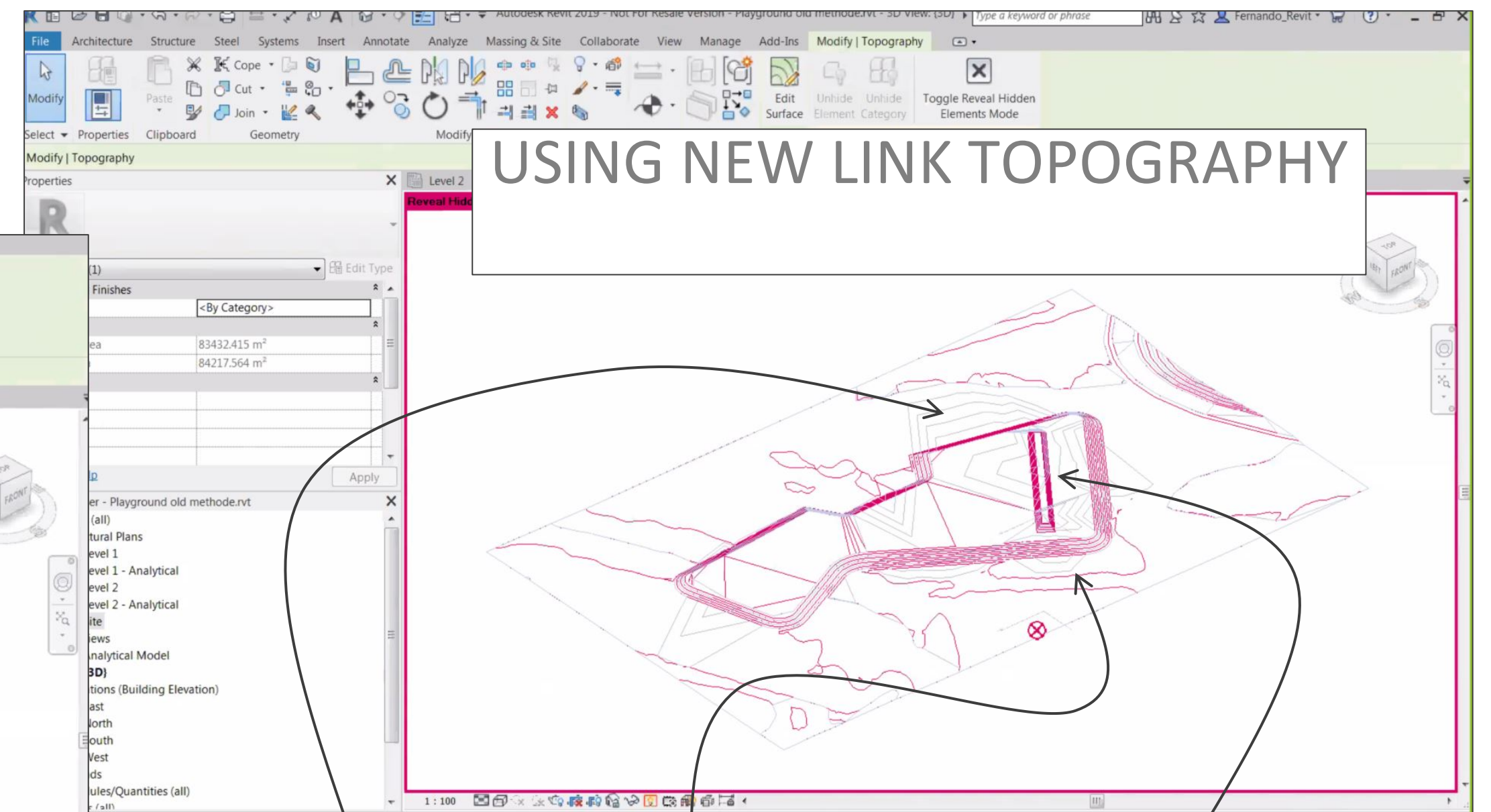
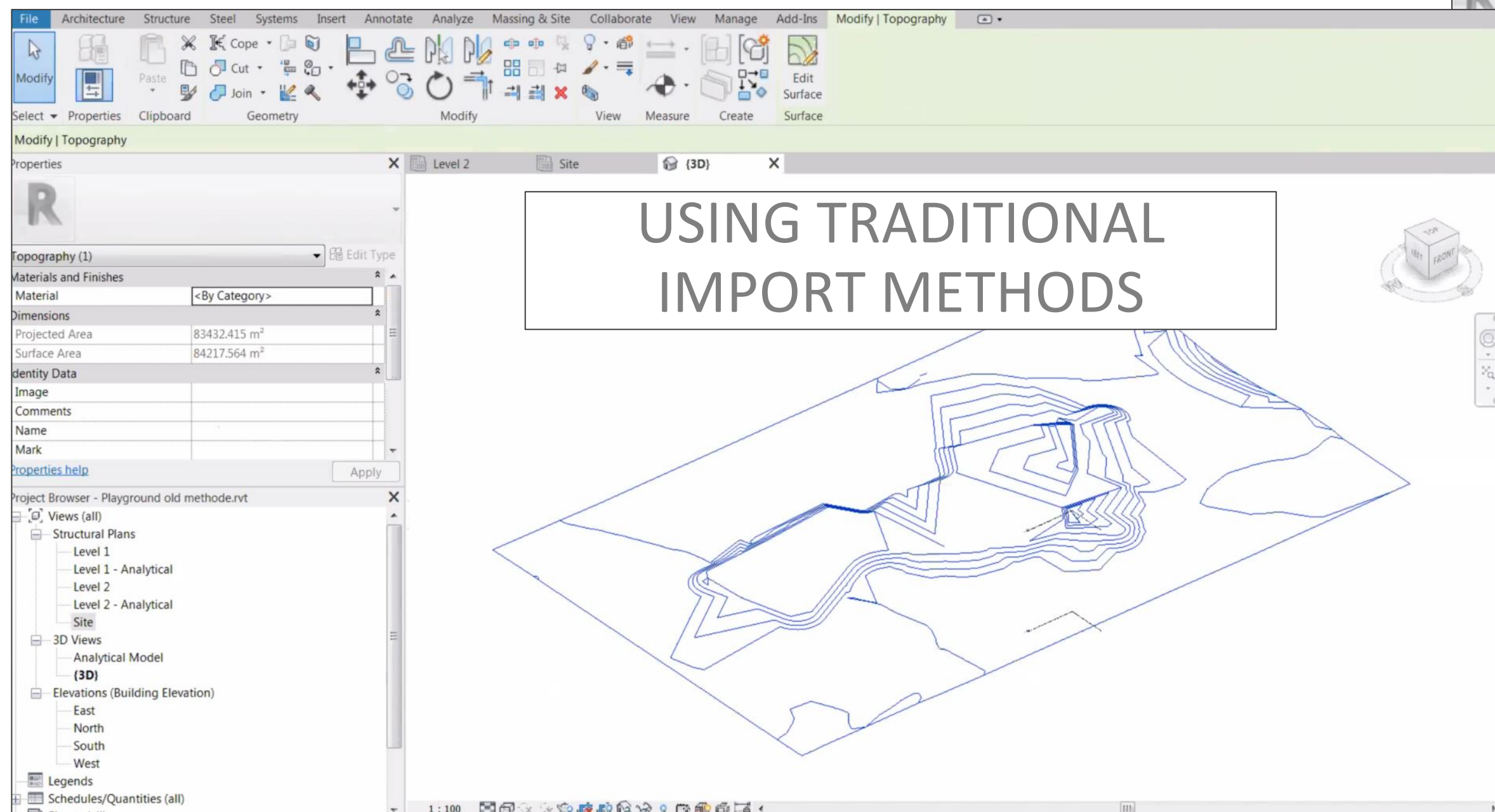
- The BIM 360 workflow greatly improves the workflow for topography transfer from civil engineers to architects
- You can make changes in Civil 3D and then upload as described in the previous process to BIM 360
- In Revit, just use reload or reload from and link topography again



Link Civil 3D Topography in Revit

What method assures the best representation?

- Using the Link Topography workflow assures an accurate representation of topography from Civil 3D surfaces in Revit. Compare the results of the same surface data in the images below:



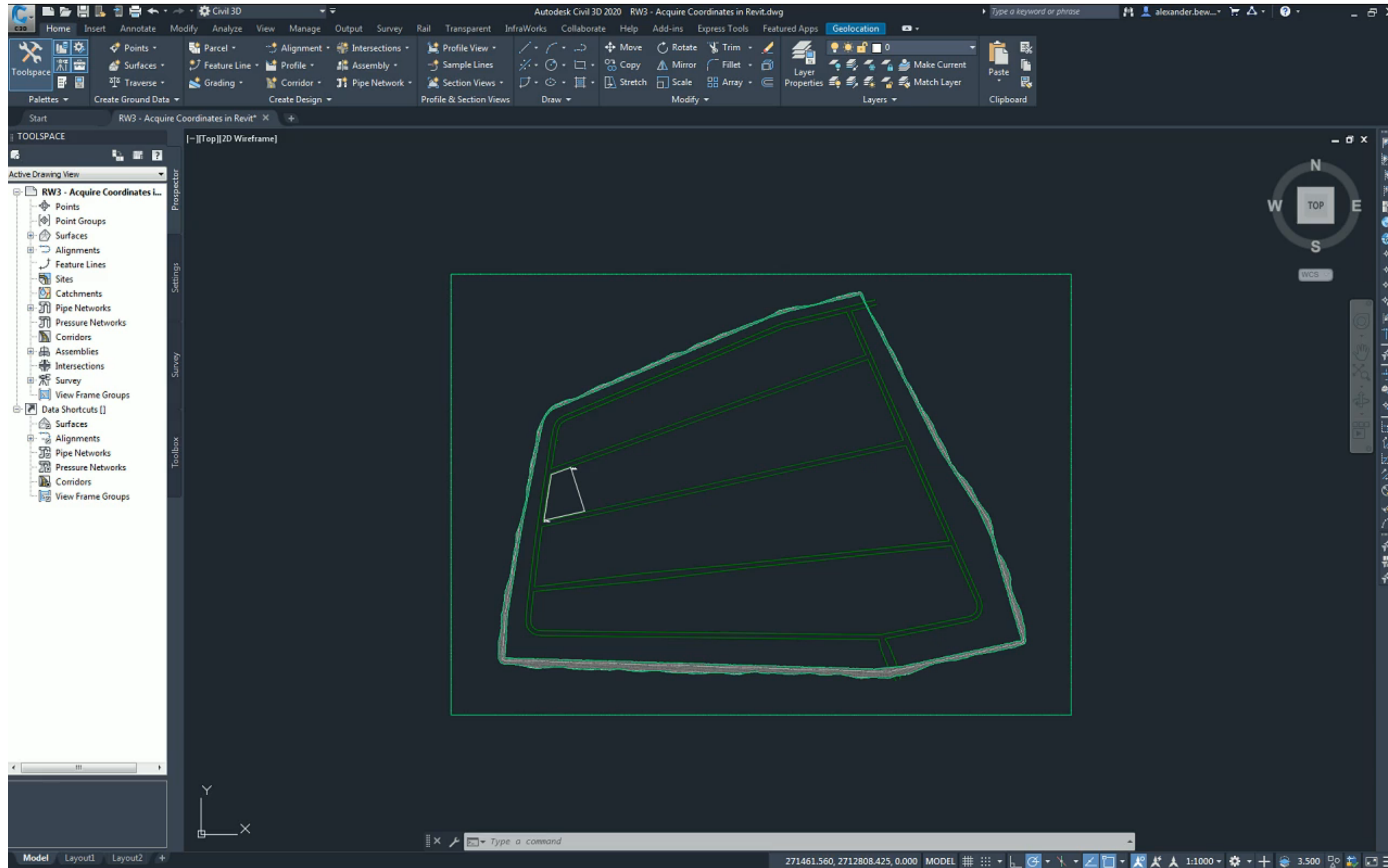
TIN triangulation is maintained

Boundaries and cut-outs remain

Break lines, steep slopes and fills are not destroyed

Link Civil 3D Topography in Revit

Video – Linking Civil 3D topography in Revit using BIM 360



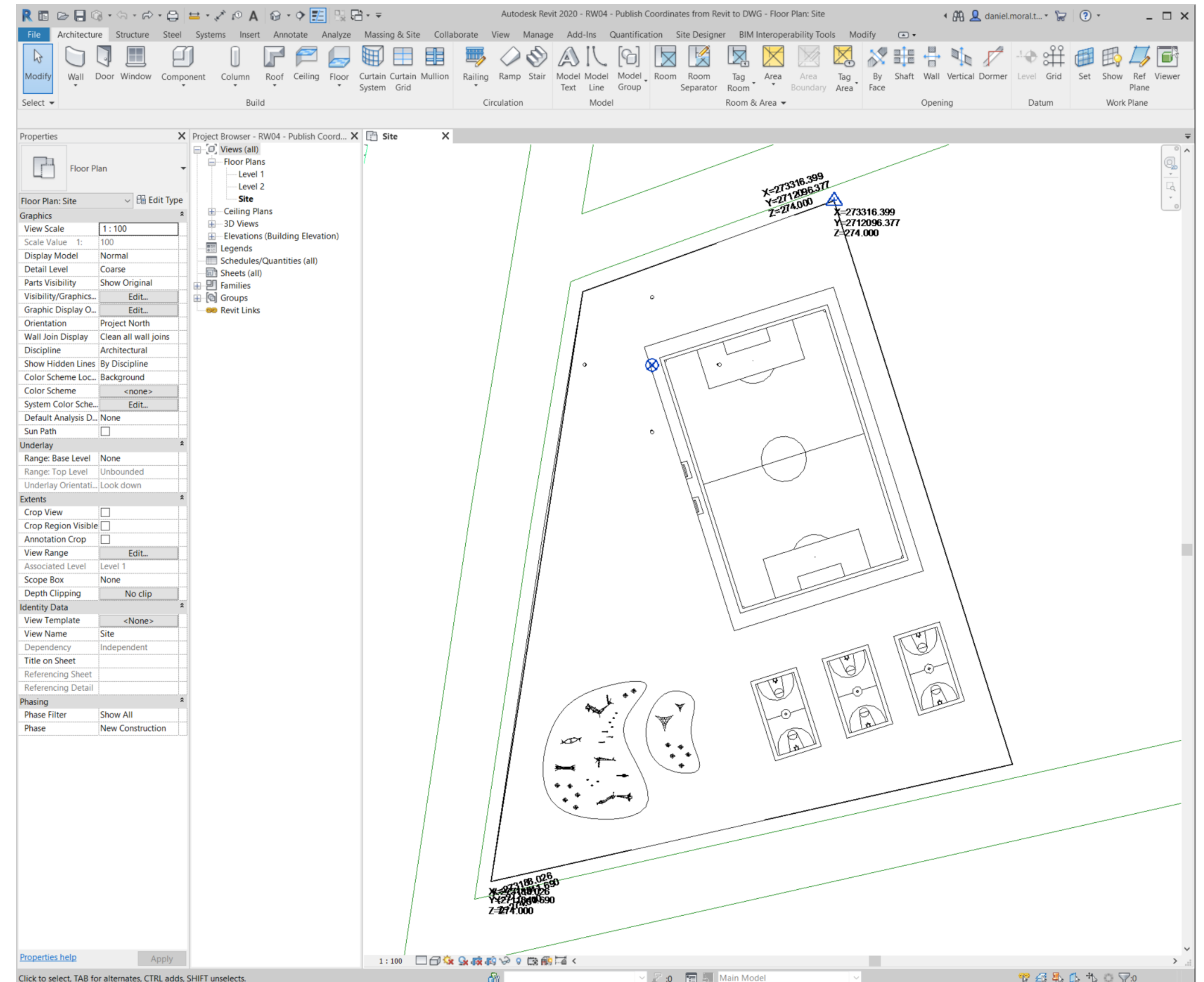
Collaborate with Revit

(RW04):
Publish Coordinates from Revit to DWG

Publish Coordinates from Revit to DWG

Get your models and drawings files easily connected to Revit

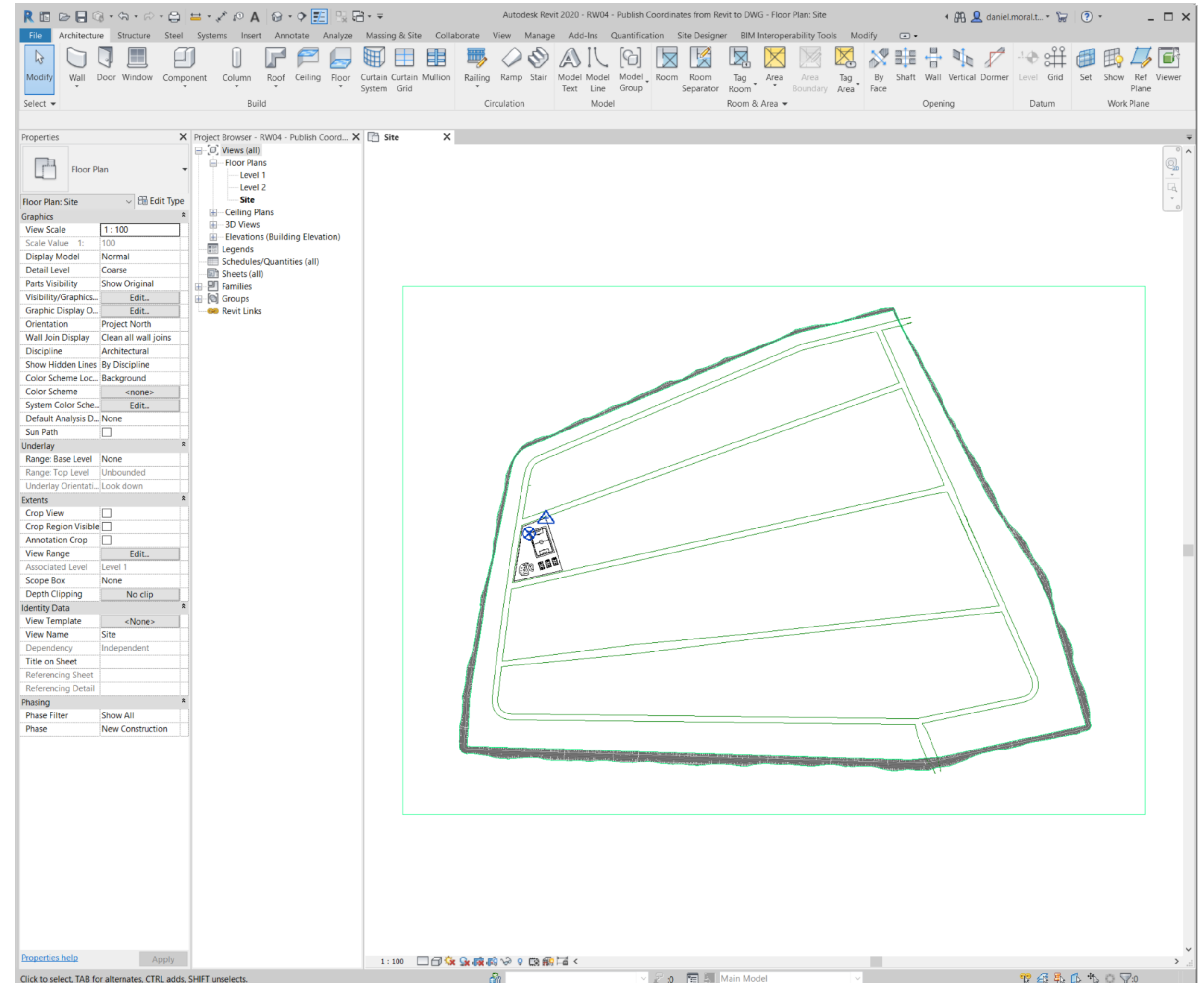
- When you publish shared coordinates from a host model to a link, the linked model/drawing is updated with the new coordinates
- The host model's True North and shared origin are recorded in the linked model/drawing, based on the current position of the linked instance
- This location is now applied in both host model and the link. More than one position of the link can be created and used
- The shared coordinates establish the relative locations of the models or drawings



Publish Coordinates from Revit to DWG

Bring the DWG to correct place in the Revit model

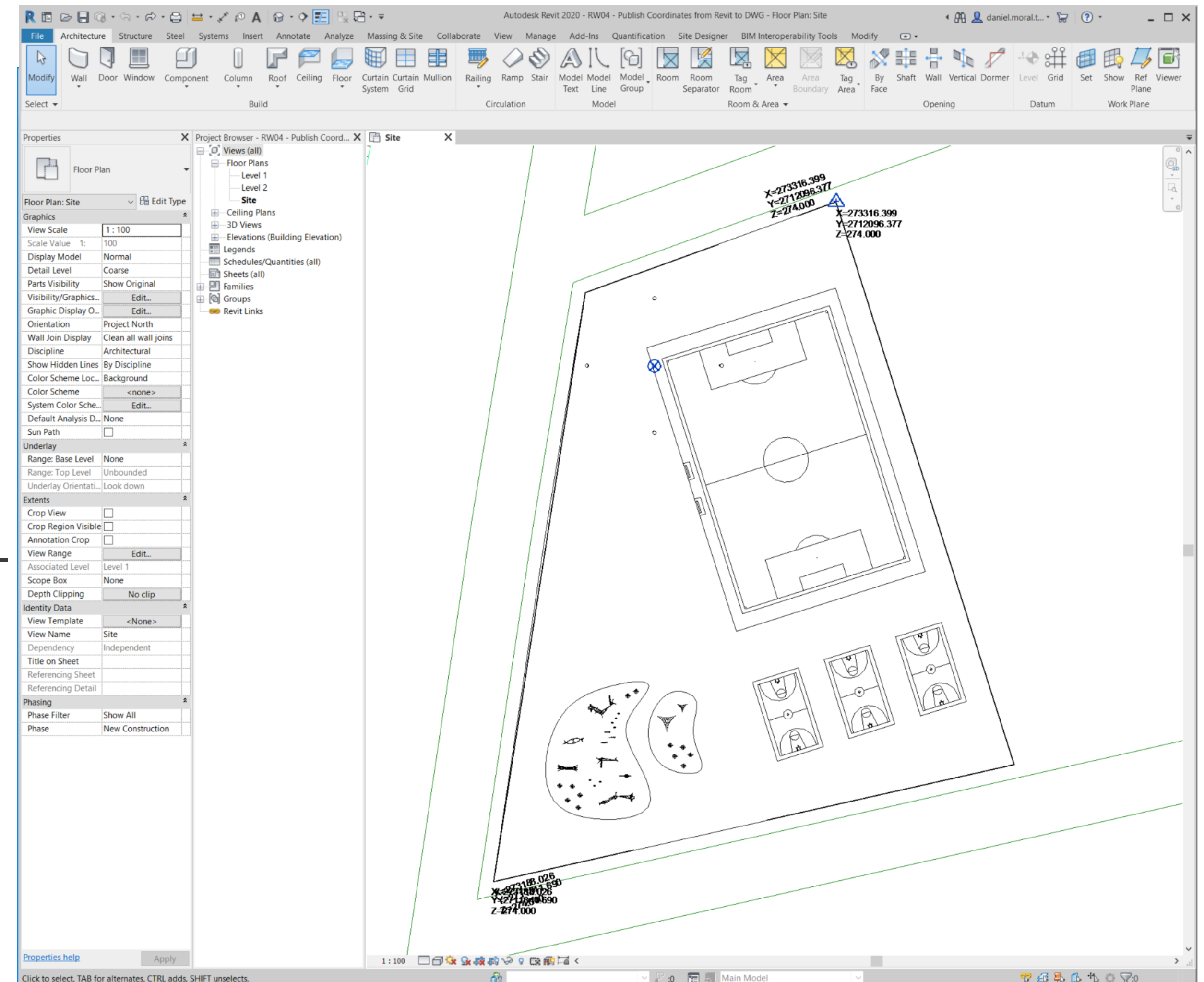
- This workflow continues from **RW01** as the Revit model has been already relocated by specifying coordinates
- Now we can publish the Revit model real world coordinates to AutoCAD drawing (or another Revit model)
- Start with the model, used for the workflow **RW01**
- Link DWG into Revit using “Center to Center”
- Align/rotate/move to the right position



Publish Coordinates from Revit to DWG

Publish Coordinates

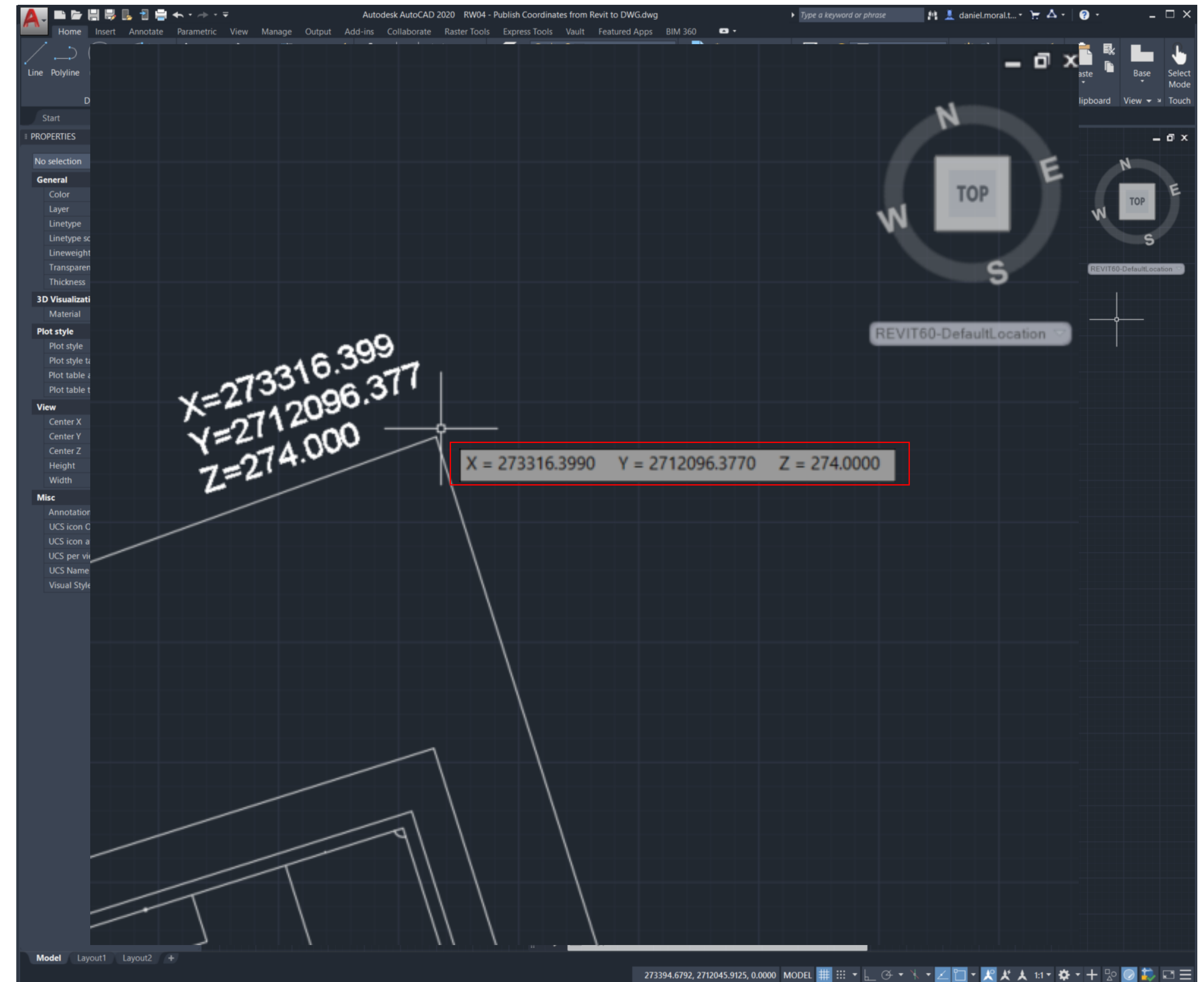
- Publish Coordinates to the DWG
 - > Manage tab > Project Location menu > Coordinates > Publish Coordinates
- Click OK & save the Revit file
- Save – save the new position back to the link (DWG/Revit files must be close)
- Remove the link and re-link it using “Auto – By Shared Coordinates”
- Finally the re-linked file should appear at the correct location, specified in the previous steps without any manual adjusting



Publish Coordinates from Revit to DWG

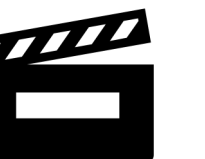
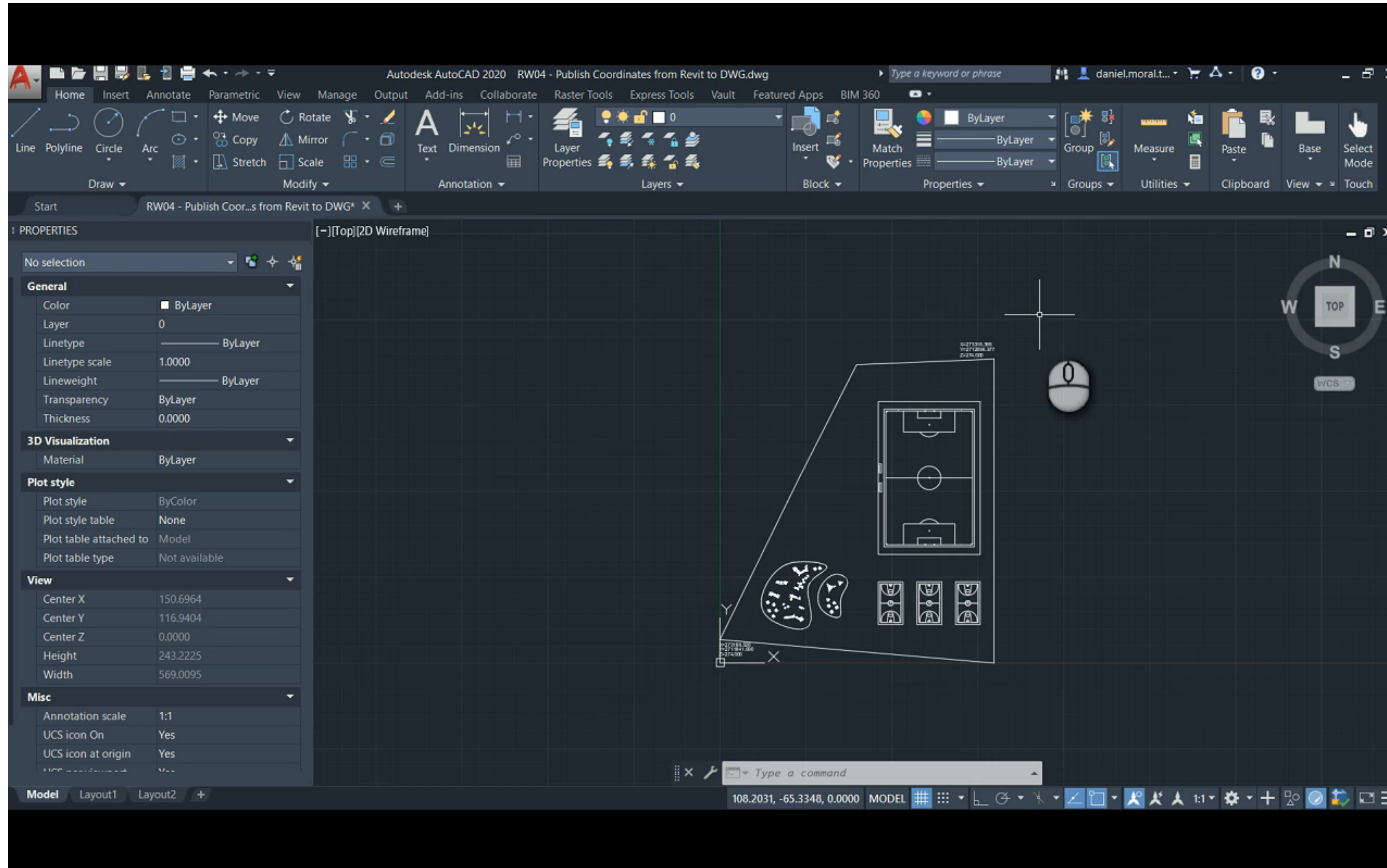
Check the coordinates from the link instance

- Open the linked file and change the UCS coordinate system to the Revit exported coordinates system:
 - Select & right click the UCS icon
 - Choose > Named UCS > Revit60-DefaultLocation
- Use Command: Plan > current UCS
- Home tab > Utilities menu > ID Point and pick a known geographical point to make sure the workflow was correctly done
- Nothing is moved/rotated in AutoCAD



Publish Coordinates from Revit to DWG

Video – Publish coordinates from Revit to a linked DWG



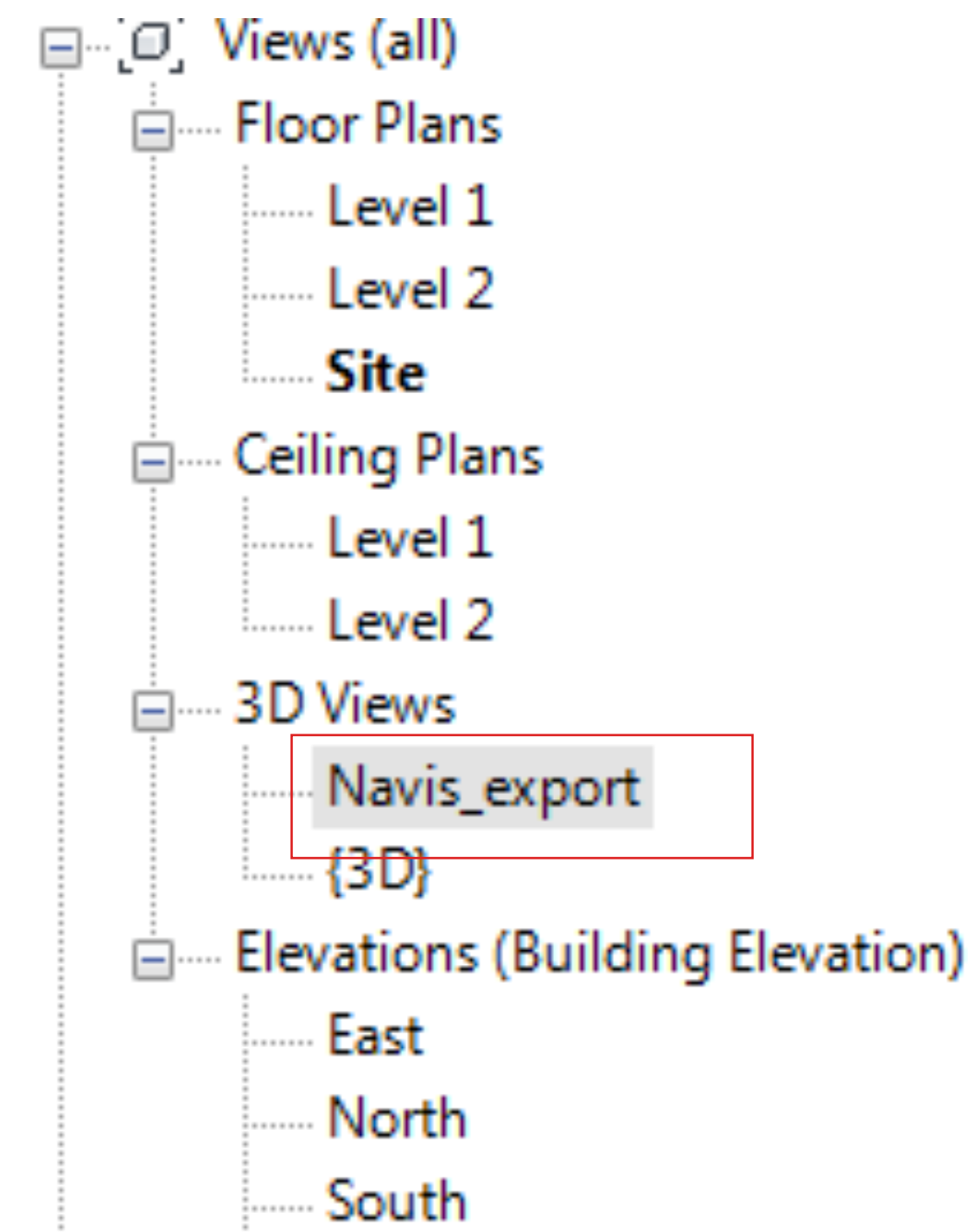
Collaborate with Revit

Prepare your Revit Model for Exporting Out

Prepare your Revit Model for Exporting Out

Custom 3D view for exporting

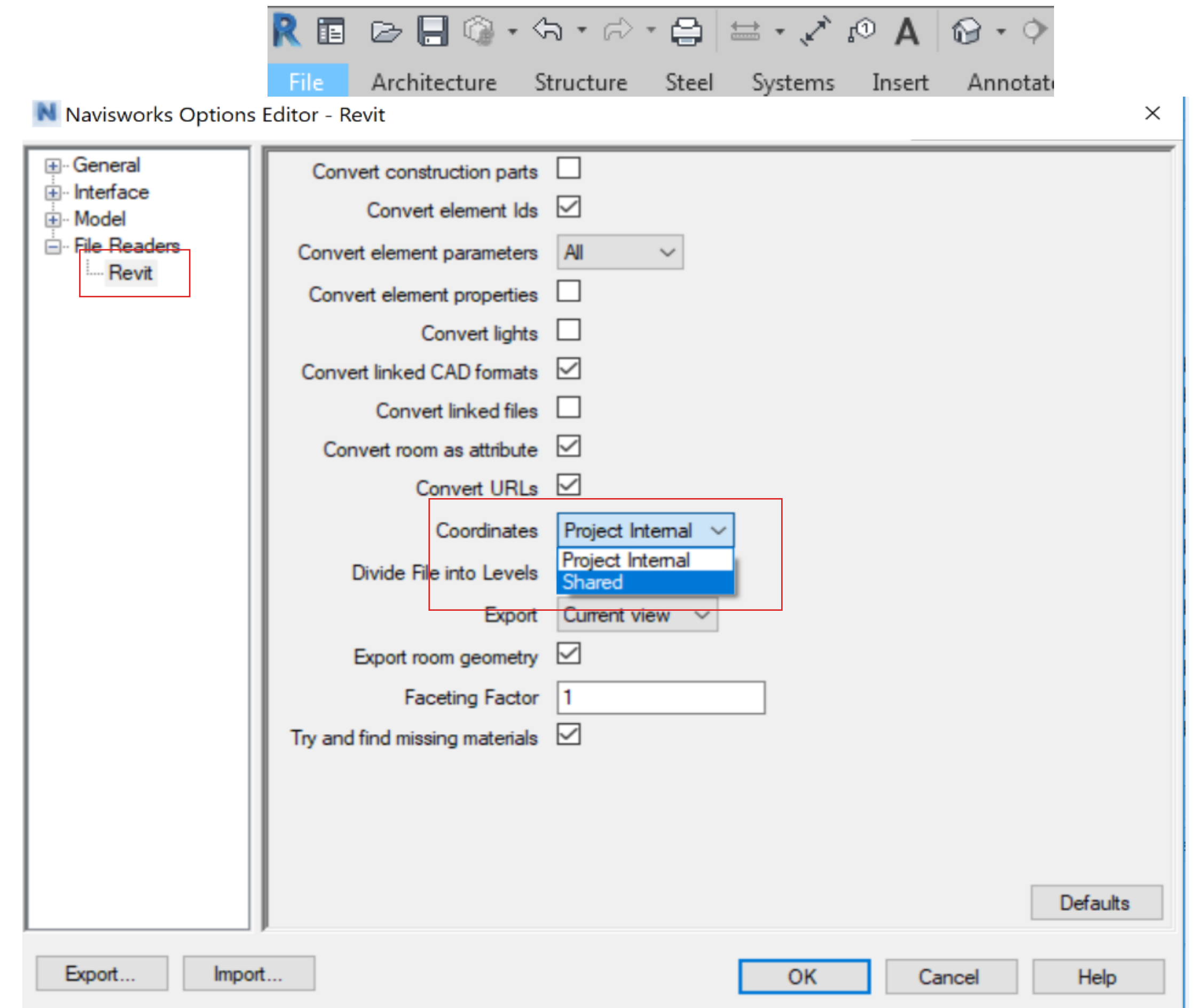
- We recommend to create a 3D view and name it with "navis" prefix as Navisworks and InfraWorks look for a Revit view with this name to import first
- In this view you can control the elements transferred turning off the categories that are not needed
- That way you can easily control the LOD (level of detail) of your exported model and facilitate the import of Revit models in other applications



Prepare your Revit Model for Exporting Out

Export to Navisworks

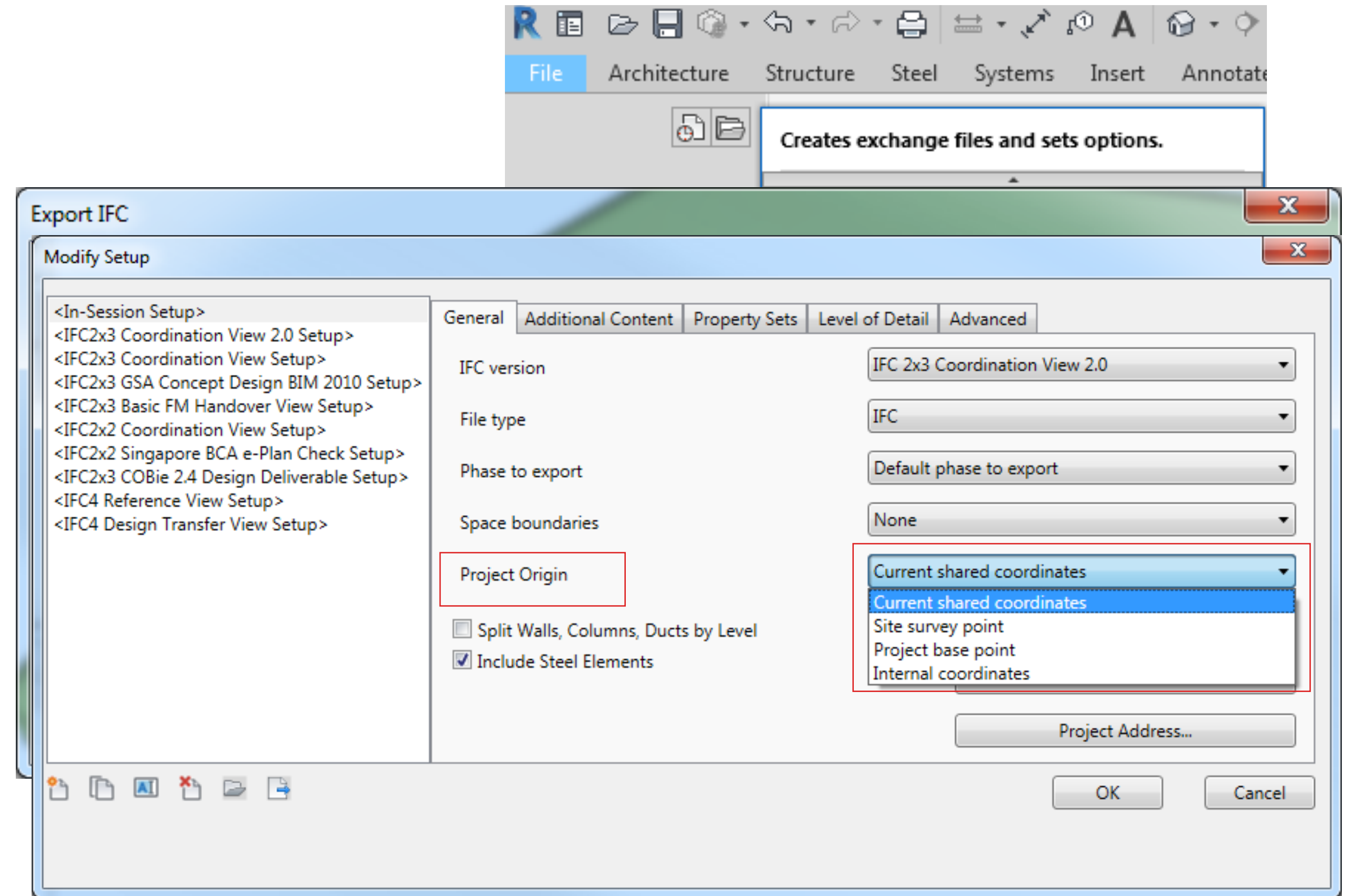
- Revit > Export > NWC
- Navisworks Options > File Readers
- Revit > Coordinates
- You have following options at Coordinates:
 - Project internal
 - Shared
- We usually recommend to work with the default option “Shared” (which means Shared Coordinates)



Prepare your Revit Model for Exporting Out

Export to IFC

- Revit > Export > IFC
- Modify Setup > General
- You have following options at Project Origin:
 - Current shared coordinates
 - Site survey point
 - Project base point
 - Internal coordinates
- We usually recommend to work with the default option “Current shared coordinates”



Streamline data sharing Civil 3D, Revit & InfraWorks

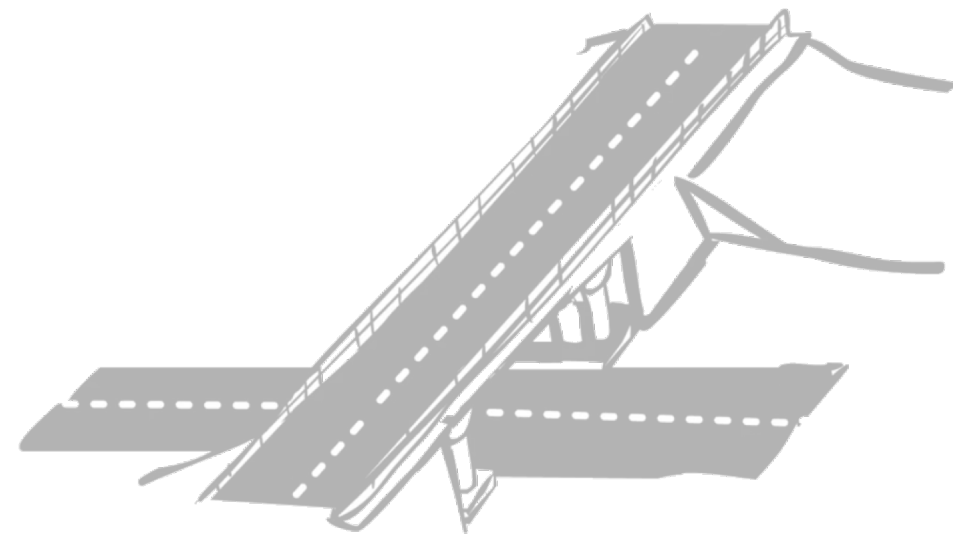
What you'll learn today

Coordinate System ?



- Coordinate System: What? Why? How?
- Understand Coordinate System for Products

Collaborate with Civil 3D



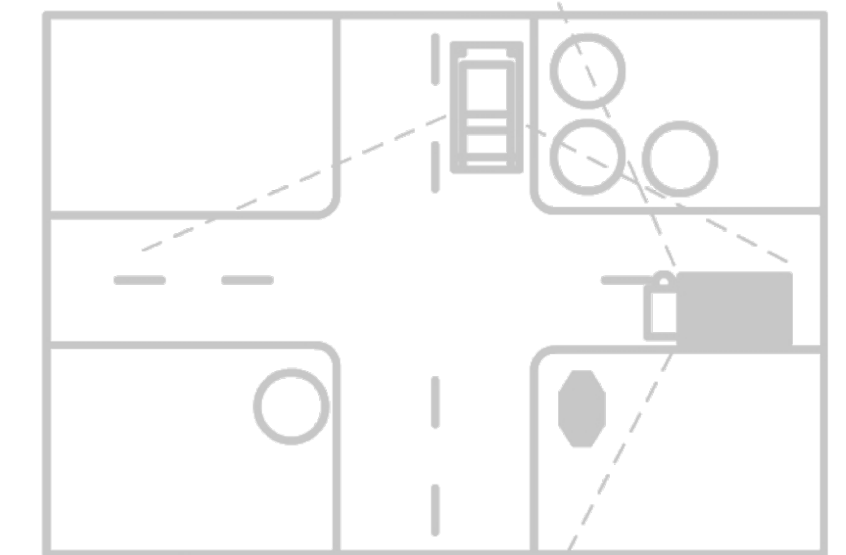
- Infraworks to Civil 3D
 - Revit to Civil 3D

Collaborate with Revit



- Workflows: Assign, Acquire, Publish Coordinates to Revit
- Prepare your Revit Model for exporting out

Collaborate with Infraworks



- Workflows: Revit, FBX, IFC & Civil 3D to Infraworks
- Prepare your Infraworks Model for exporting out

Collaborate with Infracore

Import AEC Model to Infracore

Import AEC Model to InfraWorks

Best practices to bring your AEC model into InfraWorks

Buildings Data

- IW01-Import Revit models (*.rvt)
 - Cloud Import 
 - Local Import 
- IW02-Import IFC models (*.ifc)
 - Cloud Import 
- IW03-Import 3D model (.fbx)
 - Local Import 

Infrastructure Data

- IW04-Import IMX to InfraWorks
 - Local Import 
- IW05-Import LandXML to InfraWorks
 - Local Import 
- IW06-Import Civil 3D Drawing to InfraWorks
 - Local Import 

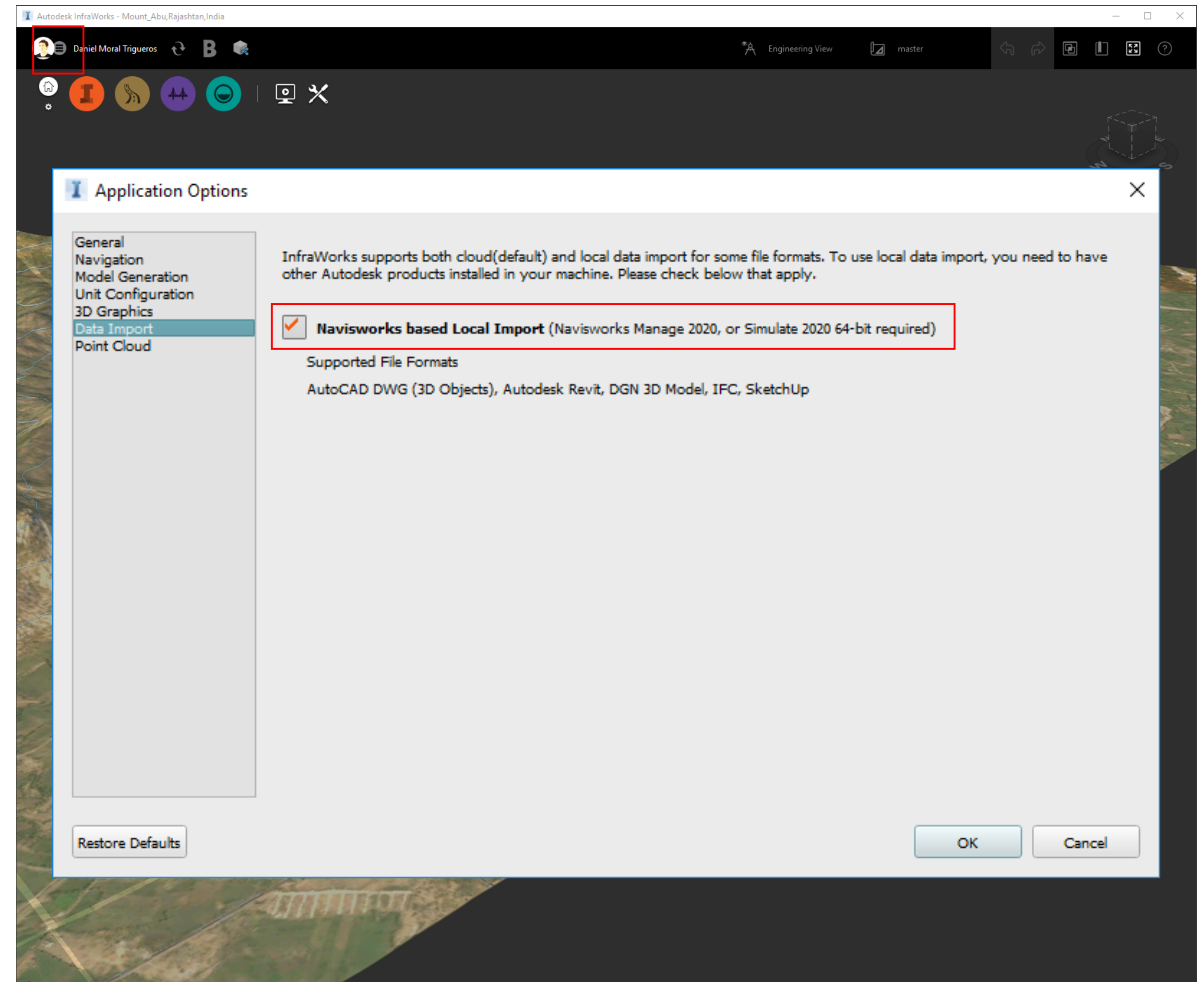
Collaborate with Infracore

(IW01):
Import Revit Model into Infracore

Import Revit Model into InfraWorks

To set data import option to local or cloud

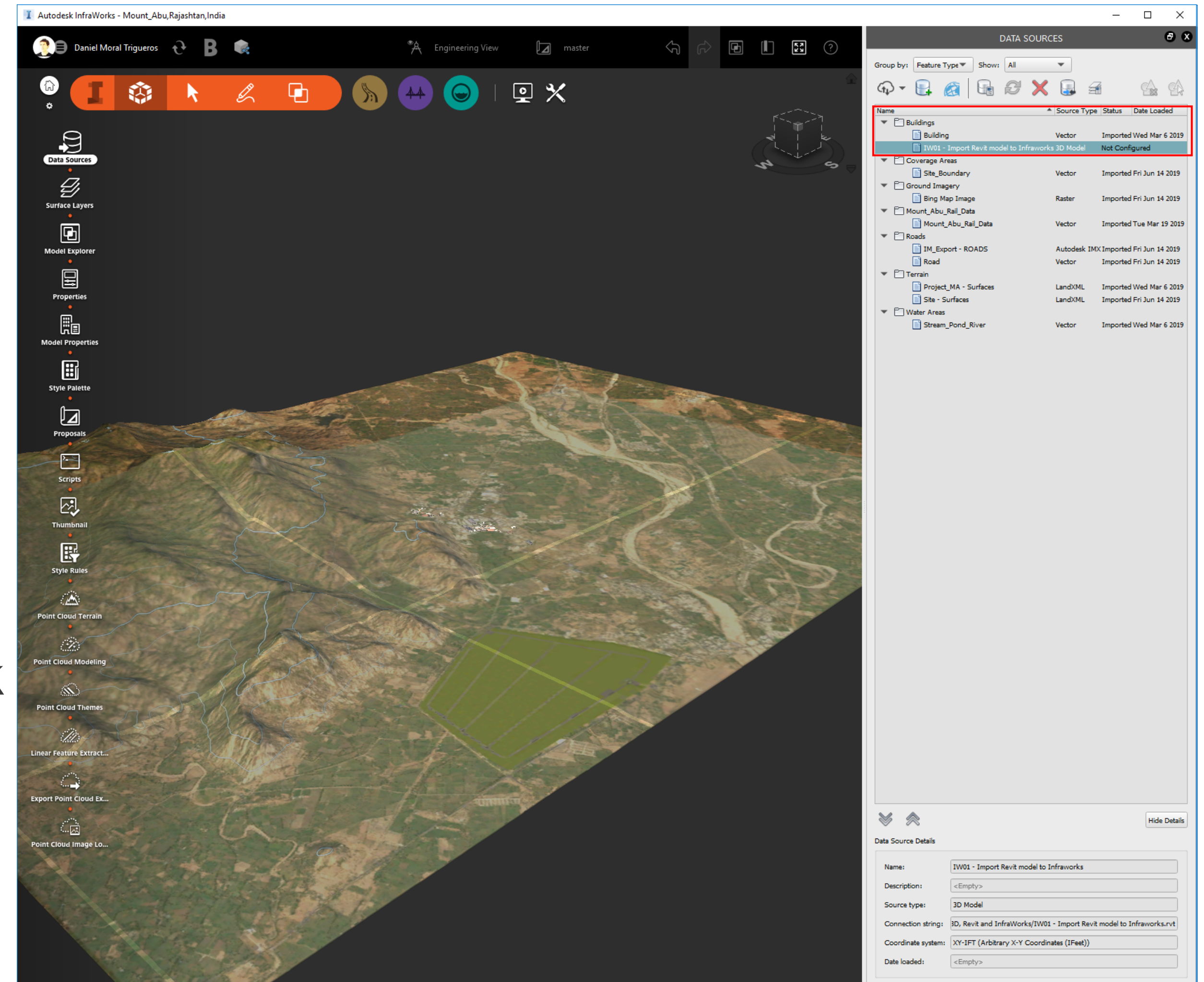
- By default, file conversion is processed in the cloud for many file formats
- Use Application Options to enable/disable local Import for supported formats
 - Cloud import 
 - Local import 
- For Local import it is required to have installed same version of Navisworks Manage or Simulate as InfraWorks
- Click  >  > Data Import > Checkmark Navisworks based Local Import



Import Revit Model into InfraWorks

Import your Revit (*.rvt) file with local import

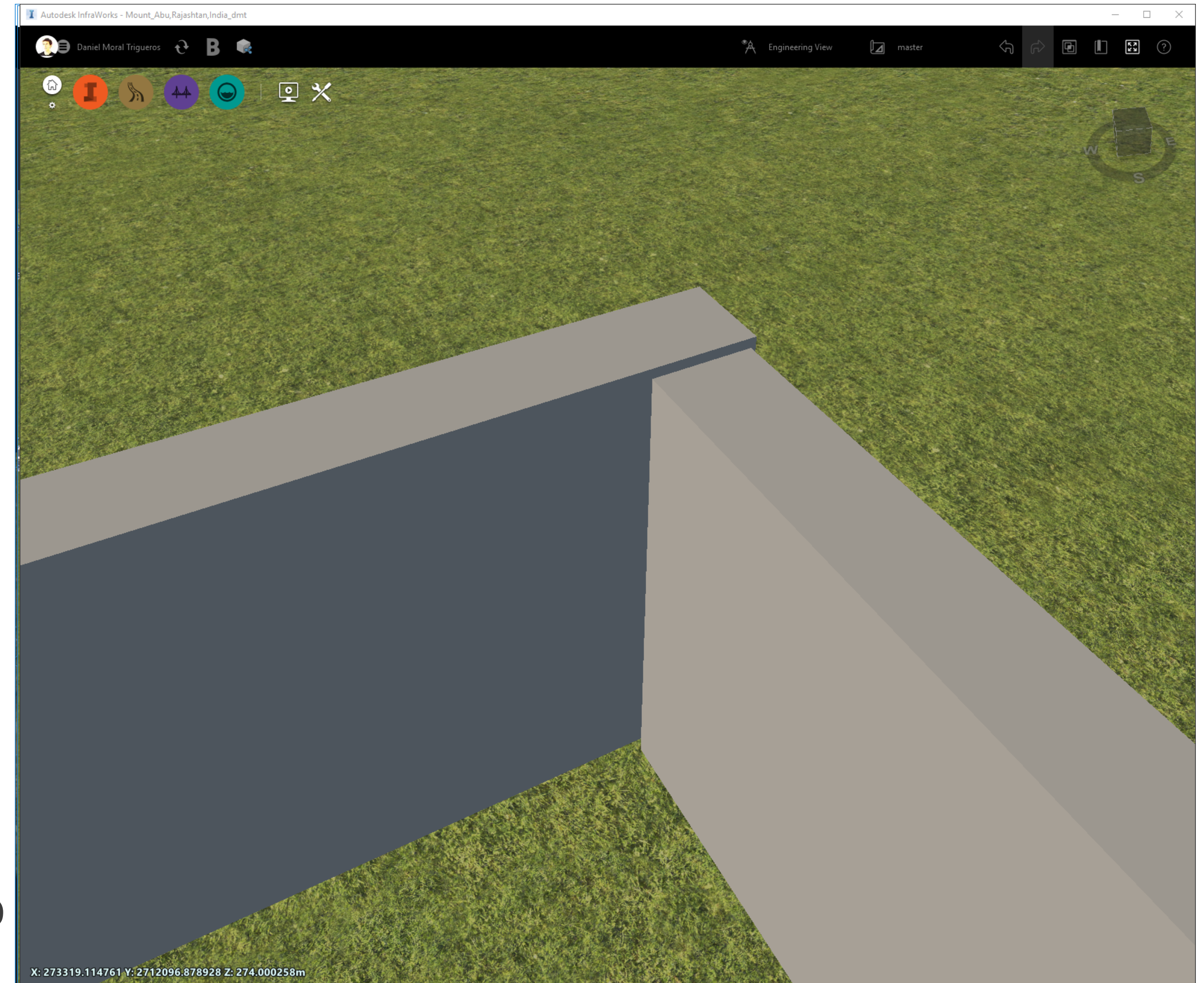
- Check Naviswork based Local import option
- In InfraWorks, click  >  > 
- On the Data Sources panel
 - Click (Add File Data Source) 
 - Click Autodesk Revit
 - Open the Revit model file
- If prompted, in the Data Import dialog, click Send
- When the model is finished processing, it displays under Buildings in the data sources list



Import Revit Model into InfraWorks

Configure your Revit (*.rvt) file with local import

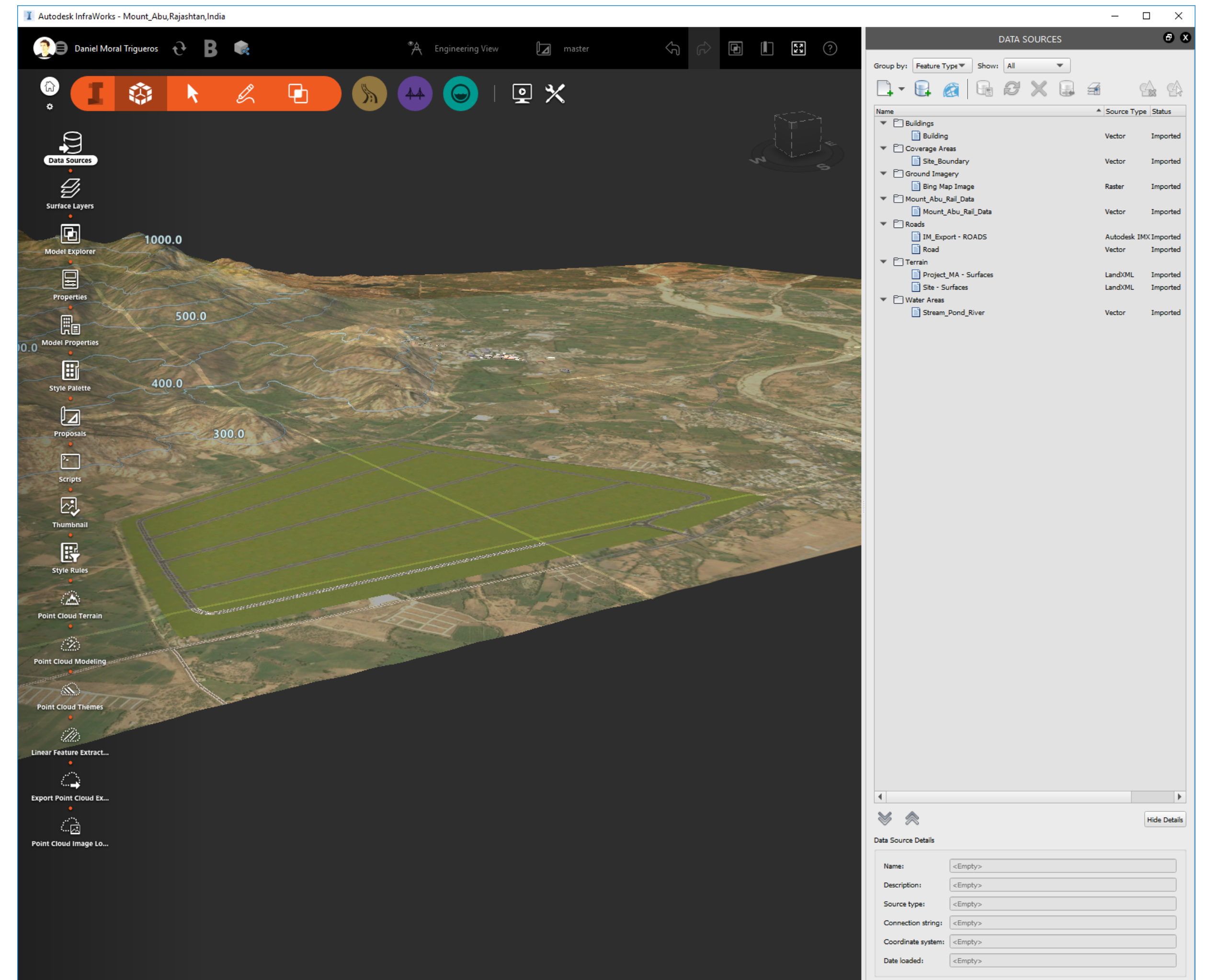
- Double-click the data source to configure it
- Geolocation Tab: InfraWorks transforms project coordinates to geographical coordinates
- Define the insertion point: choose the desired coordinates system and change coordinates to $X=0$, $Y=0$, $Z=0$
- 3D Model tab: check the geometry is correctly displayed. You may want to use LOD for big models. Close & Refresh
- Zoom in: Big models geometry elements becomes less reliable and less accurate so distortion may be seen



Import Revit Model into InfraWorks

Import your Revit (*.rvt) file with cloud import

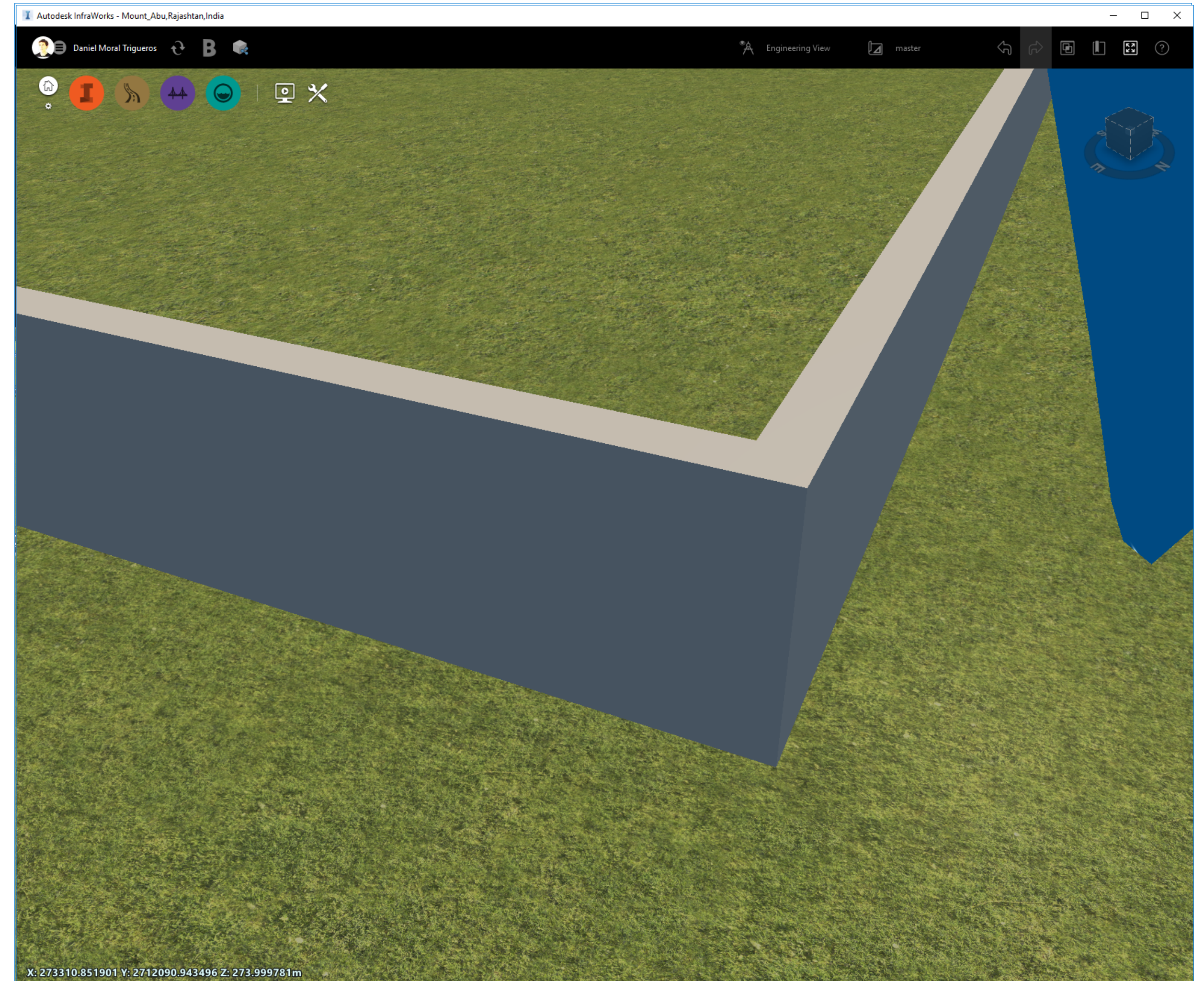
- Disable Navisworks based Local import option
- Repeat the same process as before to import the Revit model



Import Revit Model into InfraWorks

Configure your Revit (*.rvt) file with cloud import

- Double-click the data source to configure it
- Geolocation Tab: warning pops-up. InfraWorks does not read the project coordinates system from Revit
- Define insertion point: choose the desired coordinates system & change coordinates to $X=0$, $Y=0$, $Z=0$. Offset using the coordinates of the **Revit Internal Origin**
- 3D Model tab: check the geometry is correctly displayed. Close & Refresh
- The model displays in the correct place and geometry is correct



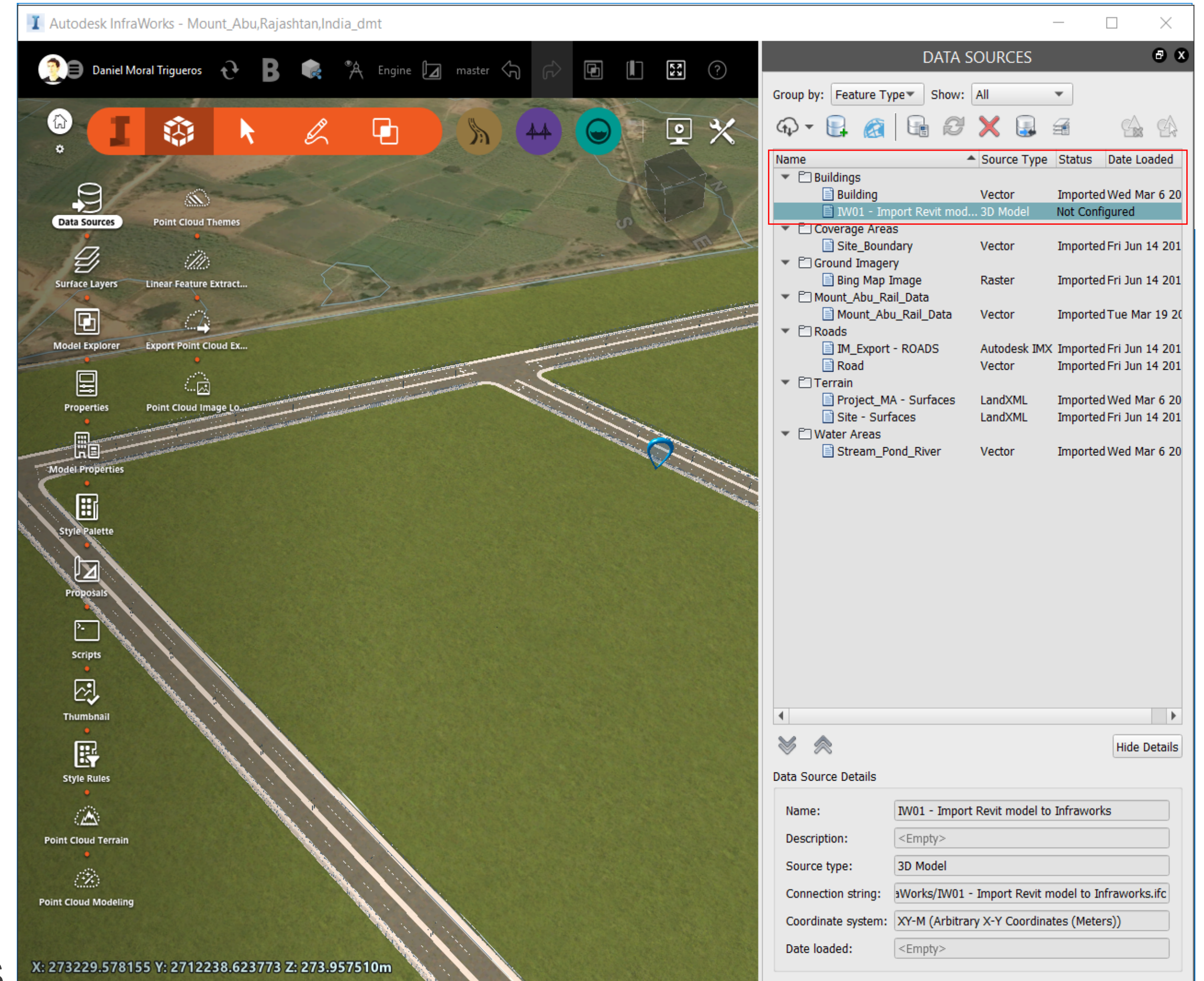
Collaborate with Infracore

(IW02):
Import IFC Model into Infracore

Import IFC Model into InfraWorks

Import your IFC model with cloud Import

- Export IFC file from Revit
- Use cloud import  to bring IFC models into InfraWorks. Click  >  > Data Import > Navisworks based Local Import should be unchecked
- In InfraWorks, click  >  > 
- On the Data Sources panel
 - Click (Add File Data Source) 
 - Click IFC
 - Open the IFC file
- When the model is finished processing, it displays under Building in the data sources



Import IFC Model into InfraWorks

Configure your IFC model with cloud Import

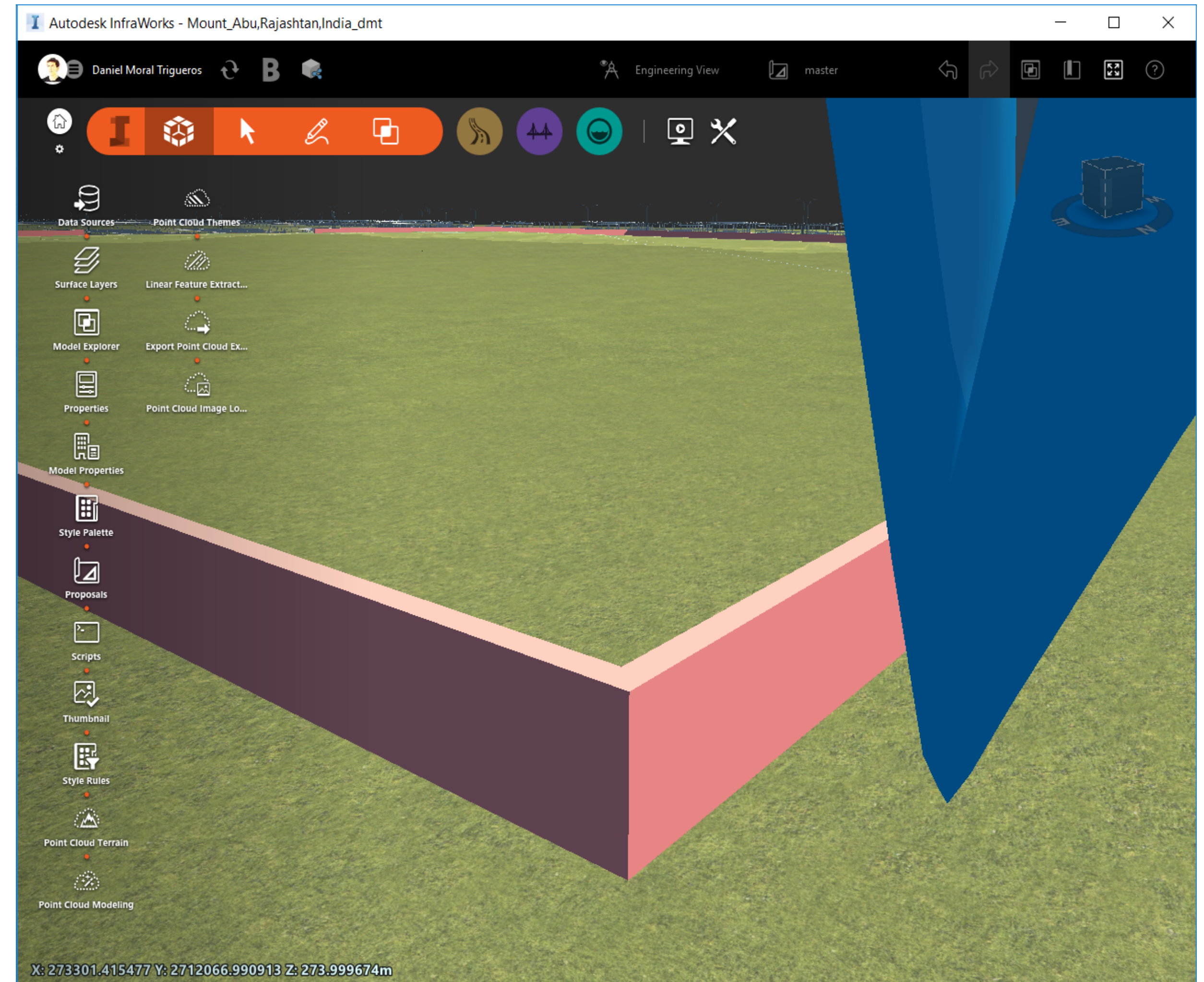
- Double-click the data source to configure it
- Geolocation Tab: warning pops-up. InfraWorks is not able to transform coordinates system from IFC
- Define insertion point: choose the desired coordinates system and change coordinates to $X=0$, $Y=0$, $Z=0$ (*)
- 3D Model tab: check the geometry. The graphical representation of elements becomes not reliable and not accurate because the model is significantly far away the origin $0,0,0$ (*)
- Close & Refresh (*)



Import IFC Model into InfraWorks

Do it correctly

- Make a copy of *.rvt model & change survey point coordinates values to 0,0,0 and bring it back to same position clipped
- Repeat process to export and import IFC
- Ignore geolocation warnings. Choose the desired coordinates system and change coordinates to X=0, Y=0, Z=0. Offset using the coordinates of the survey point as we chose same, while exporting IFC
- 3D Model tab: check the geometry is correctly displayed. Close & Refresh
- The model displays in the correct place and geometry is correct



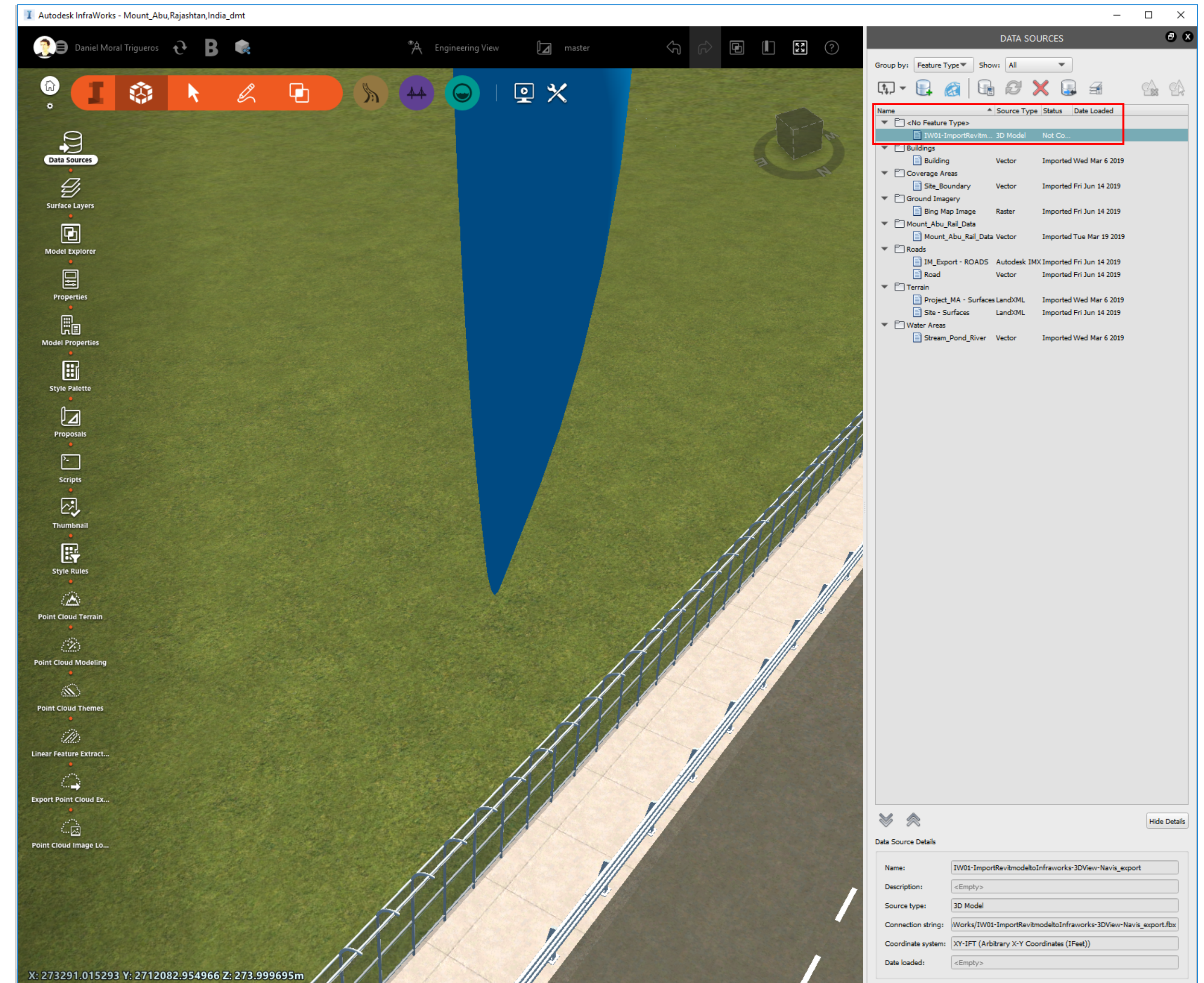
Collaborate with Infracore

(IW03):
Import FBX Model into Infracore

Import FBX Model into InfraWorks

Import your 3D model with local import

- Export FBX file from Revit. You may want to use LOD for big models
- In InfraWorks, click  >  > 
- On the Data Sources panel
 - Click (Add File Data Source) 
 - Click 3D Model
 - Open the FBX file
- When the model is finished processing, it displays under <No Feature Type> in the data sources list
- It will be always using local import  to bring 3D models into InfraWorks



Import FBX Model into InfraWorks

Configure your 3D model with local import

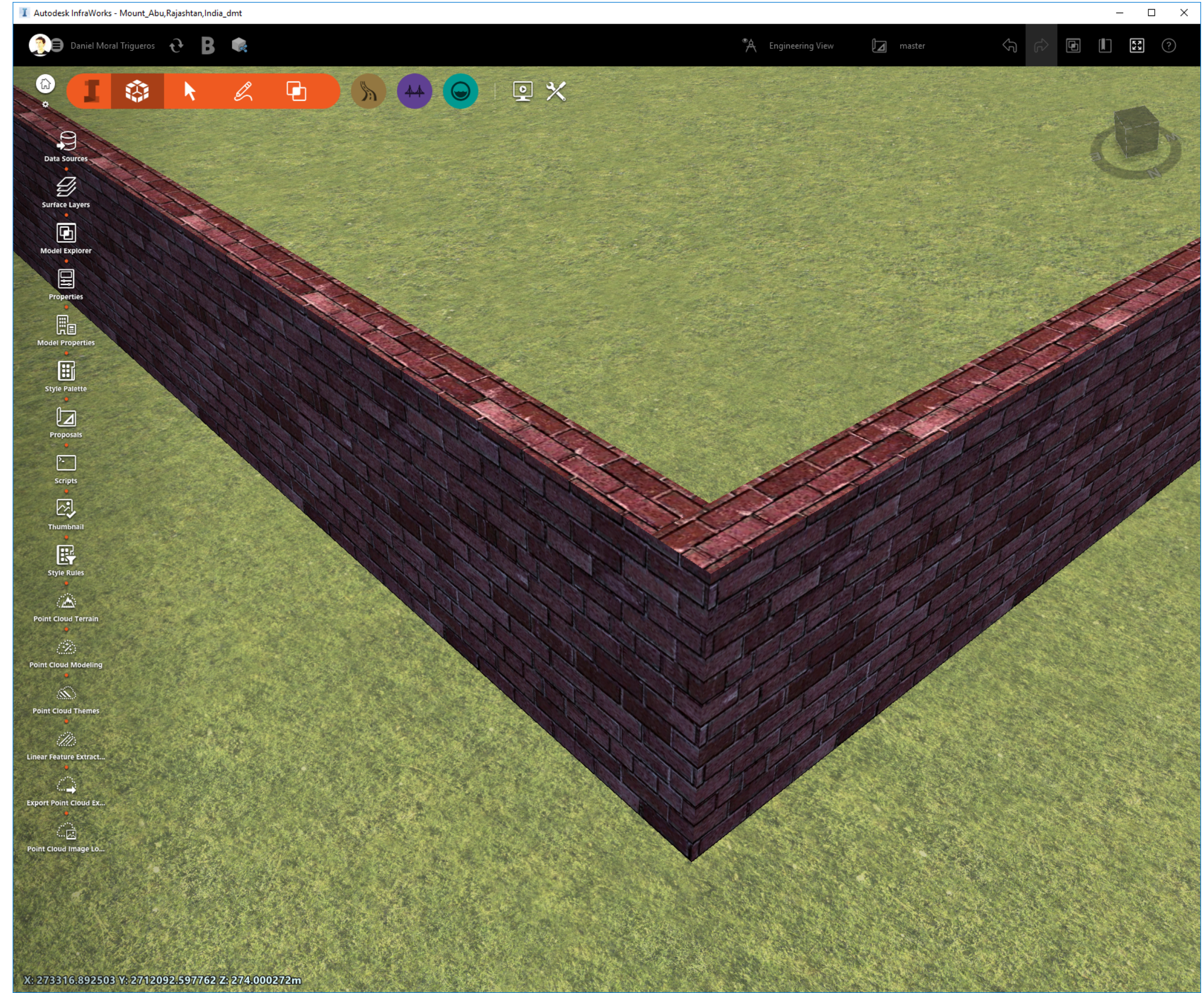
- Double-click the data source to configure it
- Some warnings pop-up. InfraWorks does not read the project coordinates system from the .fbx exported from Revit
- Change Type to Buildings
- Geolocation Tab: define insertion point. Choose the desired coordinates system and change coordinates to $X=0$, $Y=0$, $Z=0$. Offset using the coordinates of the Revit Internal Origin
- 3D Model tab: check the geometry is correctly displayed. You may want to use LOD for big models. Close & Refresh



Import FBX Model into InfraWorks

Open Data model (*.ifc) / Revit model (*.rvt) / 3D model (*.fbx)

	.ifc	.rvt	.fbx
Auto Positioning (With Local Import)	✓	✓	✗
Offset Positioning	✓	✓	✓
Reduced File Size	✓	✗	✓
Fast Process	✓	✗	✓
Texture Import	✗	✓	✓
BIM Exchange Extension	✓	✓	✗
Prevent Data lost	✗	✓	✗



Collaborate with Infracore

(IW04):
IMX to Infracore

Data Import in InfraWorks

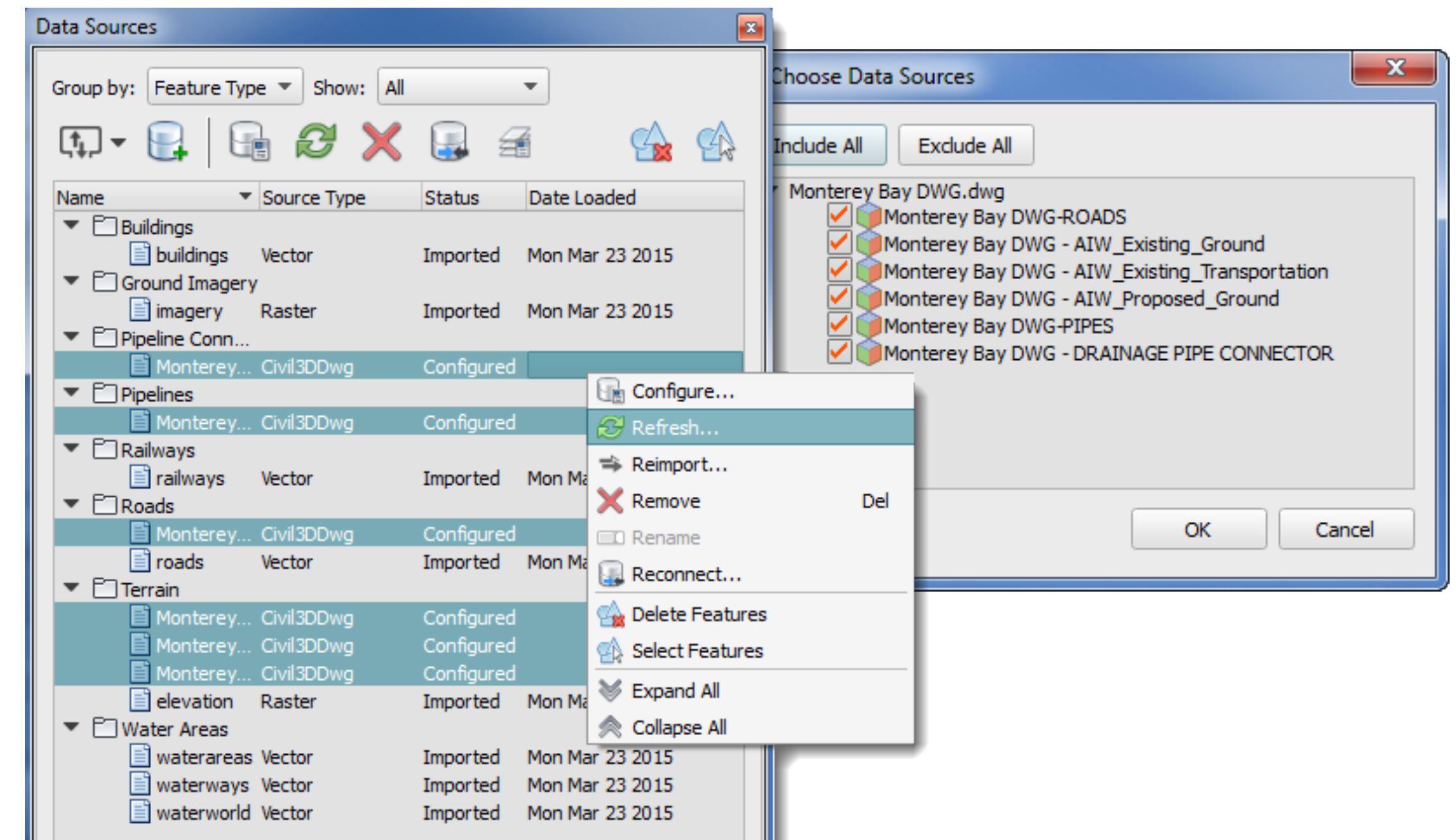
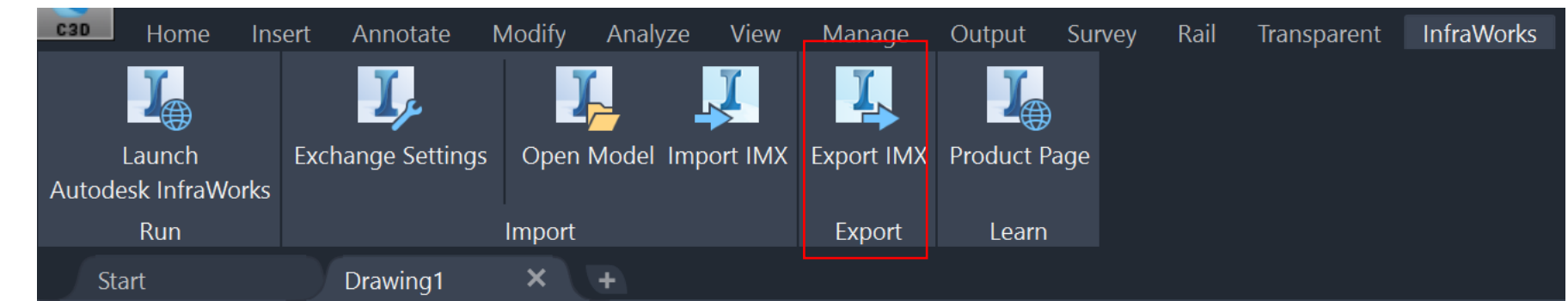
InfraWorks displays the added data as InfraWorks features

Autodesk Civil 3D drawing object	becomes... InfraWorks model object	Notes
TIN surfaces	Terrain surfaces	•Each surface is listed in the Data Sources panel. •Click  >  >  to adjust the order of terrain surface layers.
Alignments and profiles	Component roads (horizontal and vertical geometry)	•Only Centerline type alignments can be brought in as component roads. •A single profile is used for each component road, based upon the first finished ground profile that was created in the Autodesk Civil 3D drawing. Use Profile View to review the profile geometry. •Best fit profile entities are not brought into InfraWorks.
Corridors and Corridor surfaces	Coverages and terrain surfaces	•We recommended that you create one or more corridor surfaces in Autodesk Civil 3D to bring into InfraWorks. •Autodesk Civil 3D link styles are used to create coverages in InfraWorks which show the materials of the corridor. The coverages allow you to stylize the different corridor components like pavement. Important: Coverage areas are only created in InfraWorks for link codes within a code set style that have a render material assigned inAutodesk Civil 3D. The link styles are used as TAG expressions when imported to InfraWorks.
Pipe Networks	Pipelines with inlets and manholes or pipeline connectors	•If a structure in the Autodesk Civil 3D drawing has a Drainage Utility Type specified and is using the new default parts catalog with component object parts for pipeline connectors, InfraWorkswill use the same component object parts. When there is no match of pipeline connector parts, generic objects are displayed.

IMX to InfraWorks

Just import & configure

- Use Command: IMX_Export or use InfraWorks>Export IMX from Civil 3D
- InfraWorks > [Data Sources panel](#) > Add File Data Source > Click Autodesk IMX
- Select the feature classes to import “Each feature class will appear under its respective category in the Data Sources list. For example, select Pipelines if you are importing pipes, Roads if you are importing a corridor/Alignment, or Terrain if you are importing a surface.”
- Design Road/Alignment will come as a centerline & Surface as Terrain (no grading)



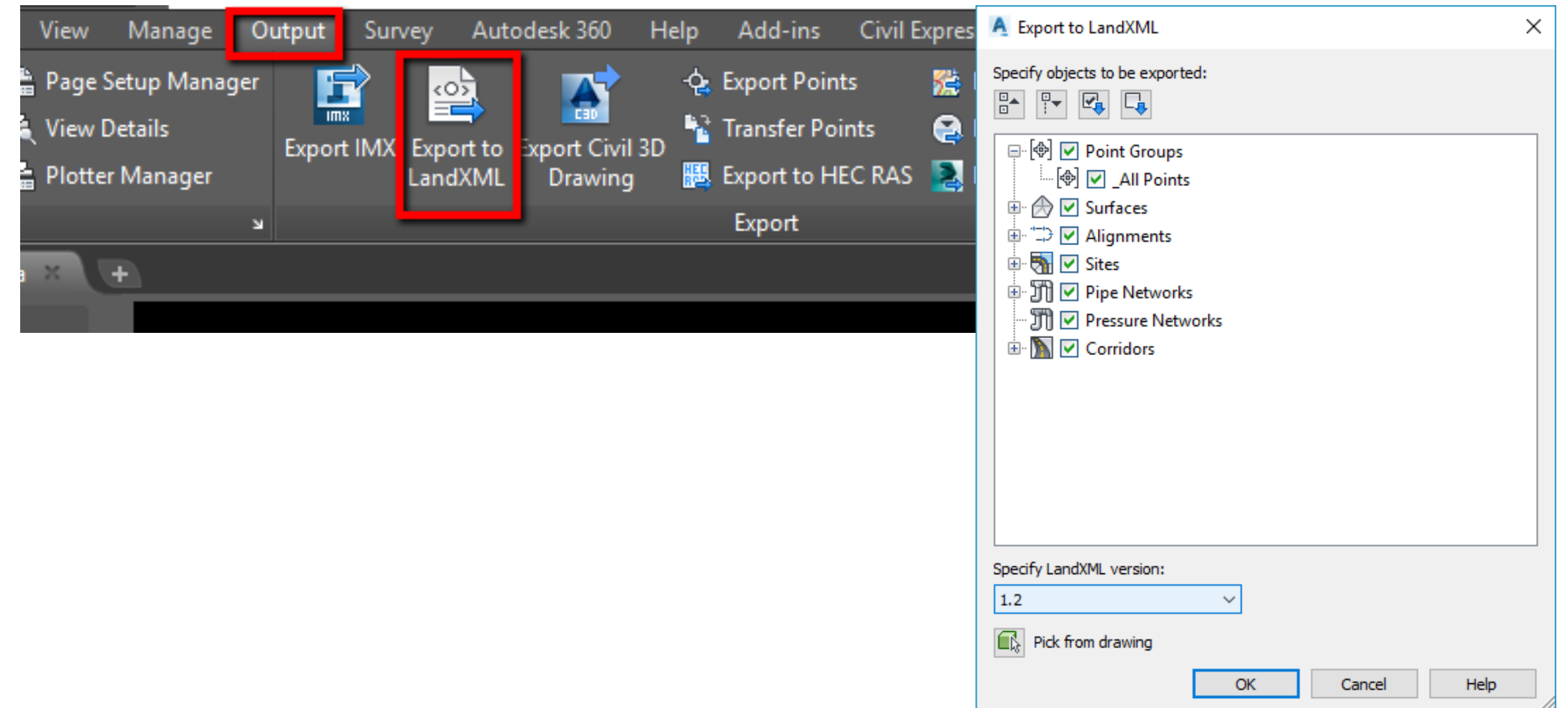


InfraWorks Workflow-05 (IW05): LandXML to InfraWorks

LandXML to InfraWorks

Export from Civil 3D

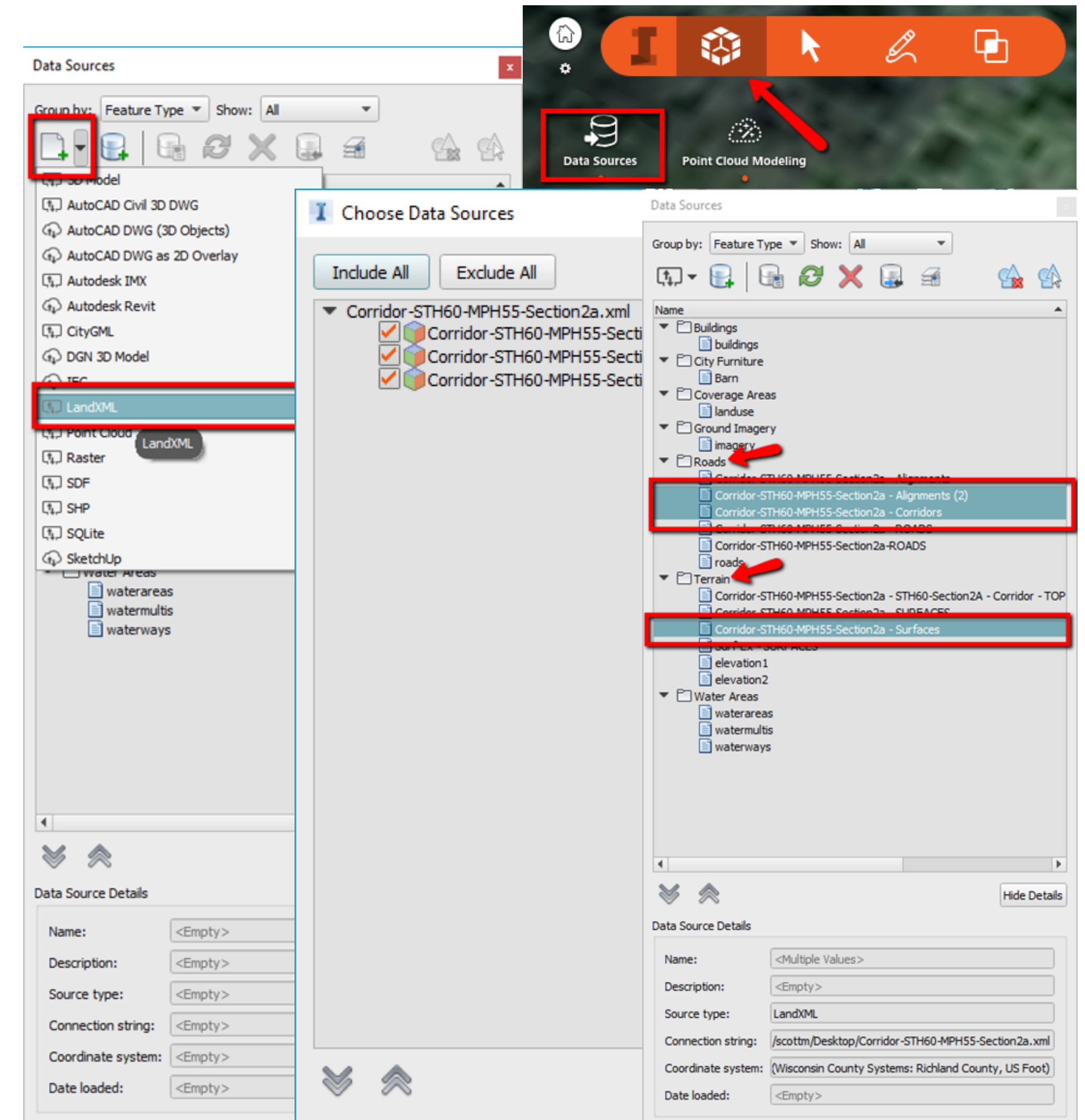
- Output tab > Export panel > Export to LandXML
- Select Civil 3D objects to be included like Point Groups, Surfaces, Alignments and Profiles, Sites, Pipe Networks, Pressure Networks, Corridors
- Specify LandXML version- 1.0, 1.1 or 1.2 > Click OK



LandXML to InfraWorks

Just Import & Configure

- InfraWorks Module > Manage your Model > Data Sources
- Add Data Source > LandXML > Select file
- Select Civil object within the LandXML file
- Surfaces will fall under the Terrain group & Corridors and Alignments will fall under the Roads group
- Design road will not come but the alignment will come as centerline





InfraWorks Workflow-06 (IW06): Civil 3D Drawing to InfraWorks

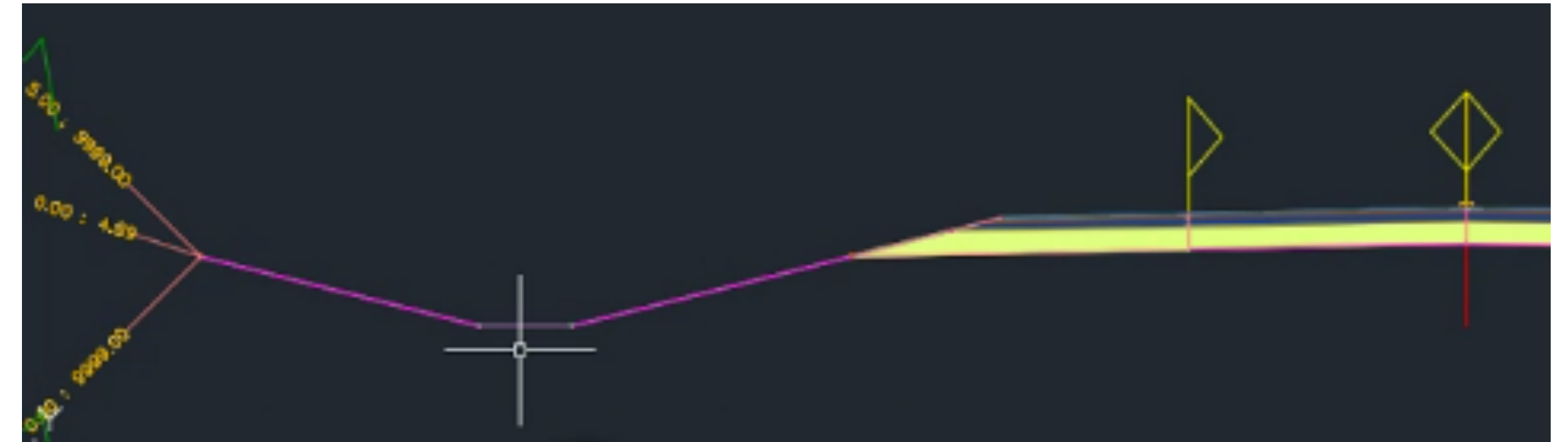
Civil 3D Drawing to InfraWorks

Things to be mindful of...

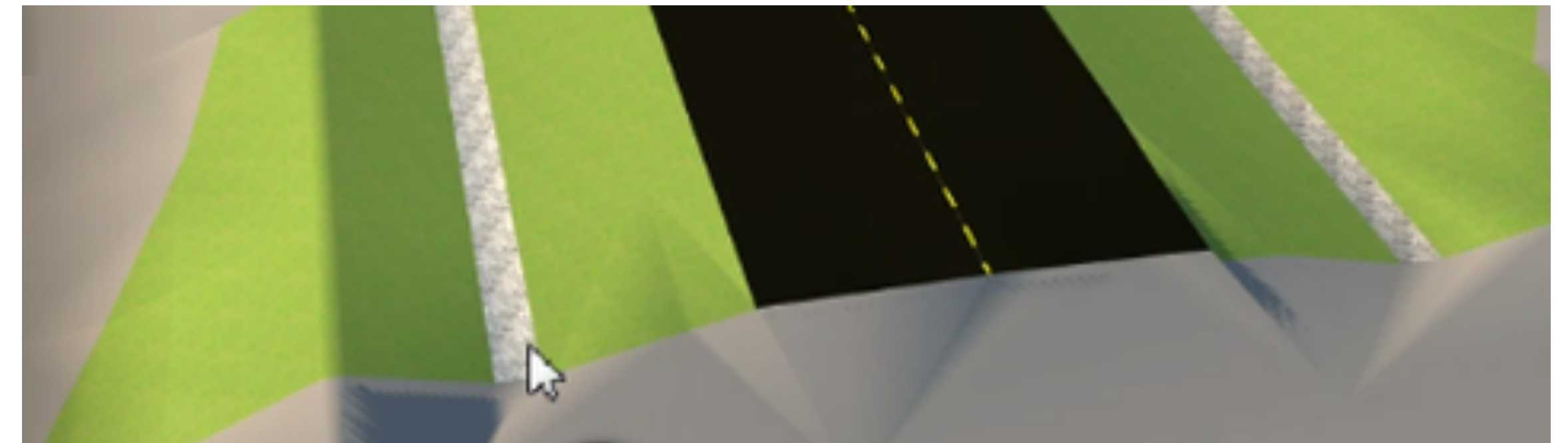
When you bring Civil 3D alignment, profile and corridor data into a model

- Centreline alignment and profile data used to define the component road with centreline
- Coverage styles to display the areas corresponding to the corridor link styles
- Civil 3D corridor comes in as corridor surface & coverage

Note: InfraWorks uses predefined style rules to map alignment styles to component road styles and corridor links to coverage area styles. These style rules are based on the Autodesk Civil 3D alignment styles and link styles included in the standard templates



A corridor assembly in a Civil 3D drawing, showing its links.

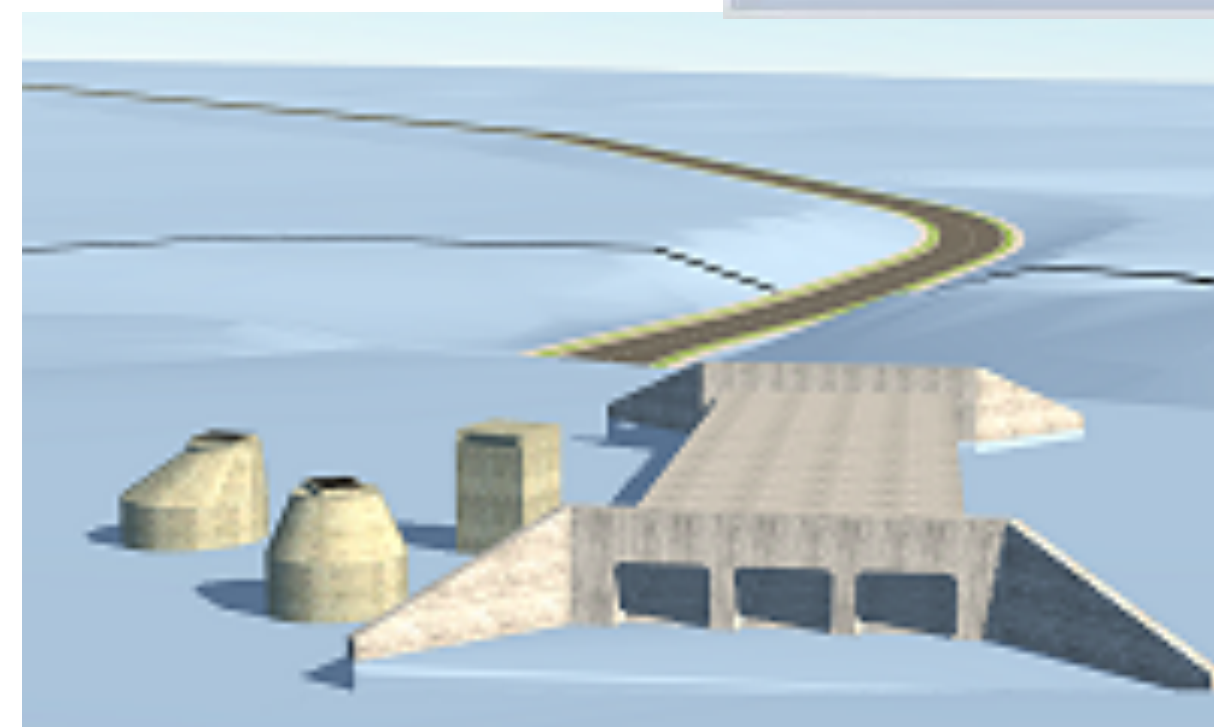
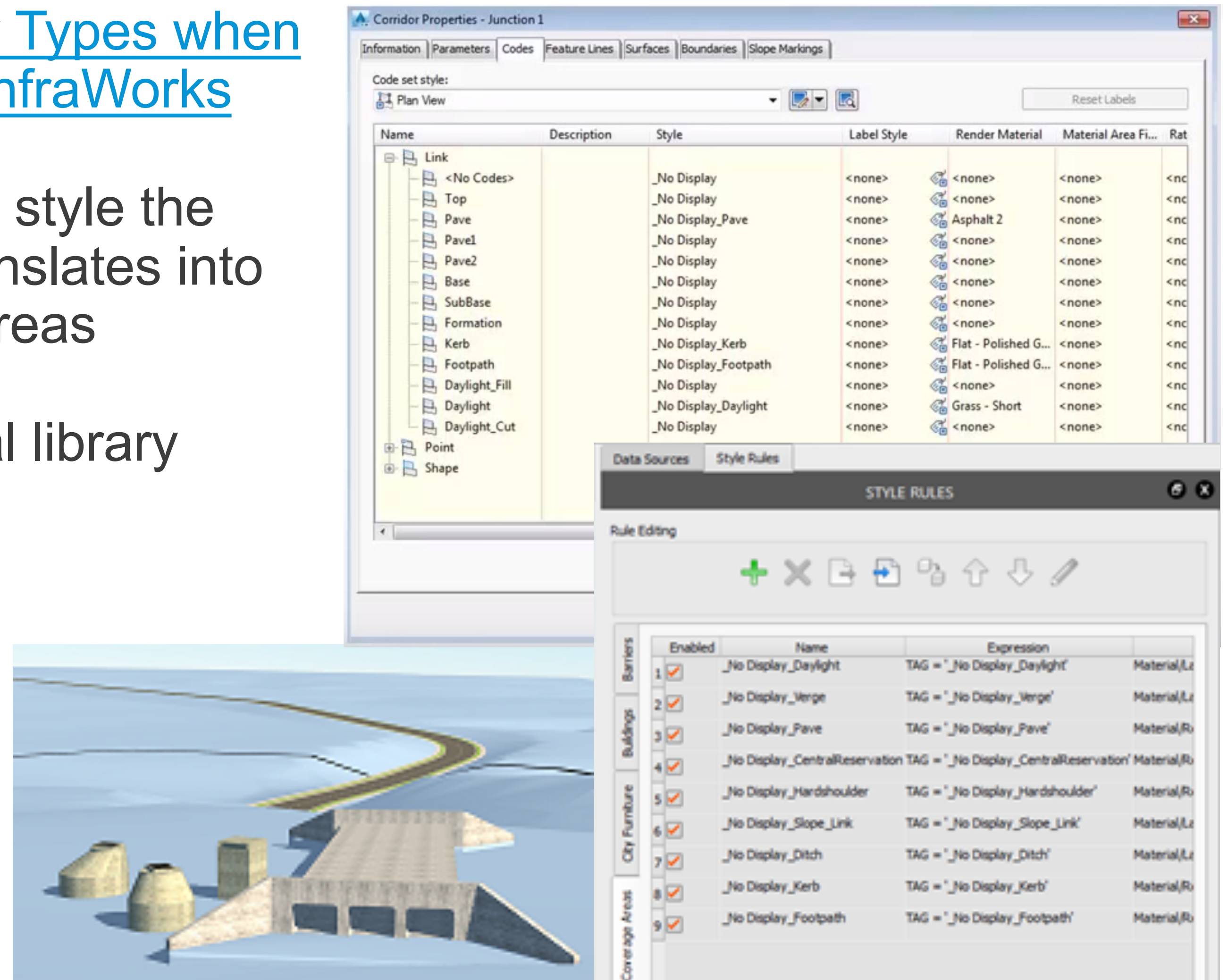


The same corridor data brought into InfraWorks, which uses default style rules to display the road and coverage areas

Civil 3D Drawing to InfraWorks

Things to be mindful of...

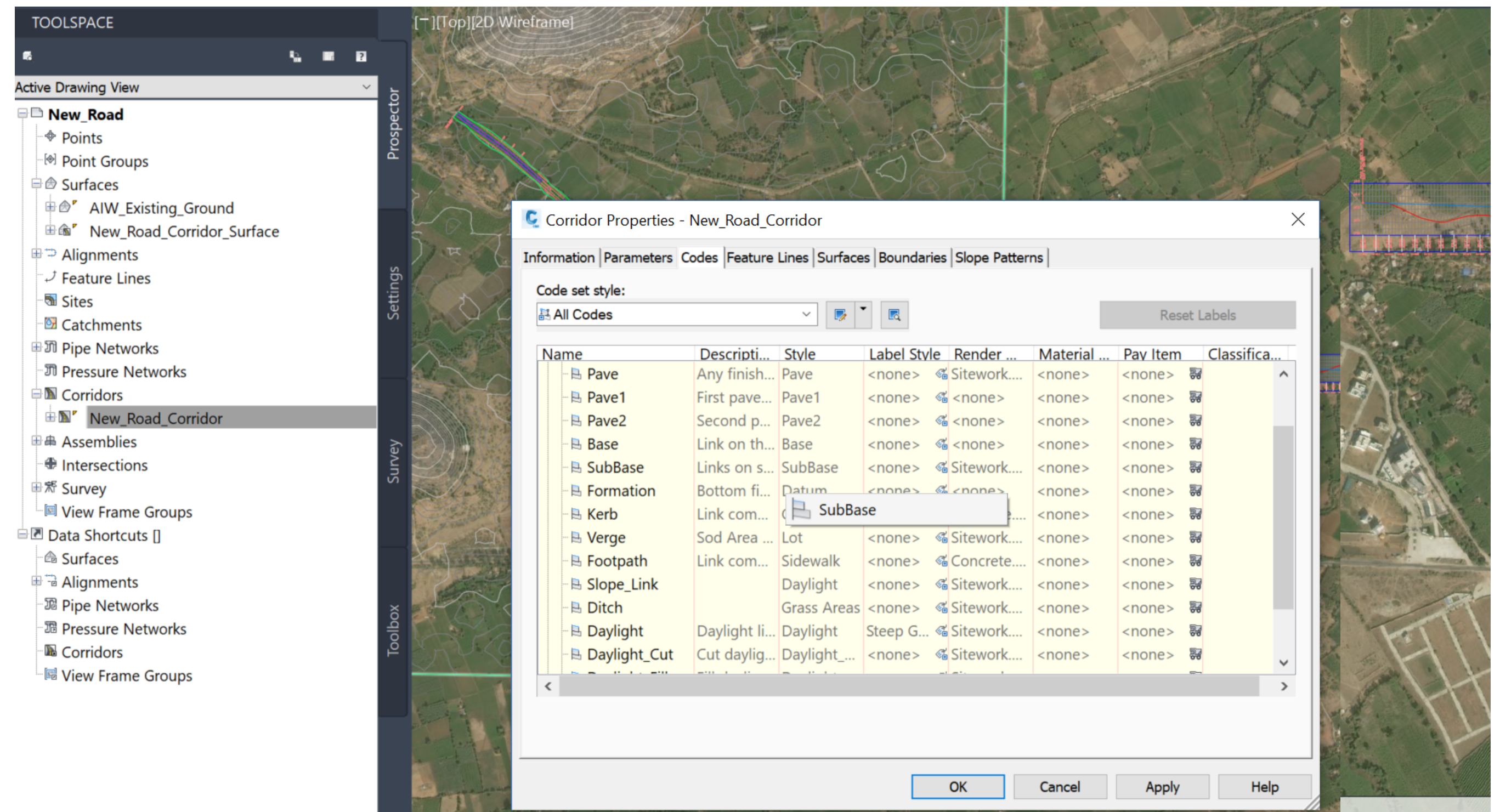
- Behaviour of Alignment and Profile Entity Types when Exchanging Data between Civil 3D and InfraWorks
- InfraWorks uses predefined style rules to style the display of AutoCAD Civil 3D data that translates into design roads and associated coverage areas
- InfraWorks & Civil 3D uses same material library



Civil 3D Drawing to InfraWorks

Open drawing in Civil 3D

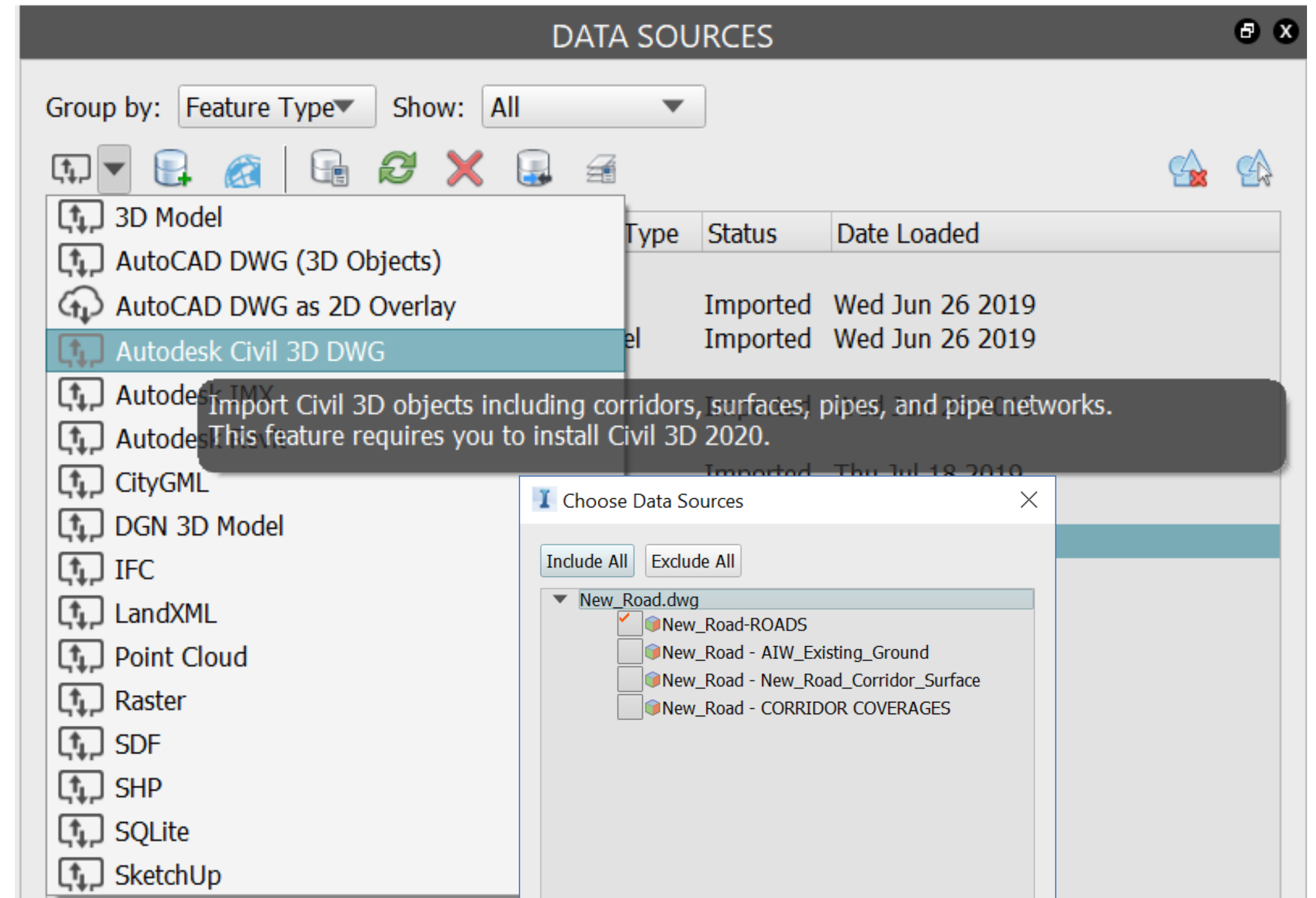
- Open Drawing “New_Road” & Make sure drawing is assigned with Projected CS - UTM84-43N
- Confirm Alignments, Corridors & Corridors Surfaces names are proper
- Default **Code Sets** need to apply to corridor if you want to see Civil 3D corridor/converted coverages with materials in InfraWorks
- Note: You can link this drawing directly to InfraWorks or take there through IMX or LandXML format



Civil 3D Drawing to InfraWorks

Insert in InfraWorks

- Click 
- Click  in the [Data Sources panel](#)
- Click > Autodesk Civil 3D DWG > select the desired Autodesk Civil 3D drawing, then click Open
- Note: A local installation of Autodesk Civil 3D 2020 is required before you can import an Autodesk Civil 3D DWG drawing

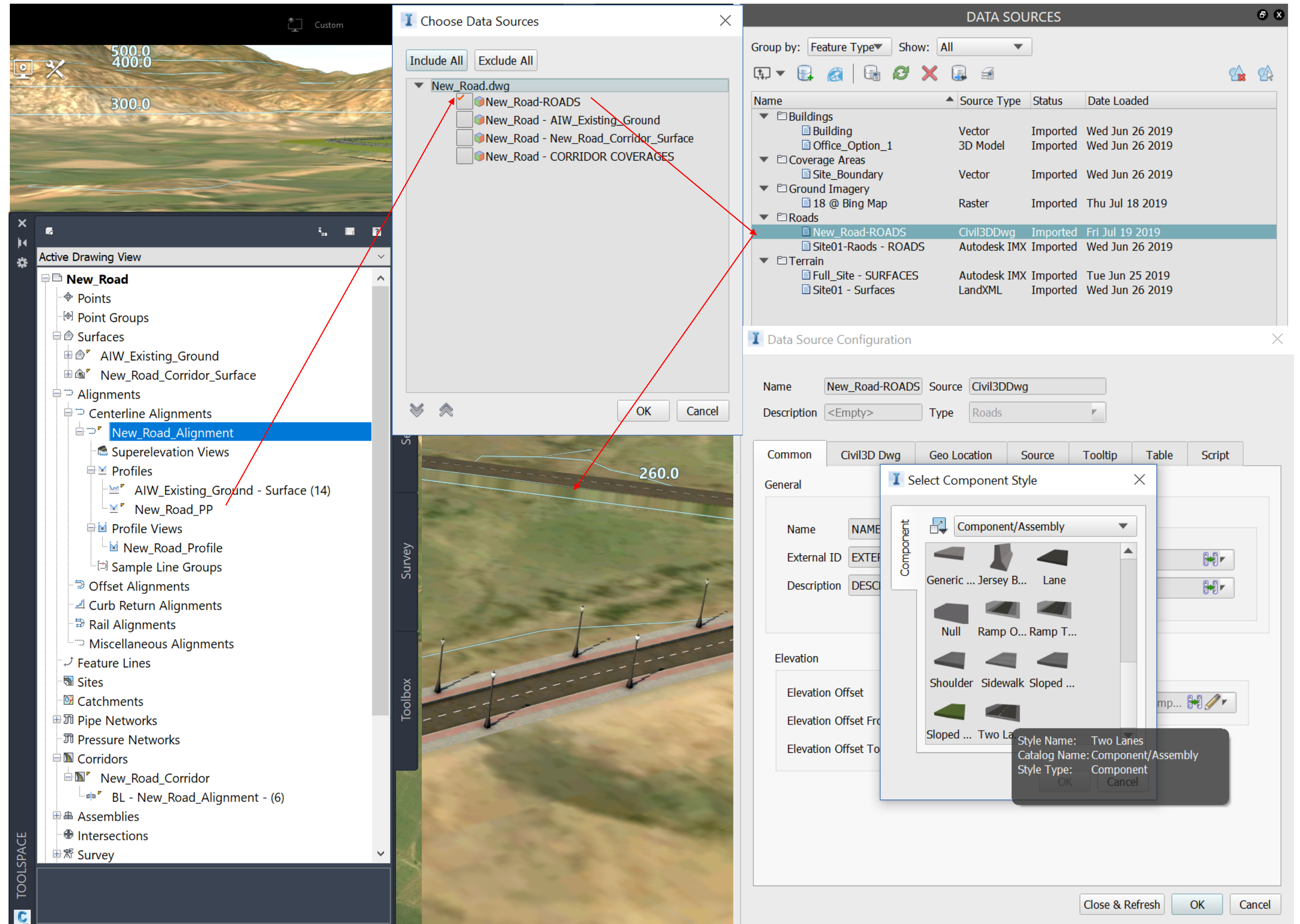


The Choose Data Sources panels appears and lists which data can be brought in as InfraWorks model objects. (InfraWorks will perform a conversion on Autodesk Civil 3D drawing objects when you bring Autodesk Civil 3D data into InfraWorks.) By default, the data you bring in from Autodesk Civil 3D is sorted by Feature class, unless you chose to sort by Source Type in the Data Sources panel.

Civil 3D Drawing to InfraWorks

Configure “Roads” in InfraWorks

- InfraWorks converts design road & alignment road both to a component road and both will react as a centerline in InfraWorks
- If you do not have an design road but only alignment then the road will behave as draped on the surface*



Civil 3D Drawing to InfraWorks

Configure Corridor in InfraWorks

- Corridor Surface = Terrain
- Corridor = Coverages

The screenshot illustrates the process of configuring a corridor in InfraWorks. It shows three main components: the TOOLSPACE, the 'Choose Data Sources' dialog, and the DATA SOURCES panel.

TOOLSPACE: The 'Active Drawing View' shows a project named 'New_Road'. The 'Prospector' pane on the right lists various elements, including 'Surfaces', 'Alignments', 'Feature Lines', 'Sites', 'Catchments', 'Pipe Networks', 'Pressure Networks', 'Corridors', 'Assemblies', 'Intersections', 'Survey', 'View Frame Groups', and 'Data Shortcuts'. The 'Corridors' section is expanded, showing 'New_Road_Corridor'.

Choose Data Sources Dialog: This dialog allows selecting data sources for the 'New_Road.dwg' project. It lists several sources, including 'New_Road-ROADS', 'New_Road - AIW_Existing_Ground', 'New_Road - New_Road_Corridor_Surface', and 'New_Road - CORRIDOR COVERAGES'. The 'New_Road - CORRIDOR COVERAGES' source is selected, and a red arrow points from this selection to the 'DATA SOURCES' panel.

DATA SOURCES Panel: This panel displays a list of data sources. The 'New_Road - CORRIDOR COVERAGES' source is highlighted, and its details are shown in the 'Data Source Details' section below. The details include:

Name	Source Type	Status	Date Loaded
New_Road - CORRIDOR C...	Civil3DDwg	Configured	

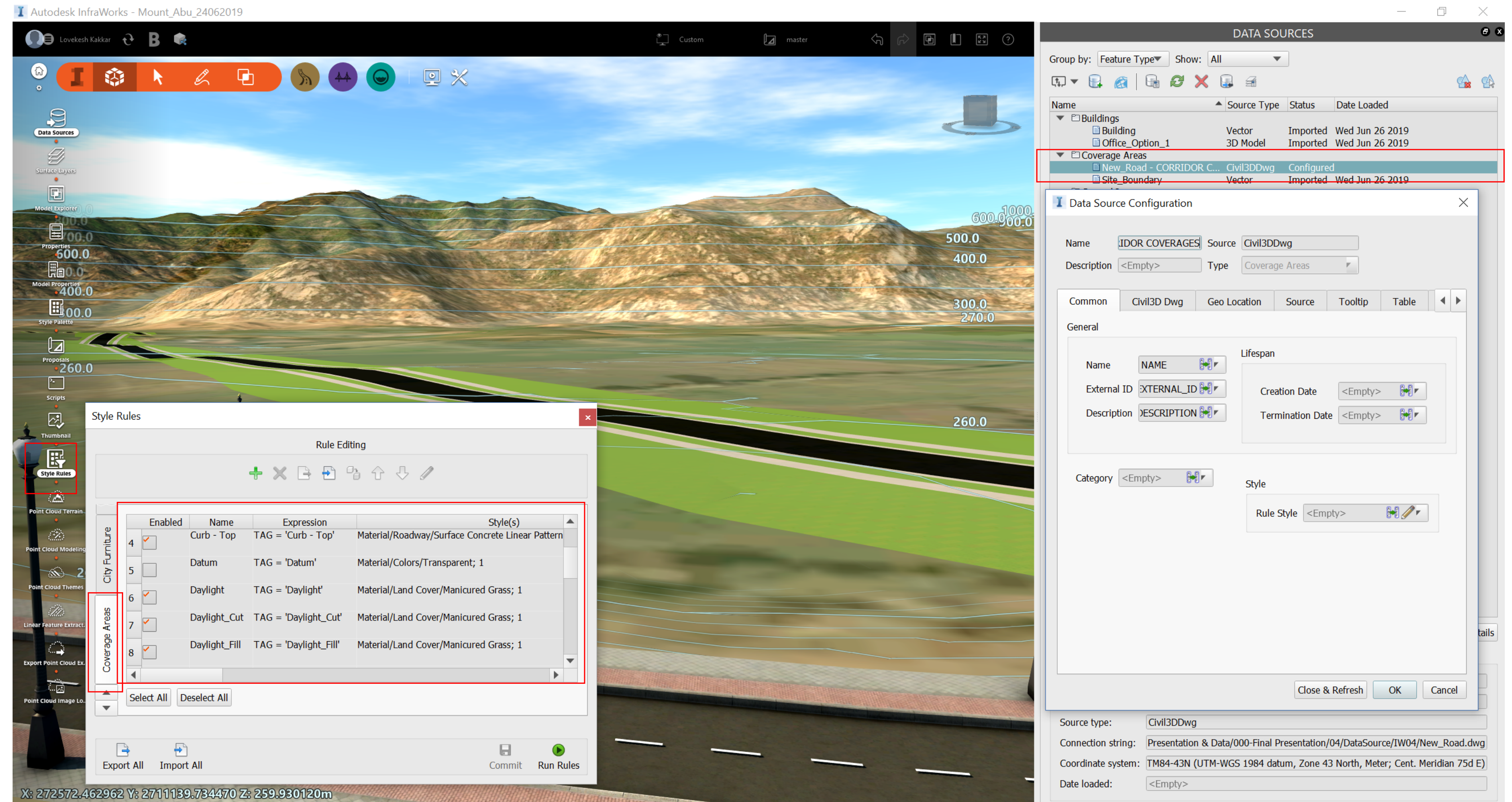
Data Source Details:

- Name: <Multiple Values>
- Description: <Empty>
- Source type: Civil3DDwg
- Connection string: Presentation & Data/000-Final Presentation/04/DataSource/IW04/New_Road.dwg
- Coordinate system: TM84-43N (UTM-WGS 1984 datum, Zone 43 North, Meter; Cent. Meridian 75d E)
- Date loaded: <Empty>

Civil 3D Drawing to InfraWorks

Let's Configure "Corridor = Coverages" in InfraWorks

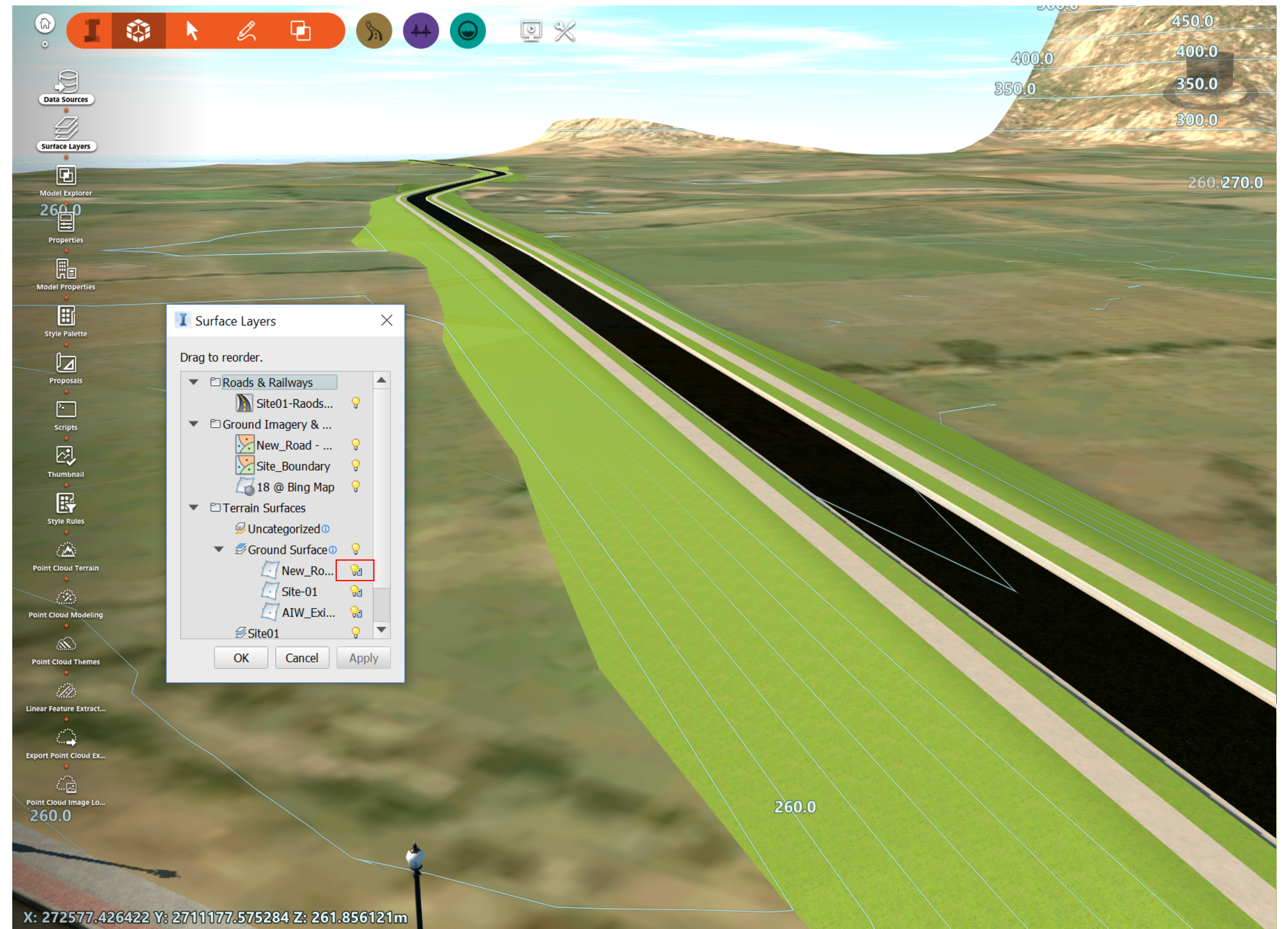
- Civil 3D Corridor gets converted in InfraWorks Coverages if imported directly as Civil 3D drawing
- You can check what style rule are existed in InfraWorks for coverages



Civil 3D Drawing to InfraWorks

Let's Configure "Corridor Surface = Terrain" in InfraWorks

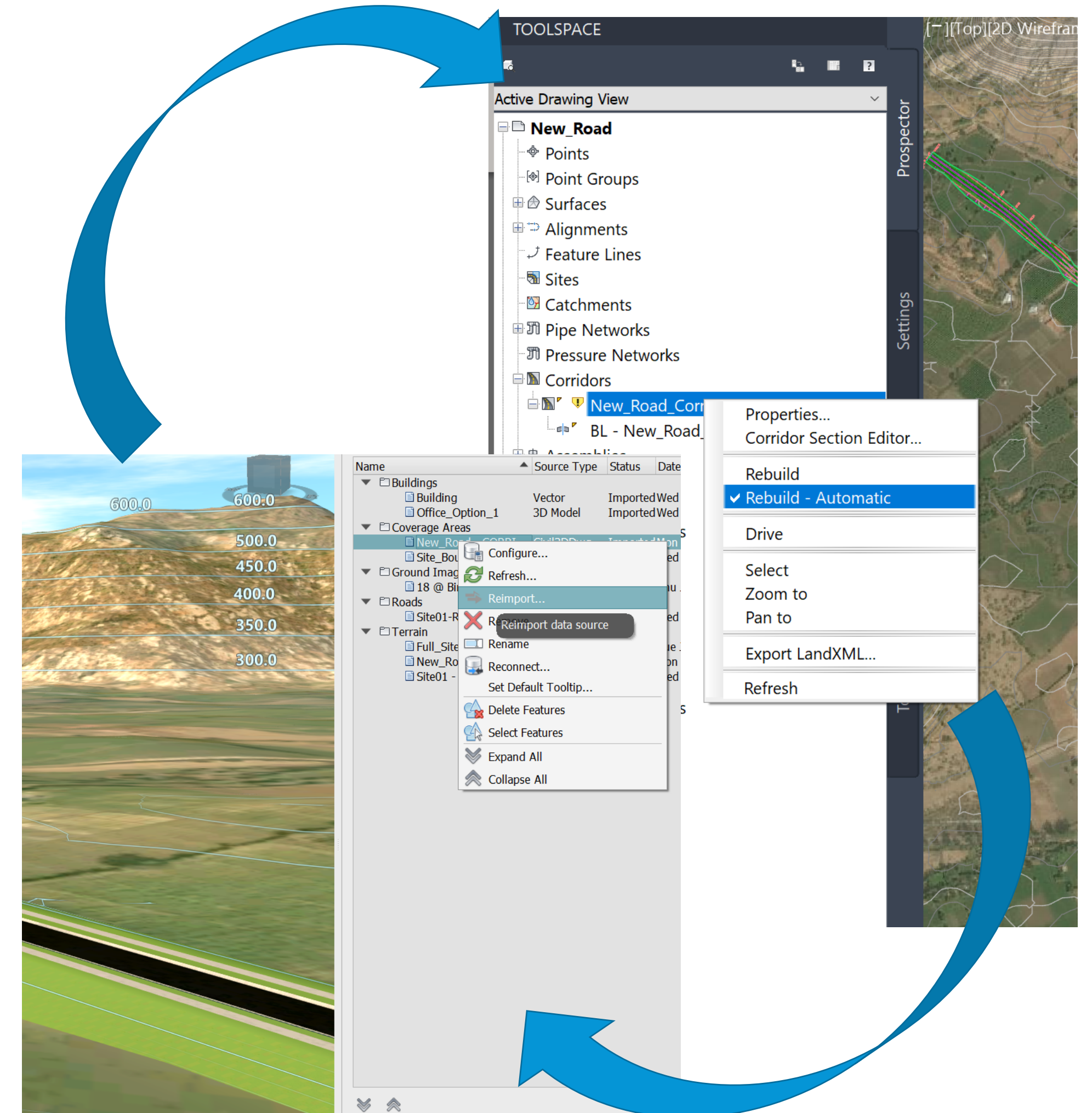
- Civil 3D Corridor surface gets converted in terrain surface if imported directly as Civil 3D drawing
- You can move it from uncategorized to ground surface or at the desire level & make sure you switch on the layer too



Civil 3D Drawing to InfraWorks

Refresh VS reimport

- **Reimport** command update the Autodesk Civil 3D drawing in your InfraWorks model and reflect design modifications. But reimporting the Civil 3D drawing will give you duplicate roads if the roads have been modified in InfraWorks
- And by chance you have edited the data already then as a workaround, you can delete all features of selected data source before reimporting it. Else if feature is not edited you use just re-import
- **Refresh** command just reread the data.
- Reimport function is not available if using IMX in InfraWorks as data source. But if you want then You can update the IMX file with newer one manually re-import in InfraWorks.



Question?





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