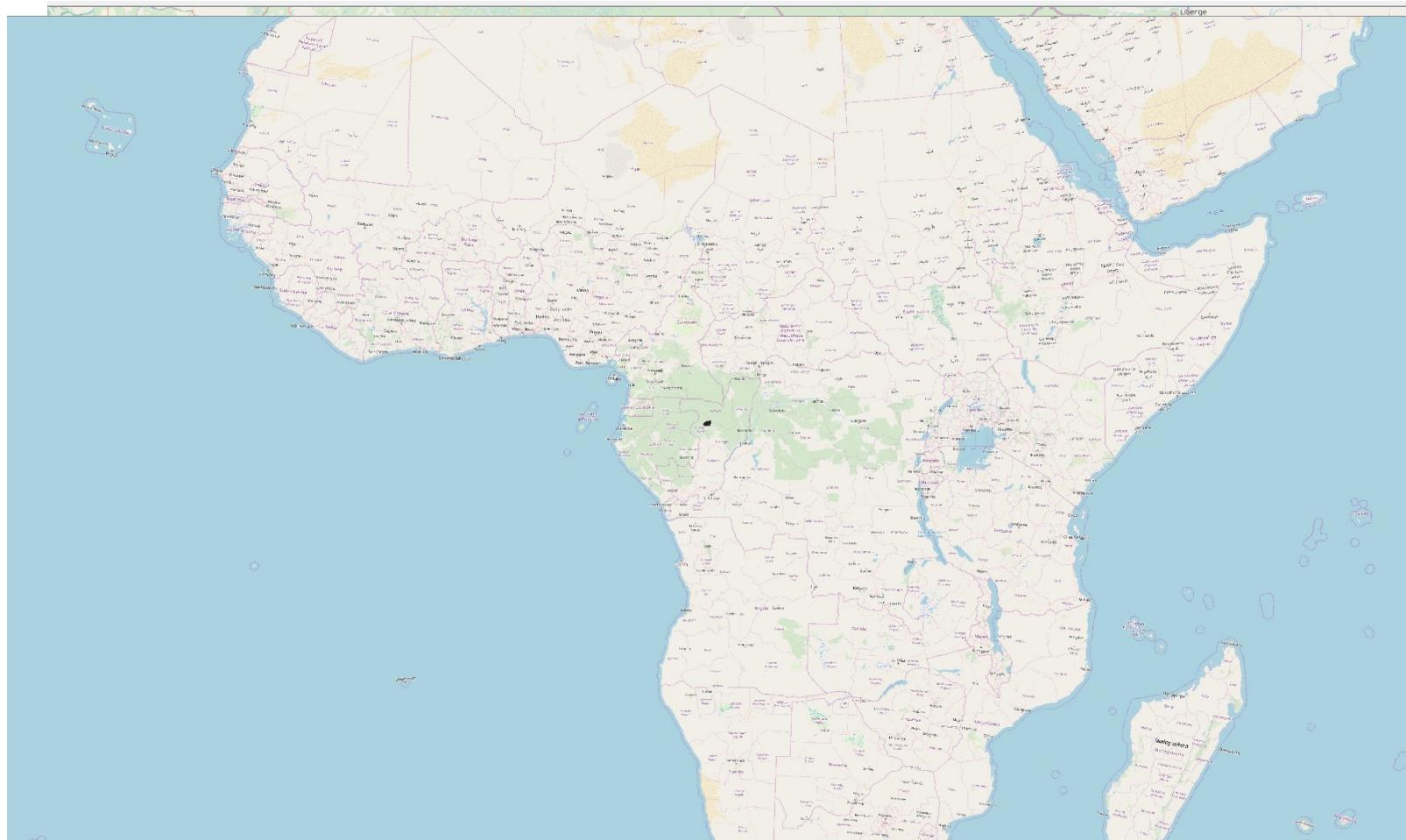


# Georeferencing BIM – a Worked Example

## GeoBIM Benchmark Workshop

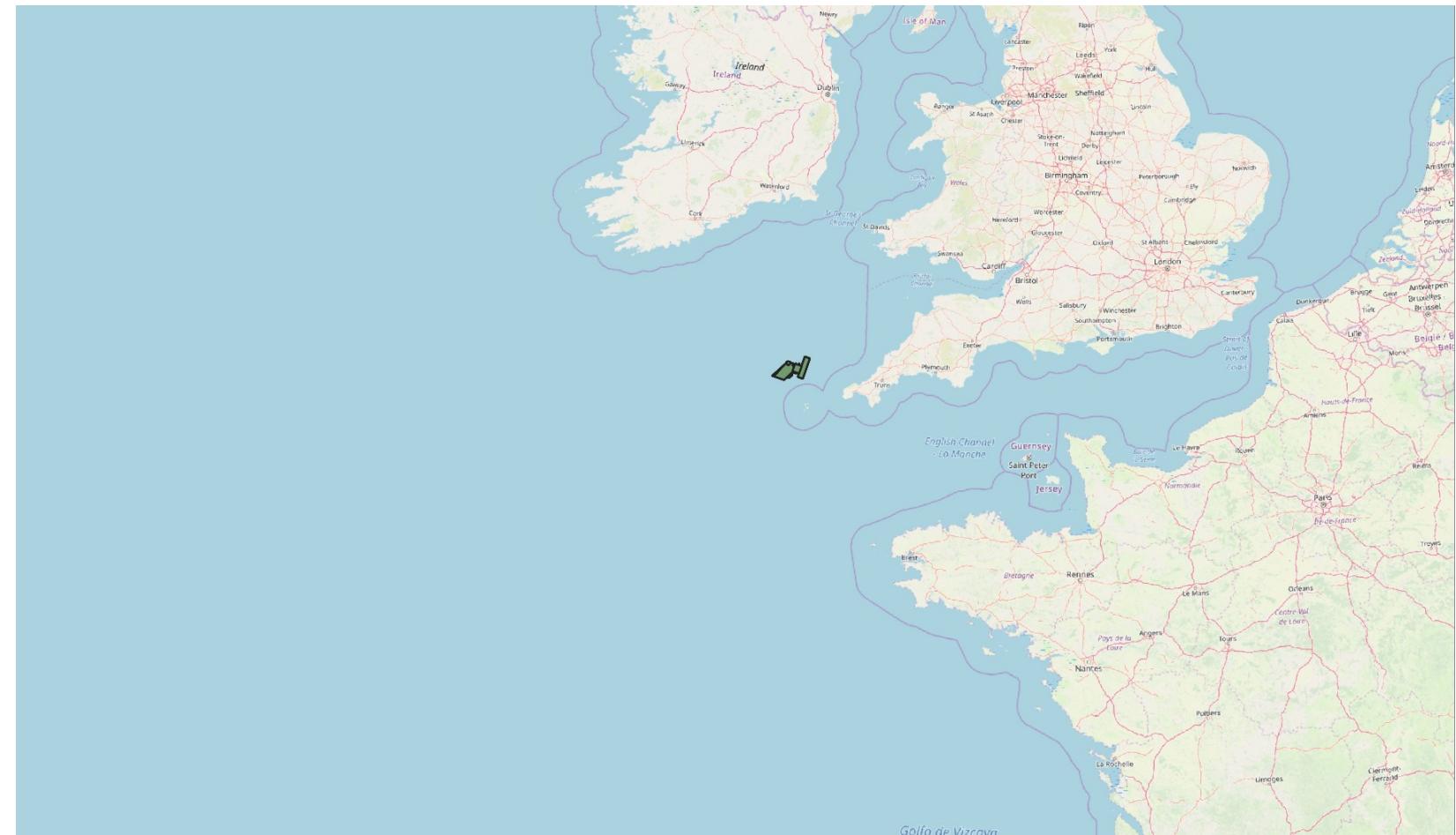
Dr Claire Ellul [c.ellul@ucl.ac.uk](mailto:c.ellul@ucl.ac.uk)

# Without Georeferencing – Myran Data IFC to Shapefile -3013



# Without Georeferencing – Myran Data IFC to Shapefile 27700

- In FME,  
setting the  
EPSG 27700  
and EPSG  
3013 give  
different  
results



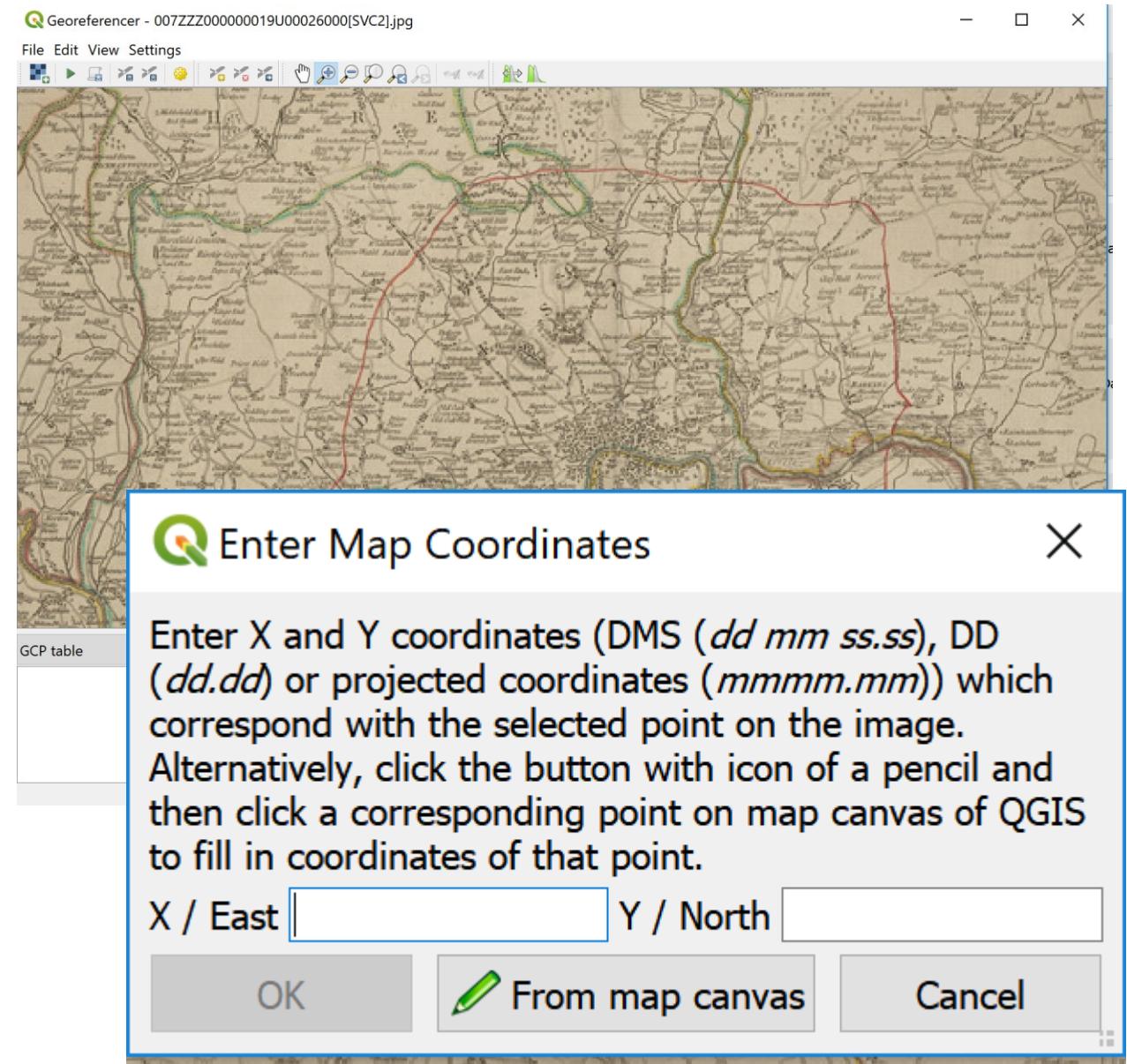
# EPSG.io

```
PROJCS["OSGB 1936 / British National Grid",
    GEOGCS["OSGB 1936",
        DATUM["OSGB_1936",
            SPHEROID["Airy 1830",6377563.396,299.3249646,
                AUTHORITY["EPSG","7001"]],
            TOWGS84[446.448,-125.157,542.06,0.15,0.247,0.842,-20.489],
                AUTHORITY["EPSG","6277"]],
            PRIMEM["Greenwich",0,
                AUTHORITY["EPSG","8901"]],
            UNIT["degree",0.0174532925199433,
                AUTHORITY["EPSG","9122"]],
                AUTHORITY["EPSG","4277"]],
            PROJECTION["Transverse_Mercator"],
            PARAMETER["latitude_of_origin",49],
            PARAMETER["central_meridian",-2],
            PARAMETER["scale_factor",0.9996012717],
            PARAMETER["false_easting",400000],
            PARAMETER["false_northing",-100000],
            UNIT["metre",1,
                AUTHORITY["EPSG","9001"]],
            AXIS["Easting",EAST],
            AXIS["Northing",NORTH],
            AUTHORITY["EPSG","27700"]]
```

```
PROJCS["SWEREF99 15 45",
    GEOGCS["SWEREF99",
        DATUM["SWEREF99",
            SPHEROID["GRS 1980",6378137.298,257222101,
                AUTHORITY["EPSG","7019"]],
            TOWGS84[0,0,0,0,0,0],
                AUTHORITY["EPSG","6619"]],
            PRIMEM["Greenwich",0,
                AUTHORITY["EPSG","8901"]],
            UNIT["degree",0.0174532925199433,
                AUTHORITY["EPSG","9122"]],
                AUTHORITY["EPSG","4619"]],
            PROJECTION["Transverse_Mercator"],
            PARAMETER["latitude_of_origin",0],
            PARAMETER["central_meridian",15.75],
            PARAMETER["scale_factor",1],
            PARAMETER["false_easting",150000],
            PARAMETER["false_northing",0],
            UNIT["metre",1,
                AUTHORITY["EPSG","9001"]],
            AUTHORITY["EPSG","3013"]]
```

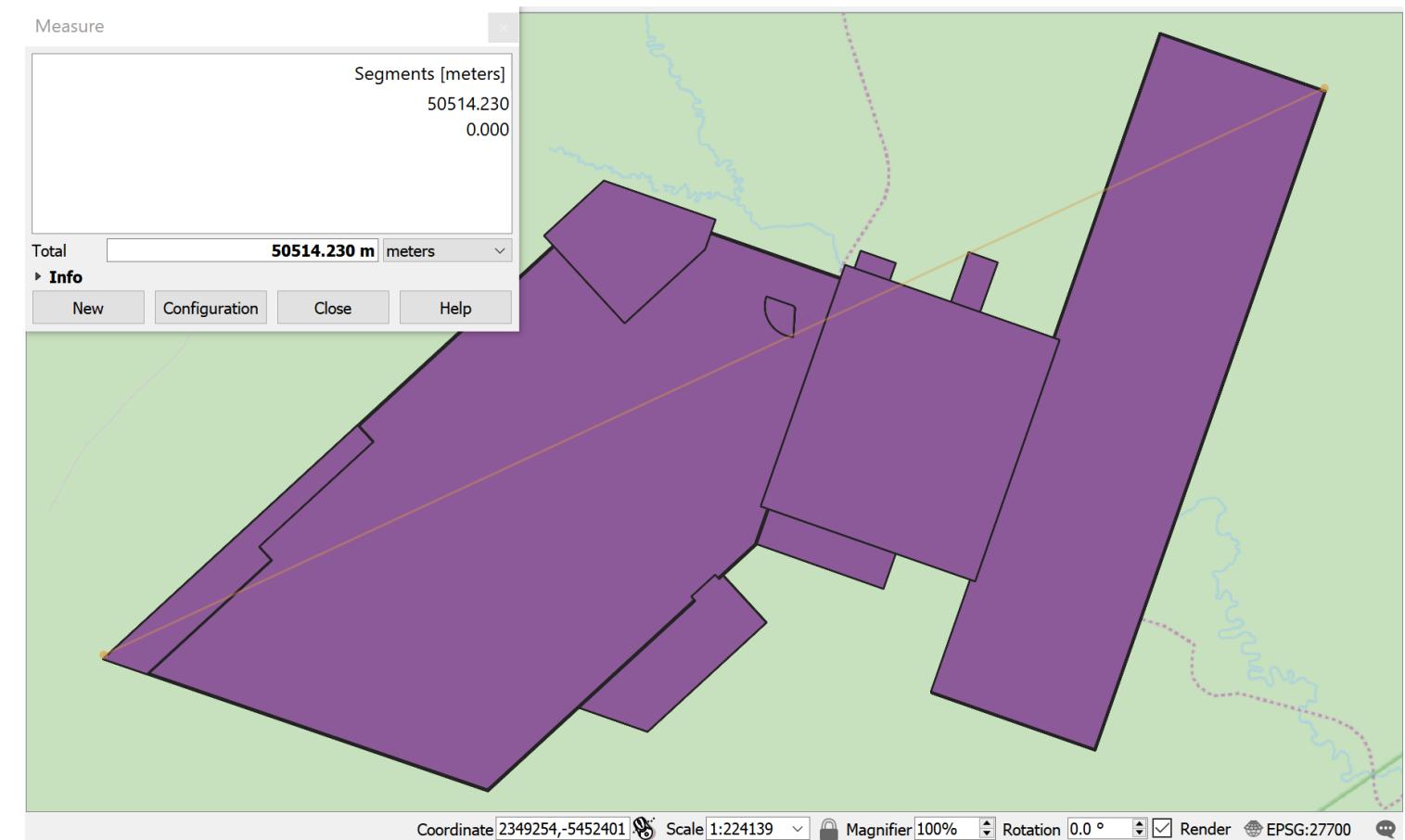
# Once Upon a Time ..

- QGIS Georeferencer
  - Create ground control points by clicking on the map and adding the coordinates
  - Minimum of 3 for **scale, rotate, translate**
  - Ideally more



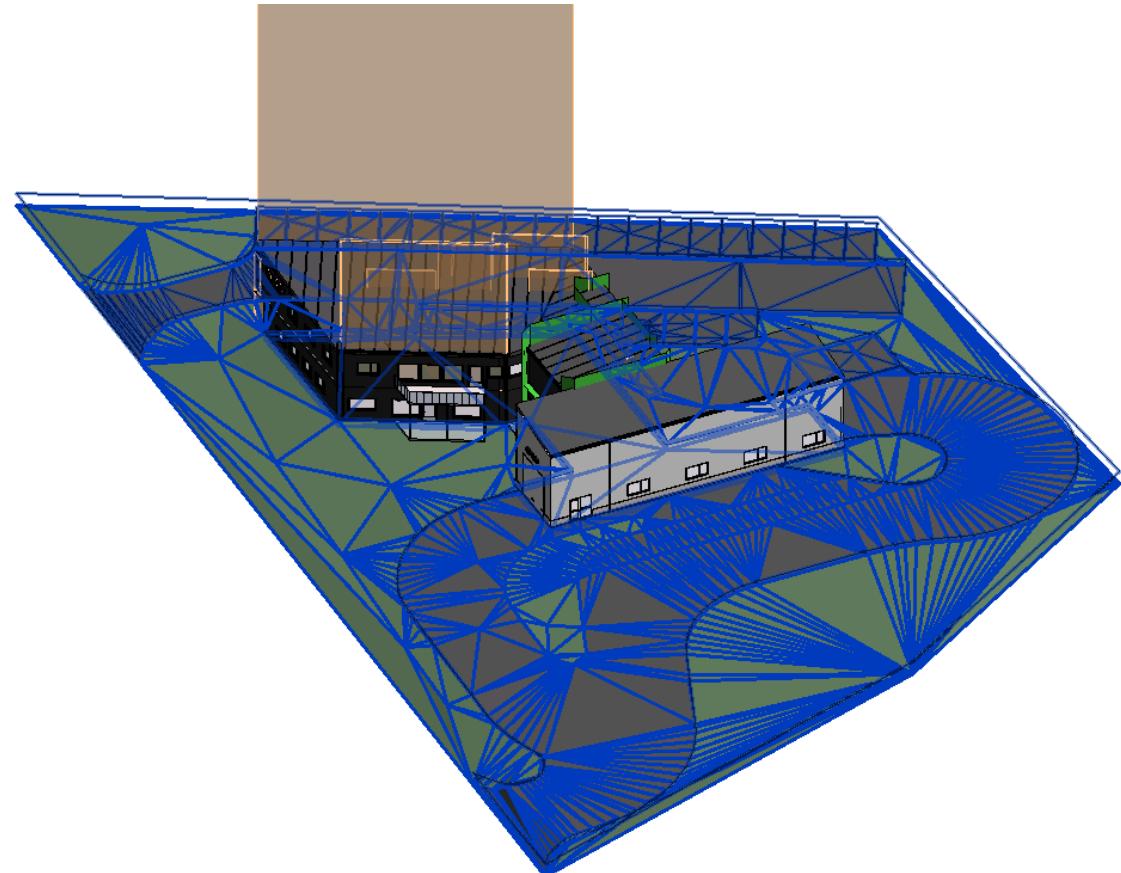
## In BIM – Myran Data IFC to Shapefile

- No need to scale – the drawing is already vector
  - However, might need to change the units
- Need to translate (move the image to the correct location)
- Many need to rotate (if the local coordinate system is not orientated north)

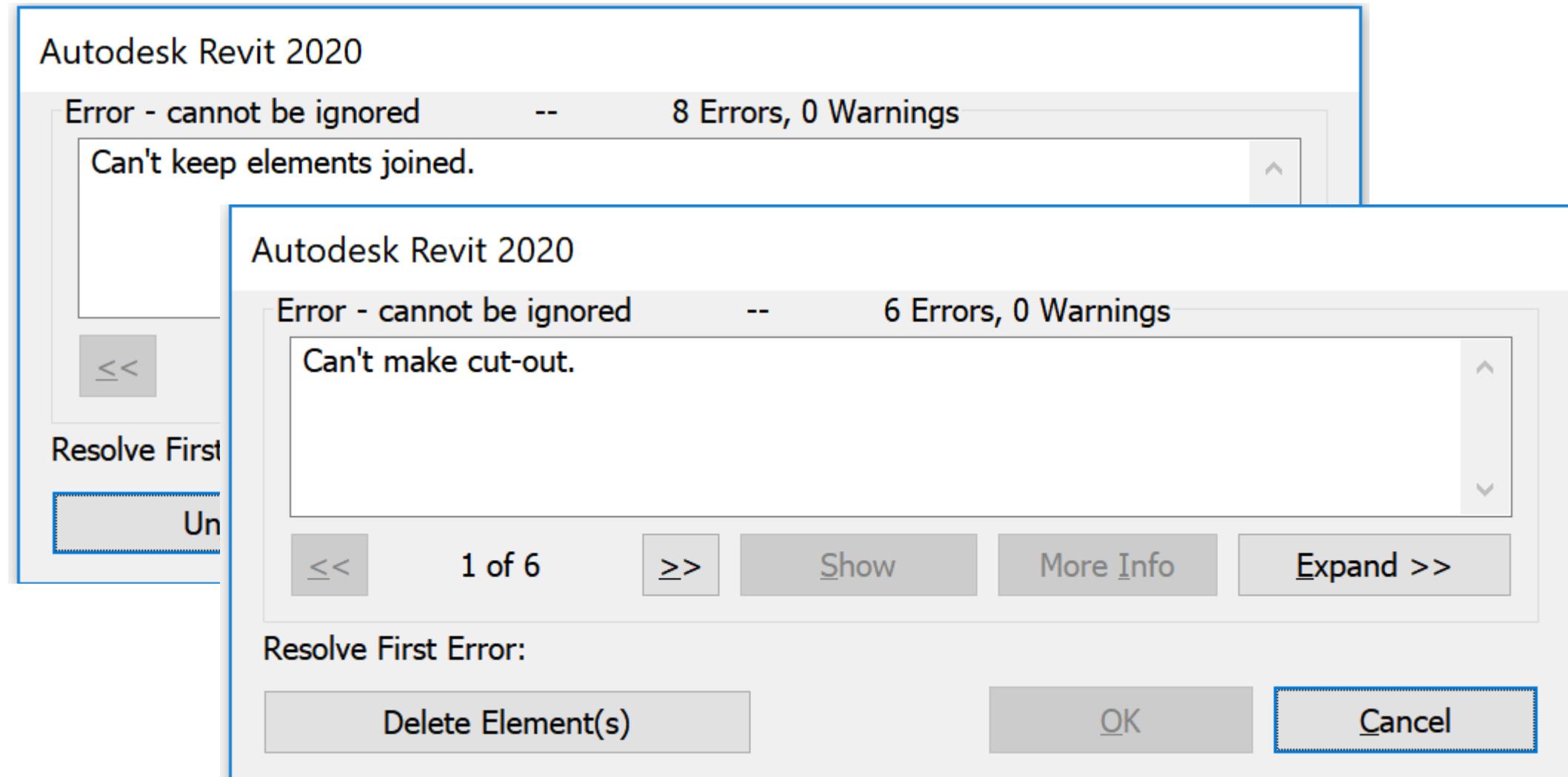


# Myran Dataset

- Revit offers the options to
  - Change the units on the drawing from mm to m if necessary (scale)
  - Move the BIM geometry to the correct location (translate)
  - Rotate the BIM geometry
- FILE > OPEN > IFC and then saved the IFC as an RVT file

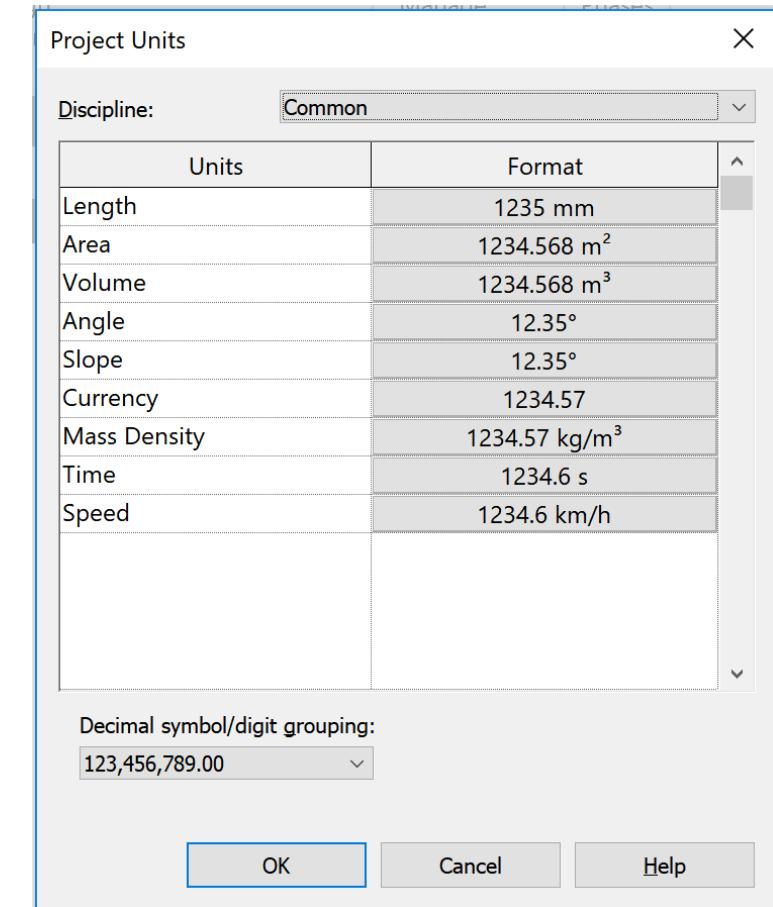


# Import the Myran Dataset IFC into Revit



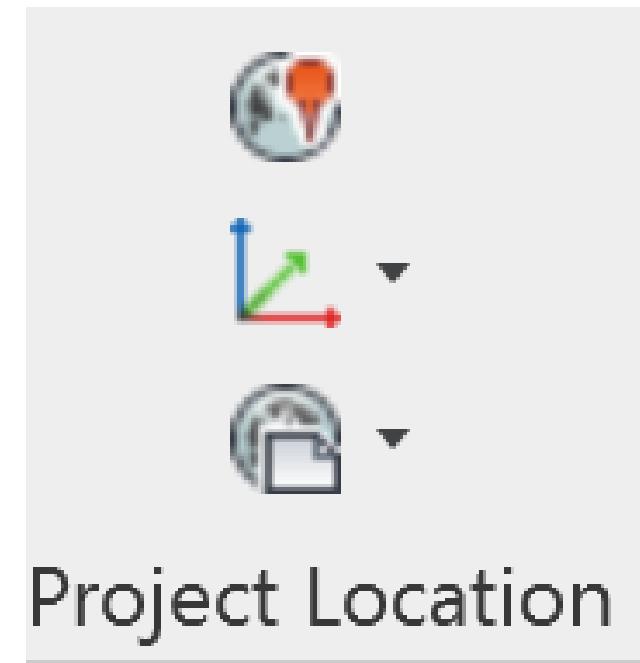
# Change the Project Units

- Manage > Settings > Project Units



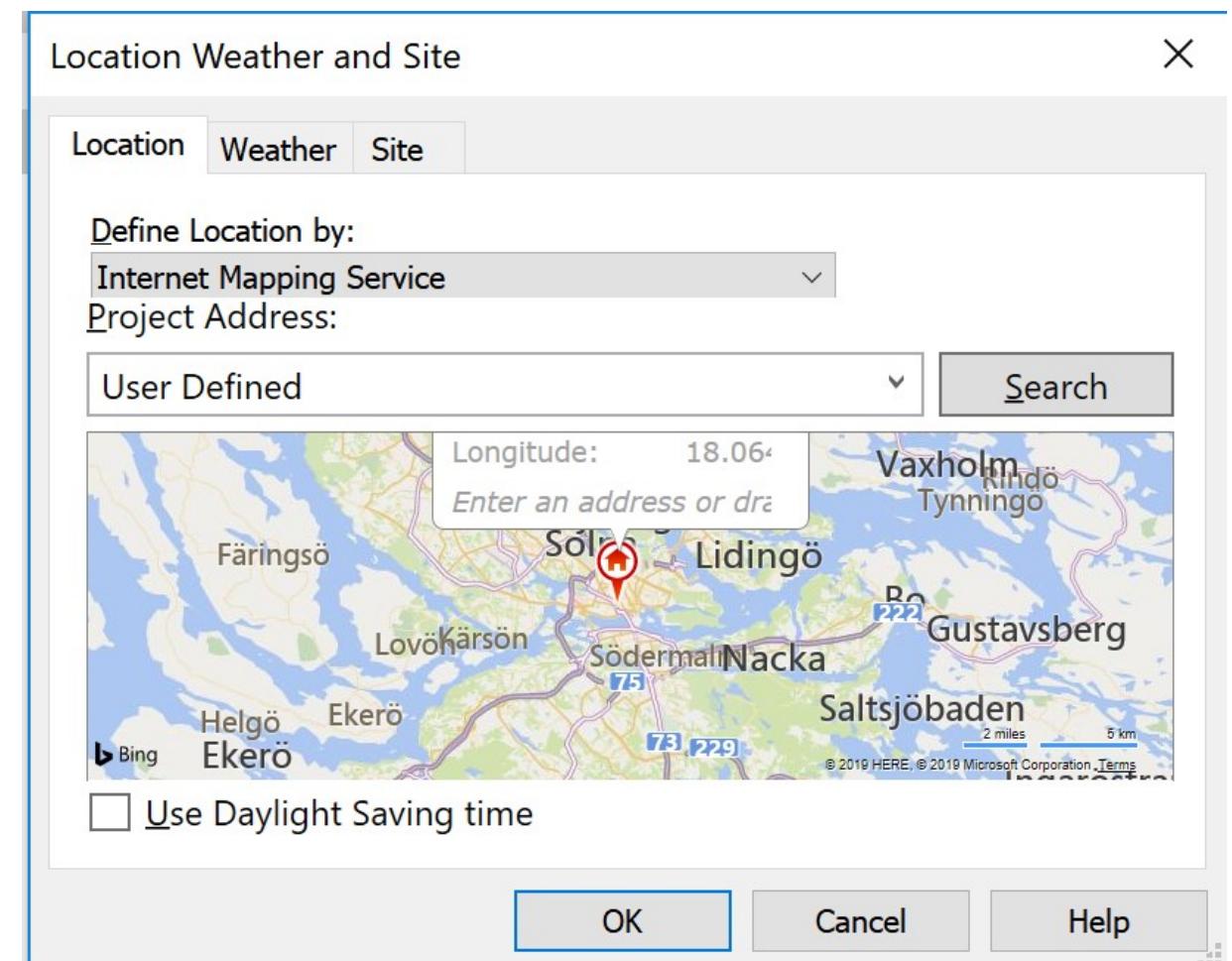
# Options for Location Definition

- Manage > Project Location
- Location
- Coordinates
- Position



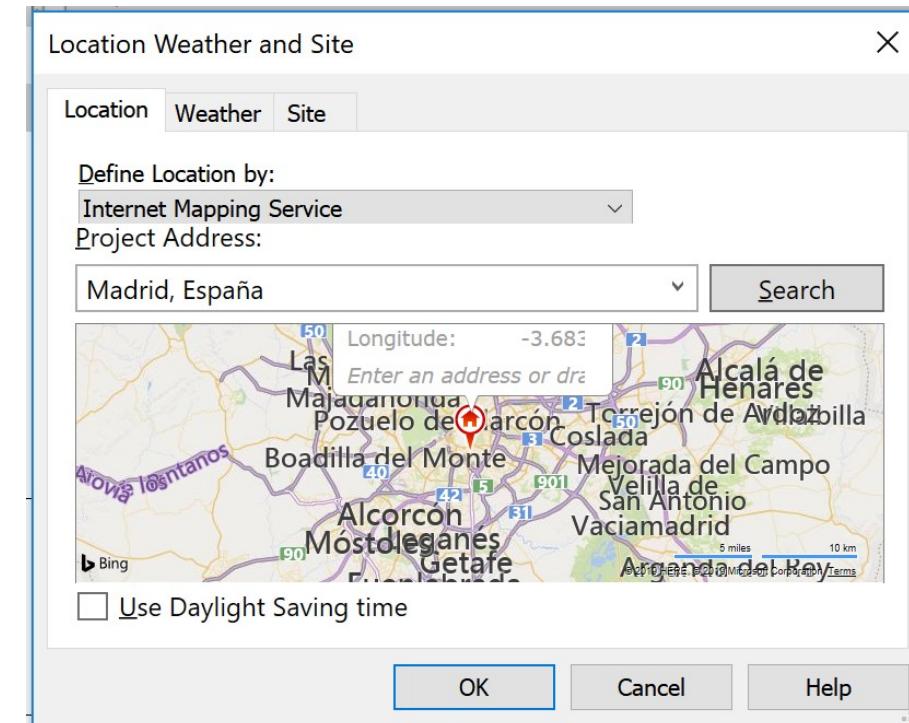
# Option 1- Location

- MANAGE > LOCATION
- Address search e.g. using street name, postcode etc
- Result will depend on the geocoder



# Option 1 - Location

- Be careful about templates!



## Option 2 – Coordinates

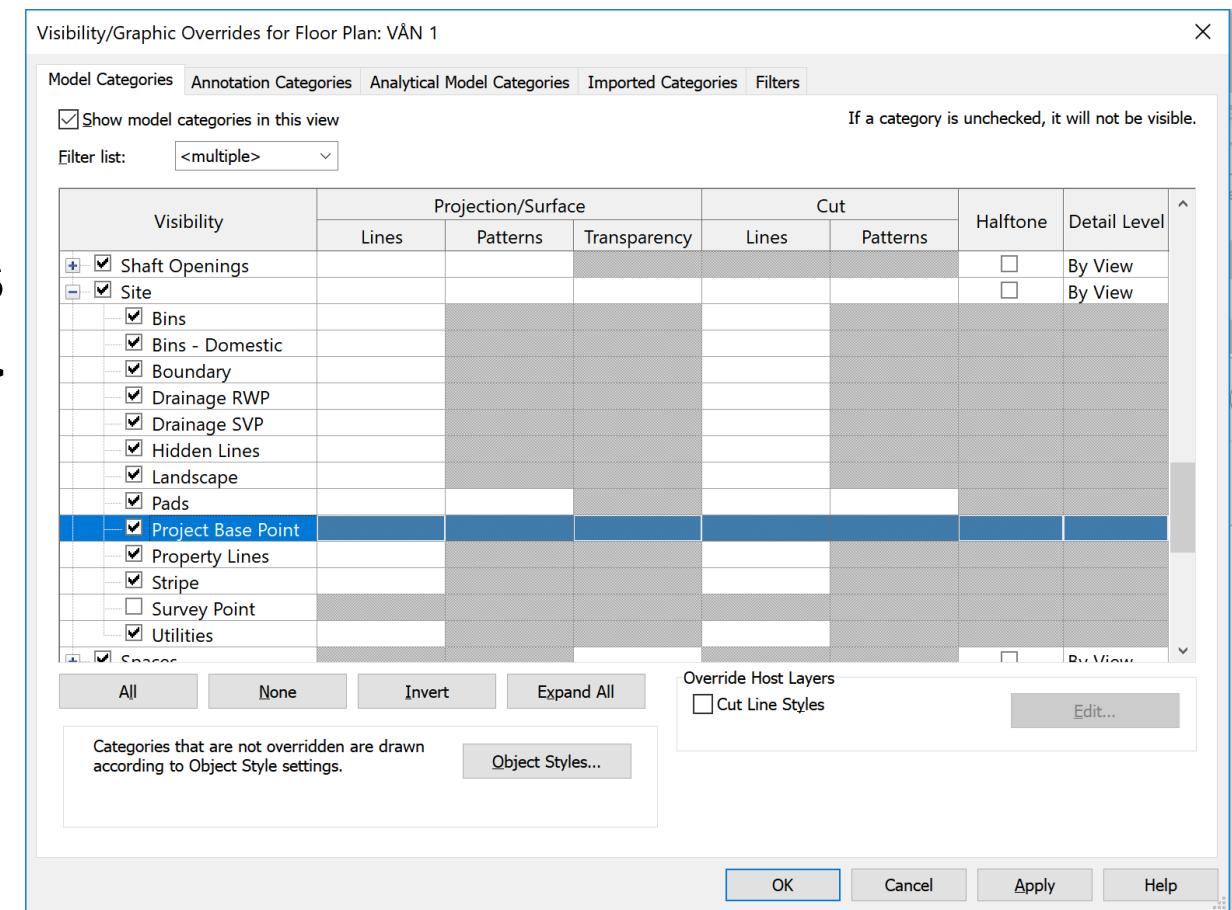
- Acquire coordinates – get the coordinates from a linked project
- Publish coordinates – share the coordinates of the current model with another project
- Specify coordinates at a point – georeferenced the model (see next slides)
- Report shared coordinates – click somewhere on the model and see the coordinates

## Specify Coordinates at a Point

- The project **base point** defines the origin (0,0,0) of the project coordinate system. Use the project **base point** as a reference **point** for measurements across the site.
- The **survey point** identifies a real-world location near the model, such as a corner of the project site or the intersection of 2 property lines
- View > Graphics > Visibility Graphics > Site > Project Base Point
- View > Graphics > Visibility Graphics > Site > Survey Point

# Specify Coordinates at a Point

- Option 1 - use the pre-defined project base point with properly surveyed coordinates
  - View > visibility graphics > site > project base point
- Option 2 – take the coordinates from a GIS map and find a matching point in the BIM



## Original georeferencing details (for Task 1)

Coordinate reference system: none

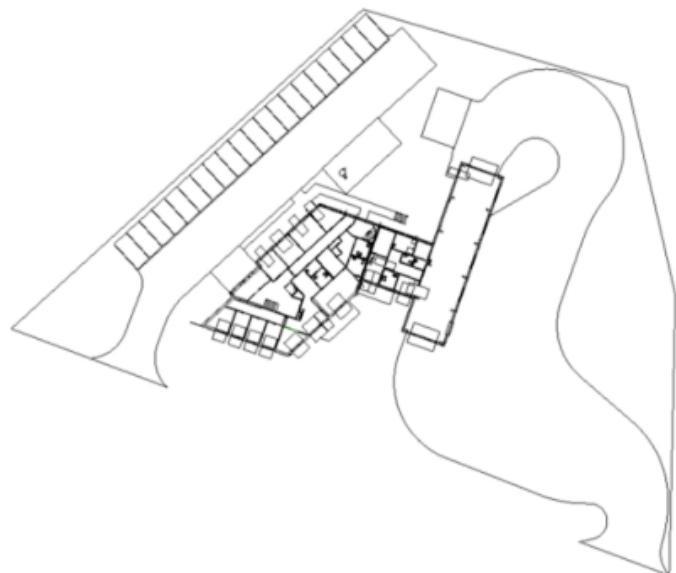
Coordinates of the reference point (blue in Figure 1):

E: 152677.777 m

N: 6555555.555 m

H: 148.2 m

Rotation to the true North of the reference direction (blue in Figure 2): 32.3°.



## Georeferencing parameters (for Task 2)

Coordinate reference system: EPSG::3013 SWEREF 99 15 45, RH2000

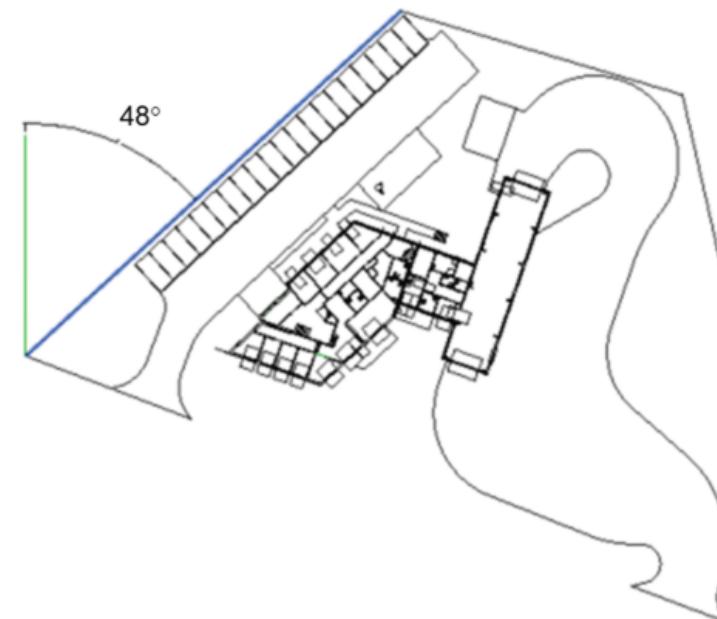
Coordinates of the reference point (blue in Figure 1):

E: 145312.8320 m

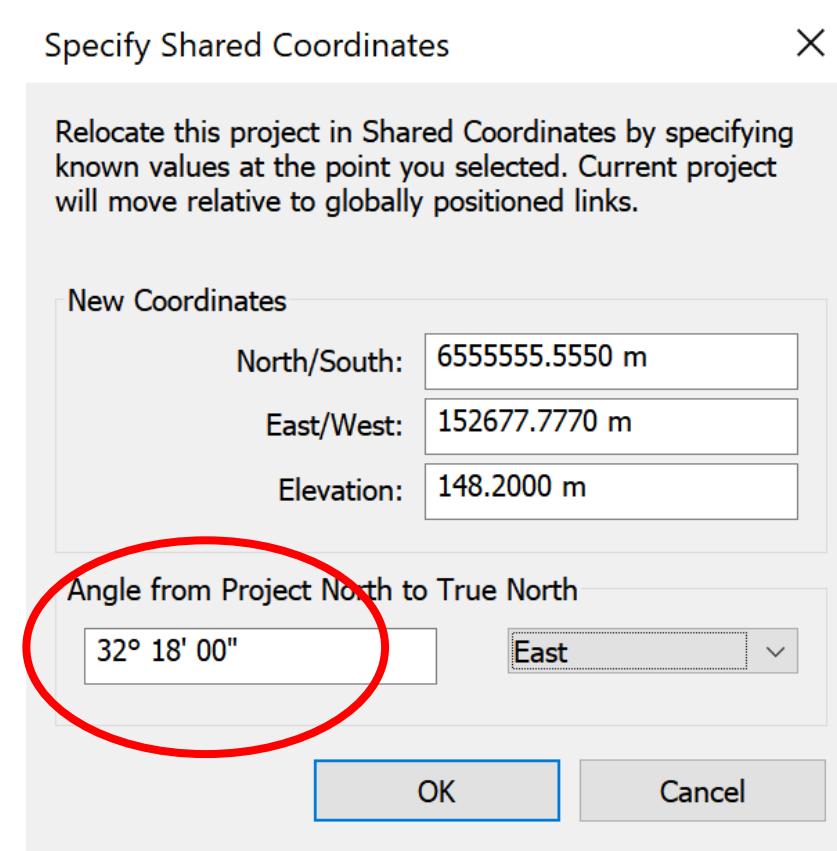
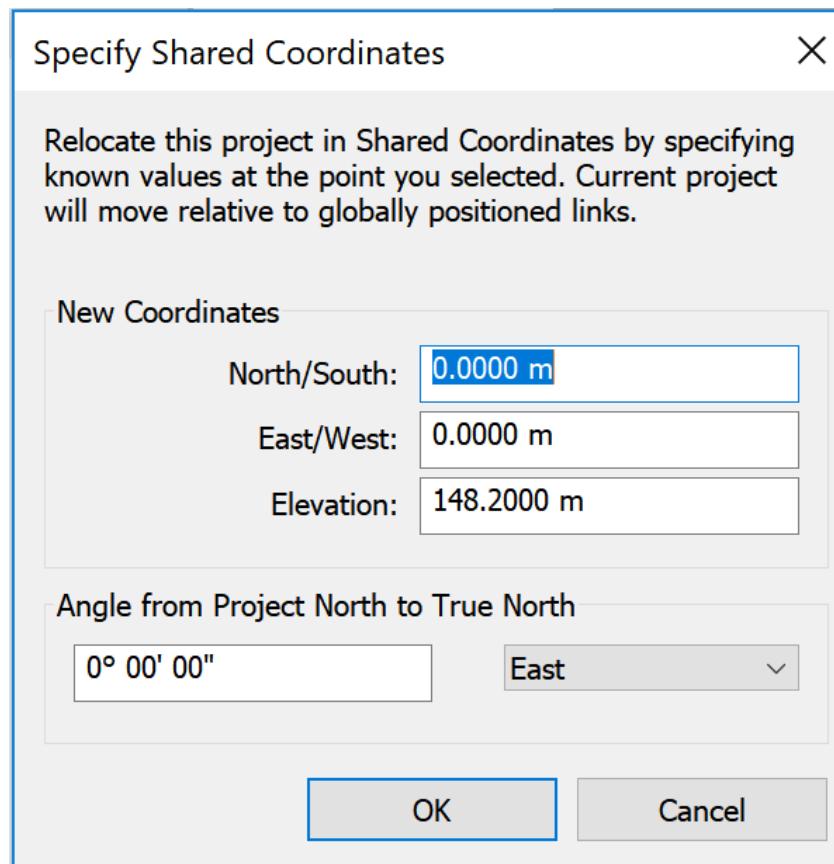
N: 6721748.645 m

H: 340.5 m

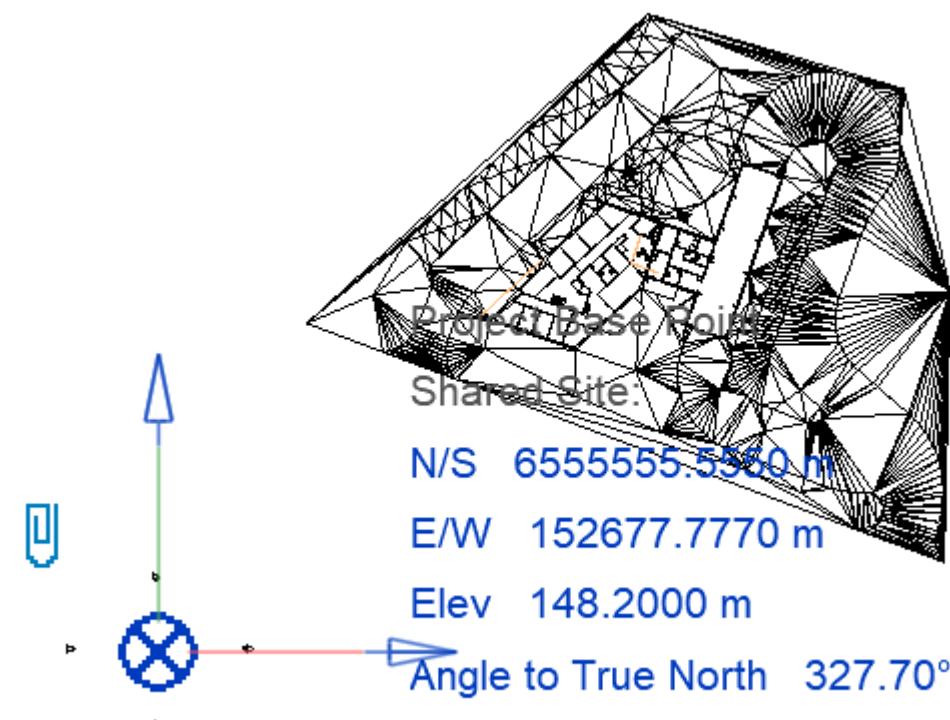
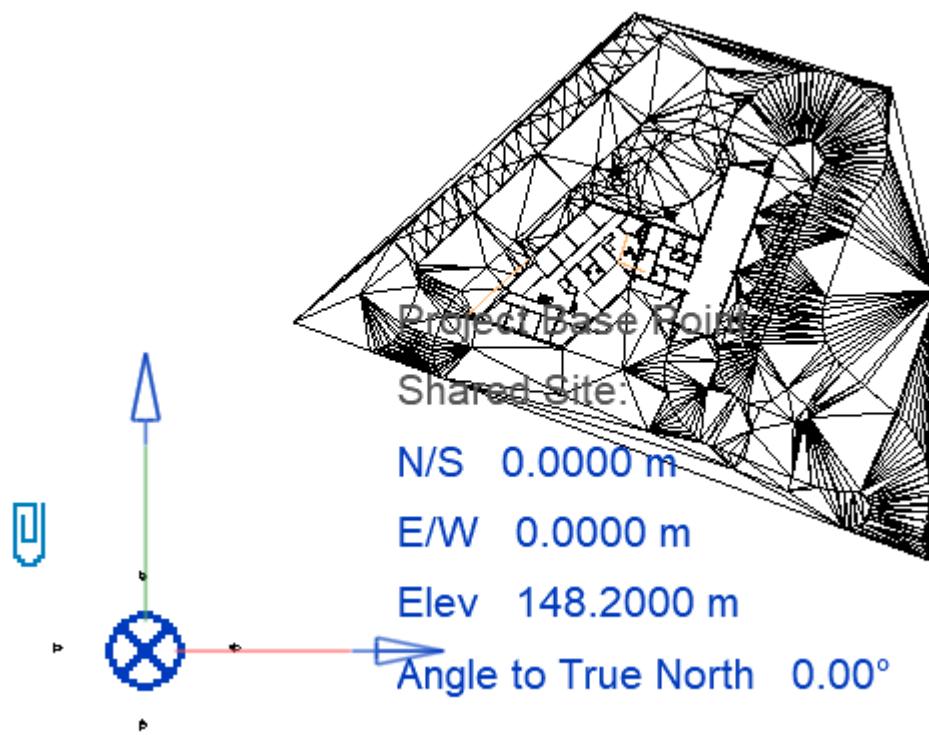
Rotation to the true North of the reference direction (blue in Figure 2): 48°.



# Specify Coordinates at a Point



# Specify Coordinates at a Point



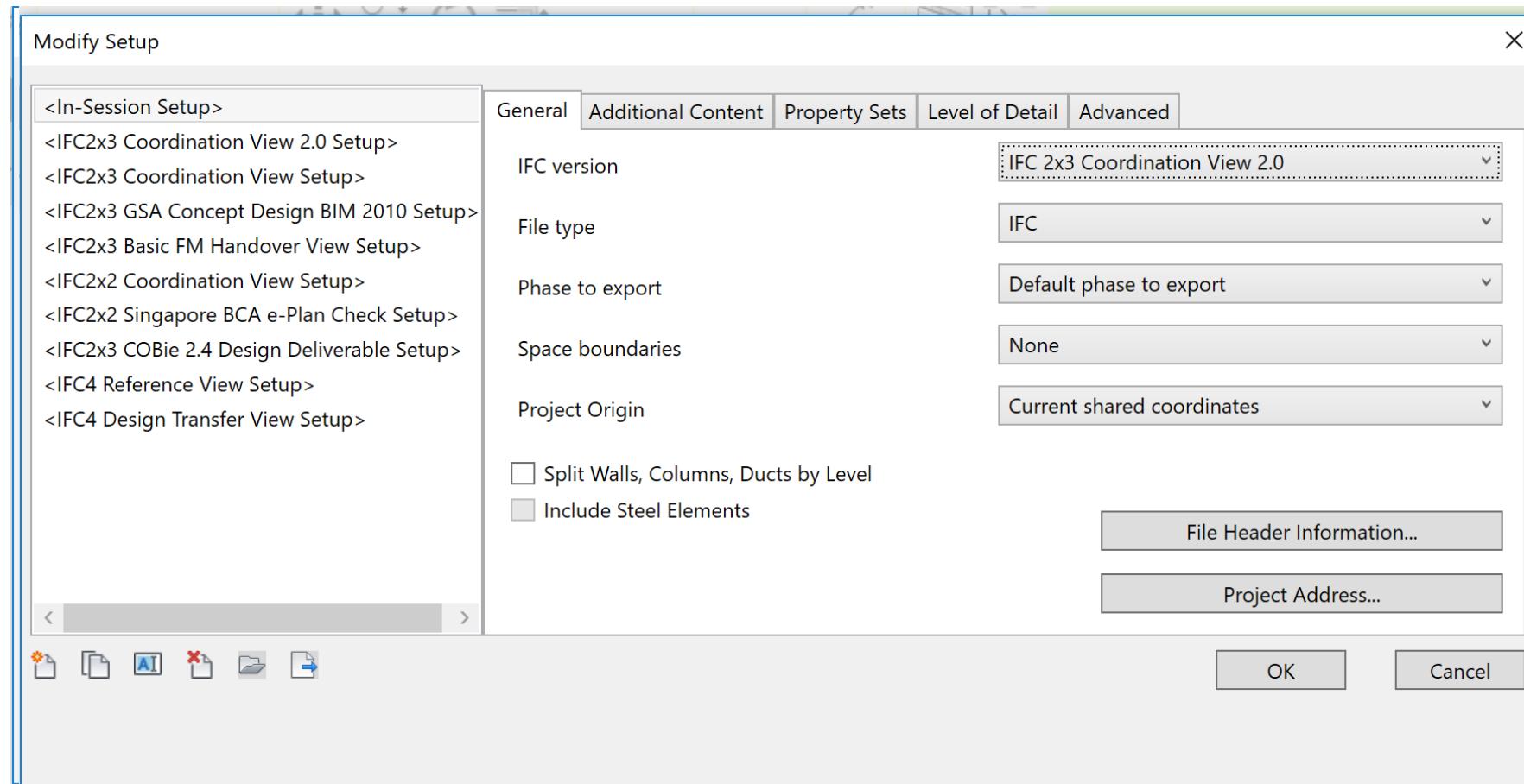
# Report Shared Coordinates

- Check by clicking on Manage > Project Location > Coordinates > Report Shared
- Be careful – if you haven't changed the units the values will be in mm

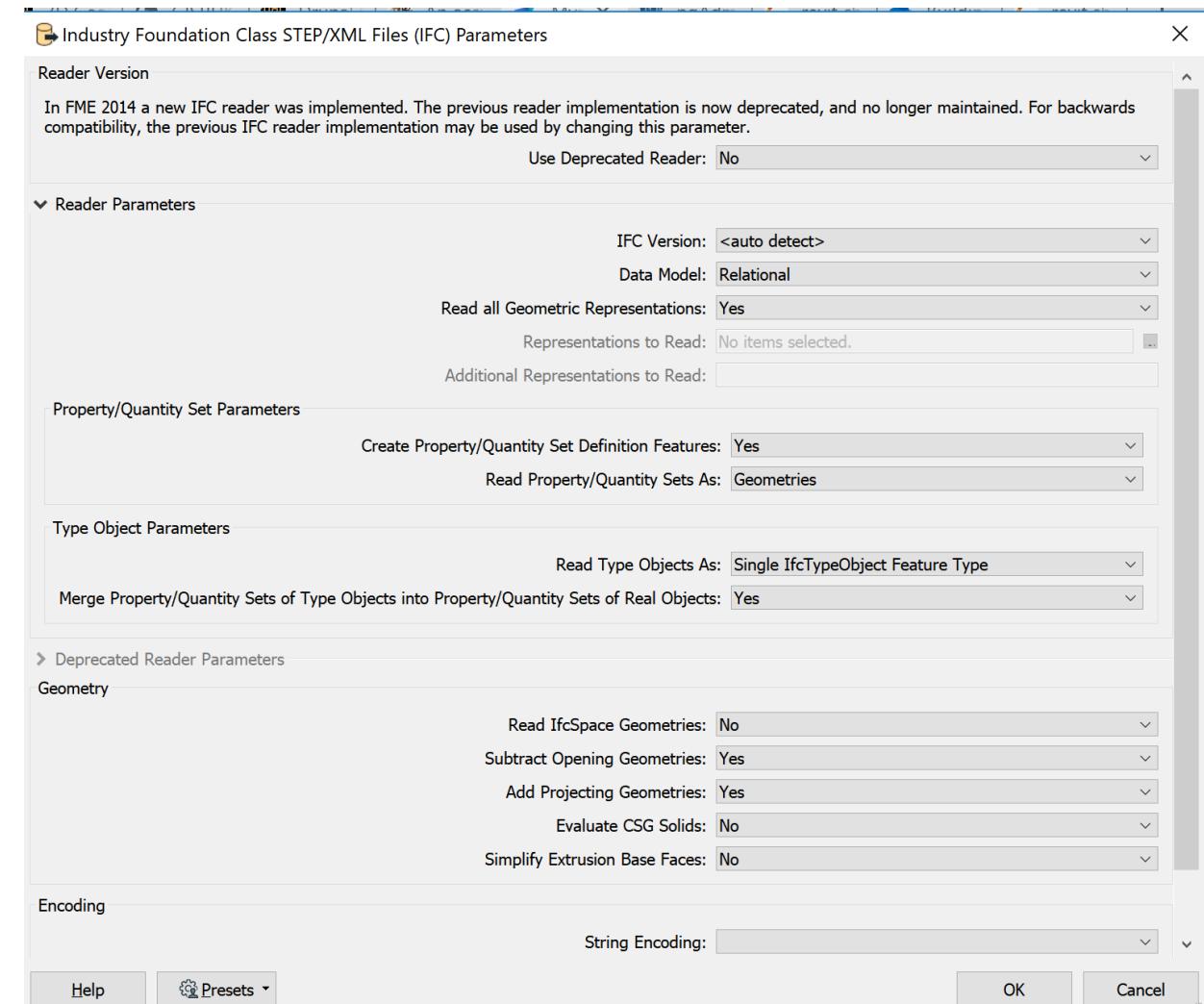
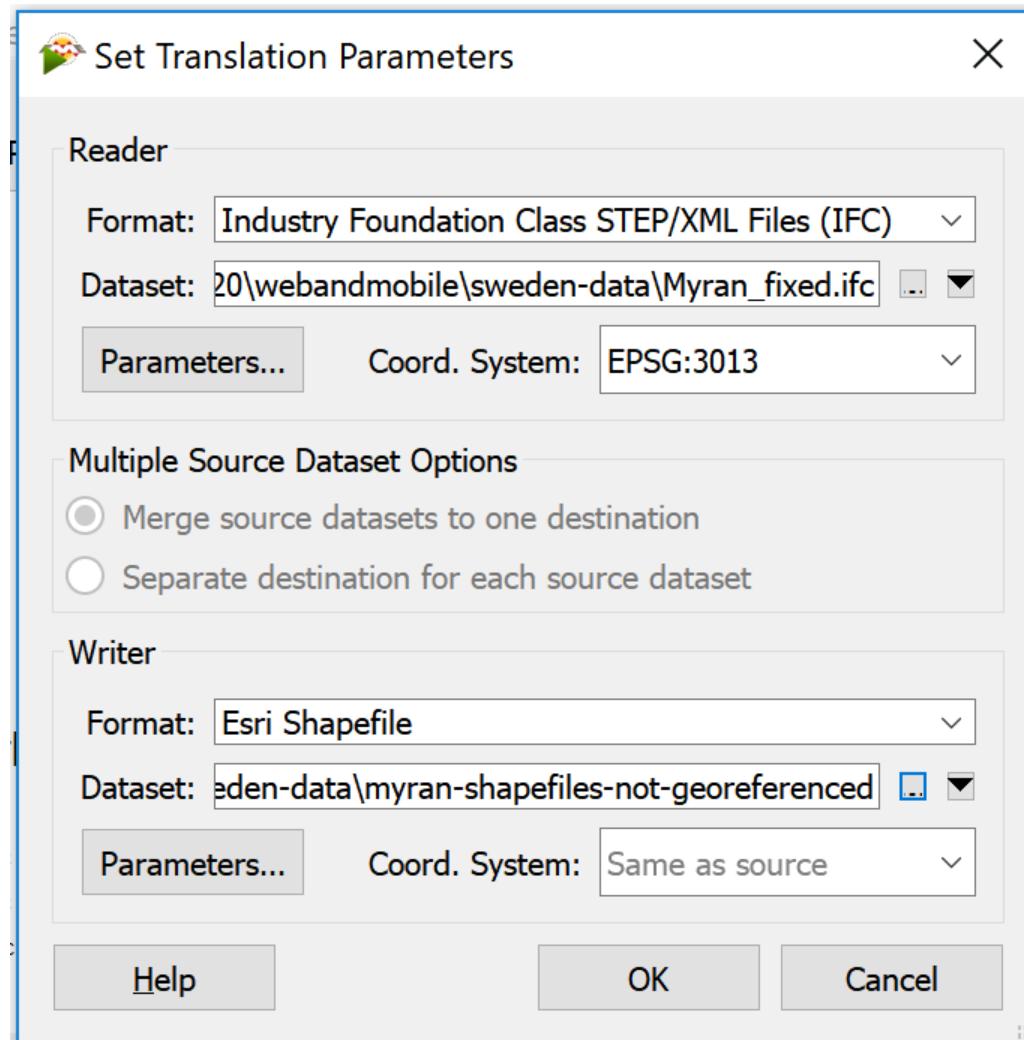
N/S: 49585.2 m E/W: 22320.5 m Elevation: 148200.0 m

N/S: 53.6553 m E/W: 46.8444 m Elevation: 147.8830 m

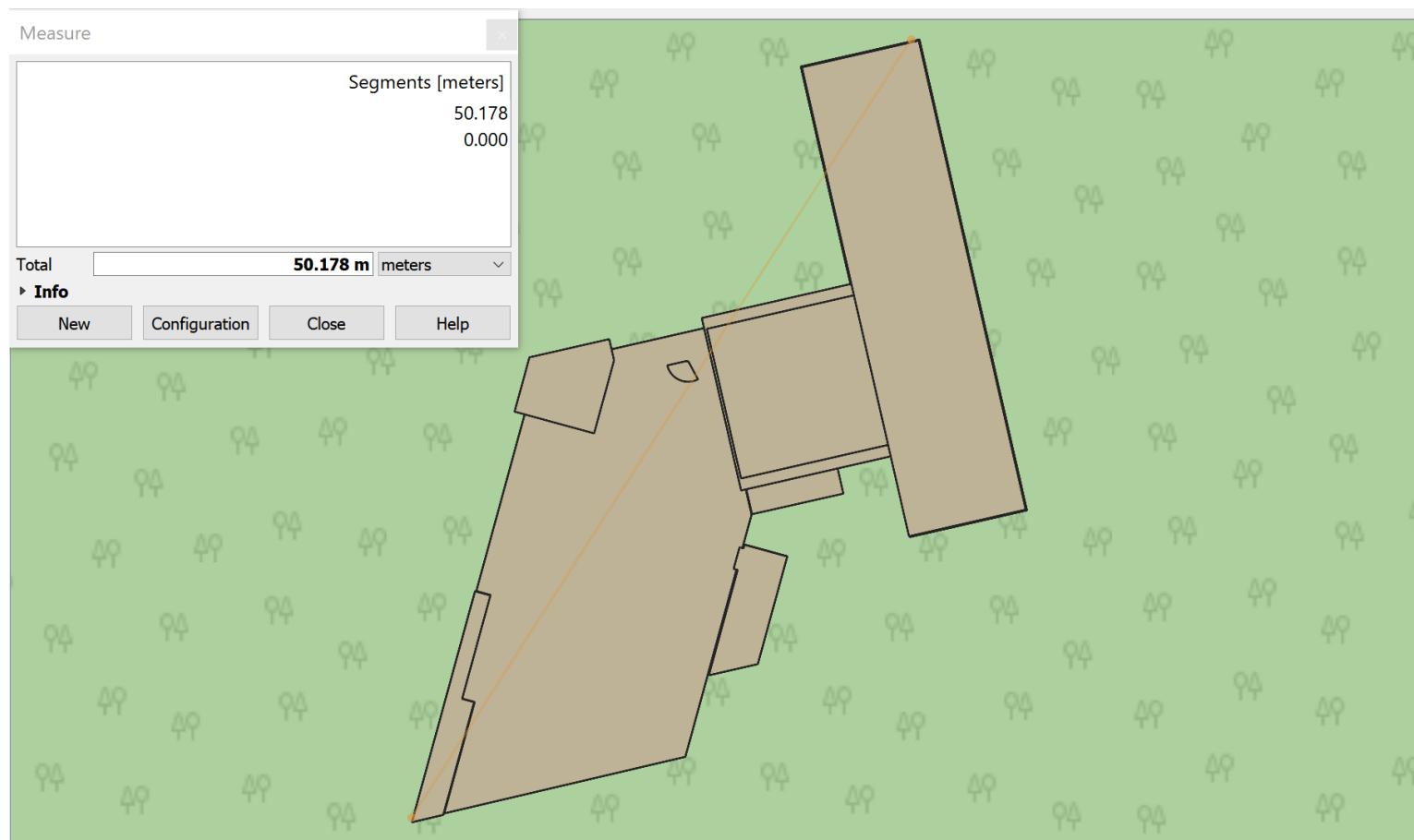
# Export to IFC



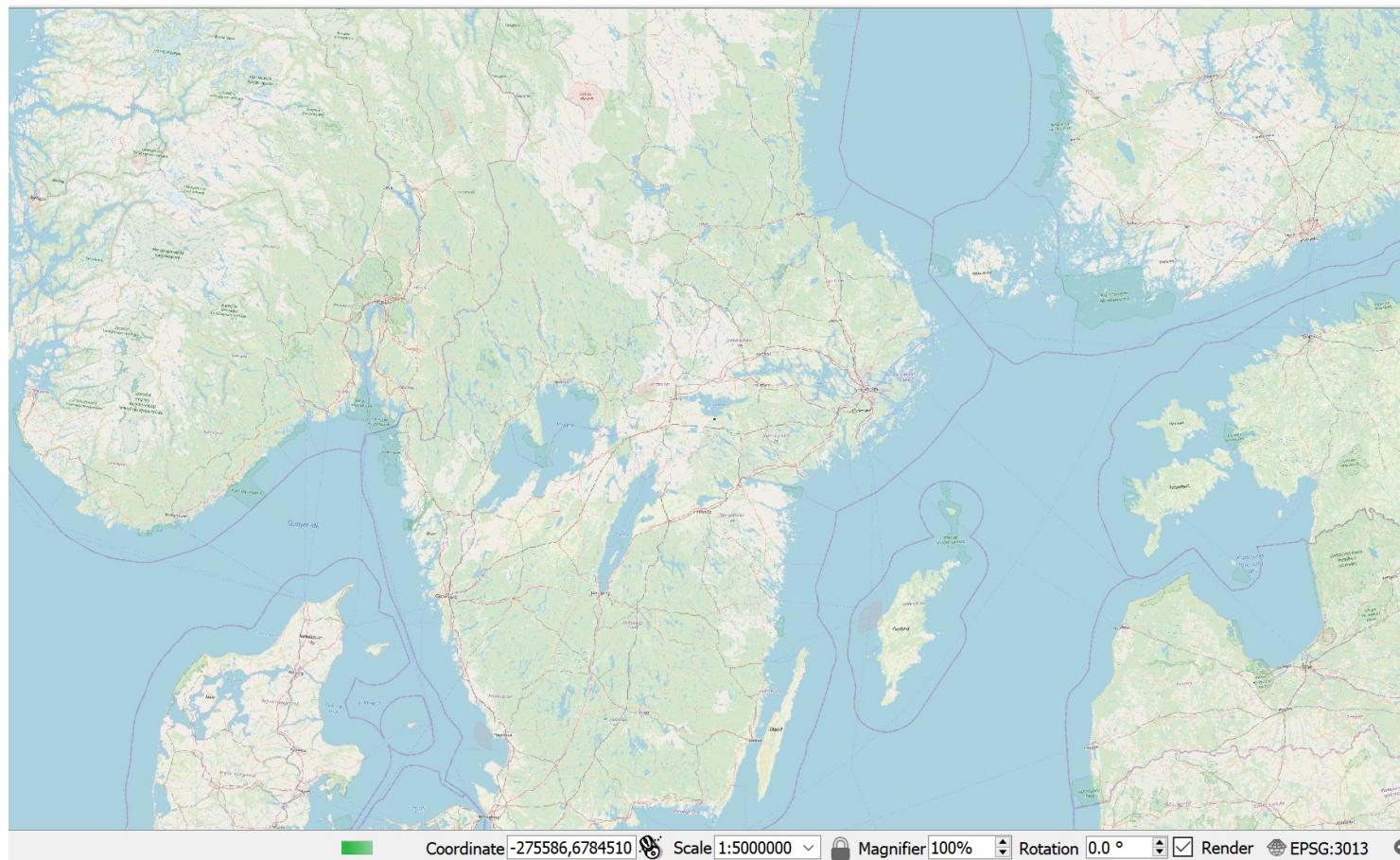
# FME IFC to Shapefile



# Myran – Georeferenced and Correctly Scaled



# Myran – Georeferenced and Correctly Scaled



# IFC – Not Georeferenced versus Georferenced

```
#588608=
IFCCARTESIANPOINT((0.,0.,0.));
#588610=
IFCAXIS2PLACEMENT3D(#588608,$,$);
#588611=
IFCLOCALPLACEMENT($,#588610);
#588612=
IFCSITE('1DGwFa8Z17QBmPE_Rf9B2I',
#41,'Surface:3759715',$,",",#588611,#588606,$,.ELEMENT.,(59,19,55,199999),(18,3,53,999999),148200.,$$);
```

```
#4016781=
IFCCARTESIANPOINT((33.8693163757324,41.0554707641601,-1.2000000915529));
#4016783=
IFCAXIS2PLACEMENT3D(#4016781,$,$);
#4016784=
IFCLOCALPLACEMENT(#124,#4016783);
#4016785=
IFCSITE('1DGwFa8Z17QBmPE_Rf9B2I',#41,'Surface:3759715:3759715 : Surface:3759715:328157$',,'Surface:3759715:3759715 : Surface:3759715',#4016784,#4016779,$,$,$,$,$,$,$);
```

# Georeferencing in Revit

- NB – you don't need to do the scale/rotate/translate in Revit
- See here for some alternative approaches:
  - [https://3d.bk.tudelft.nl/pdfs/18\\_georeferencing.pdf](https://3d.bk.tudelft.nl/pdfs/18_georeferencing.pdf)

About the Geo-referencing of BIM models

Abdoulaye Diakité

- <https://pro.arcgis.com/en/pro-app/help/data/revit/adding-revit-data-to-arcgis-pro.htm> (Esri alternative)