AUTODESK. UNIVERSITY

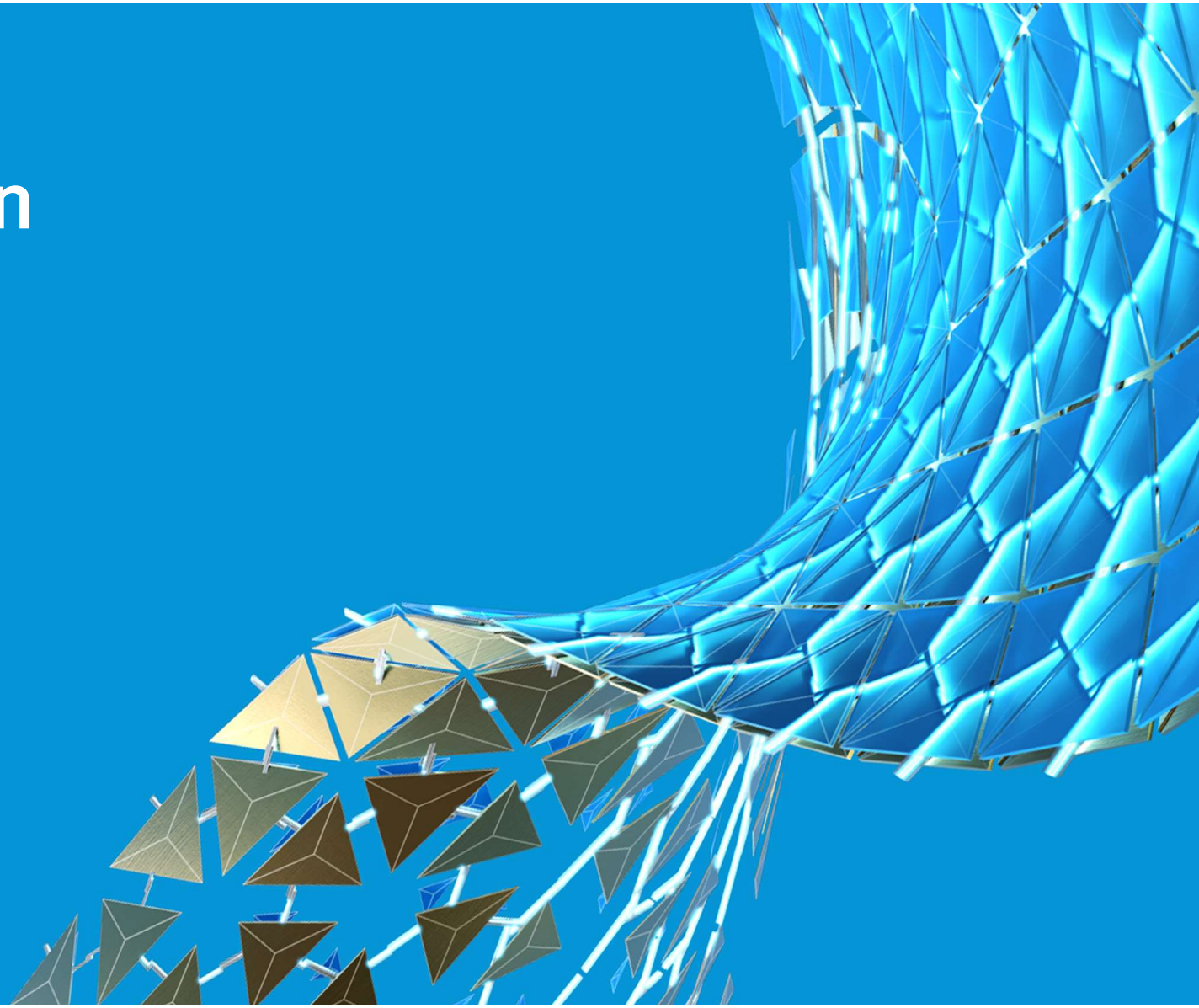
Connecting BIM and GIS: The New Reality of Environmental Projects

CES468882

Pál Porkoláb

BIM Manager · linkedin.com/in/palporkolab/

Introduction



About the speaker

BIM Manager – Civil Engineer

pal.porkolab@arcadis.com

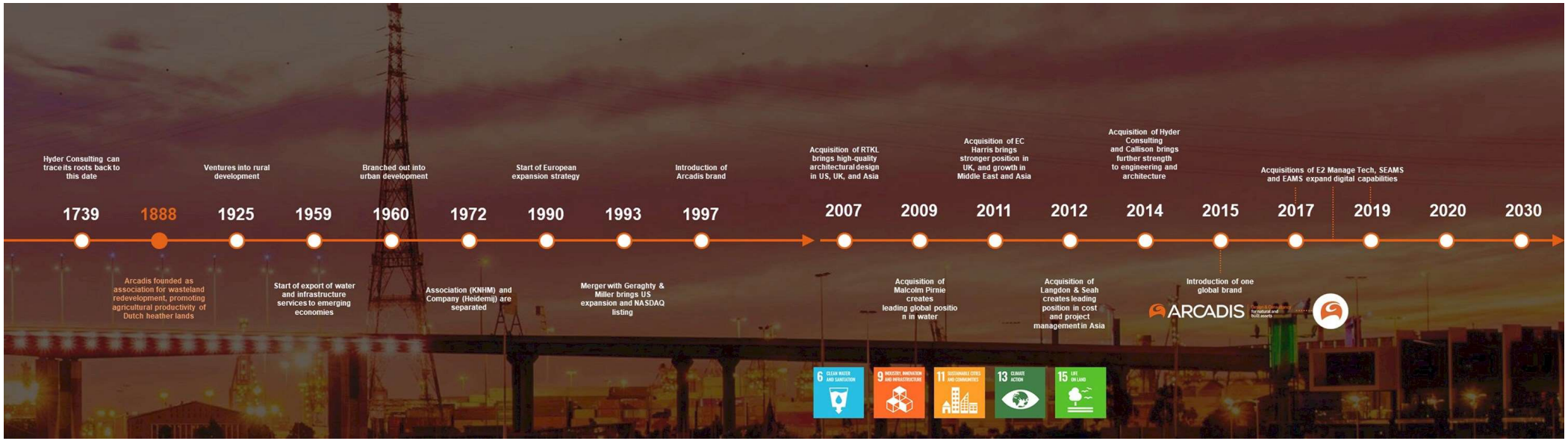
I am a civil engineer having multi years of experience in infrastructure design for rail and roadways. In the past few years I am working as a BIM manager supporting projects and teams to implement new technologies and 3D digital delivery.

I am a second time speaker on AU.

ABOUT ARCADIS

ARCADIS Design & Consultancy for natural and built assets

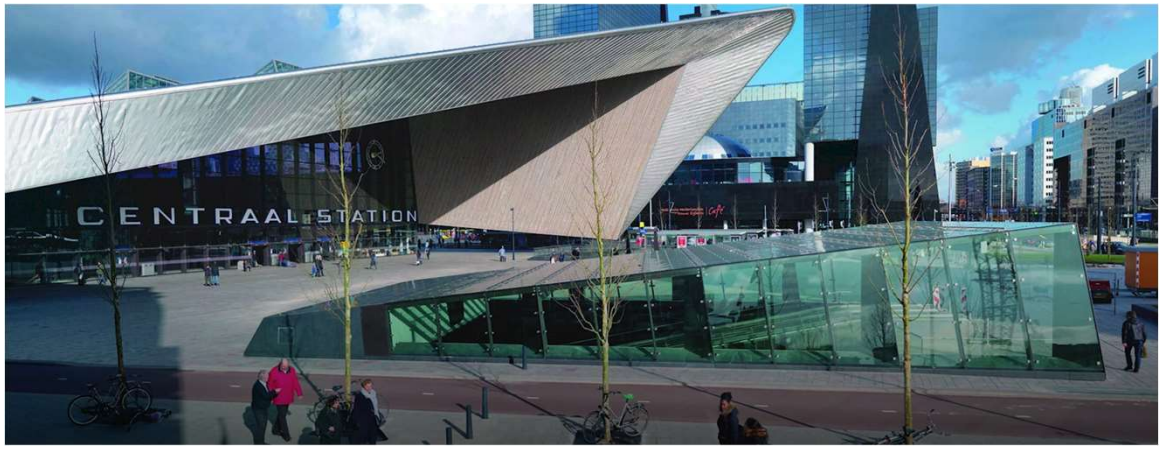
PEOPLE FIRST	INTEGRITY	CLIENT SUCCESS	COLLABORATION	SUSTAINABILITY



CES466890 - Automate Boring Stuff in Autodesk using RPA

ABOUT ARCADIS

ARCADIS Design & Consultancy for natural and built assets



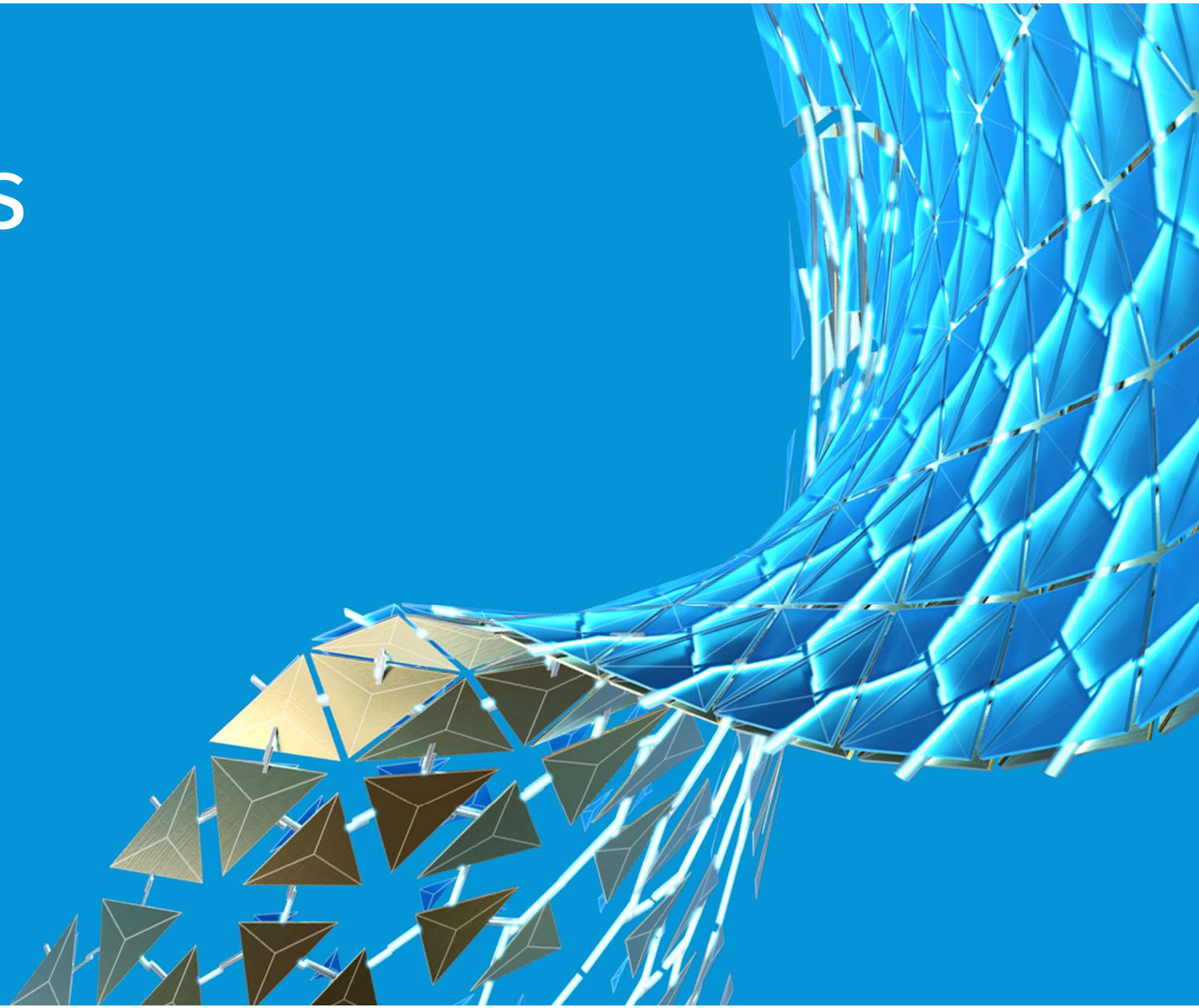
Key Facts

Established	Employees	Geographic reach	Revenues
1888	28,000	350	€3.5
	Worldwide	Offices in over 40 countries	Billion (2019)

Connecting BIM and GIS:
The New Reality of Environmental Projects

While talking about BIM (Building Information Modeling) and geographic information system (GIS) integration, it is clear that these are two systems with their specific purposes and use cases: GIS, with its mapping features and geographical database, and BIM as an object-based information model, tailored for built assets. The connection between the two platforms is advancing and gaining credibility, especially in large complex projects. Architectural and civil projects tend to use BIM technologies, while environmental projects are traditionally carried out using GIS systems. In this class, we will look beyond the standard use of 2D maps, GIS layers, and shapefile sets. We will go through all the benefits, challenges, and differences between using GIS and BIM technologies. The adoption of 3D and BIM processes and technologies will largely benefit the environment and remediation industries. It will open the door for more-inclusive stakeholder engagement, better design quality, and data-driven decision making.

BIM and GIS



What is BIM?

Definitions

The American Institute of Architects has defined BIM as **"a model-based technology linked with a database of project information",** and this reflects the general reliance on database technology as the foundation. In the future, structured text documents such as specifications may be able to be searched and linked to regional, national, and international standards.

https://en.wikipedia.org/wiki/Building_information_modeling


Beaufort Sea
Bay
Greenland
East Siberian Sea
Norwegian Sea
Davis Strait
Hudson Bay
Gulf of Alaska
Canada
Sweden
Finland
Norway
Russia
United Kingdom
Poland
Germany
Ukraine
Kazakhstan
Sea of Okhotsk
France
Mongolia
Italy
Spain
Greece
Turkey
South Korea
Japan
North Pacific Ocean
North Atlantic Ocean
United States
China
Iran
Algeria
Libya
Egypt
Saudi Arabia
India
Myanmar (Burma)
México
Caribbean Sea
Arabian Sea
Mali
Niger
Chad
Sudan
Nigeria
Ethiopia
Venezuela
Colombia
DR Congo
Tanzania
Indonesia
Perú
Brazil
Angola
Zambia
Bolivia
Coral Sea
Namibia
Indian Ocean
Australia
South Pacific Ocean
South Africa
South Atlantic Ocean
Tasman Sea
Argentina
Scotia
Esri, USGS | Esri, Garmin, FAO, NOAA
esri

What is GIS?

Definitions

A geographic information system (GIS) is a conceptualized framework that provides the ability to **capture and analyze spatial and geographic data**. GIS applications (or GIS apps) are computer-based tools that allow the user to create interactive queries (user-created searches), store and edit spatial and non-spatial data, analyze spatial information output, and visually share the results of these operations by **presenting them as maps**.

https://en.wikipedia.org/wiki/Geographic_information_system

BIM

3D representation of assets using complex geometries

Rich database of attribute information

Structured platform

Analytics and evaluation

GIS

2D representation of large-scale geospatial shapes

Rich database of attribute information

Structured platform

Analytics and evaluation

So what is truly common on both platforms?

Does GIS require always 3D representation?

Data driven workflows

Integrating the database of both platforms is going to be crucial in the new age of data regardless of 3D representations.

What is missing in GIS from a BIM perspective?

GIS building blocks (vector data)

POINTS

Zero-dimensional points are used for geographical features that can best be expressed by a single point reference

LINES

One-dimensional lines or polylines are used for linear features such as rivers, roads, railroads, trails, and topographic lines.

AREA FEATURES

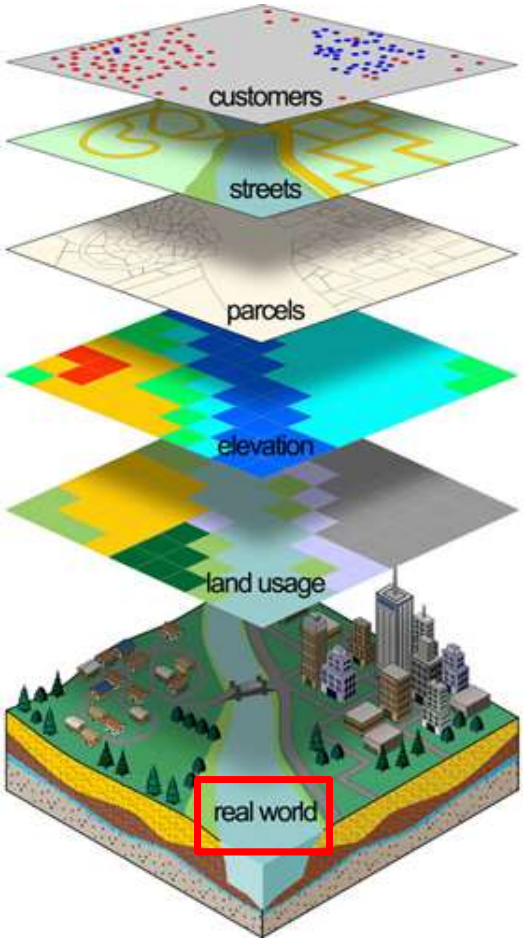
Two-dimensional polygons are used for geographical features that cover a particular area of the earth's surface.

https://en.wikipedia.org/wiki/GIS_file_formats

Let’s connect GIS and BIM!

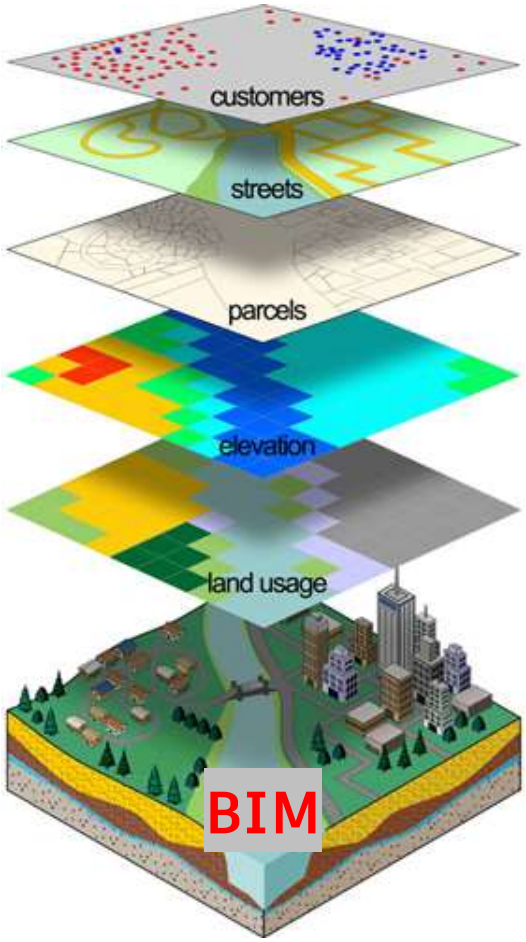
We have the GIS information but how to put into a 3D model?

GIS

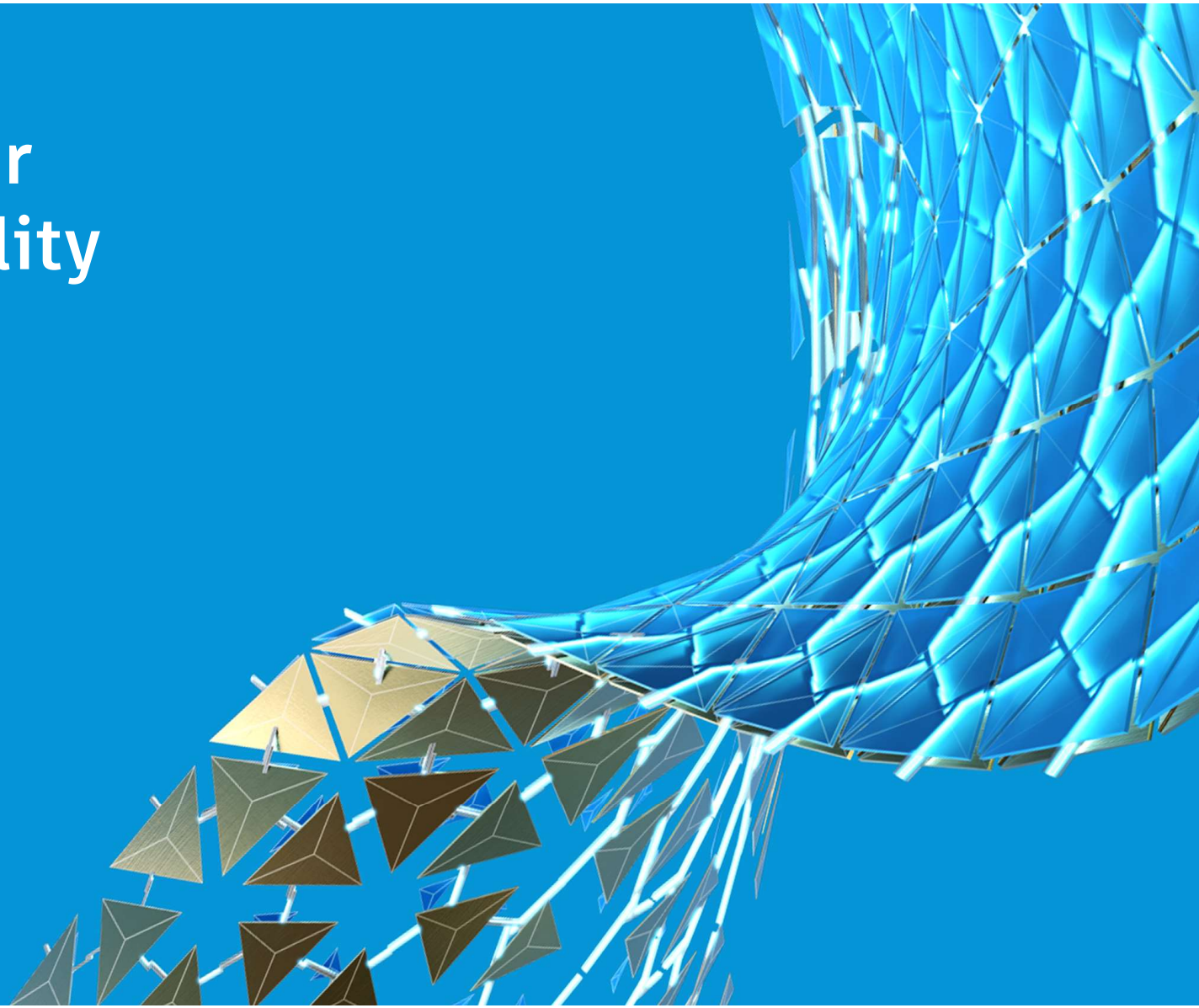

customers
streets
parcels
elevation
land usage
real world

?

BIM+GIS


customers
streets
parcels
elevation
land usage
BIM

Interaction or Interoperability



Workflows

AUTODESK CONNECTOR FOR ARCGIS (CIVIL3D)

Civil3D connection for data consumption and resharing

Default object/feature types

Attribution

MAPIMPORT (CIVIL3D)

Manual process

Converting to cad objects

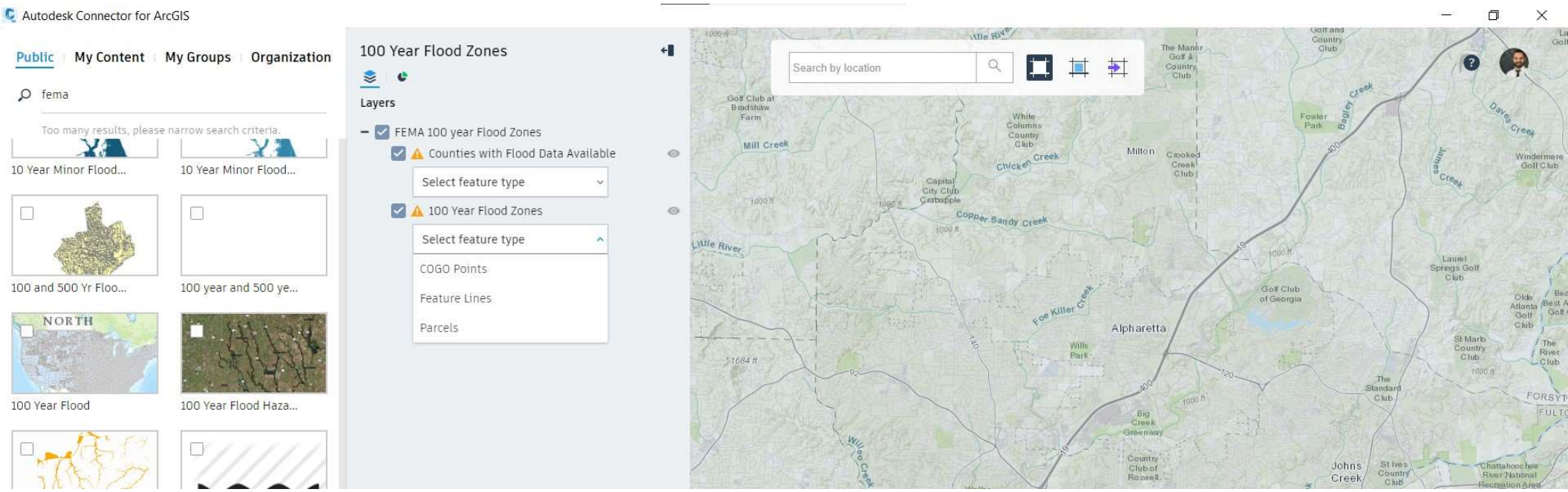
Attribution

CUSTOMIZED WORKFLOW

Automatized data reading

Flexible object generation

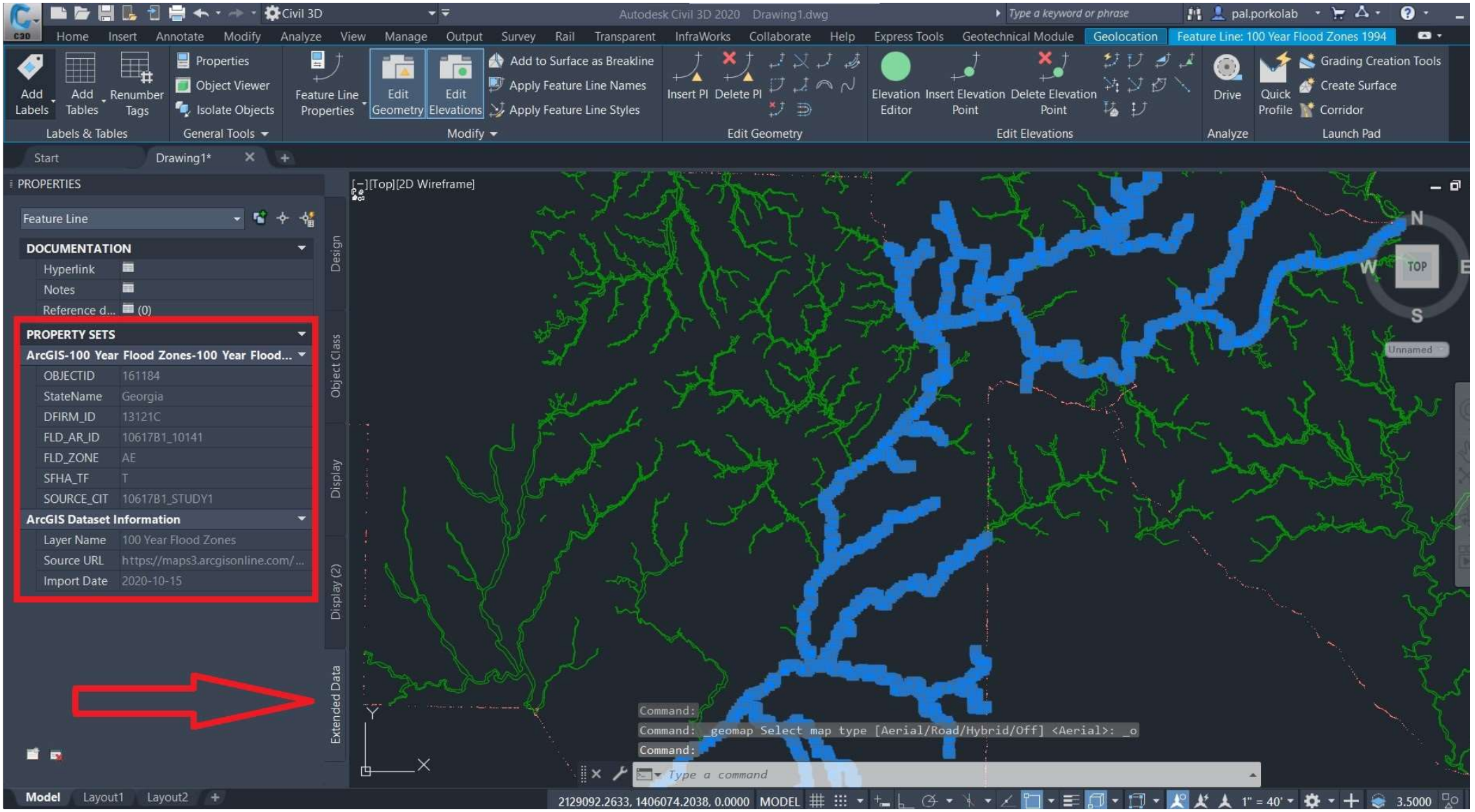
Metadata management and attribution

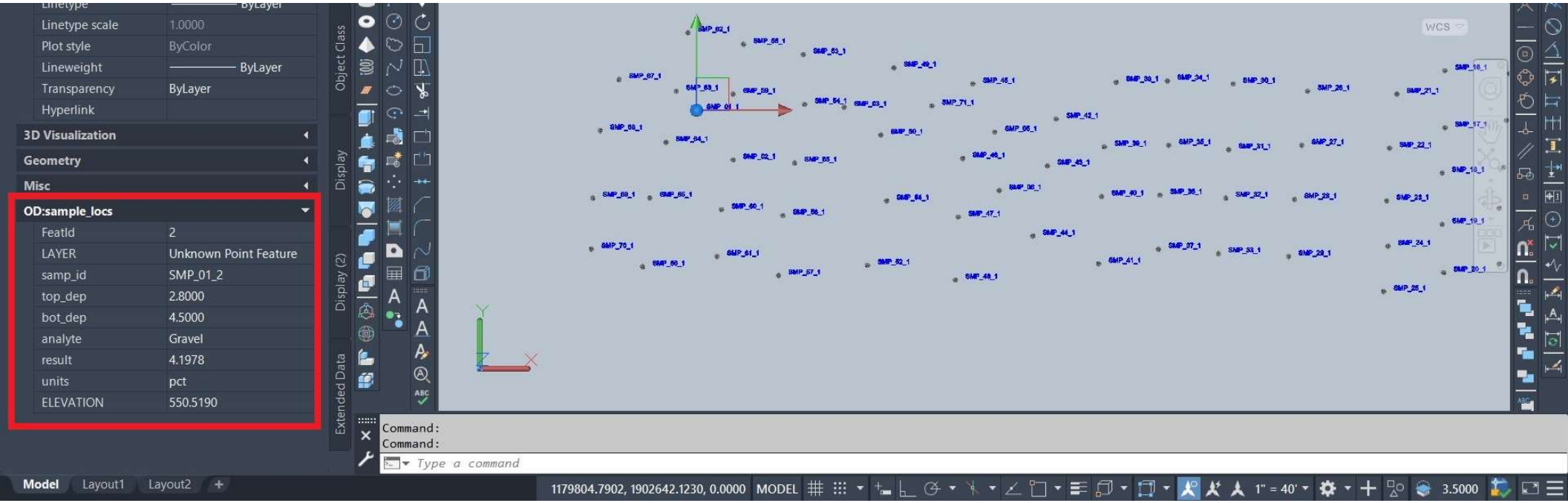


Autodesk connector for ArcGIS (Civil3D)

Feature types:

- COGO points
- Feature lines
- Structures
- Parcels
- Gravity pipes
- Alignments


Civil 3D
Autodesk Civil 3D 2020 Drawing1.dwg
Type a keyword or phrase
pal.porkolab
Home Insert Annotate Modify Analyze View Manage Output Survey Rail Transparent InfraWorks Collaborate Help Express Tools Geotechnical Module Geolocation Feature Line: 100 Year Flood Zones 1994
Add Labels
Add Tables
Renumber Tags
Labels & Tables
Properties
Object Viewer
Isolate Objects
General Tools
Feature Line Properties
Edit Geometry
Edit Elevations
Add to Surface as Breakline
Apply Feature Line Names
Apply Feature Line Styles
Modify
Insert PI
Delete PI
Edit Geometry
Elevation Editor
Insert Elevation Point
Delete Elevation Point
Edit Elevations
Drive
Analyze
Quick Profile
Grading Creation Tools
Create Surface
Corridor
Launch Pad
Start
Drawing1*
PROPERTIES
Feature Line
DOCUMENTATION
Hyperlink
Notes
Reference d... (0)
PROPERTY SETS
ArcGIS-100 Year Flood Zones-100 Year Flood...
OBJECTID 161184
StateName Georgia
DFIRM_ID 13121C
FLD_AR_ID 10617B1_10141
FLD_ZONE AE
SFHA_TF T
SOURCE_CIT 10617B1_STUDY1
ArcGIS Dataset Information
Layer Name 100 Year Flood Zones
Source URL https://maps3.arcgisonline.com/...
Import Date 2020-10-15
Design
Object Class
Display
Display (2)
Extended Data
[−][Top][2D Wireframe]
N
W
TOP
E
S
Unnamed
Command:
Command: _geomap Select map type [Aerial/Road/Hybrid/Off] <Aerial>: _o
Command:
Type a command
Model
Layout1
Layout2
2129092.2633, 1406074.2038, 0.0000
MODEL
1" = 40'
3.5000

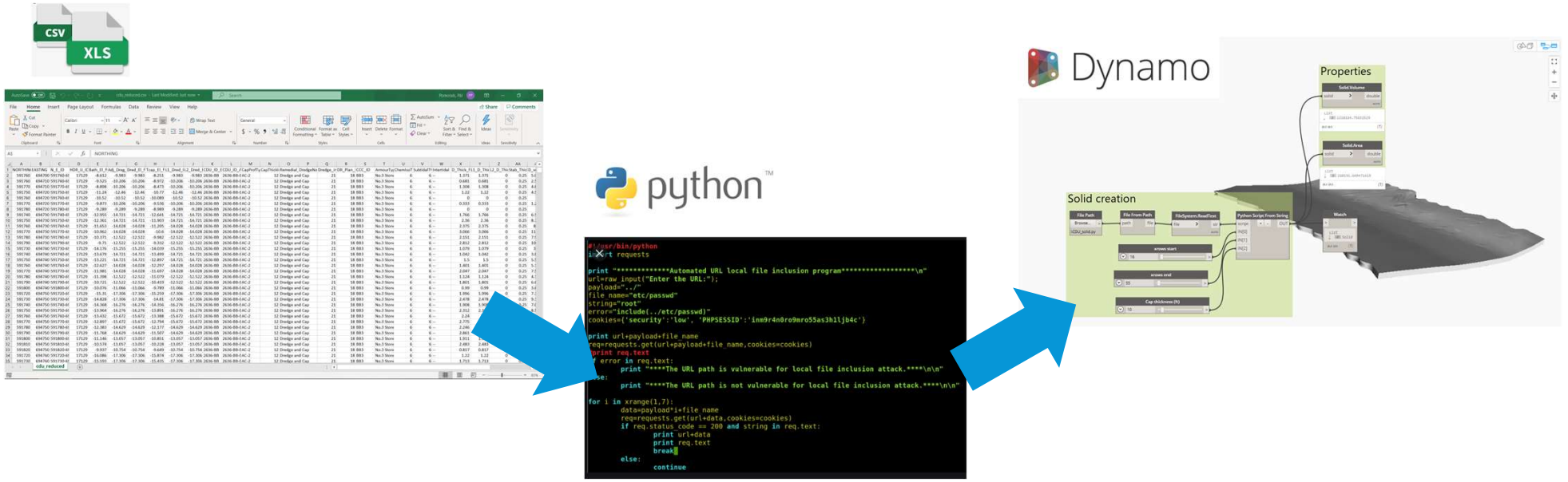


Civil3D Mapimport

Loading shp files, generating 3D blocks for point features, reading properties

Property sets are added as Object Data

Navisworks can read only Property Sets and Extended Data – losing BIM information

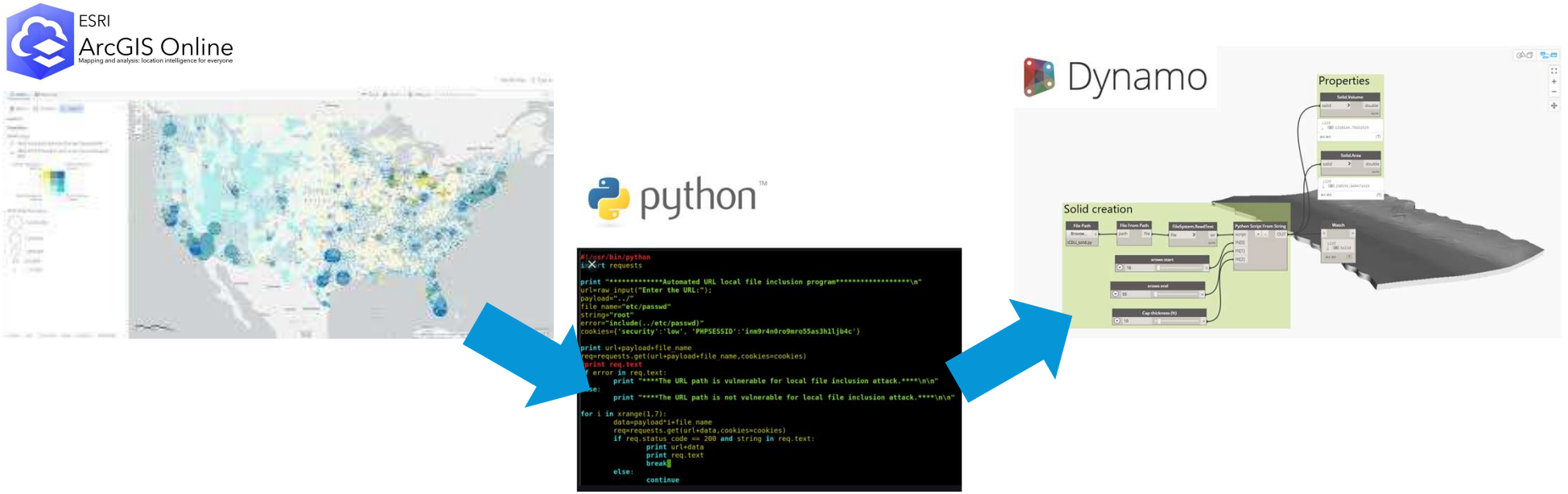


Customized workflow

CSV datasets

Python scrip to manipulate and process

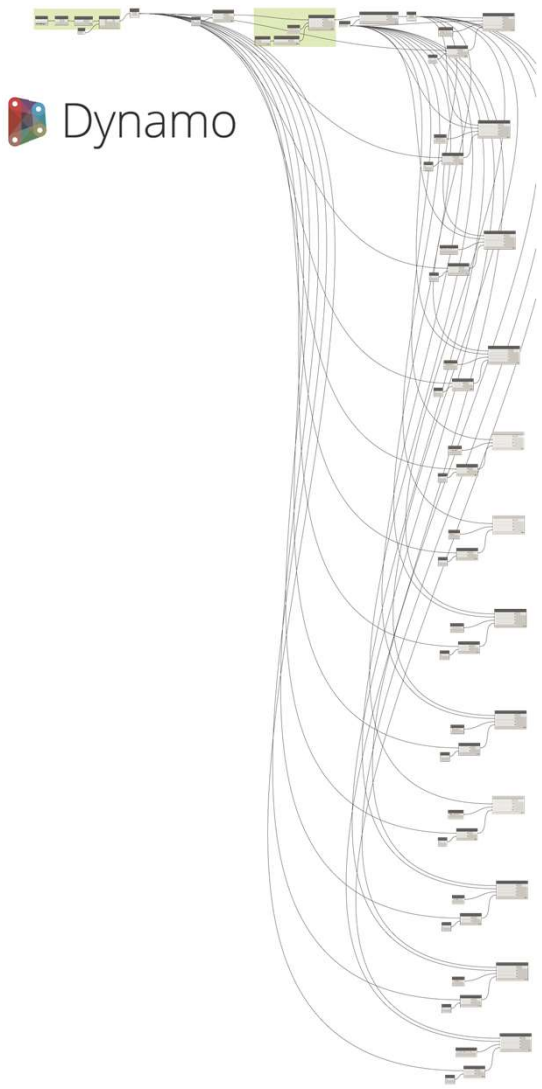
Dynamo to generate custom models with attributes (volumes, etc.)

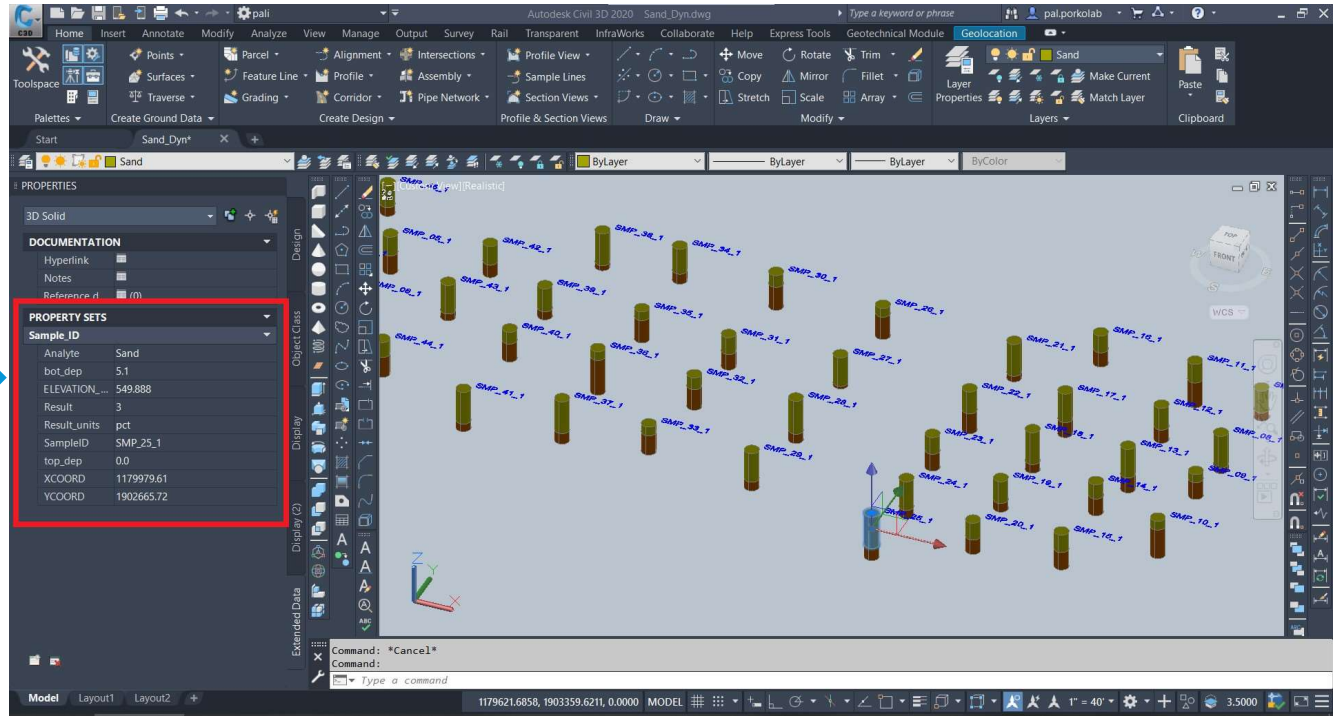


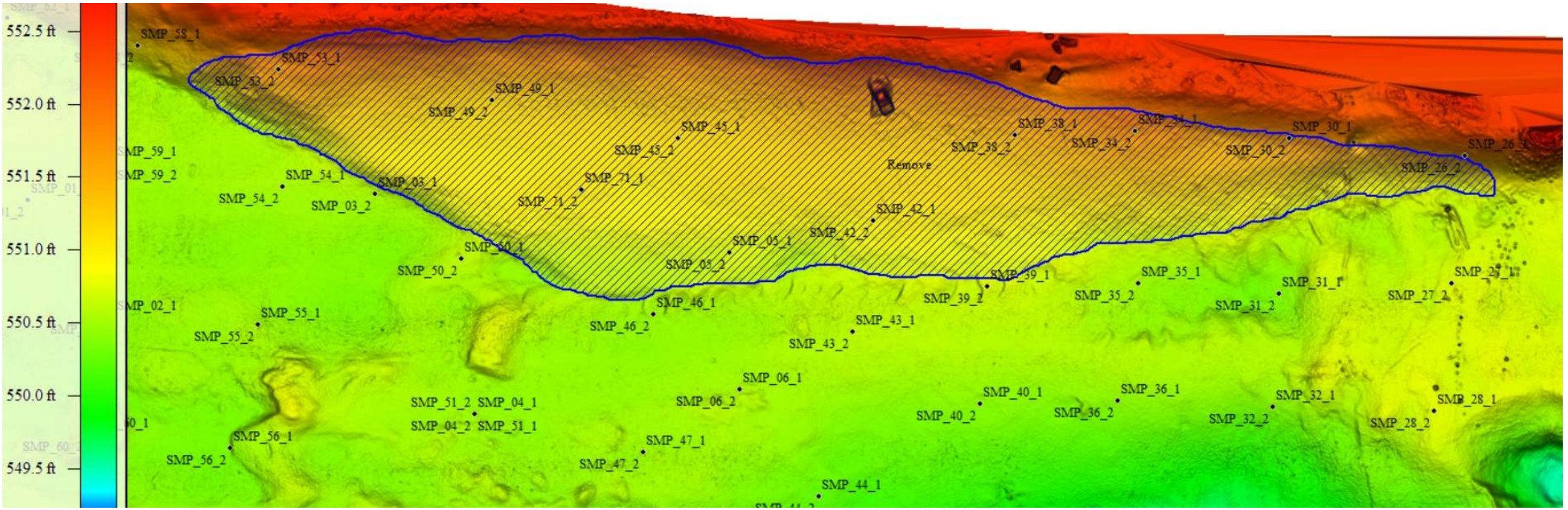
Customized workflow - Automation

```
from arcgis.gis import GIS

search_results = gis.content.search(query=query, max_items=10)
```


Dynamo

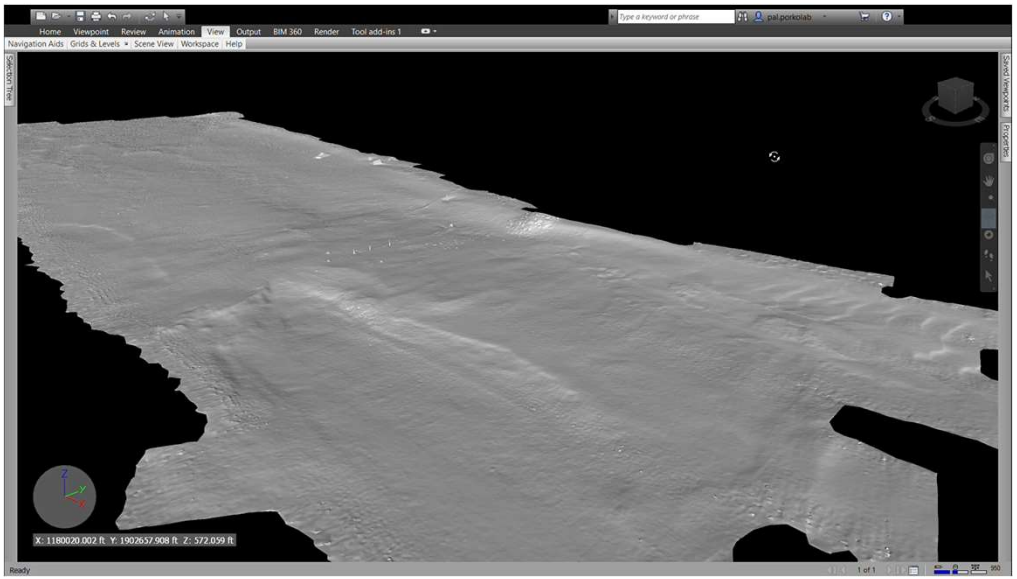

Autodesk Civil 3D 2020 Sand_Dyn.dwg
Home Insert Annotate Modify Analyze View Manage Output Survey Rail Transparent InfraWorks Collaborate Help Express Tools Geotechnical Module Geolocation
Toolspace
Points Surfaces Traverse
Parcel Feature Line Grading
Alignment Profile Corridor
Intersections Assembly Pipe Network
Profile View Sample Lines Section Views
Move Copy Stretch
Rotate Mirror Scale
Trim Fillet Array
Layer Properties
Make Current Match Layer
Paste
Palettes
Create Ground Data
Create Design
Profile & Section Views
Draw
Modify
Layers
Clipboard
Start
Sand_Dyn*
PROPERTIES
3D Solid
DOCUMENTATION
Hyperlink
Notes
PROPERTY SETS
Sample_ID
Analyte Sand
bot_dep 5.1
ELEVATION_... 549.888
Result 3
Result_units pct
SampleID SMP_25_1
top_dep 0.0
XCOORD 1179979.61
YCOORD 1902665.72
Object Class
Display
Display (2)
Extended Data
Command: *Cancel*
Command:
Type a command
Model Layout1 Layout2
1179621.6858, 1903359.6211, 0.0000 MODEL

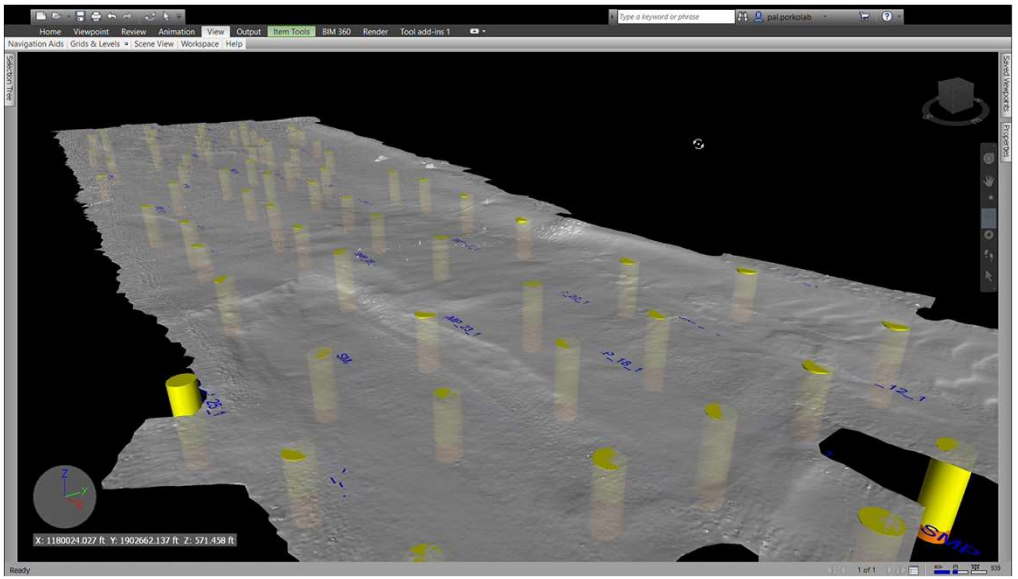


Regular GIS view

Raster image, terrain data, DTM with texture

2D shapes for points, lines, area features

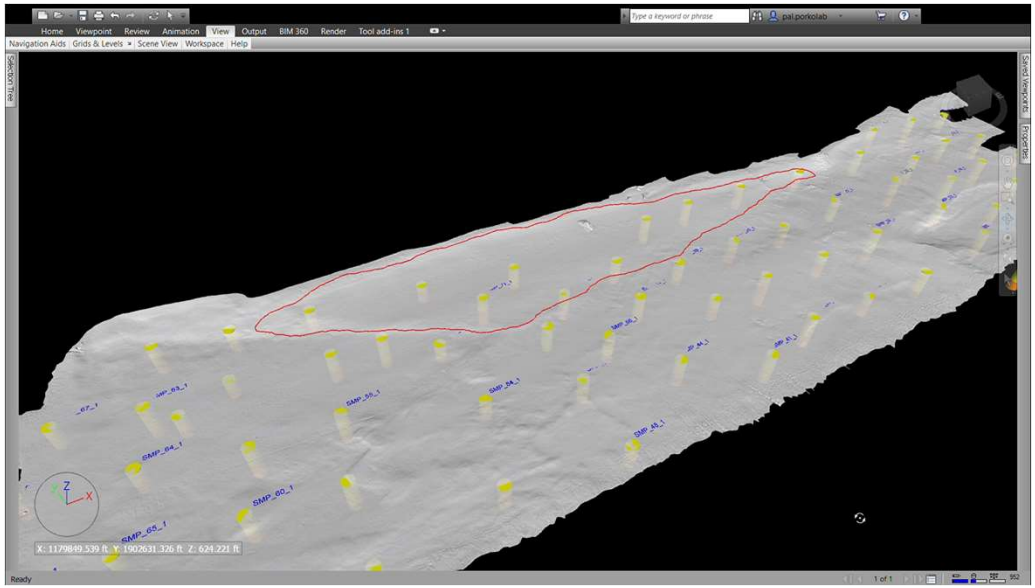


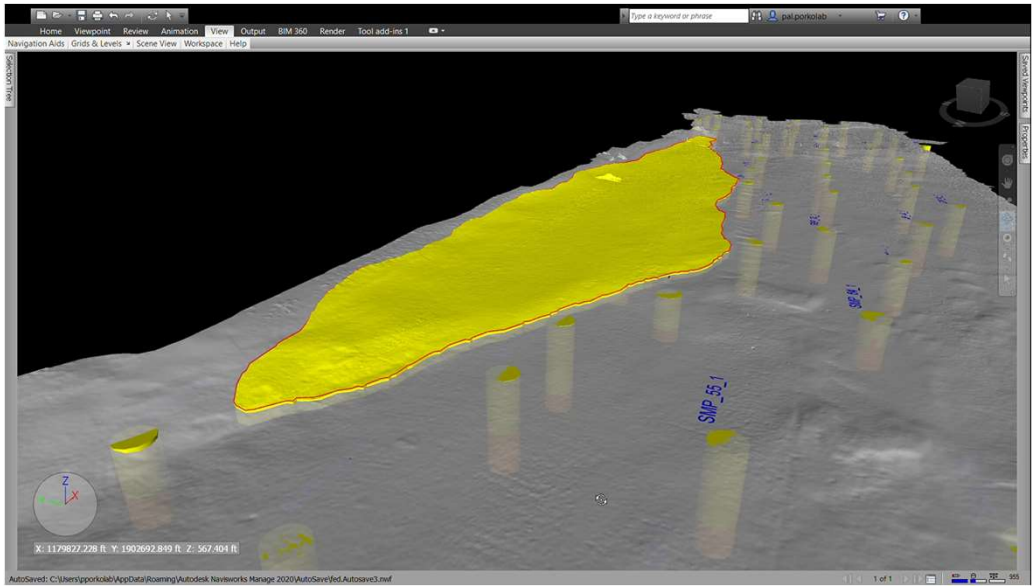


GIS to BIM

3D surface for identifying anomalies, debris, shapes

3D spatial modeling and evaluation, potential conflict check

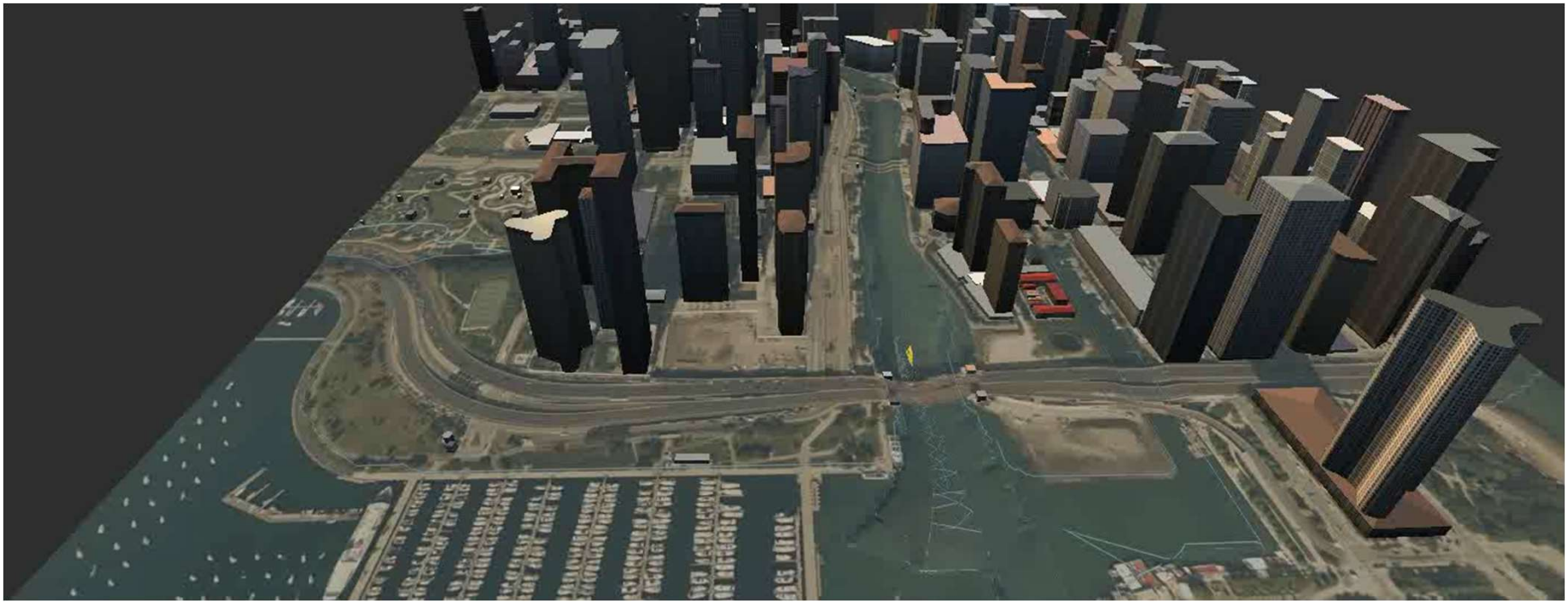




GIS to BIM

Regular shape file representation

Enhanced modeling and object conversion



BIM+GIS integration

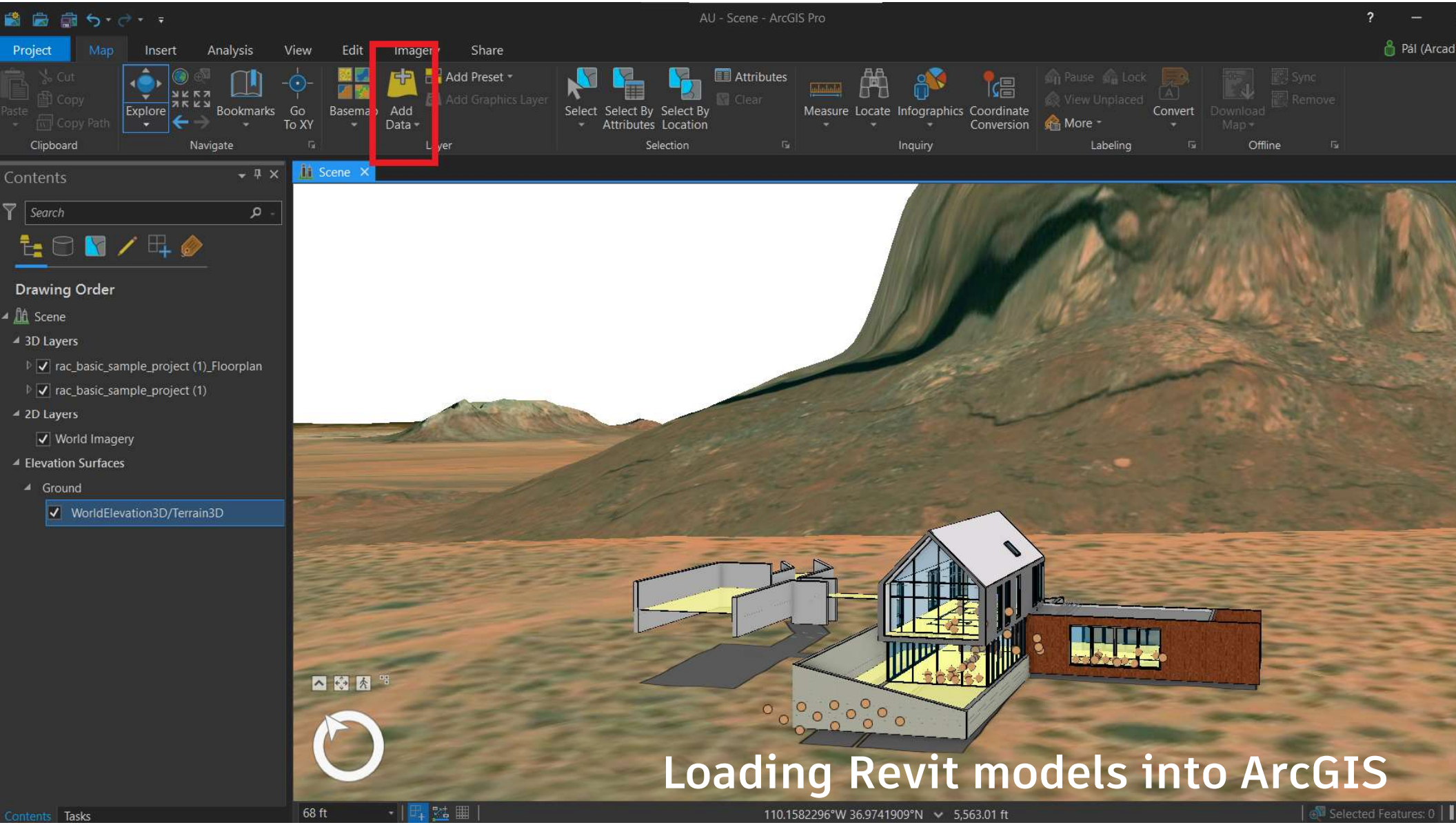
3D terrain representation

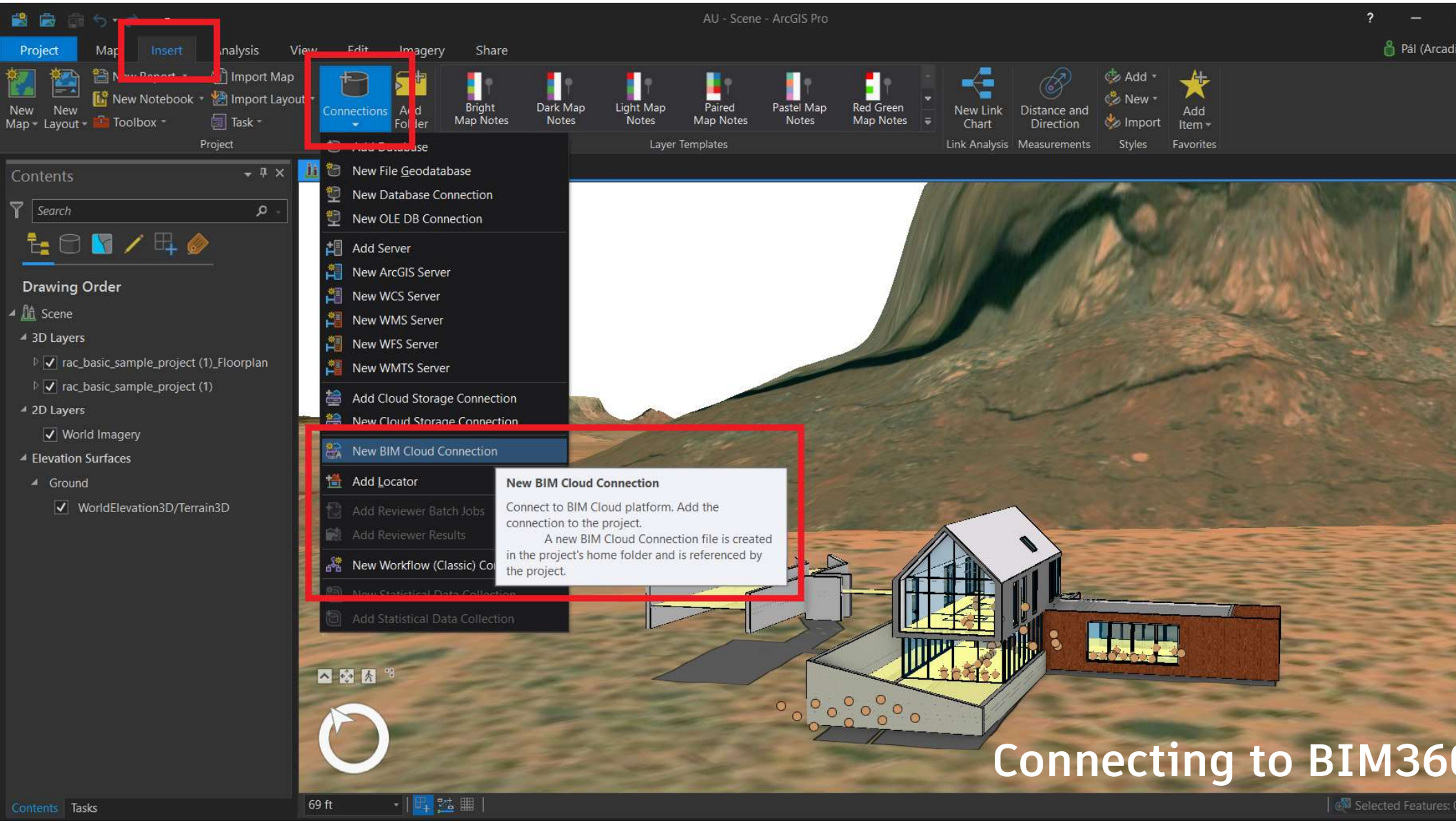
Object based contents

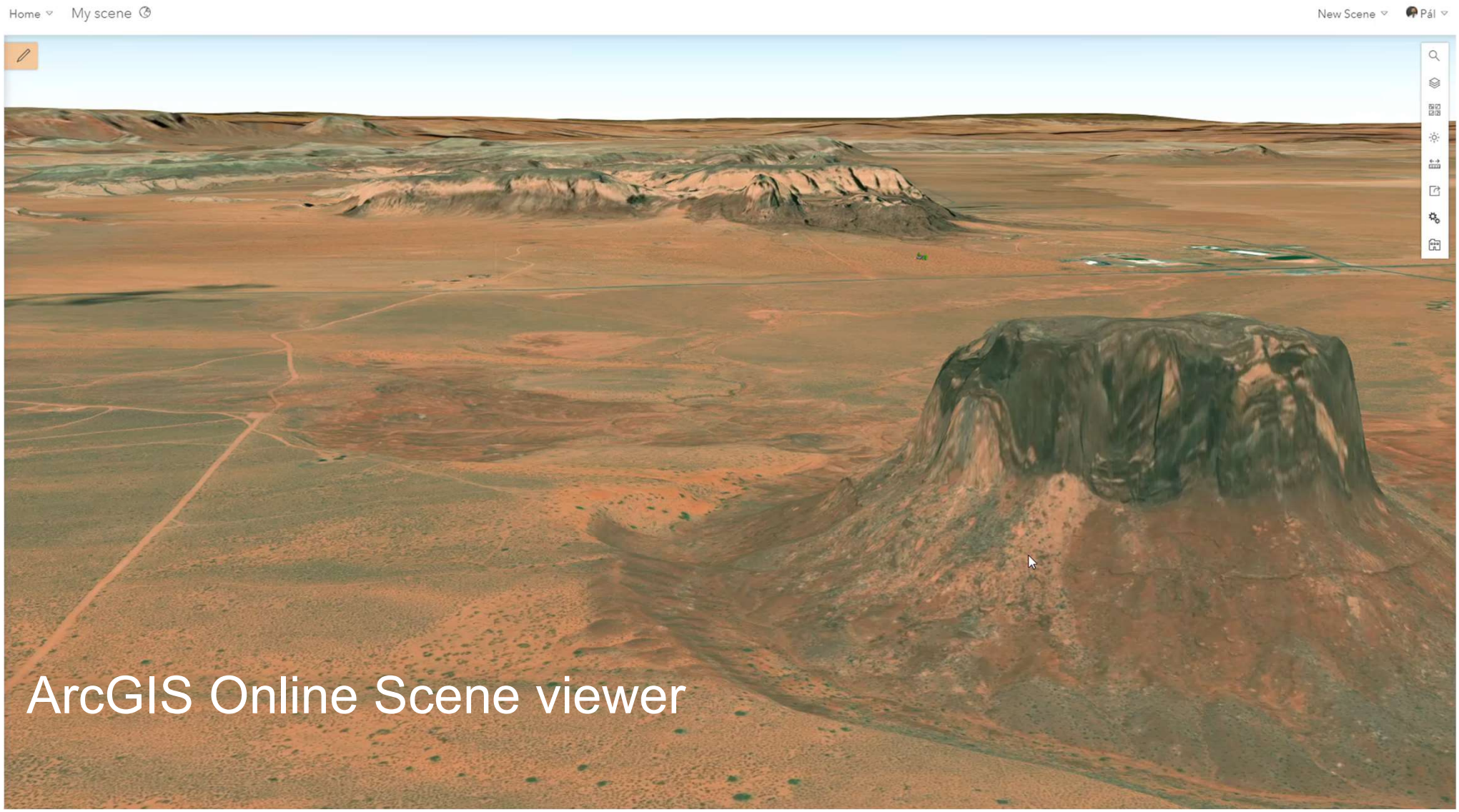
Visual conflicts

3D quantification

We have the BIM information but how to put into a GIS model?


AU - Scene - ArcGIS Pro
Project
Map
Insert
Analysis
View
Edit
Share
Cut
Copy
Copy Path
Paste
Explore
Bookmarks
Go To XY
Add Data
Add Preset
Add Graphics Layer
Select
Select By Attributes
Select By Location
Attributes
Clear
Measure
Locate
Infographics
Coordinate Conversion
Pause
Lock
View Unplaced
More
Convert
Download Map
Sync
Remove
Clipboard
Navigate
Selection
Inquiry
Labeling
Offline
Contents
Search
Drawing Order
Scene
3D Layers
rac_basic_sample_project (1)_Floorplan
rac_basic_sample_project (1)
2D Layers
World Imagery
Elevation Surfaces
Ground
WorldElevation3D/Terrain3D
Scene
Loading Revit models into ArcGIS
Contents
Tasks
68 ft
110.1582296°W 36.9741909°N
5,563.01 ft
Selected Features: 0


AU - Scene - ArcGIS Pro
Project
Map
Insert
Analysis
View
Edit
Imagery
Share
Import Map
New Notebook
Import Layout
Toolbox
Task
Connections
Bright Map Notes
Dark Map Notes
Light Map Notes
Paired Map Notes
Pastel Map Notes
Red Green Map Notes
New Link Chart
Distance and Direction
Add
New
Import
Add Item
Project
Layer Templates
Link Analysis
Measurements
Styles
Favorites
Contents
Search
Drawing Order
Scene
3D Layers
rac_basic_sample_project (1)_Floorplan
rac_basic_sample_project (1)
2D Layers
World Imagery
Elevation Surfaces
Ground
WorldElevation3D/Terrain3D
New File Geodatabase
New Database Connection
New OLE DB Connection
Add Server
New ArcGIS Server
New WCS Server
New WMS Server
New WFS Server
New WMTS Server
Add Cloud Storage Connection
New BIM Cloud Connection
Add Locator
Add Reviewer Batch Jobs
Add Reviewer Results
New Workflow (Classic)
Add Statistical Data Collection
New BIM Cloud Connection
Connect to BIM Cloud platform. Add the connection to the project.
A new BIM Cloud Connection file is created in the project's home folder and is referenced by the project.
Connecting to BIM360
Contents
Tasks
69 ft
Selected Features


Home
My scene
New Scene
Pál
ArcGIS Online Scene viewer

Summary

- The two systems are not really far away
- Connections are available
- Bi-directional workflows
- Post processing of GIS information is needed
- BIM representation of GIS information is beneficial

Thank you for your attention!

Pál Porkoláb

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Q & A