Bentley
Sustaining Infrastructure

Reality Modeling:
Utilising Drone and Aerial Photos

November 2017

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Introduction

Quick poll

- ContextCapture users ?
- Other Bentley reality modeling product users ?
- Total beginners ?
- Persons in charge of data capture ?
- Persons consuming reality modeling data ?

What is Reality Modeling ?




What is reality modeling ?

Capturing existing conditions in **3D using one or a combination devices.**
(UAVs, Handheld Camera, Laser Scanner)

to support different applications such as

Mapping, Design, Construction, Inspection and
Asset Management

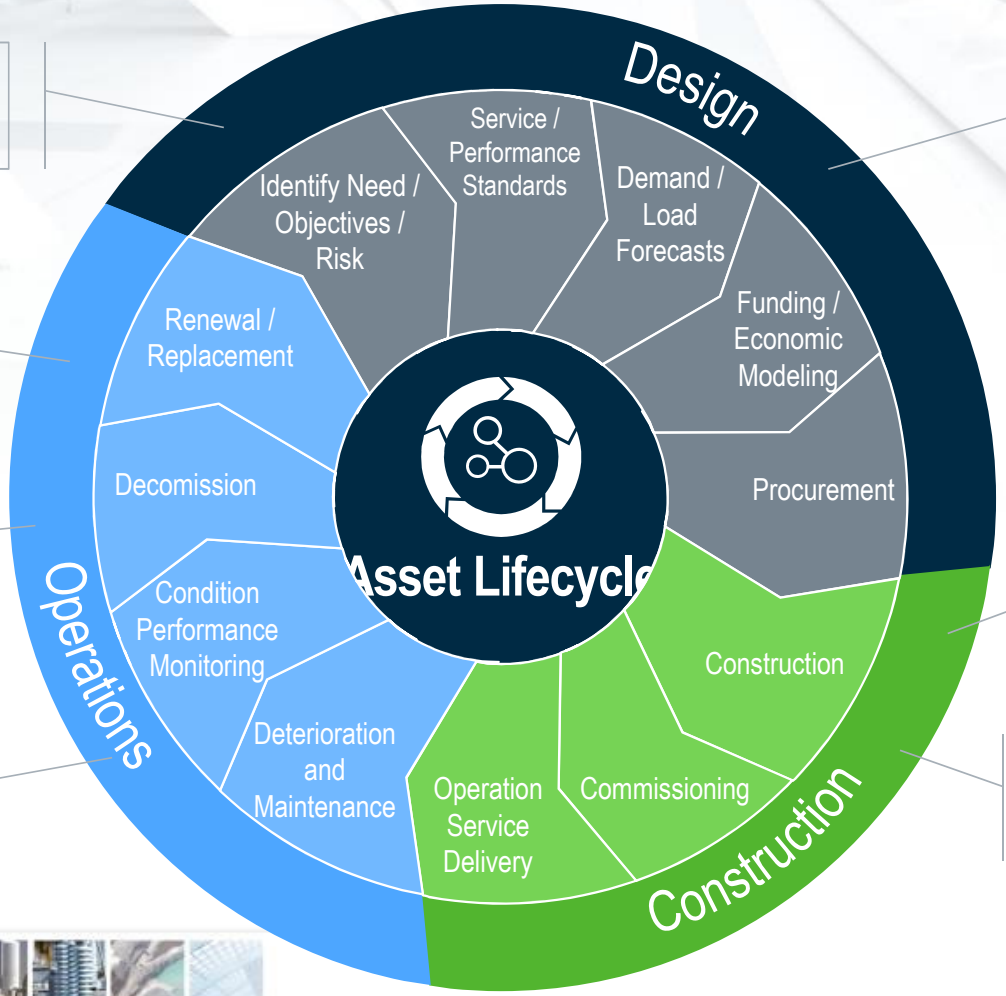
Why Model Reality?

Understand the existing conditions

Virtual Inspection

Visual Operation

Training and simulation



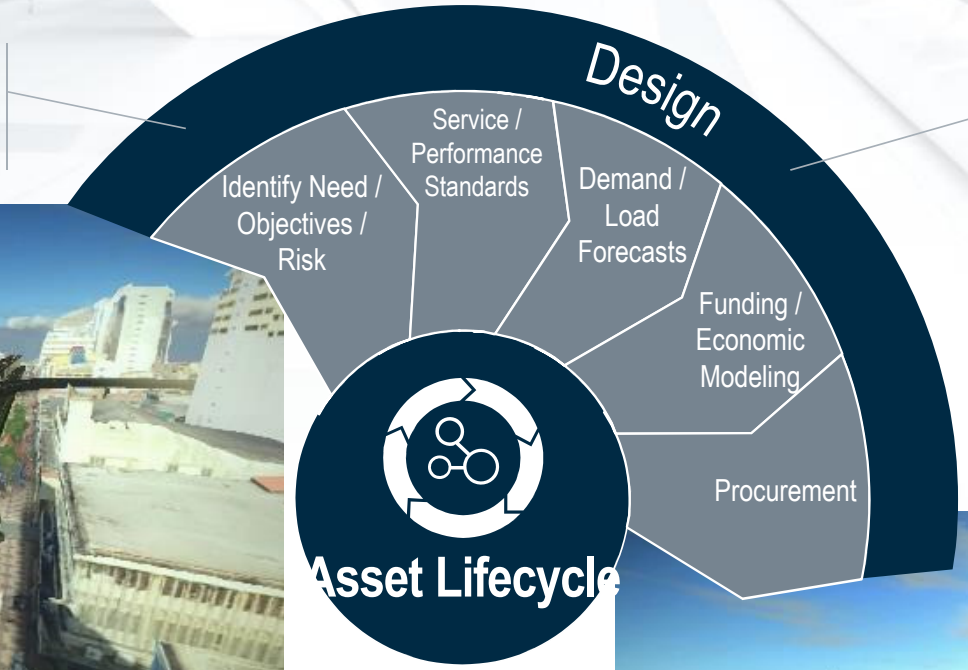
Risk management

Changes detection

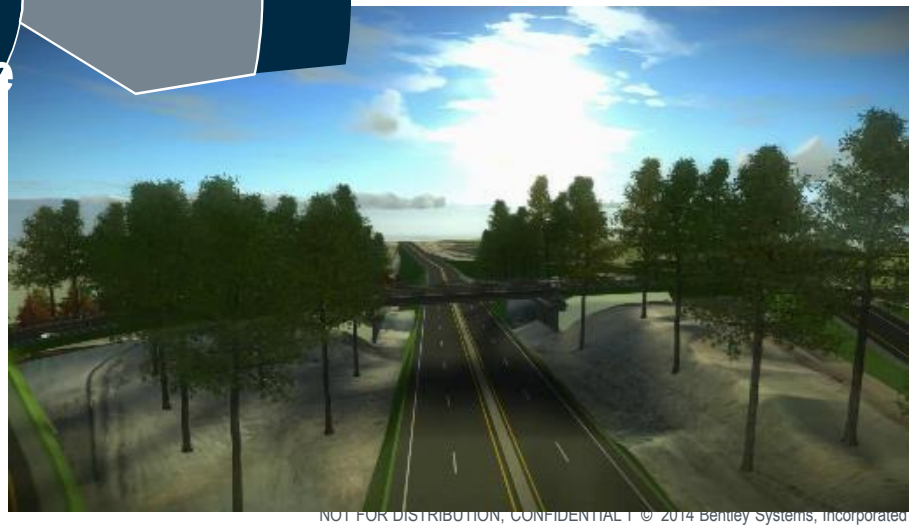
Document construction

Why Model Reality?

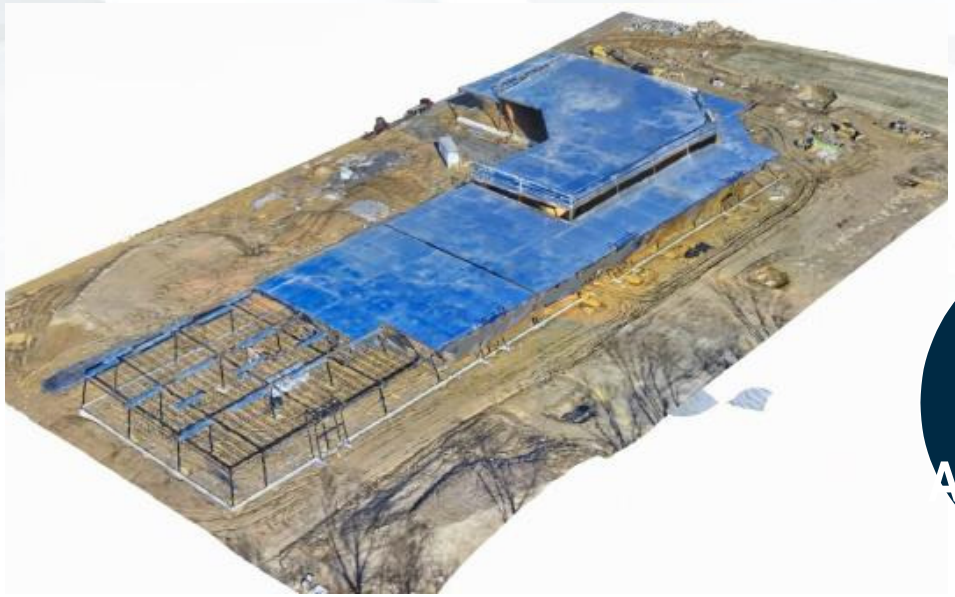
Understand the existing conditions

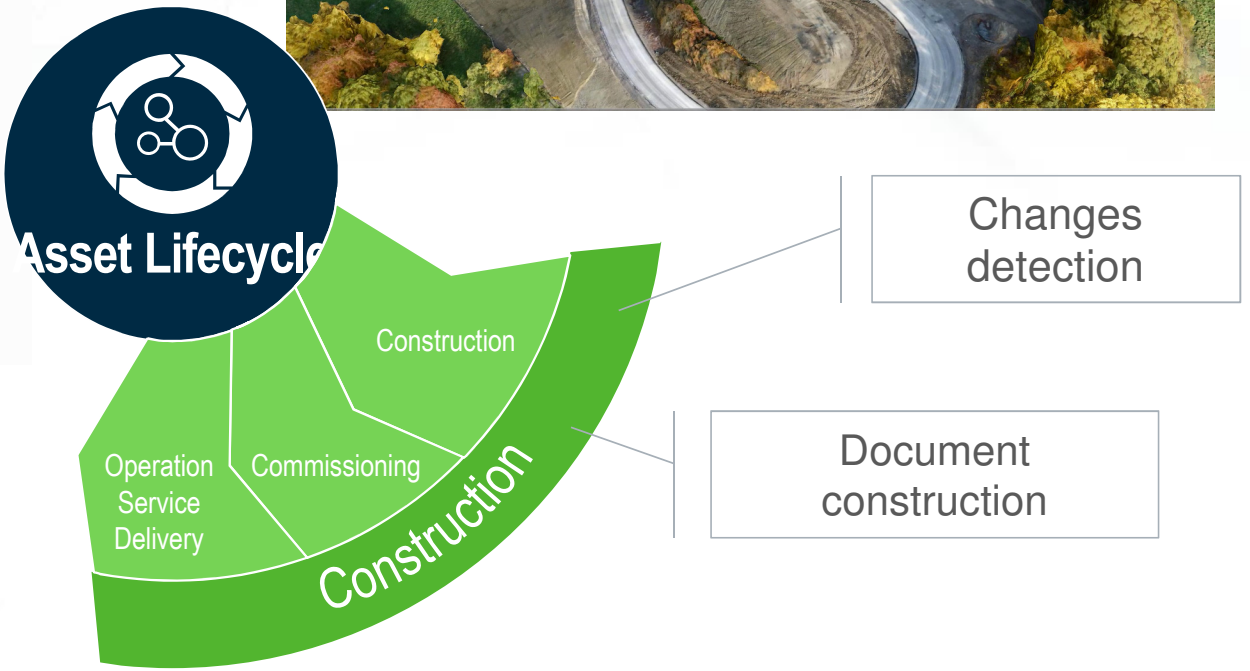


Risk management

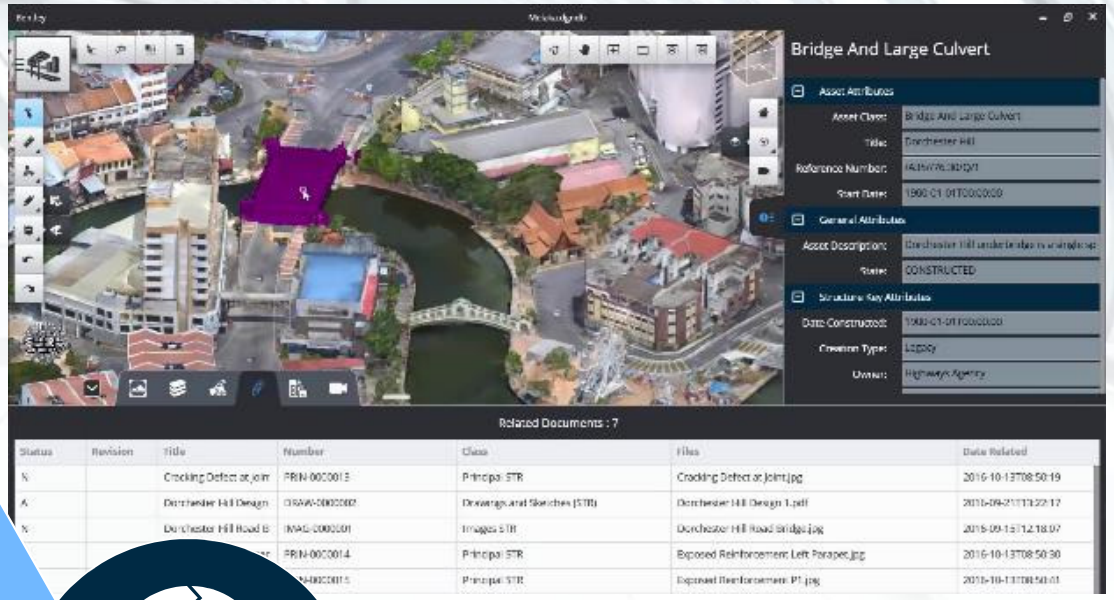


Why Model Reality?



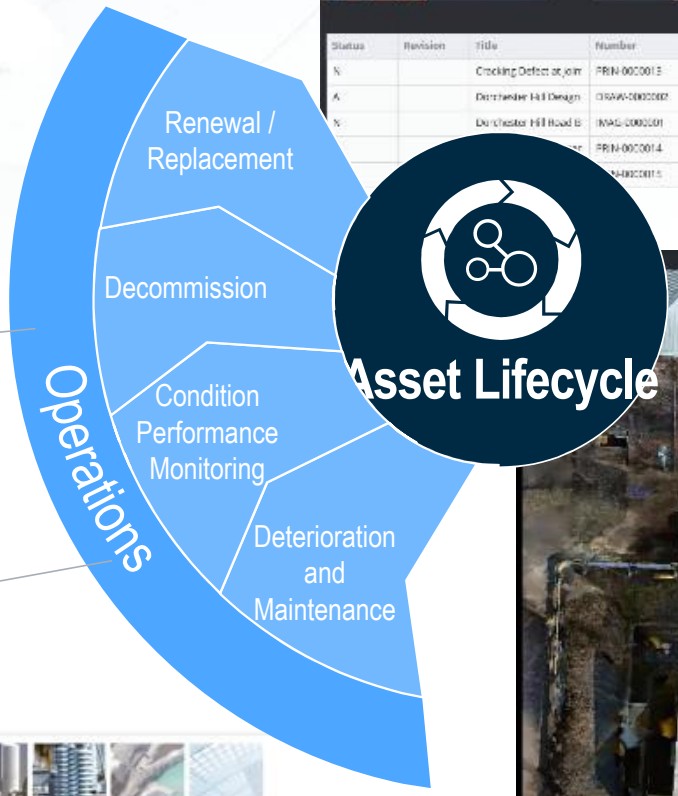


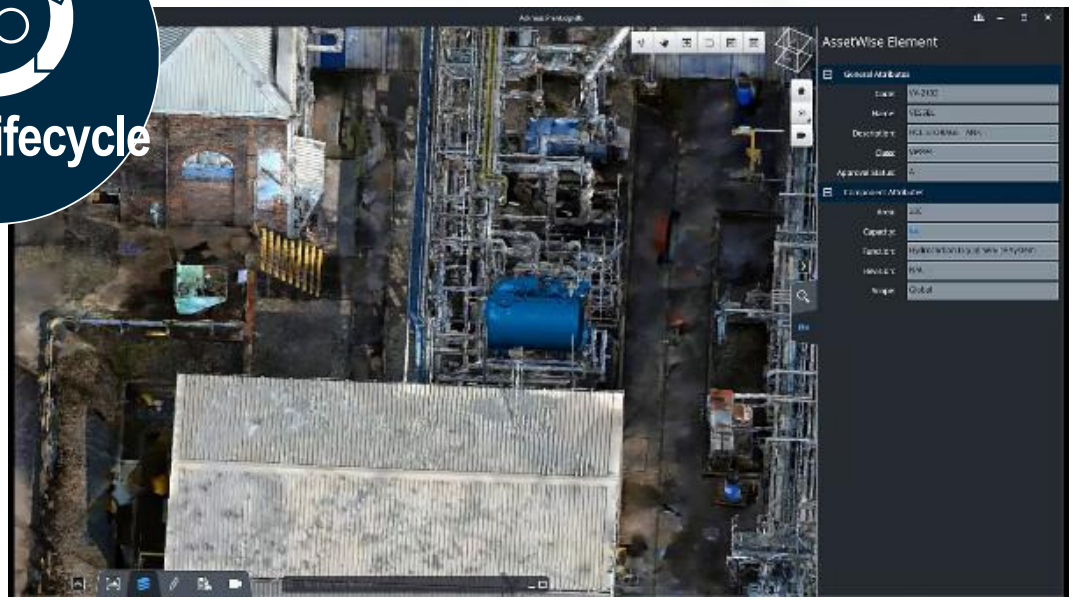
Why Model Reality?



Visual Operation

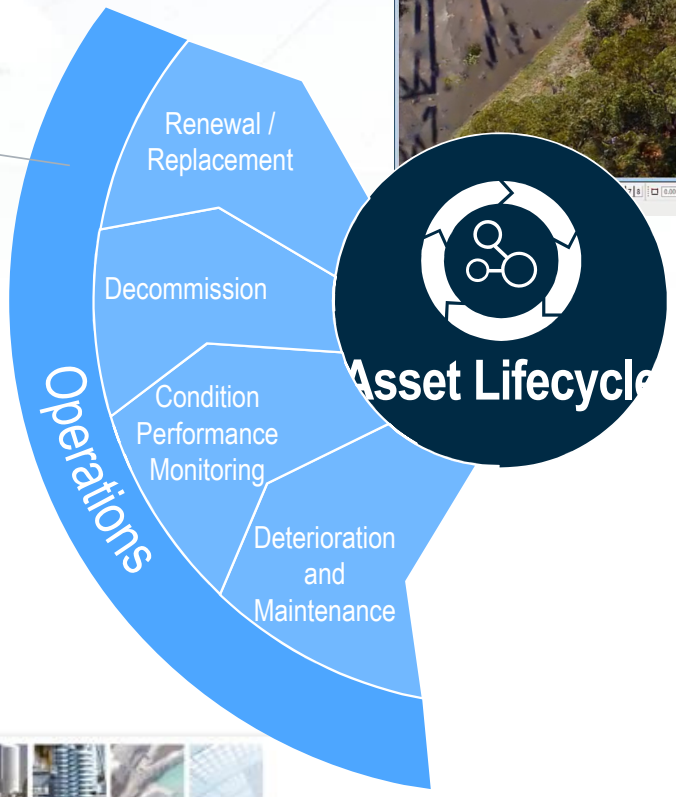
Training and simulation

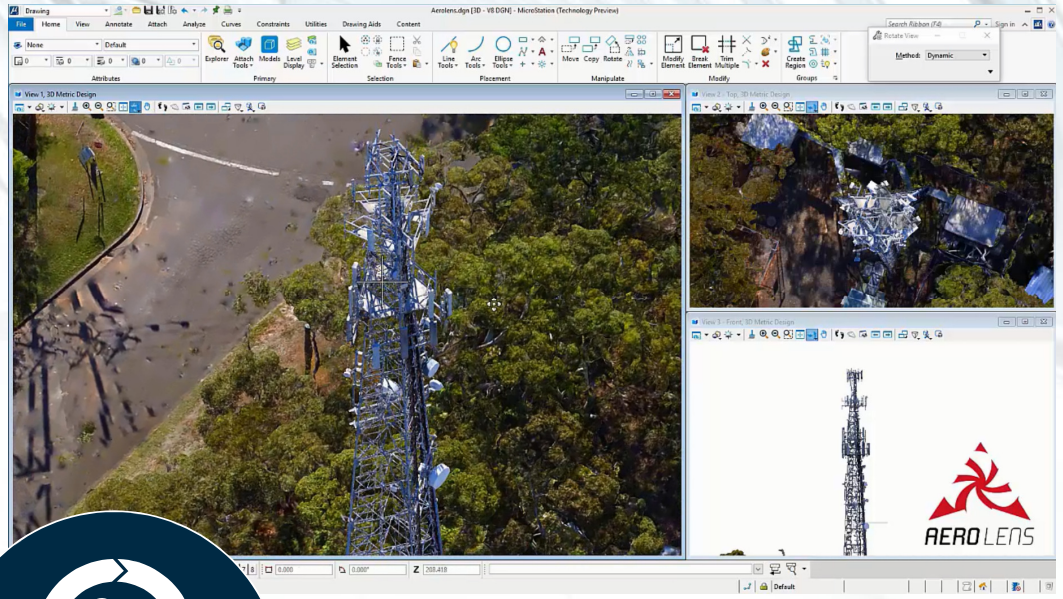




Why Model Reality?

Virtual Inspection





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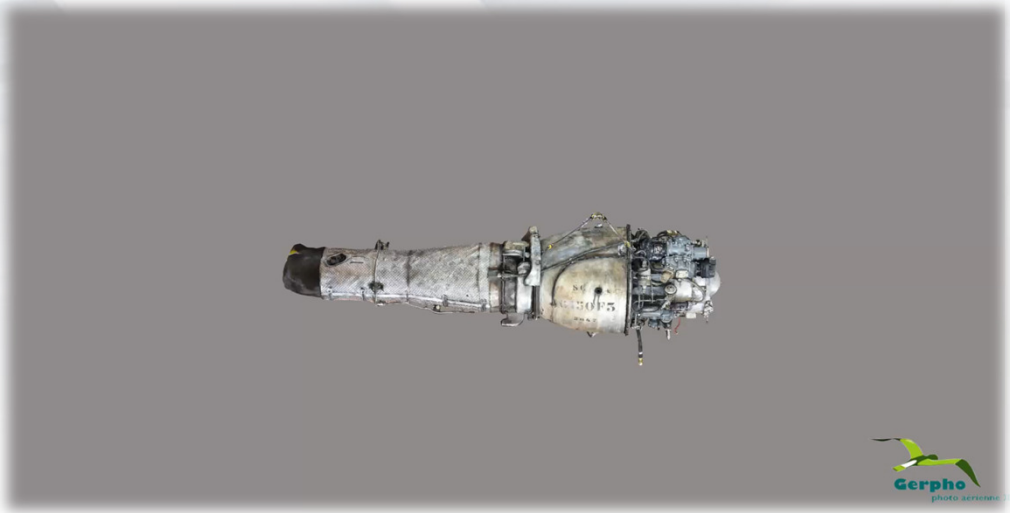

Unlimited Scalability

Example Aerial Models




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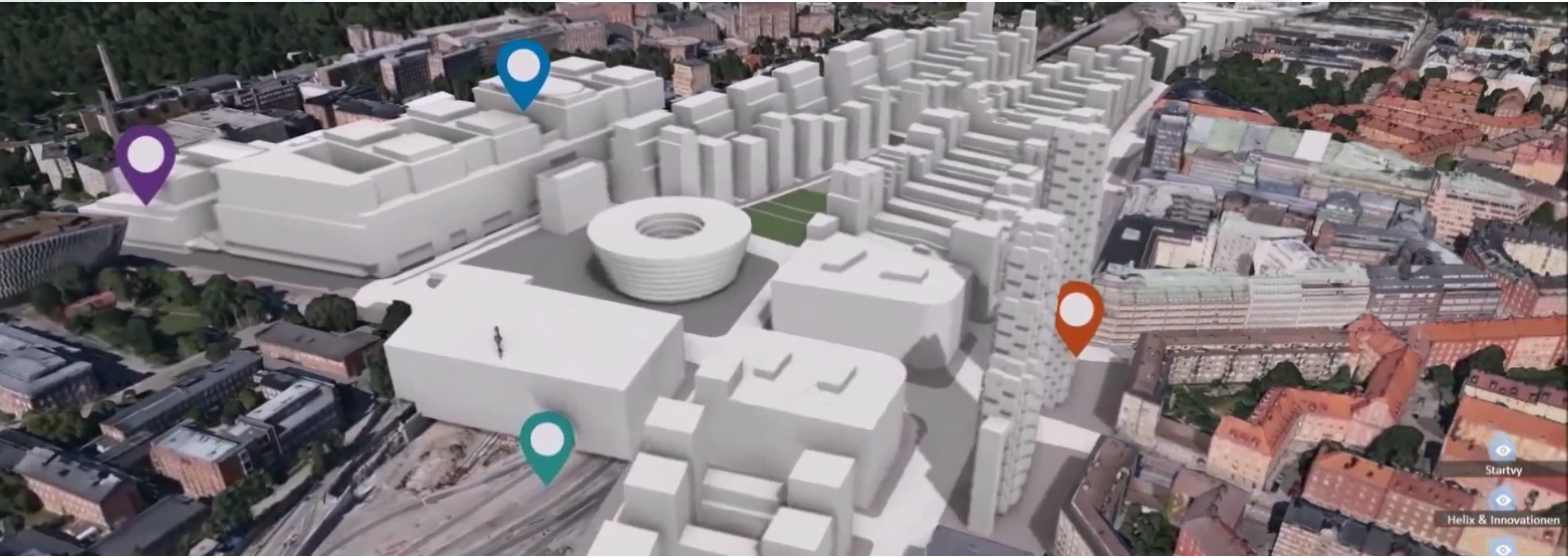
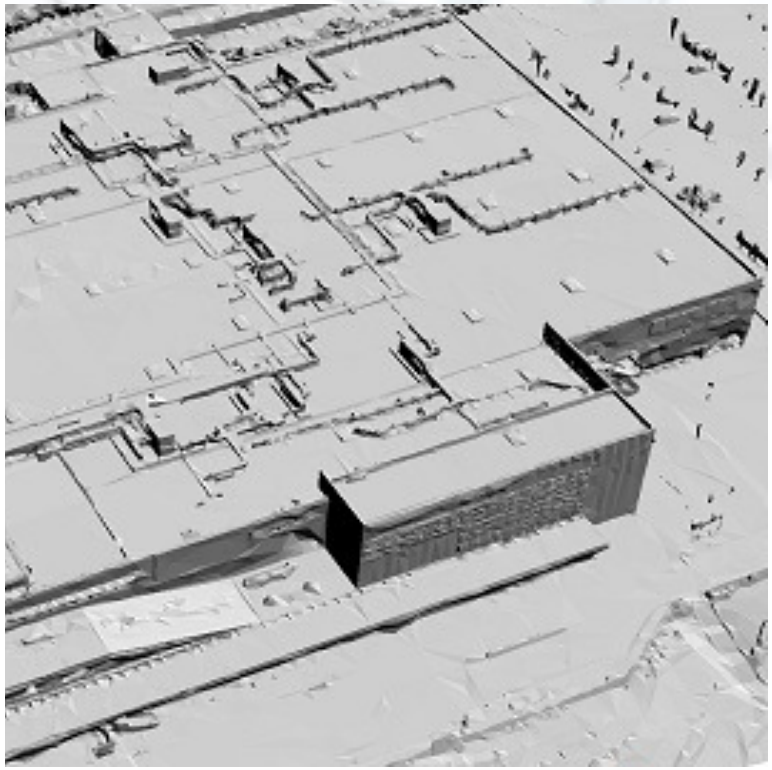
Infrastructure | Petrochemical Plant

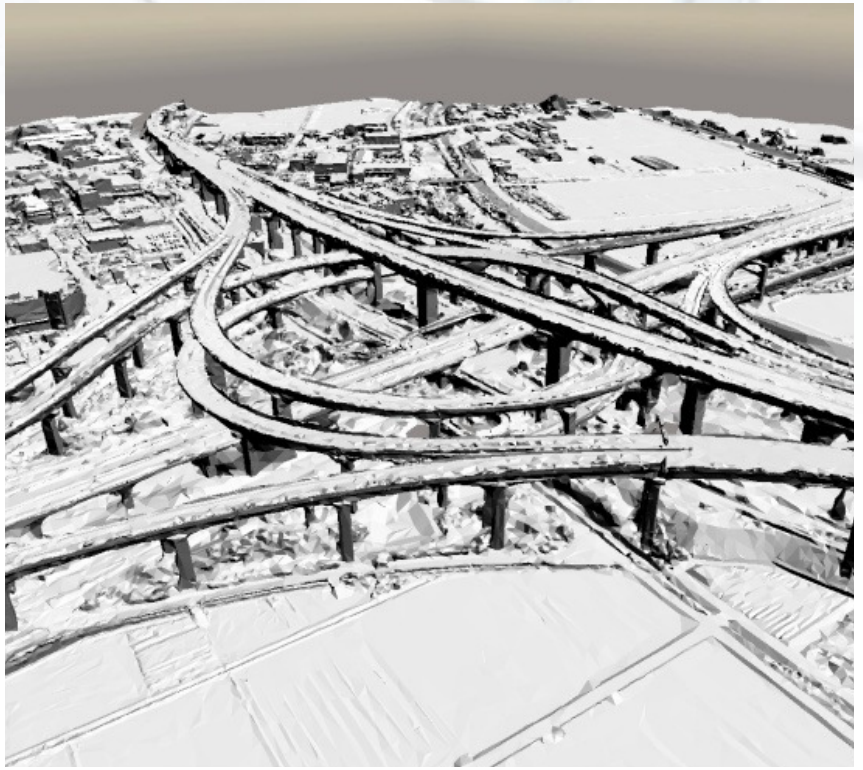
Urban Planning | Aligning Conceptual Design With Reality



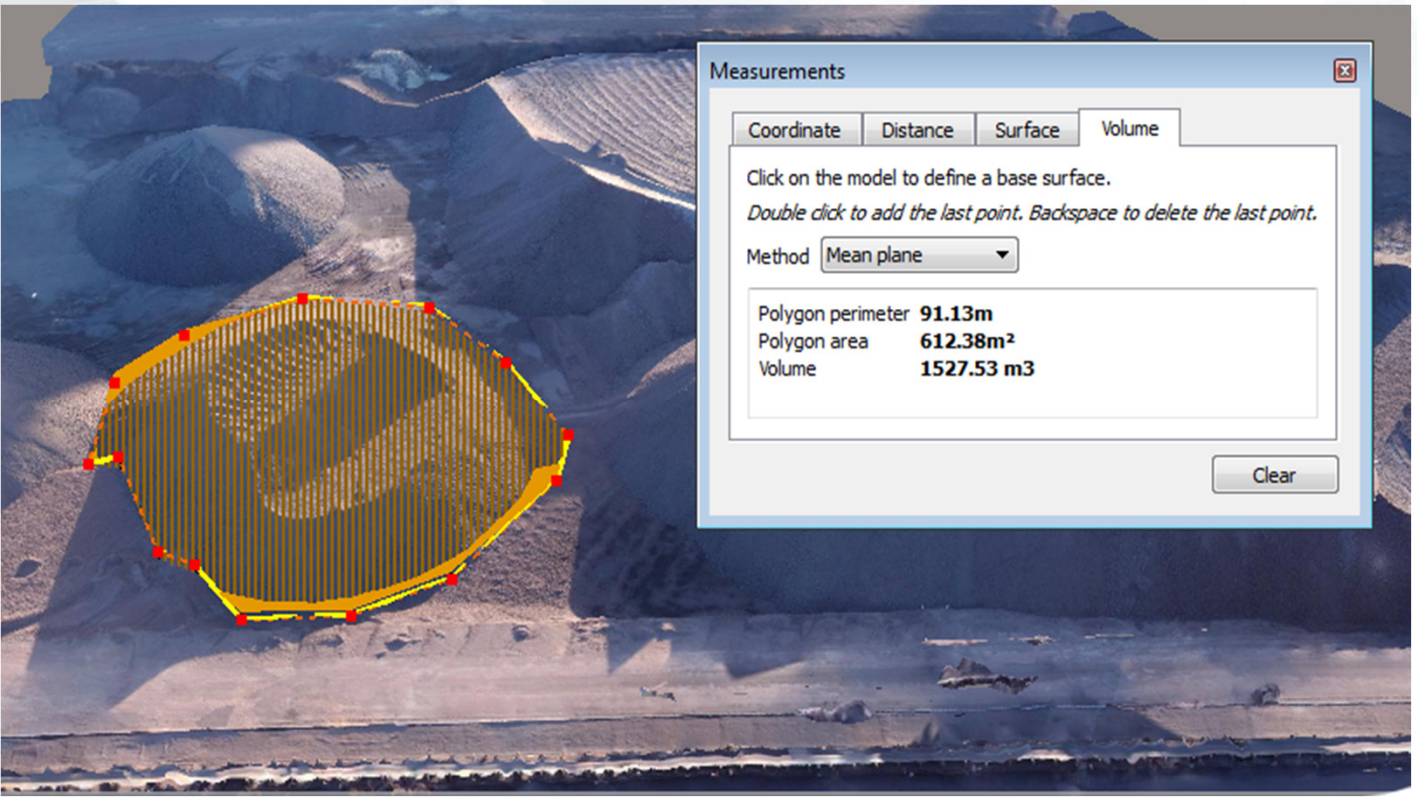
Surveying | Building Conditions and Roof Structures

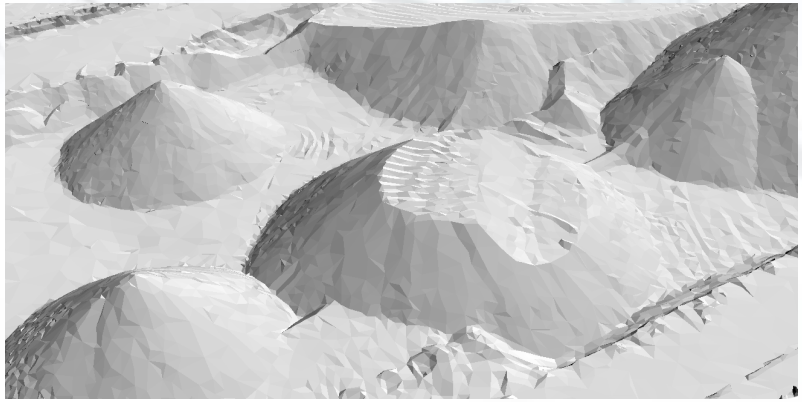


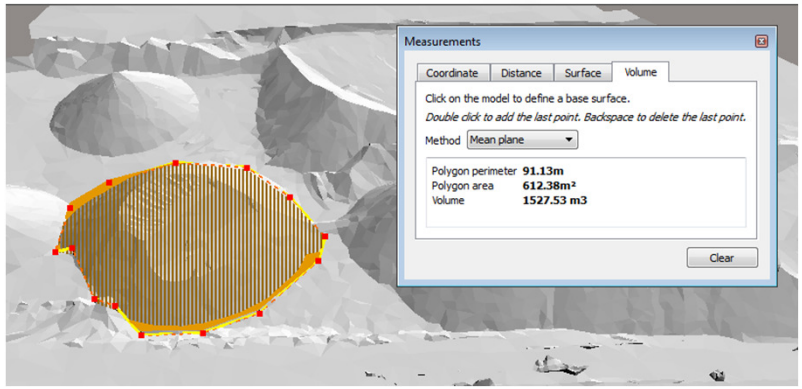
Transportation | As-Built Structures Modeling



Surveying | Stockpile Volume Measurement







Communication | Illustration of Disaster Impacts

Mixing aerial and ground photography

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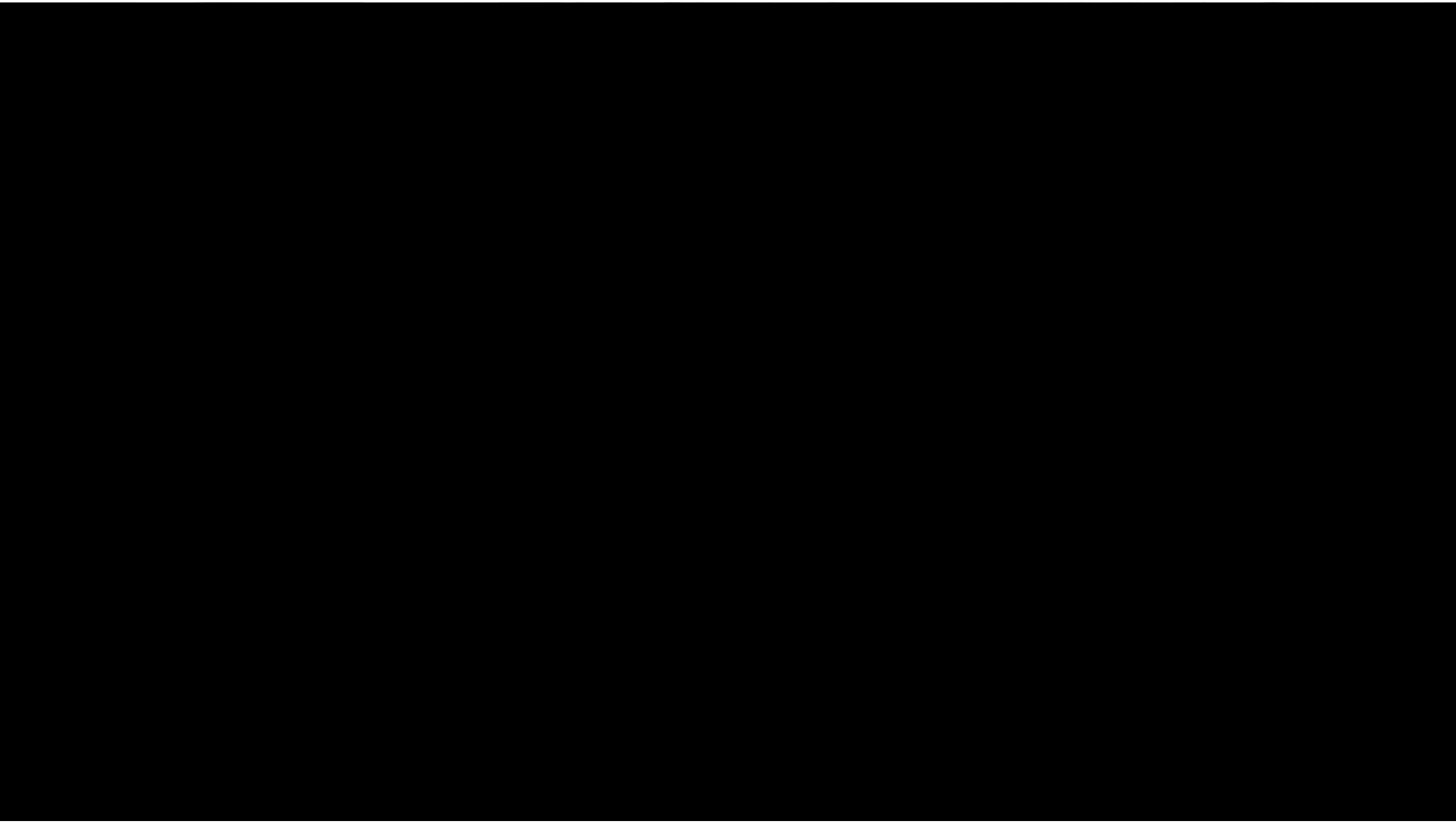
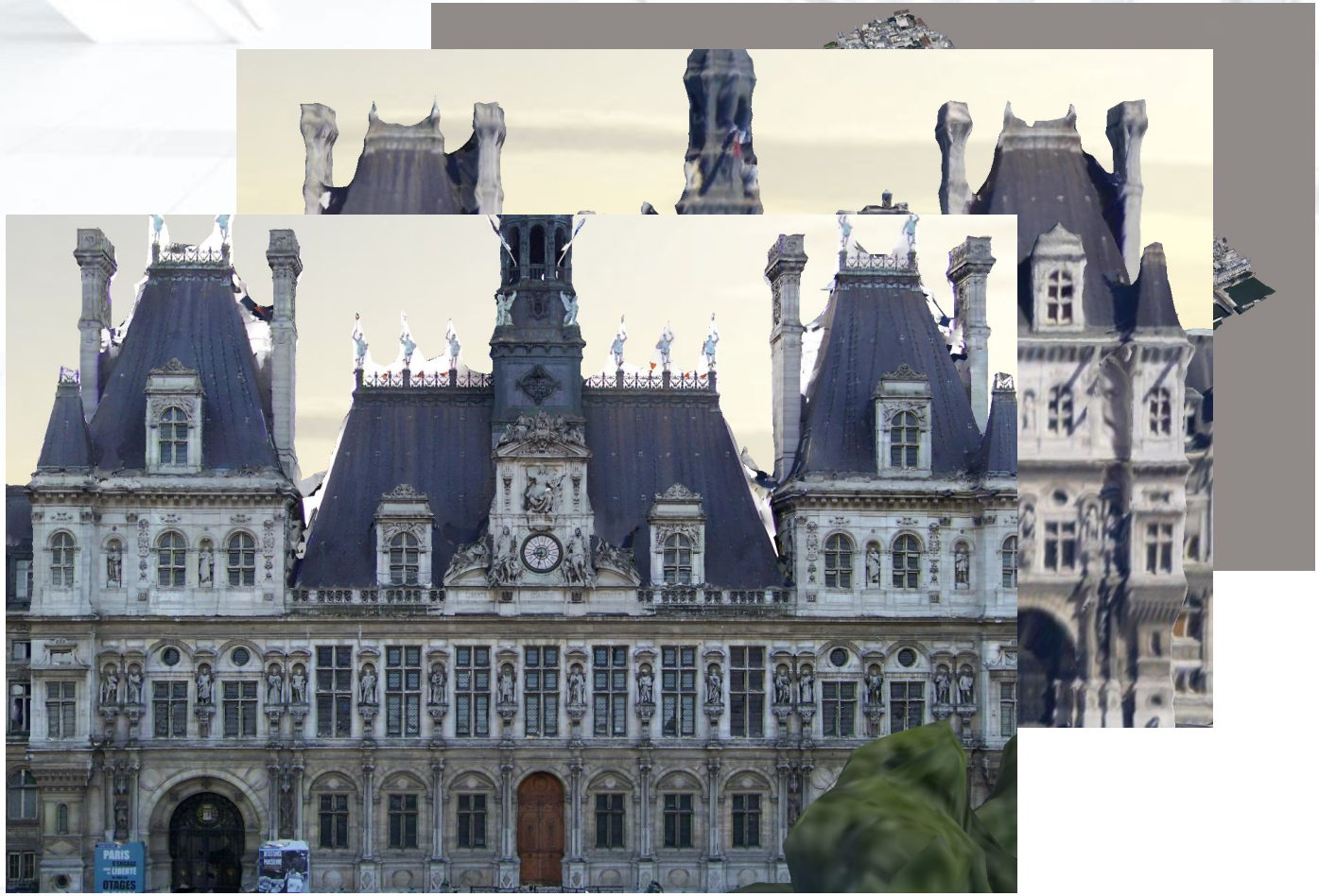
Advancing Infrastructure



The interest of the fusion

- Mixing dataset from different point of view
- Covering the model from all angles
- Mixing dataset at different resolution



Two workflows

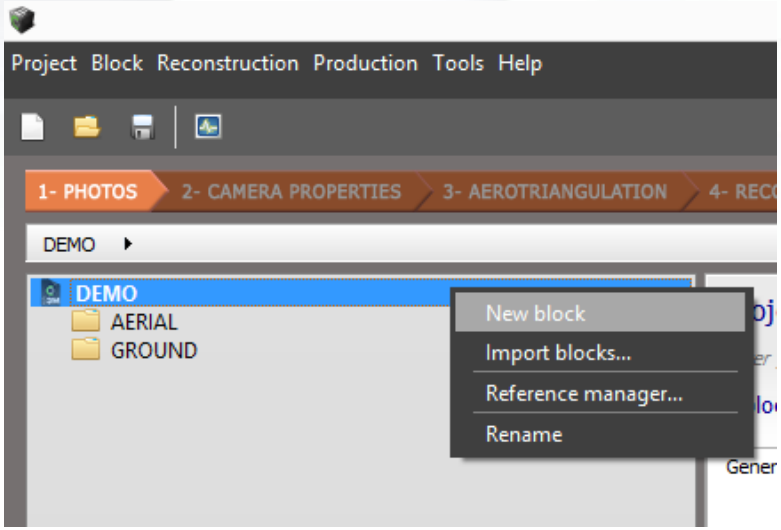
- Workflow 1 : mixing dataset that are too different to be matched automatically.
- Workflow 2 : mixing dataset that are difficult to mix fully automatically.

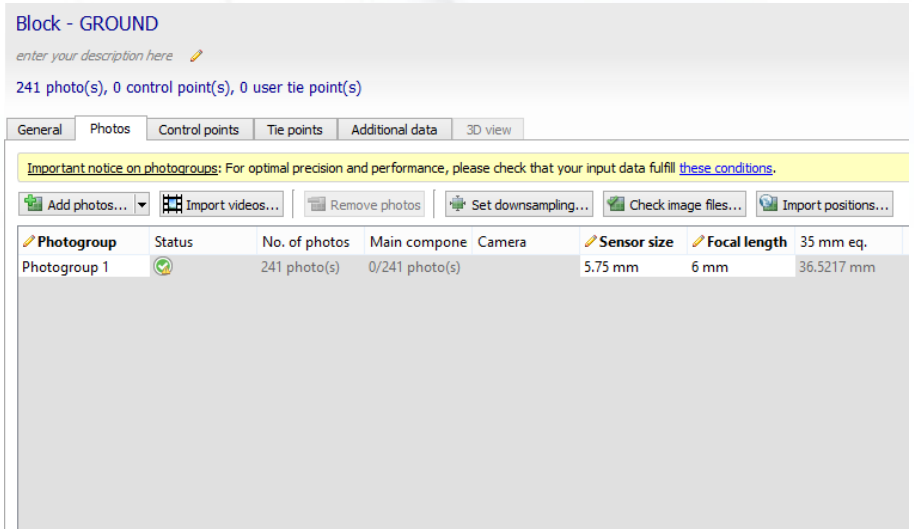
Two workflows

- **Workflow 1** : mixing dataset that are too different to be matched automatically
  - Create two independent blocks (or more) : Block_1 / Block_2
  - Process AT separately on each of this block.
  - Create user tie-points in Block_1 (at least 3). It should be visible in the photos of Block_2 as well.
  - Export the tie-point list in a txt file.
  - Import the tie-points as control points in Block_2
  - Perform the control points measurement in Block_2
  - Resubmit Block_2 AT and choose “use control points for rigid registration”
  - Merge both blocks
  - Create a reconstruction (adaptive tiling)
  - Submit production

Workflow 1

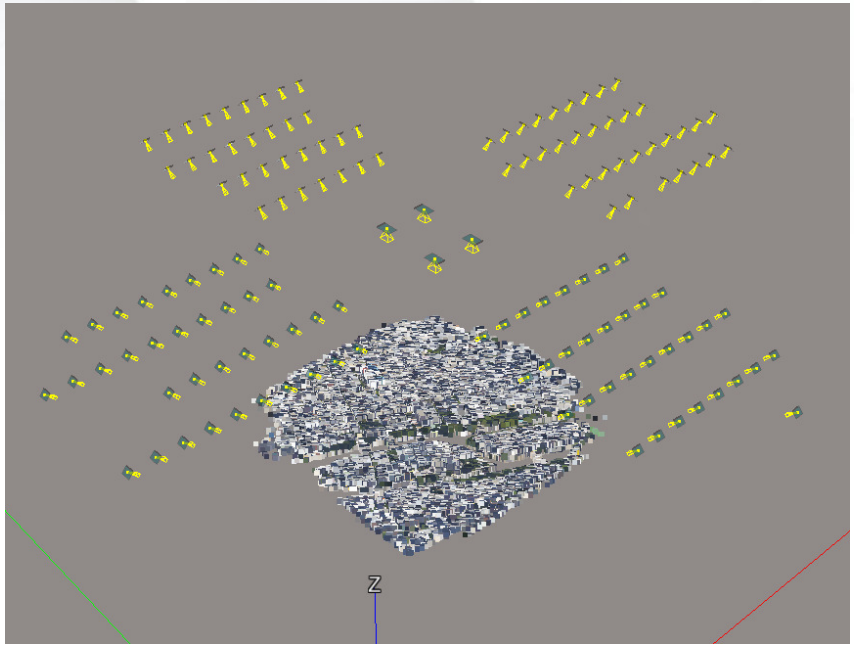
- Create two independent blocks (or more) : Block_1 / Block_2

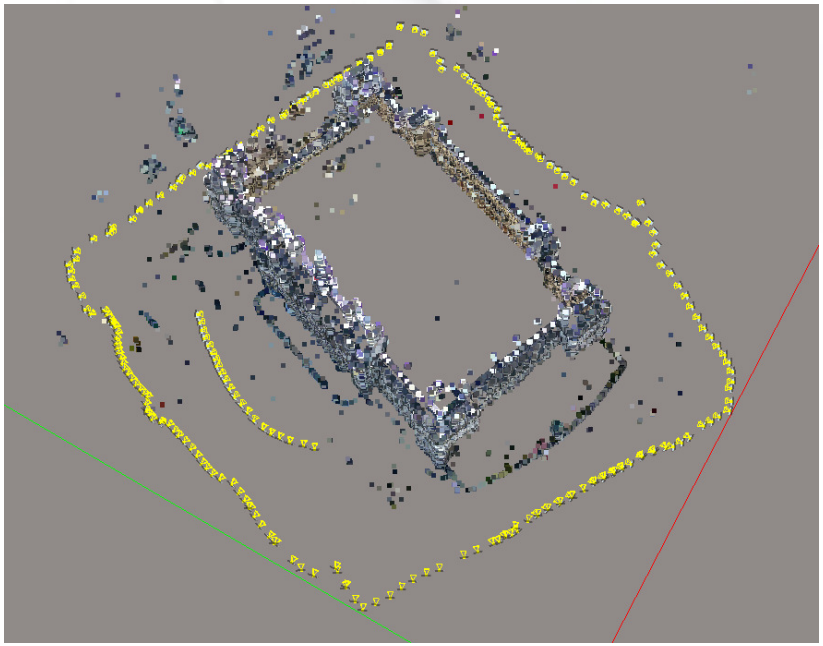




Workflow 1

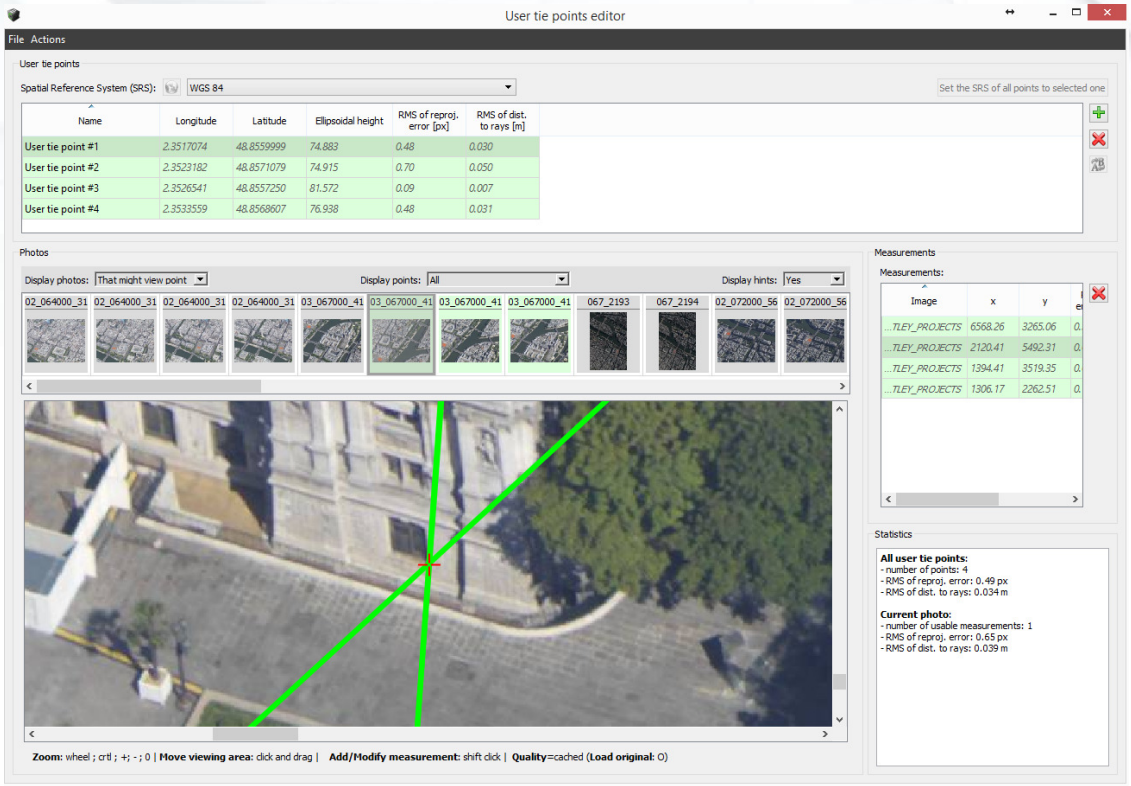
- Process AT separately on each of this block.





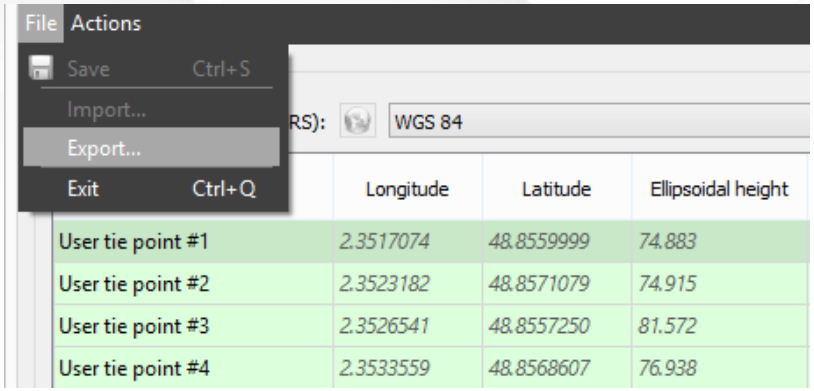
Workflow 1

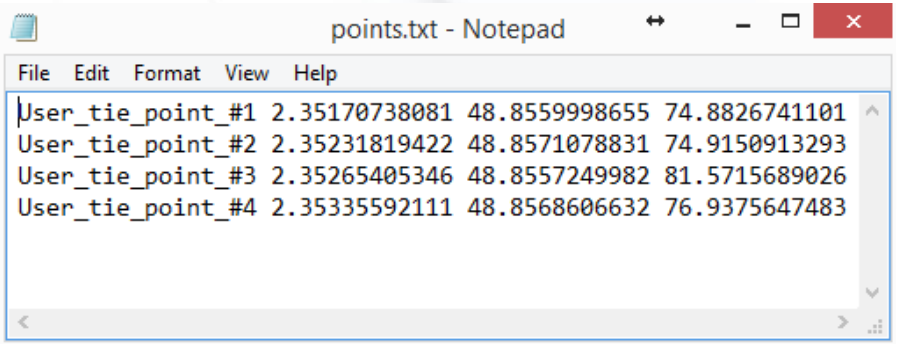
- Create user tie-points in Block_1 (at least 3). It should be visible in the photos of Block_2 as well.



Workflow 1

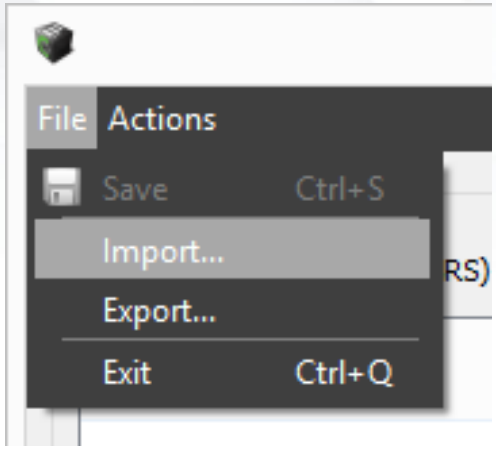
- Export the tie-point list in a txt file.





Workflow 1

- Import the tie-points as control points in Block_2



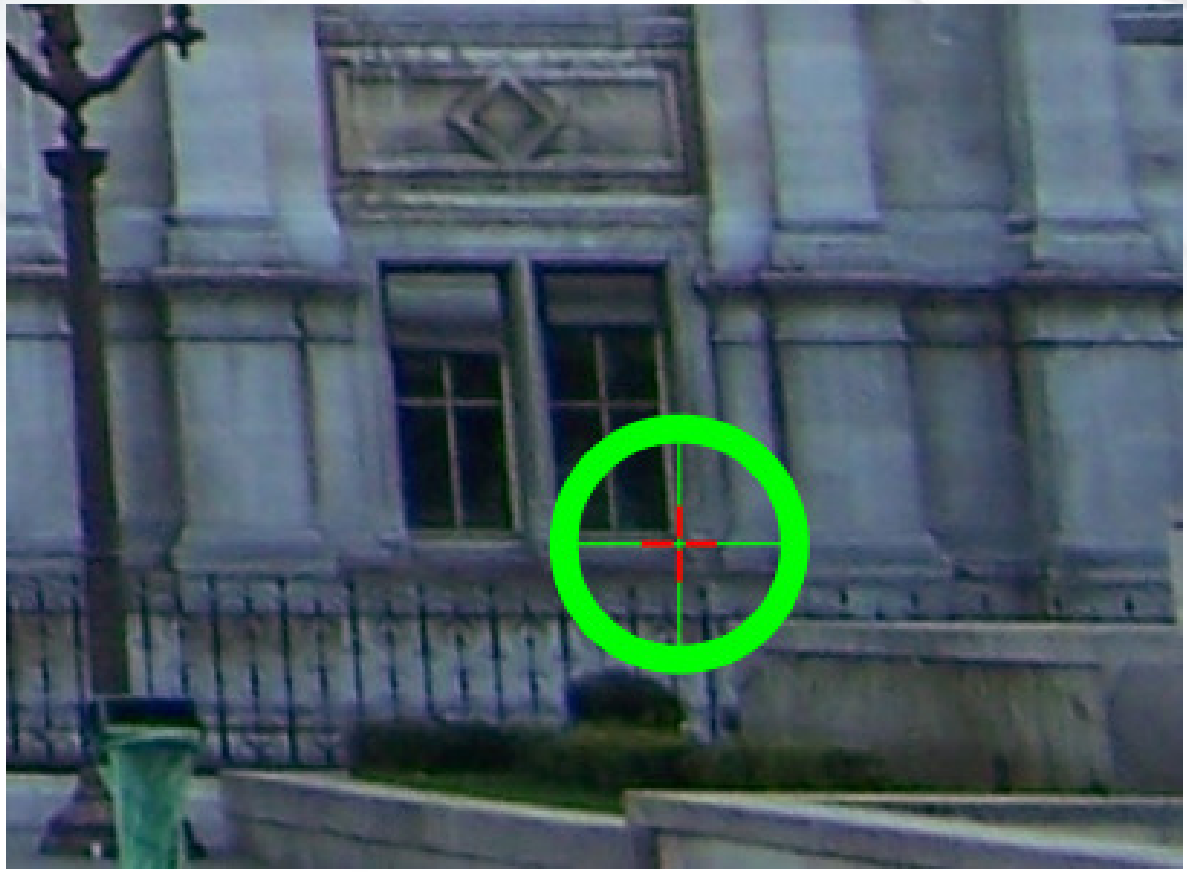
Control points

Spatial Reference System (SRS): WGS 84

Name	Category	Check point	Given Longitude	Given Latitude	Given Ellipsoidal height
Control point #1	Full	☐	2.3517074	48.8559999	74.883
Control point #2	Full	☐	2.3523182	48.8571079	74.915
Control point #3	Full	☐	2.3526541	48.8557250	81.572
Control point #4	Full	☐	2.3533559	48.8568607	76.938

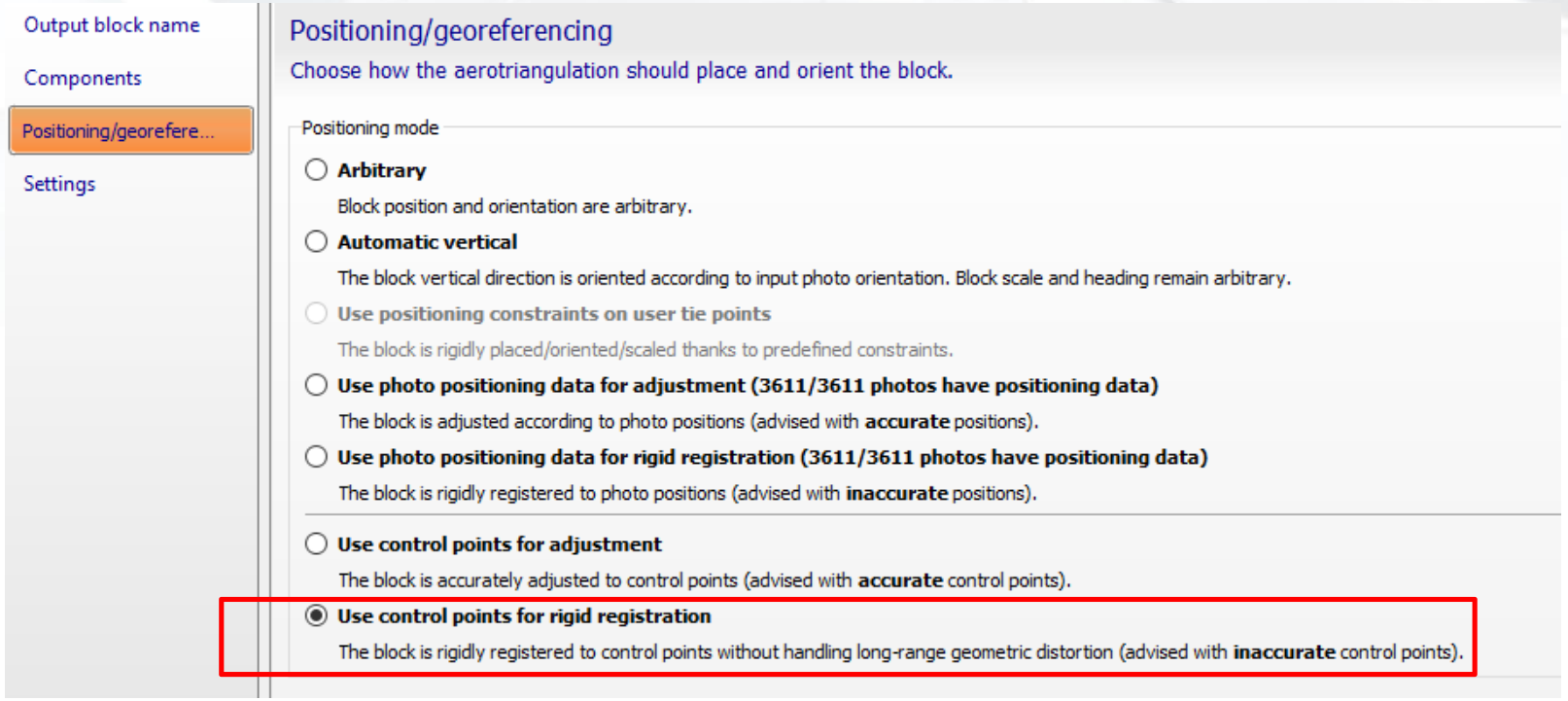
Workflow 1

- Perform the control points measurement in Block_2



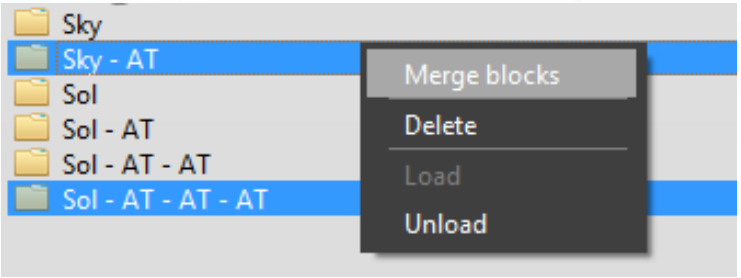
Workflow 1

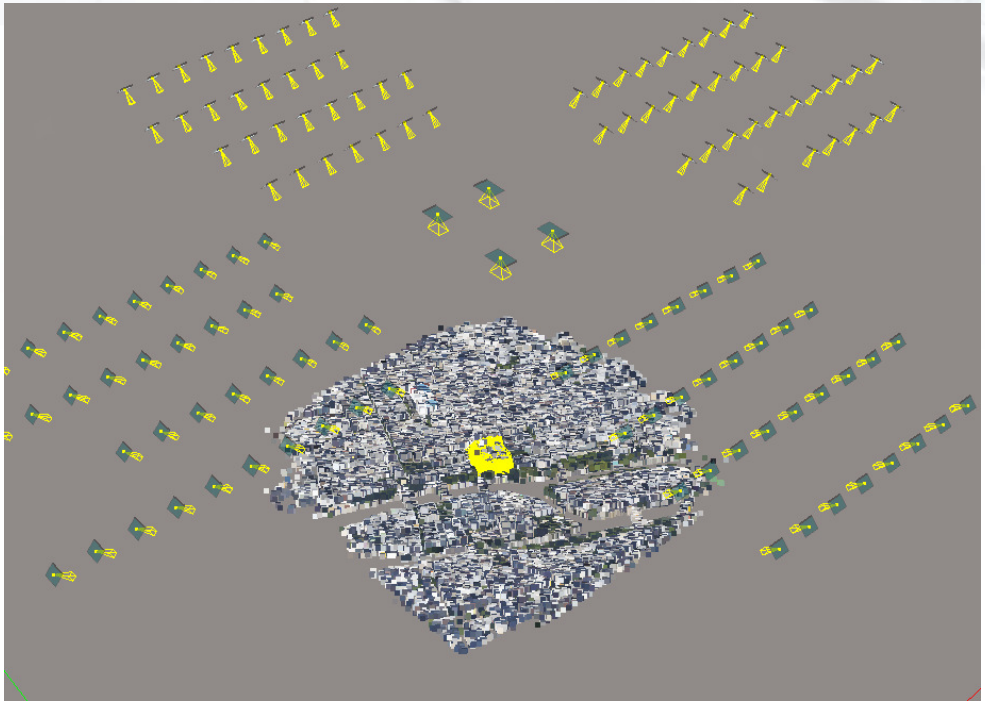
- Resubmit Block_2 AT and choose “use control points for rigid registration”



Workflow 1

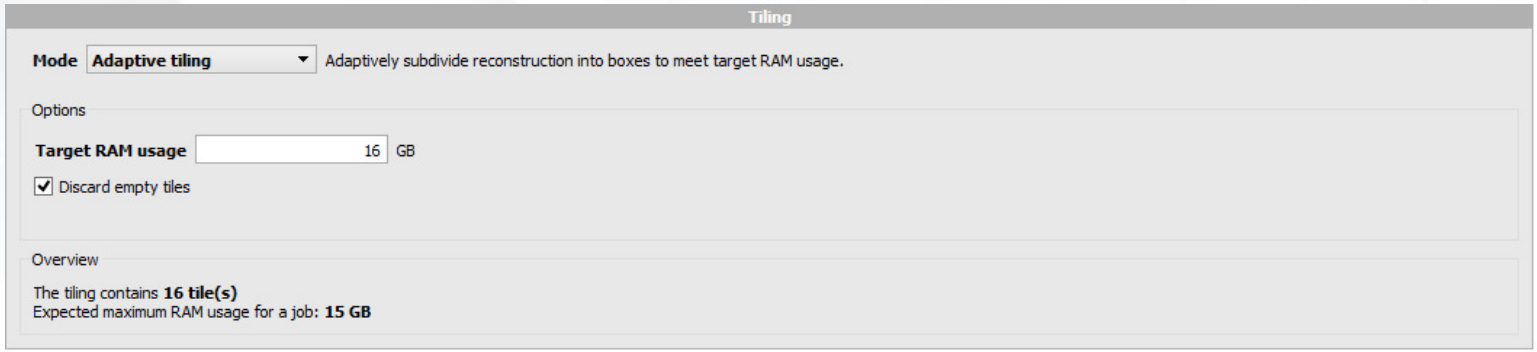
- Merge both blocks

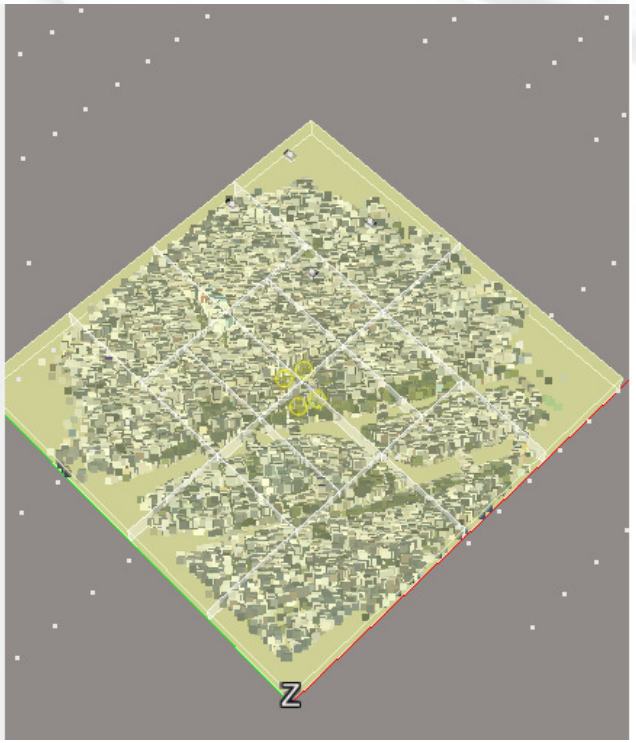




Workflow 1

- Create a reconstruction (adaptive tiling)



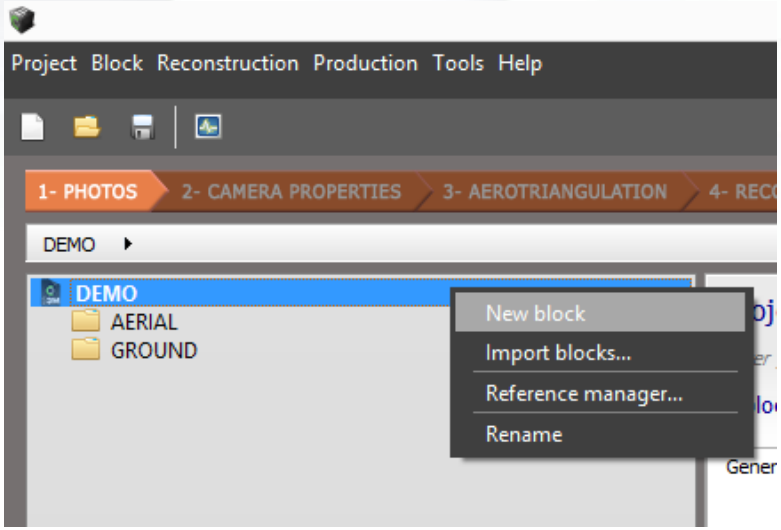


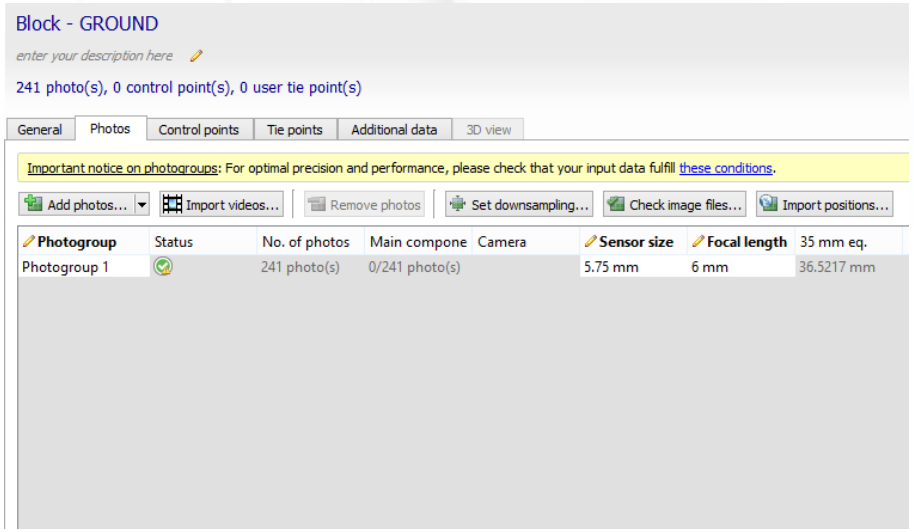
Two workflows

- **Workflow 2** : mixing dataset that are difficult to mix fully automatically
  - Create two independent blocks (or more) : Block_1 / Block_2
  - Process AT separately on each of this block.
  - Geo-reference both blocks separately (GPS tags, control points, control points extracted from one block using tie-points).
  - Merge both blocks
  - Set the block type to “structured aerial dataset”
  - Submit a new AT of the merged block
  - Create a reconstruction (adaptive tiling)
  - Submit production

Workflow 2

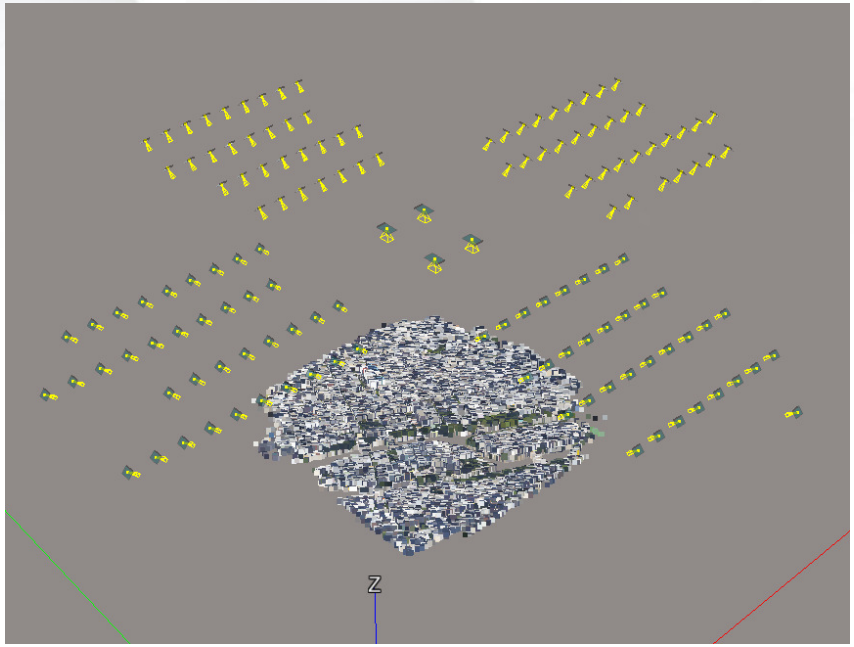
- Create two independent blocks (or more) : Block_1 / Block_2

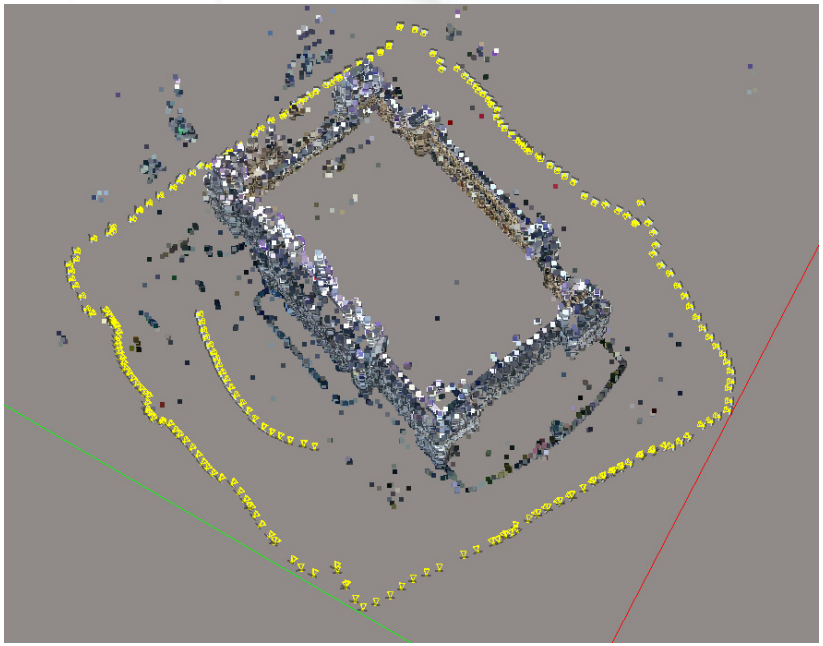




Workflow 2

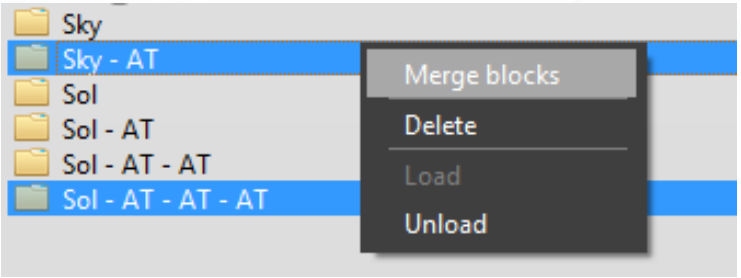
- Geo-reference both blocks separately (GPS tags, control points, control points extracted from one block using tie-points).

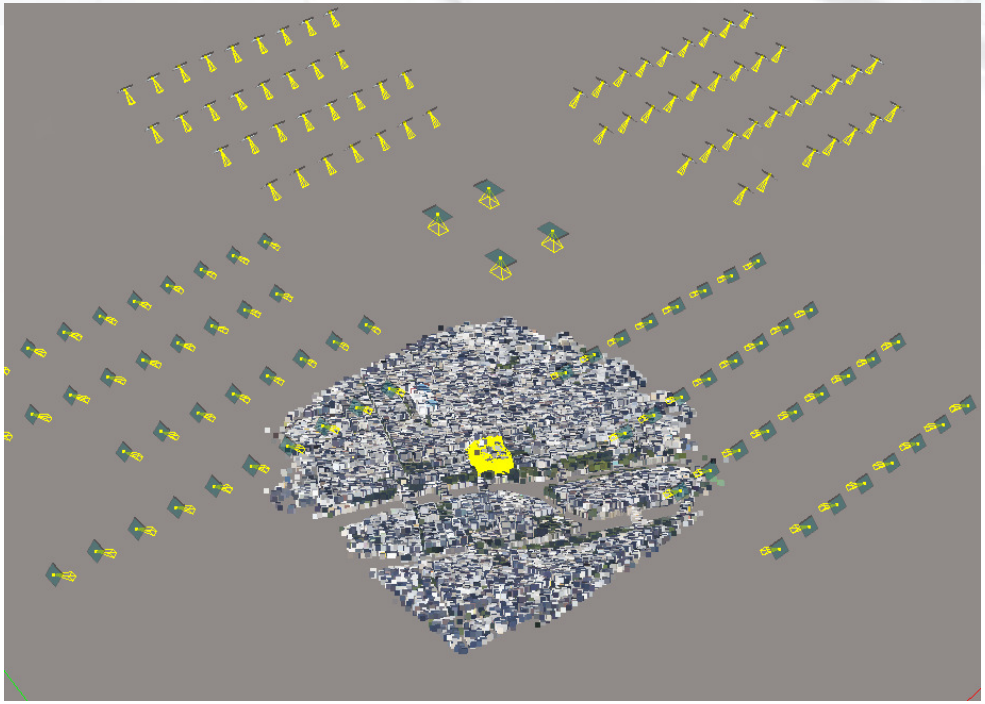




Workflow 2

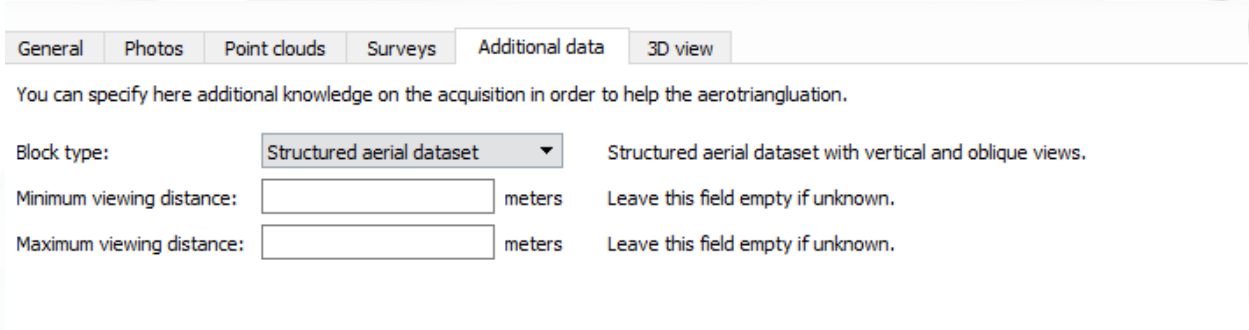
- Merge both blocks





Workflow 2

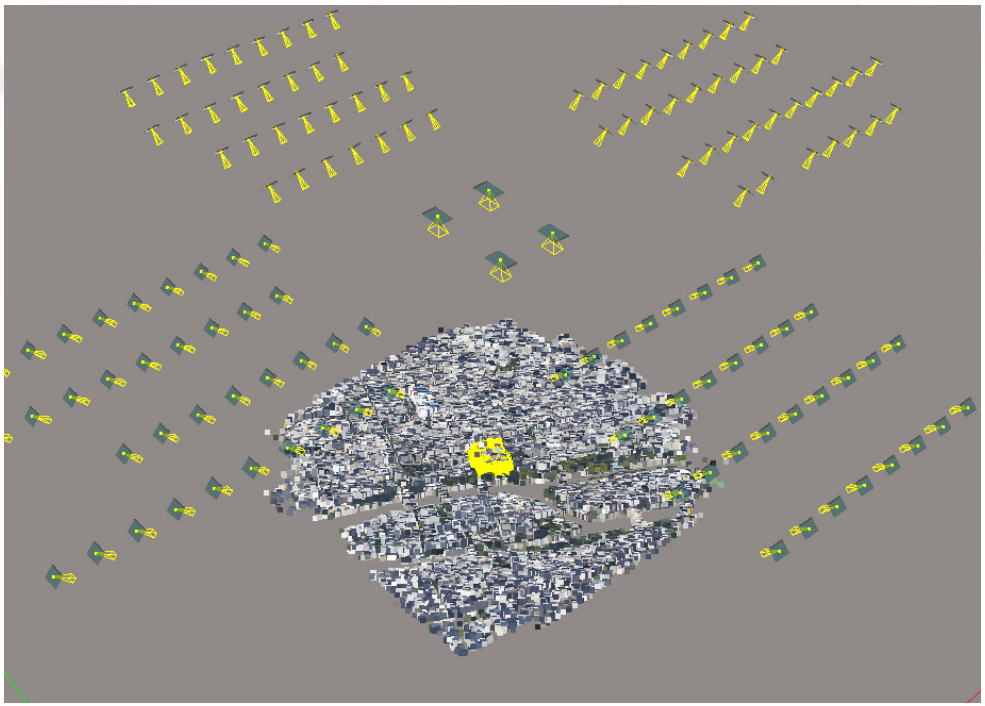
- Set the block type to “structured aerial dataset”



When a block type is set to structured aerial data and all the photos have position and rotation information, a **tilt ratio** is applied to help the keypoint matching of oblique and Nadir photos. Oblique photos will be shrunk so that the horizontal surfaces will be similar to the nadir photos.

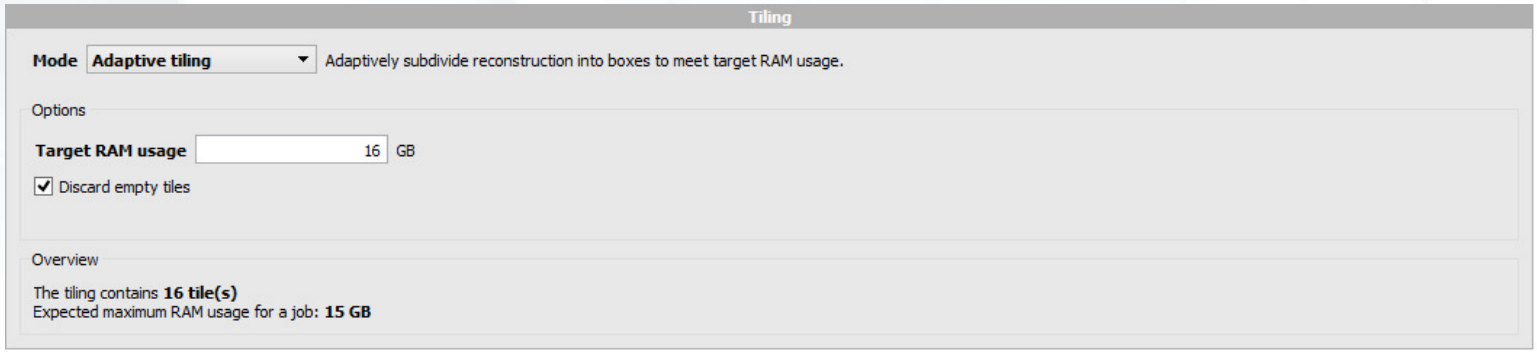
Workflow 2

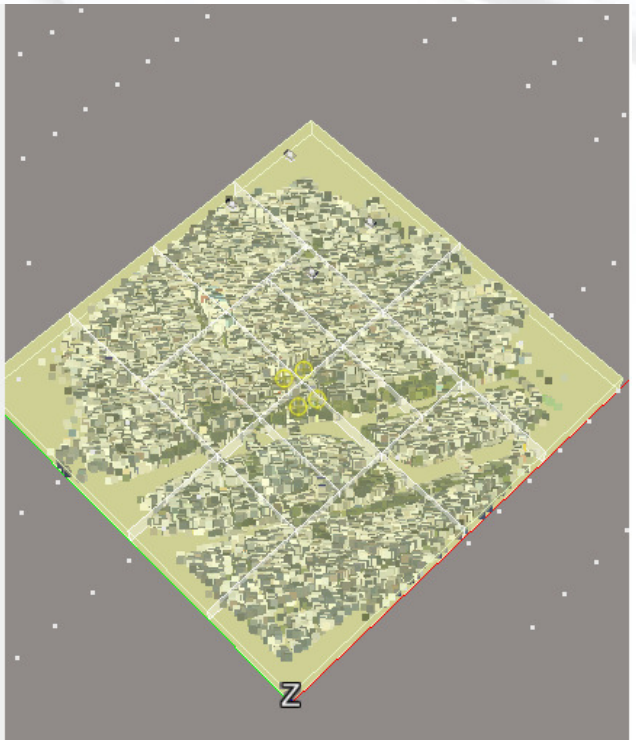
- Submit a new AT on the merged block



Workflow 2

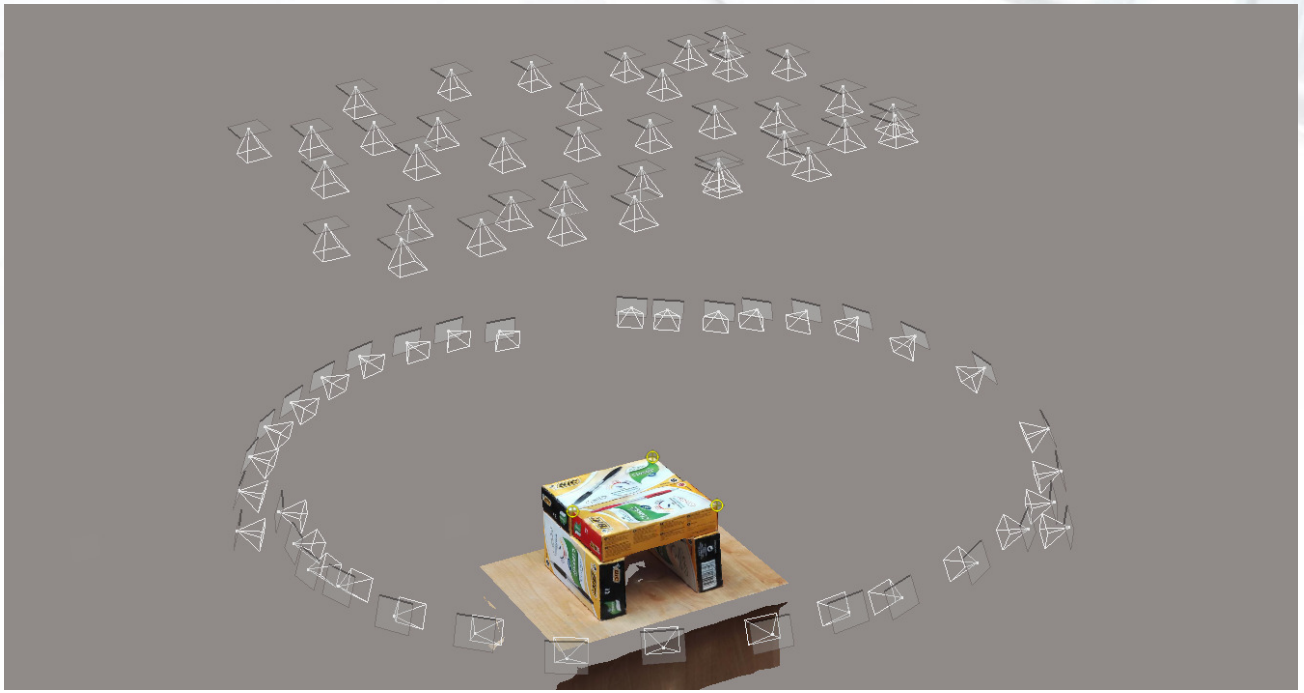
- Create a reconstruction (adaptive tiling)





Workflow 2

- Submit production



Demo

Any questions?

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