Walk-in Slide: AU 2014 Social Media Feed

1. Click on the link below, this will open your web browser

http://aucache.autodesk.com/social/visualization.html

2. Use “Extended Display” to project the website on screen if you plan to work on your computer. Use “Duplicate” to display same image on screen and computer.

Extreme Reality Computing from a Hexacopter

Mike Gemmell - Autodesk
Dominique Pouliquen - Autodesk
William Pryor - SKYCATCH
Hannu Linberg - DPR Construction

Class summary

Scene re-creation with the help of an unmanned aerial vehicle (UAV/ Drone) has many applications that range from disaster recovery to infrastructure concept design. Creating these scenes with the help of a UAV is becoming more common as the flying camera UAV craze explodes worldwide. This session will cover camera equipment and UAVs, and we'll also discuss building custom UAVs, taking pictures from a UAV, post-processing pictures with Lightroom.

We will also hear from SKYCATCH, a firm that is currently working with DPR to utilize automated drone systems on construction projects. SKYCATCH will also provide an update for us on the FAA's progress with setting standards for the commercial use of drones.

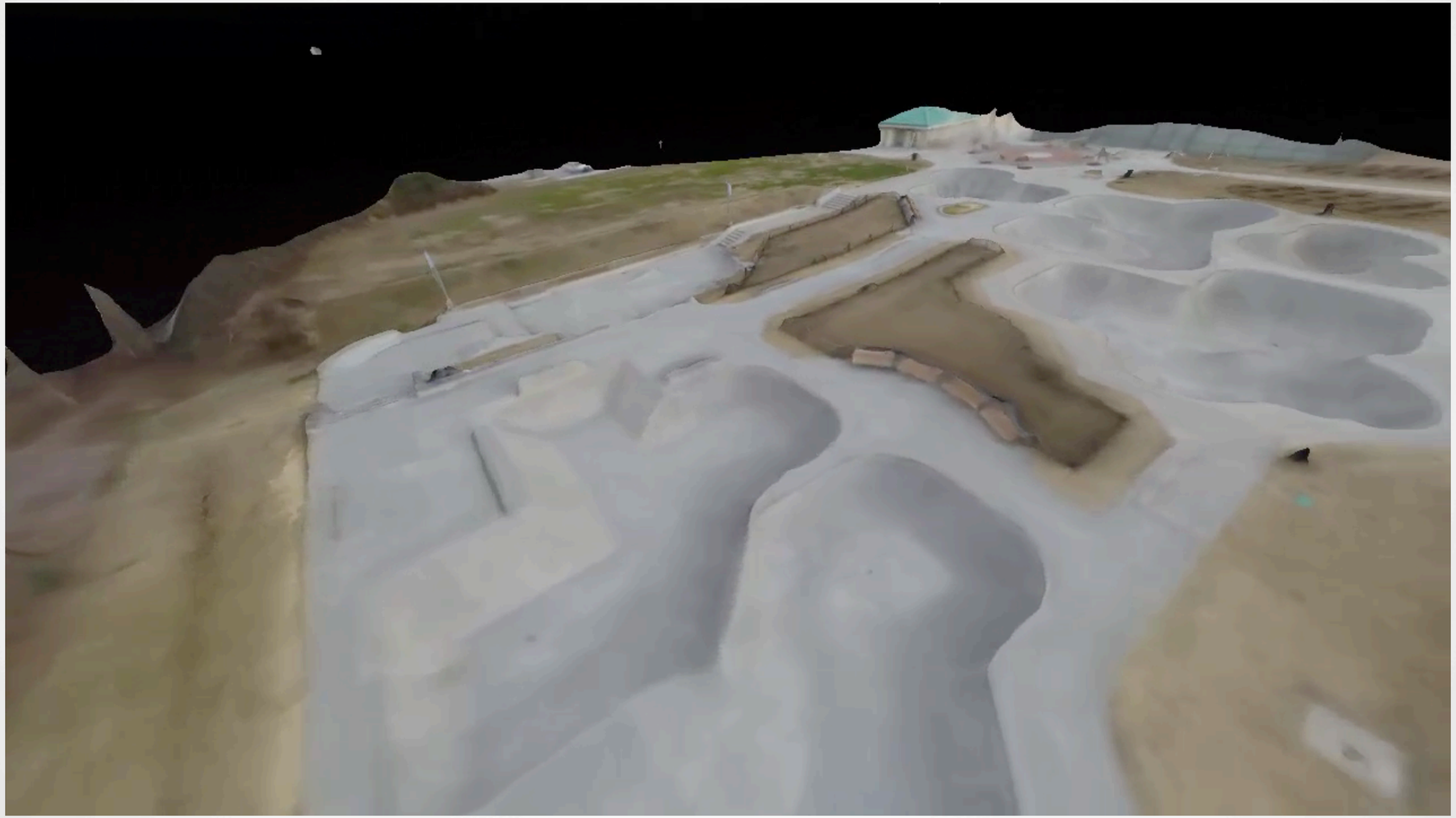
Key learning objectives

At the end of this class, you will learn about:

- UAV's / Drones used to create 3D models
- Photography from a drone
- Photo post-processing for best results
- Current use cases for construction
- Latest on FAA Commercial use

Skate Park

Gopro Hero 3+



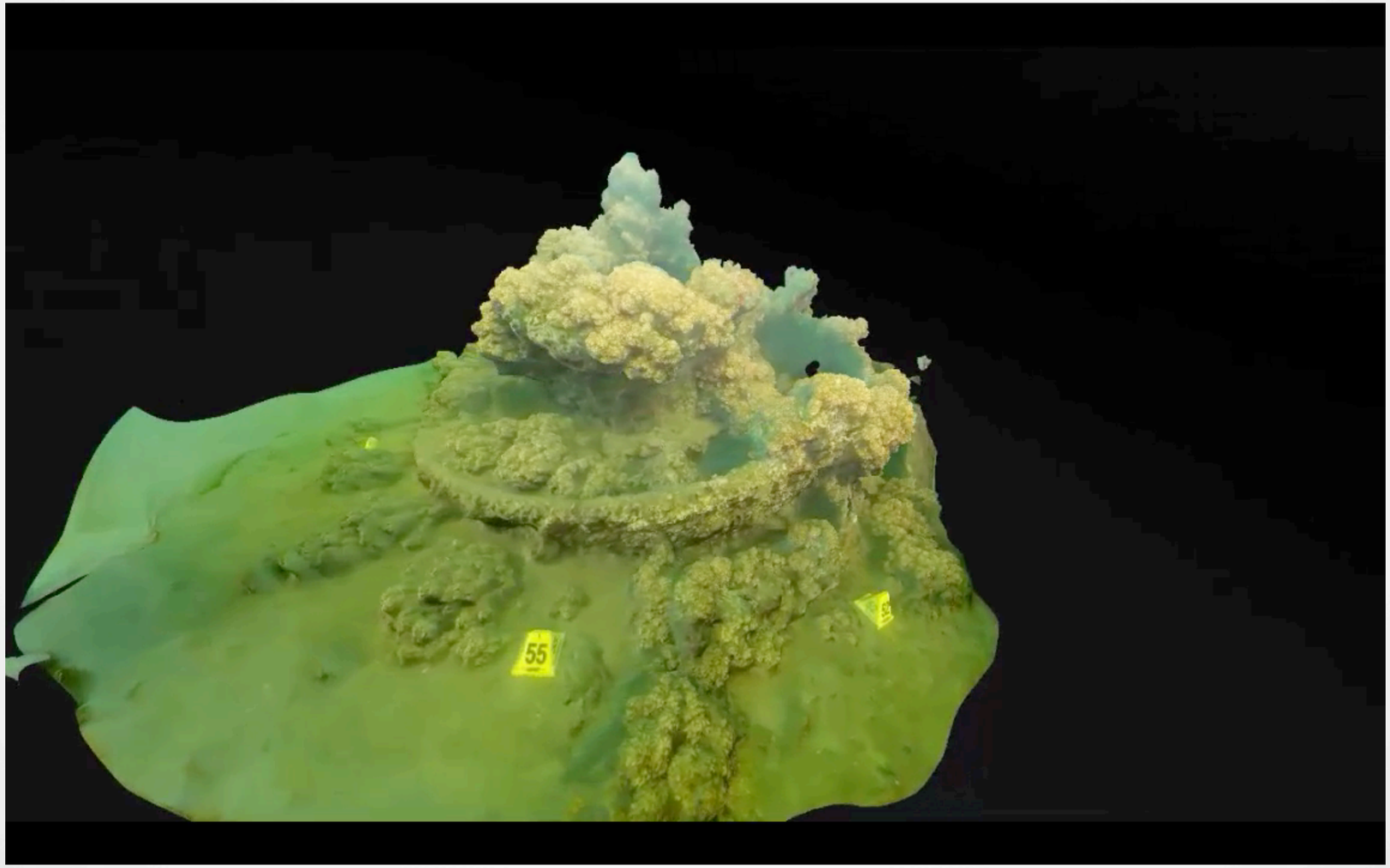
Louvre Tablet

Olympus OMD



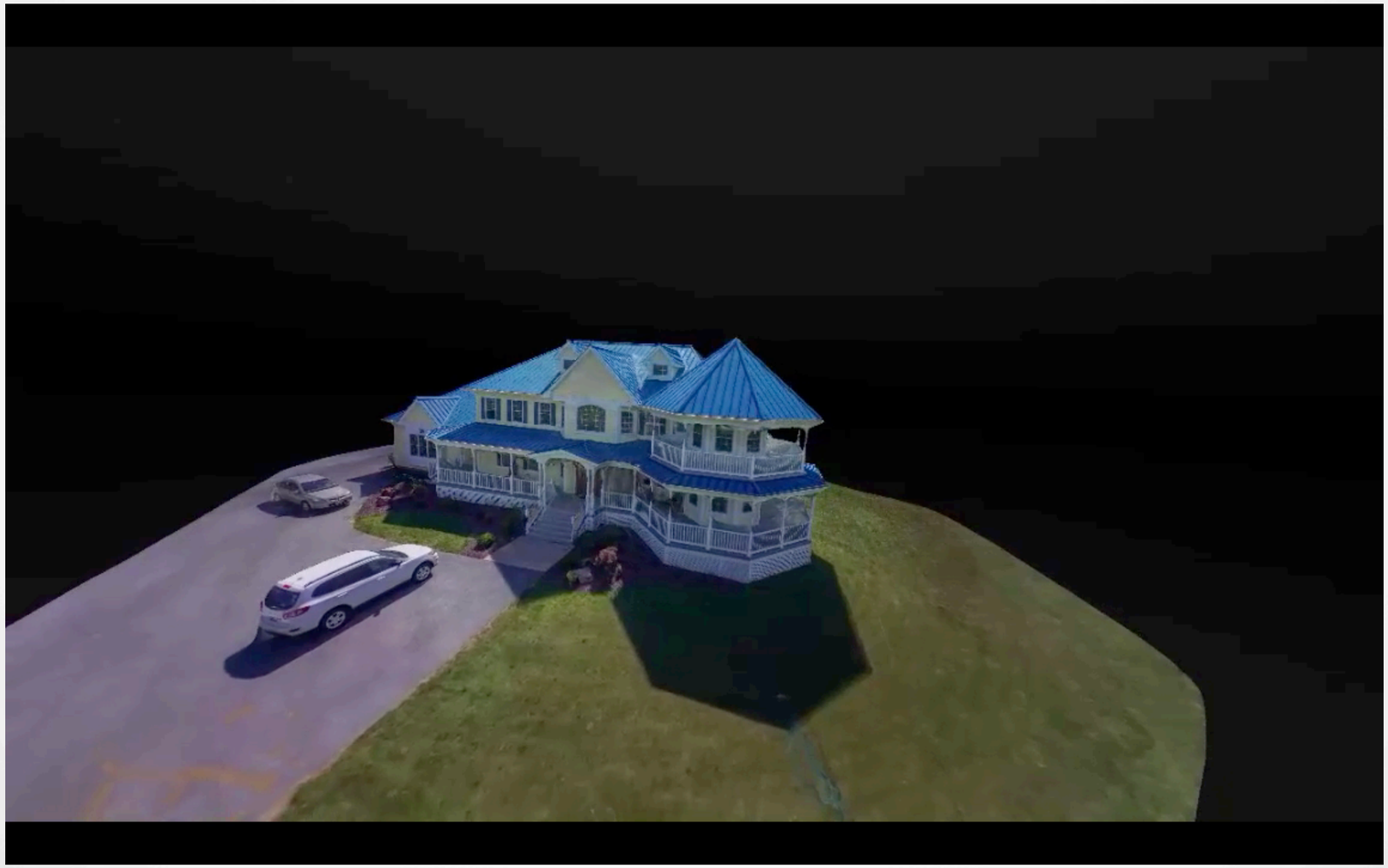
USS Arizona – Air Duct

Nikon D800



Rochester House Example

Sony a7R
Voigtlander 20mm Rangefinder



Original Gym – 2014

Sony a7R
Voigtlander 20mm Lens



Most Frequent Questions

- How did you learn to fly?
- What kind of drone should I get?
- What camera should I use?
- How do we get the best results?
- How accurate is this?
- Am I allowed to fly?

Learning to Fly





- www.flitetest.com -RotorBones
- www.atlantahobby.com -Cliff Whitney
- http://www.brilliancephotography.com -Bob Hughes
- https://www.youtube.com/user/AnthonyMorganti

Flight Controllers **Power Systems** **Lipo Batteries**

Radio Transmitters **Drone Setup** **Camera Gimbals**

Learning to Fly

Blade MDX



Learning to Fly

Flying while under Nerf-Gun fire…

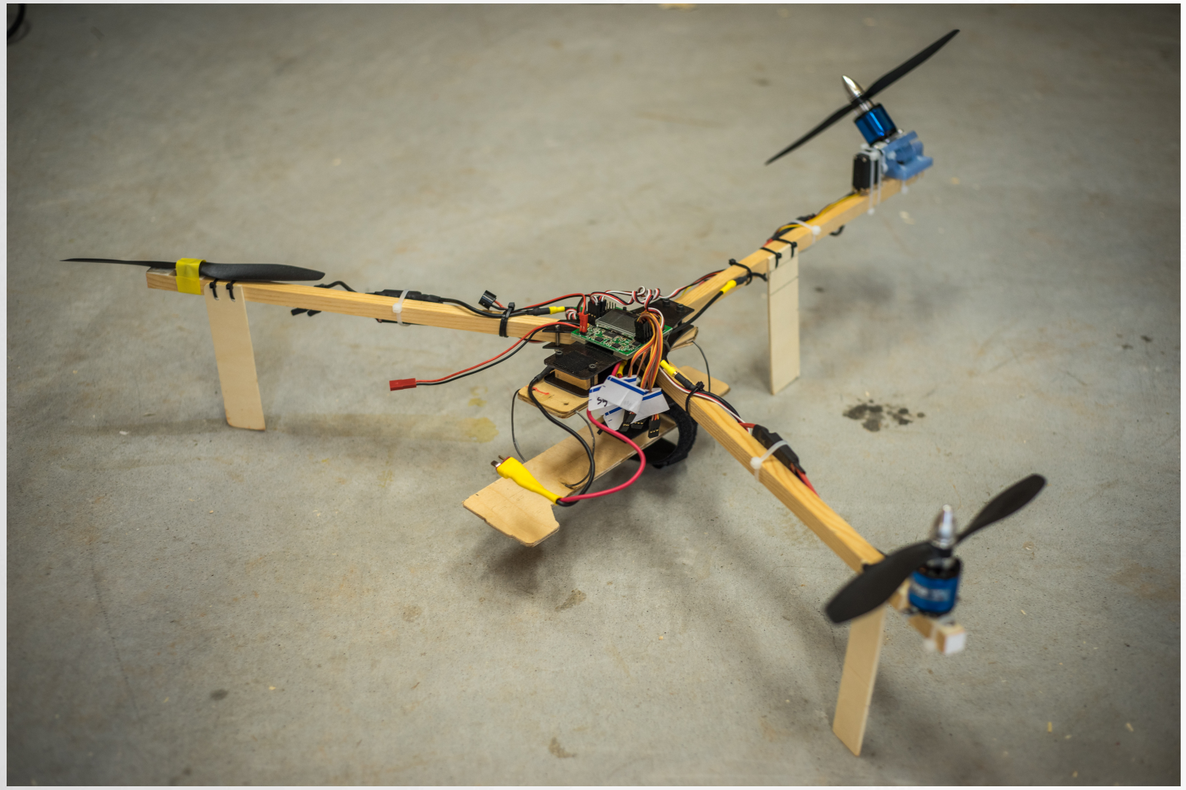


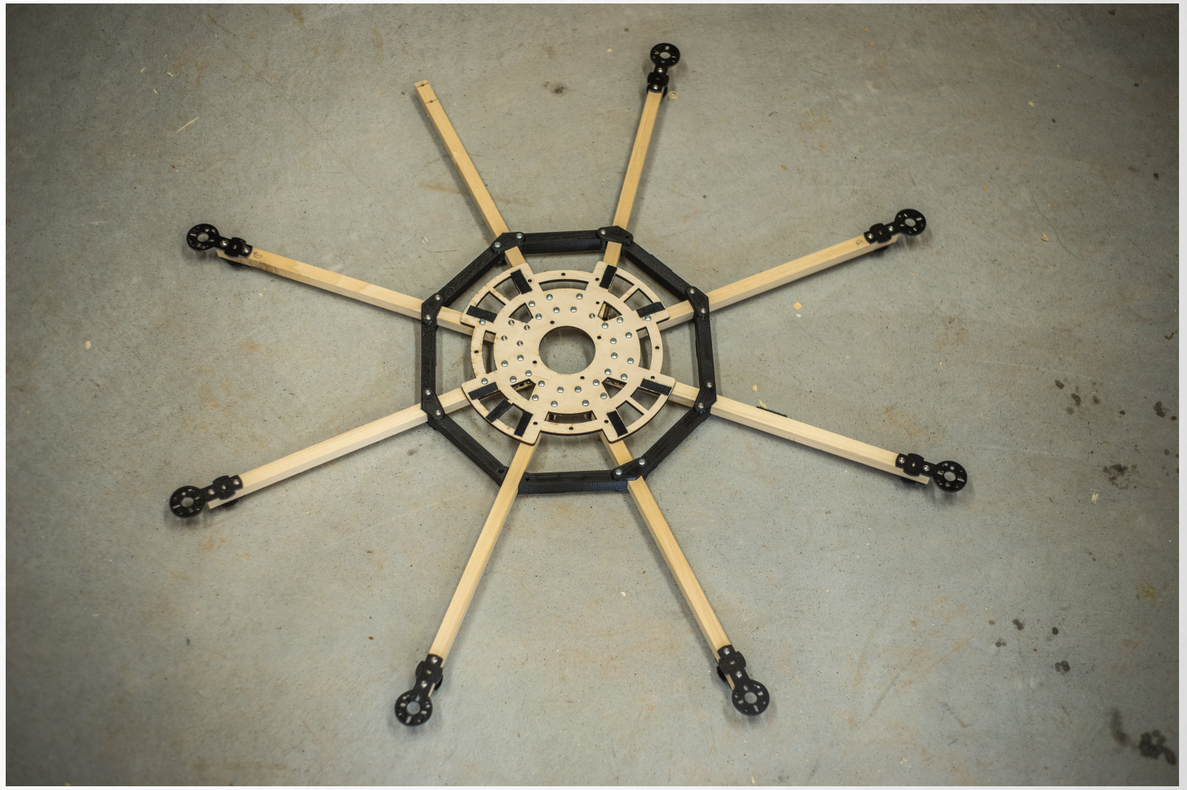
Learning to Fly



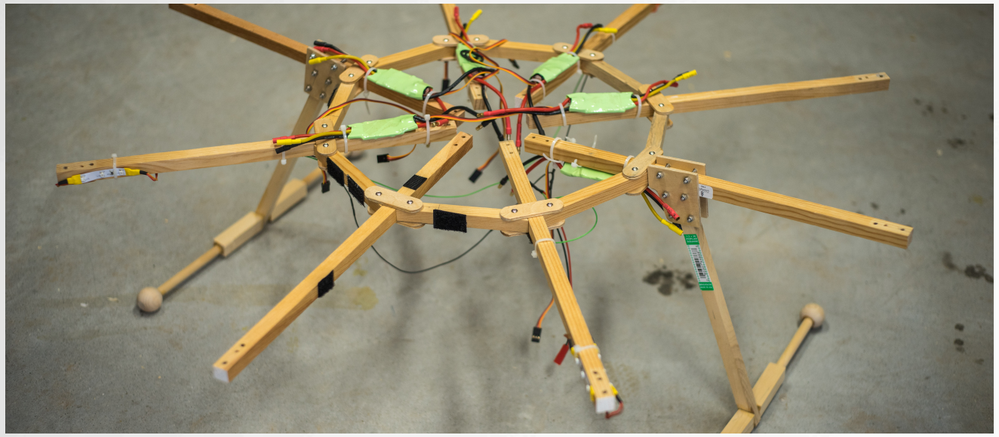
What kind of drone?

- My progression based on cameras needed





What kind of drone?

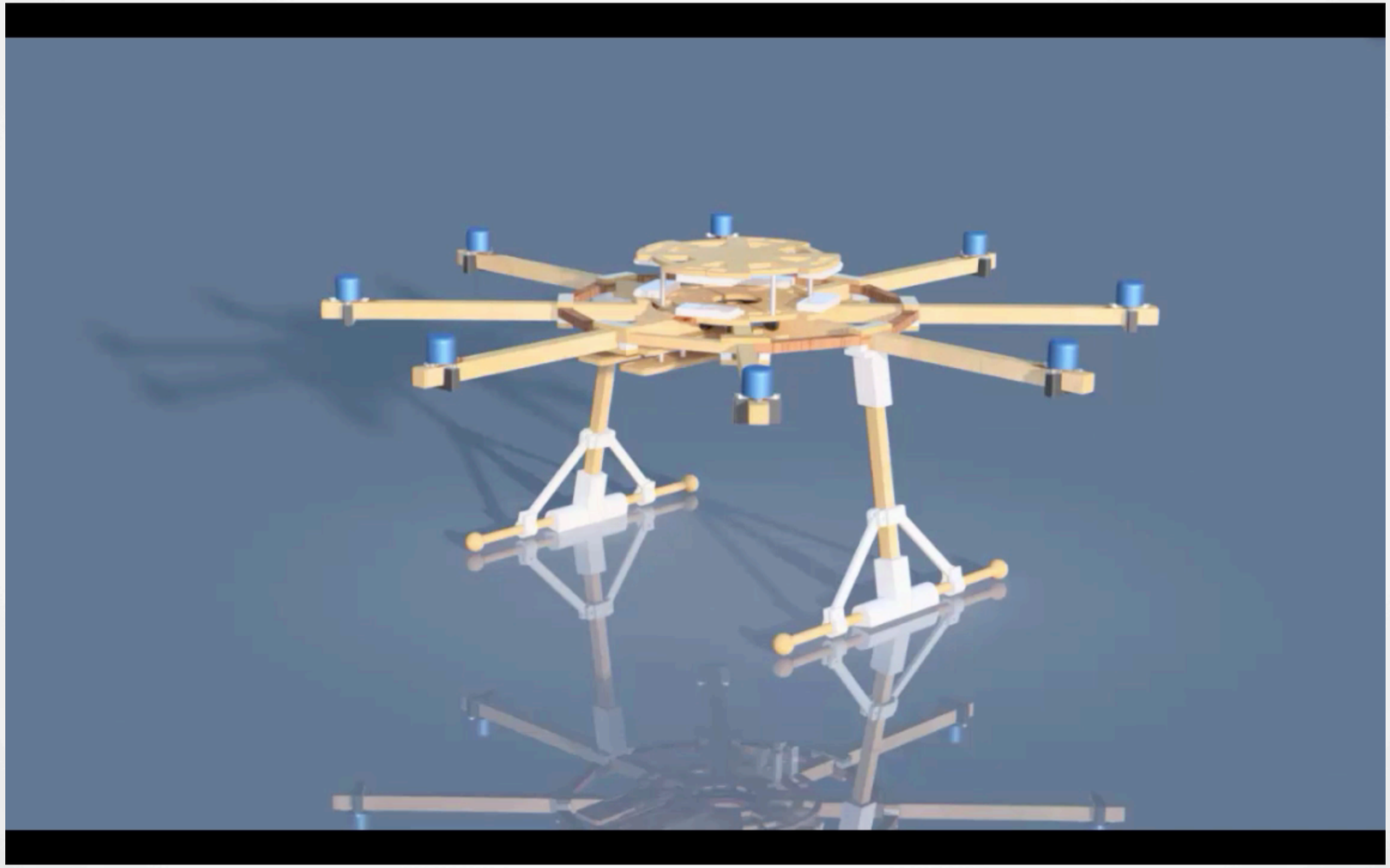




Octocopters:

- Good Lift
- Redundant Power
- Poor wind performance
- Poor flight performance
- Poor flight time
- Travel difficult

Custom Designs in Fusion 360



What kind of drone?





Hexacopter:

- Good Lift
- Good flight preformance
- More portable

Super Quadcopter / X8:

- Great Lift
- Great flight performance
- Longer flight times
- Very travel friendly

Summary – What to Consider in Drone Selection

- Camera payload
- Flight times required
  - Higher voltages
  - Spin larger props as slow as possible
  - Reduce weight
- Flight Control Systems
  - GPS hold
  - Waypoints ?
- FPV
  - Goggles vs. LCD

What Camera should I use?



GoPro Hero 3+

Weight: 75g

Lens (Fish Eye)

Sensor: 4-6mm (12MP)



Weight: 560g

Lens: Olympus 12mm Prime

Sensor: Micro 4/3’s (16MP)

What camera should I use?



Sony NEX 6

Weight: 443g
APS-C 16MP Sensor
Kit – 16-50mm Zoom Lens



Sony a7R:

Weight: 630g
Sensor: 35mm, 36MP
Lens: Voigtlander 20mm Skopar
Adapter: Fotodiox M39-NEX

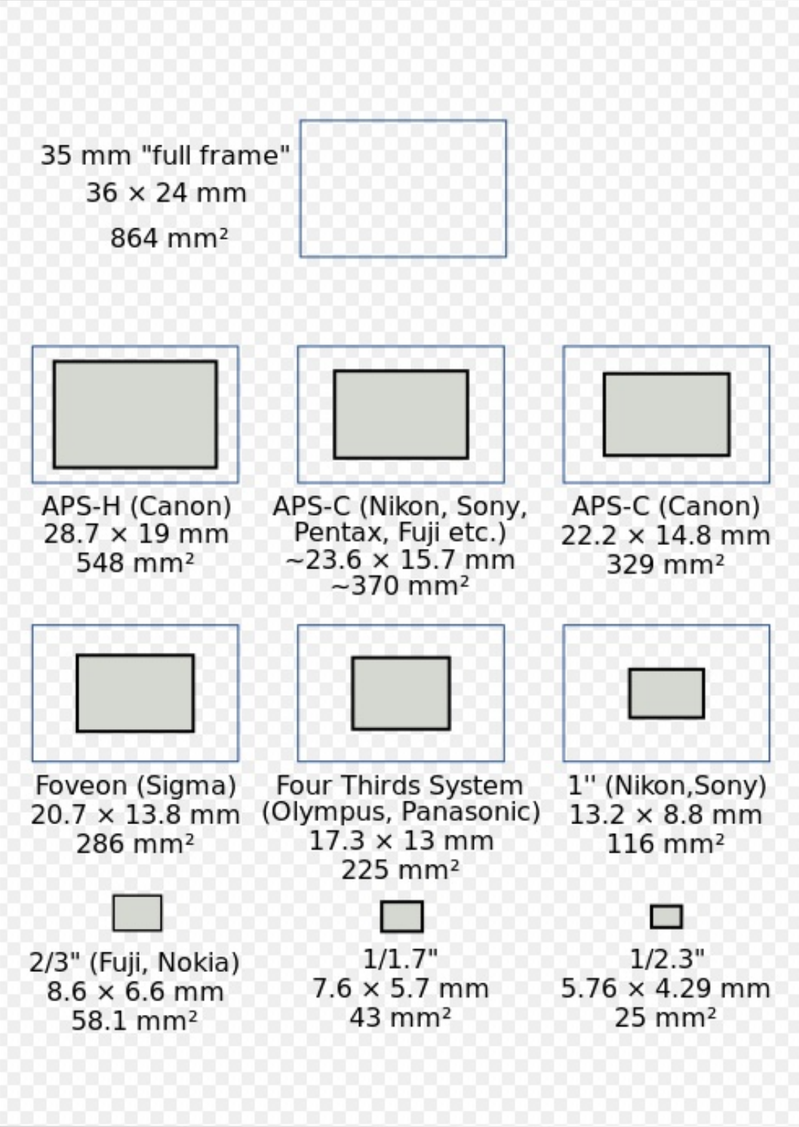
Digital Sensors

Physical Size Comparison



from: cameraimagesensor.com

Digital Sensors



Sony a7R

Sony NEX 6

Olympus OMD

GoPro

from: http://en.wikipedia.org/wiki/Image_sensor_format

Camera Settings

- Manual or Shutter Priority
- Pre-set focus to infinity
- Shutter at 1/500 – 1/1000
- Aperture at F5.6 – F16
  - Try to center at lens sweet spot usually F5.6 – F8
- ISO – sensor sensitivity
  - 100 – 800 (lower best, higher settings introduce more noise)
- RAW digital format when possible

Sensor Comparison

GoPro 3+



Olympus OMD



Sony a7R



GoPro Hero 3+

2:1 Zoom



Olympus OMD

2:1 Zoom



Sony a7R

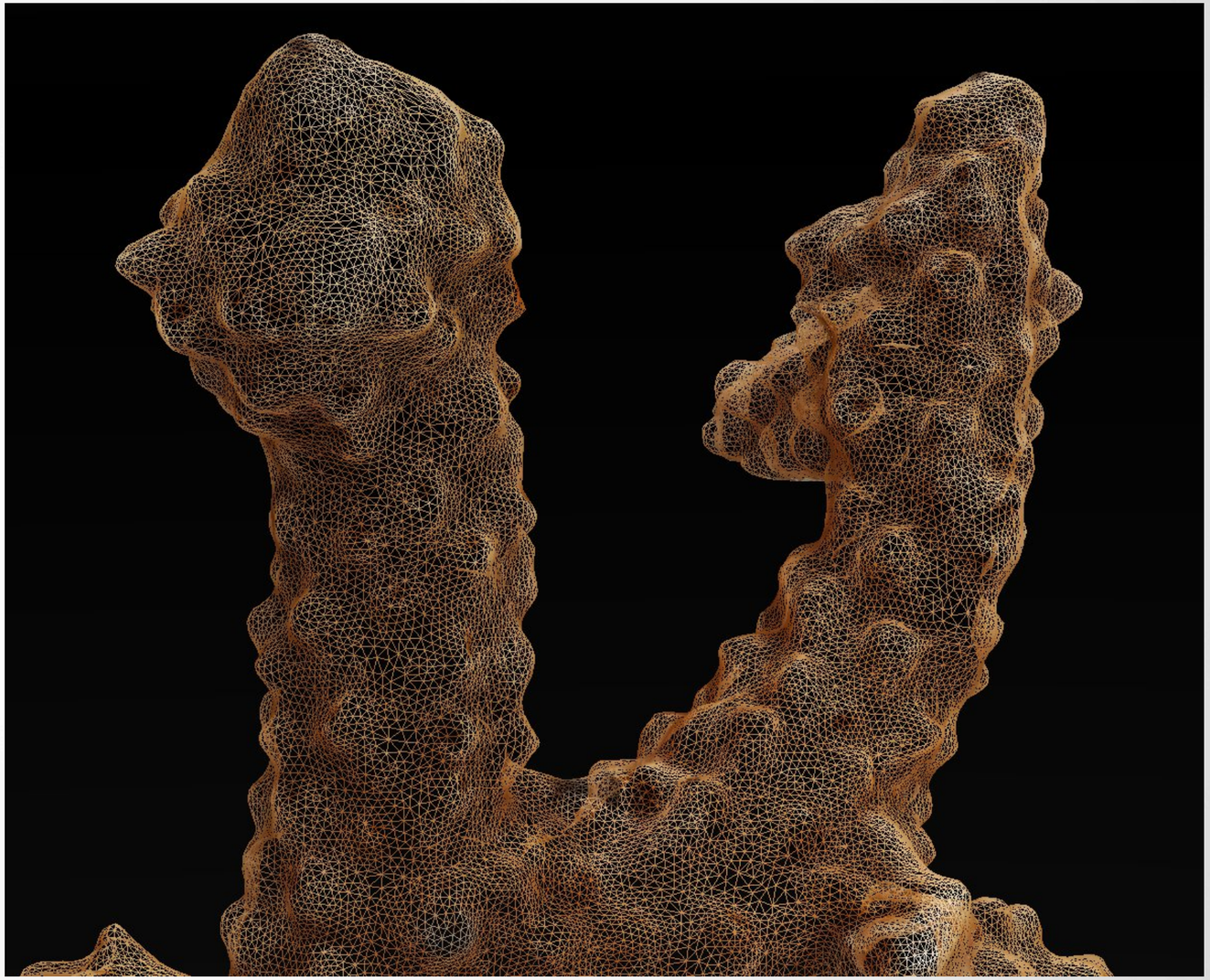
2:1 Zoom



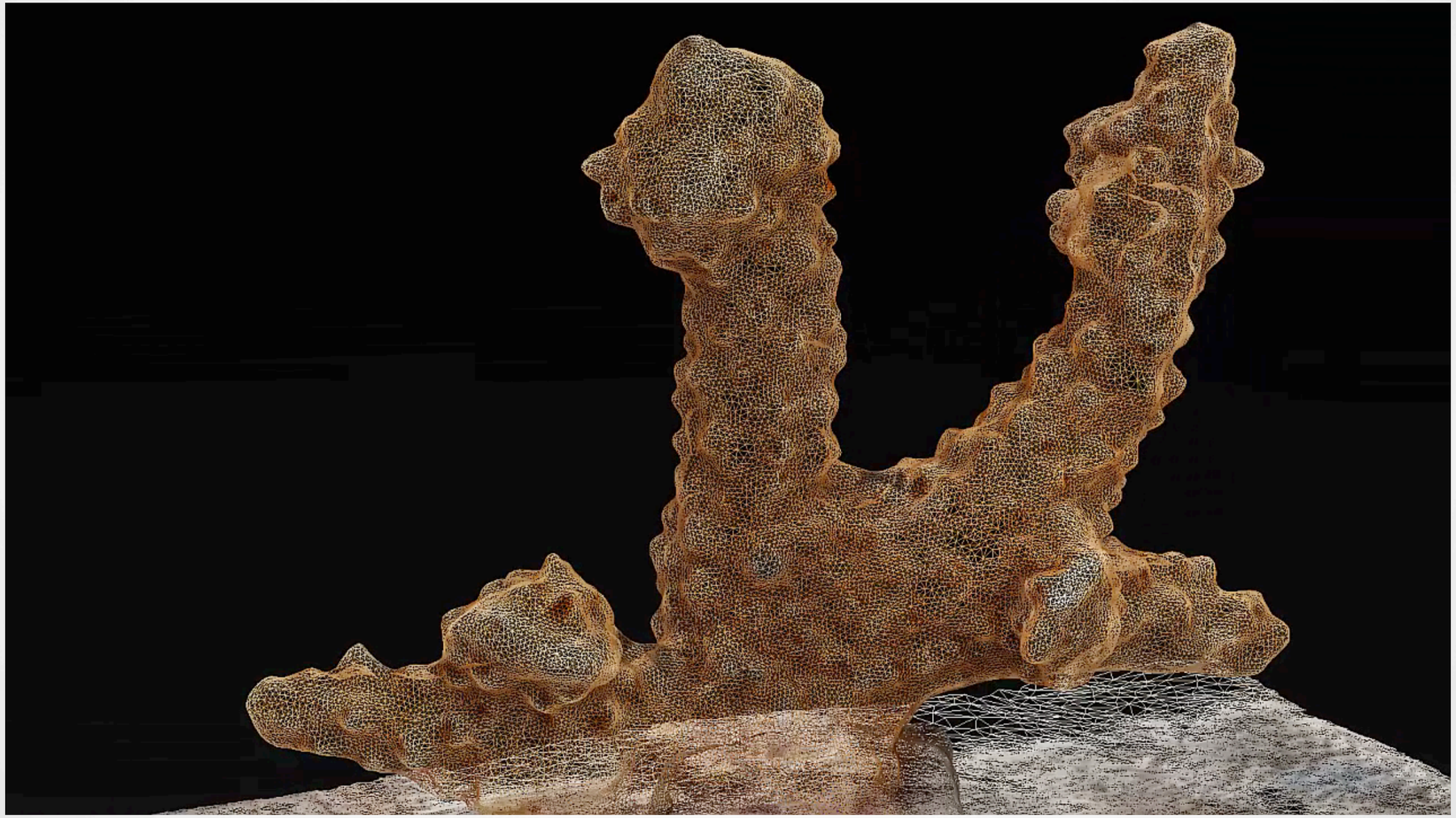
Lens Discovery

Minolta 50mm manual focus





Lens Discovery



Lens Selection

- Prime(fixed focal length) better than zoom
- Wide angle *usually* better than longer focal distances
- Manual focus to infinity better than auto focus
- Be aware of Depth of Field

Flight Path for Photo Sequence

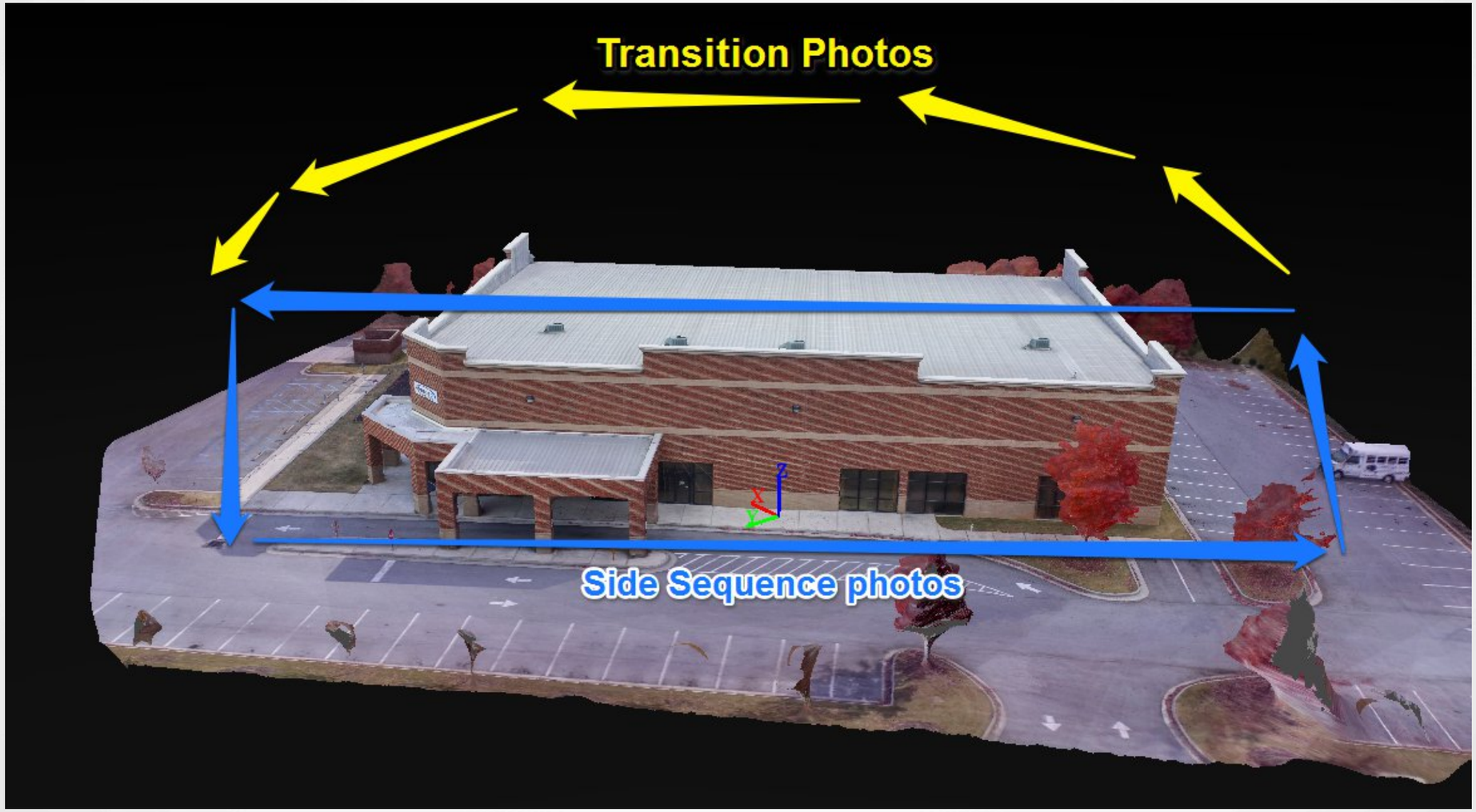


Photo Sequence

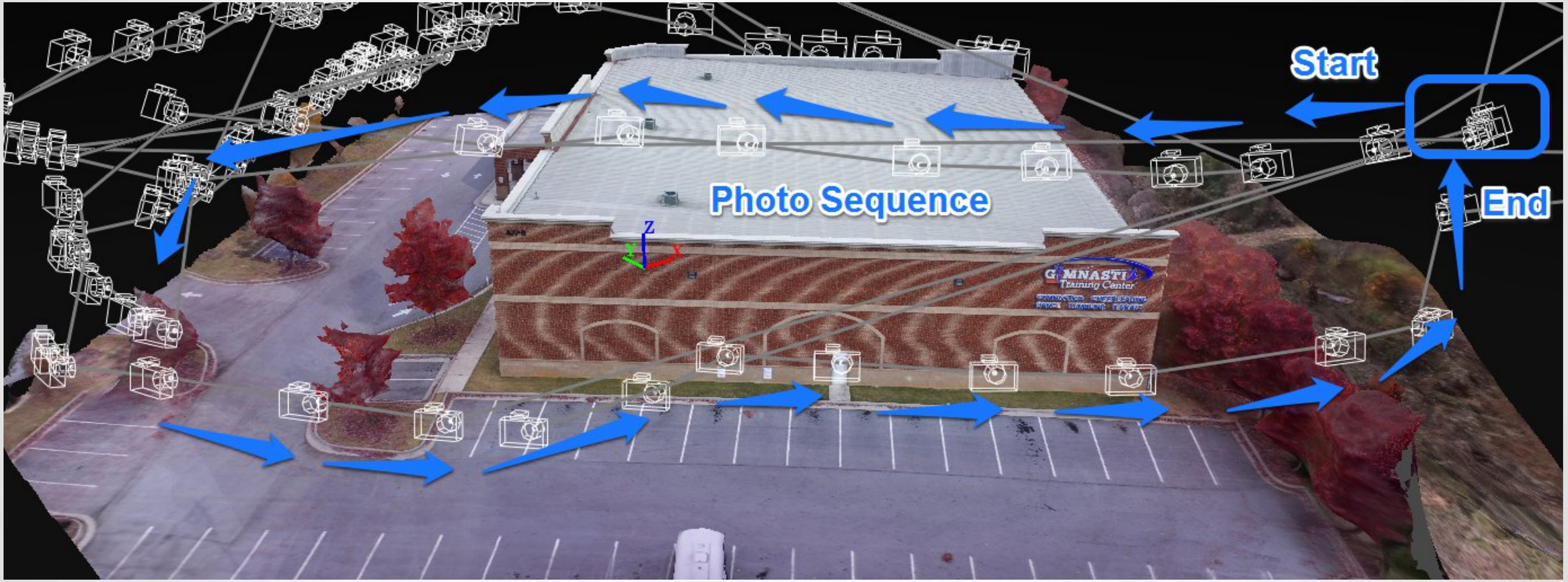
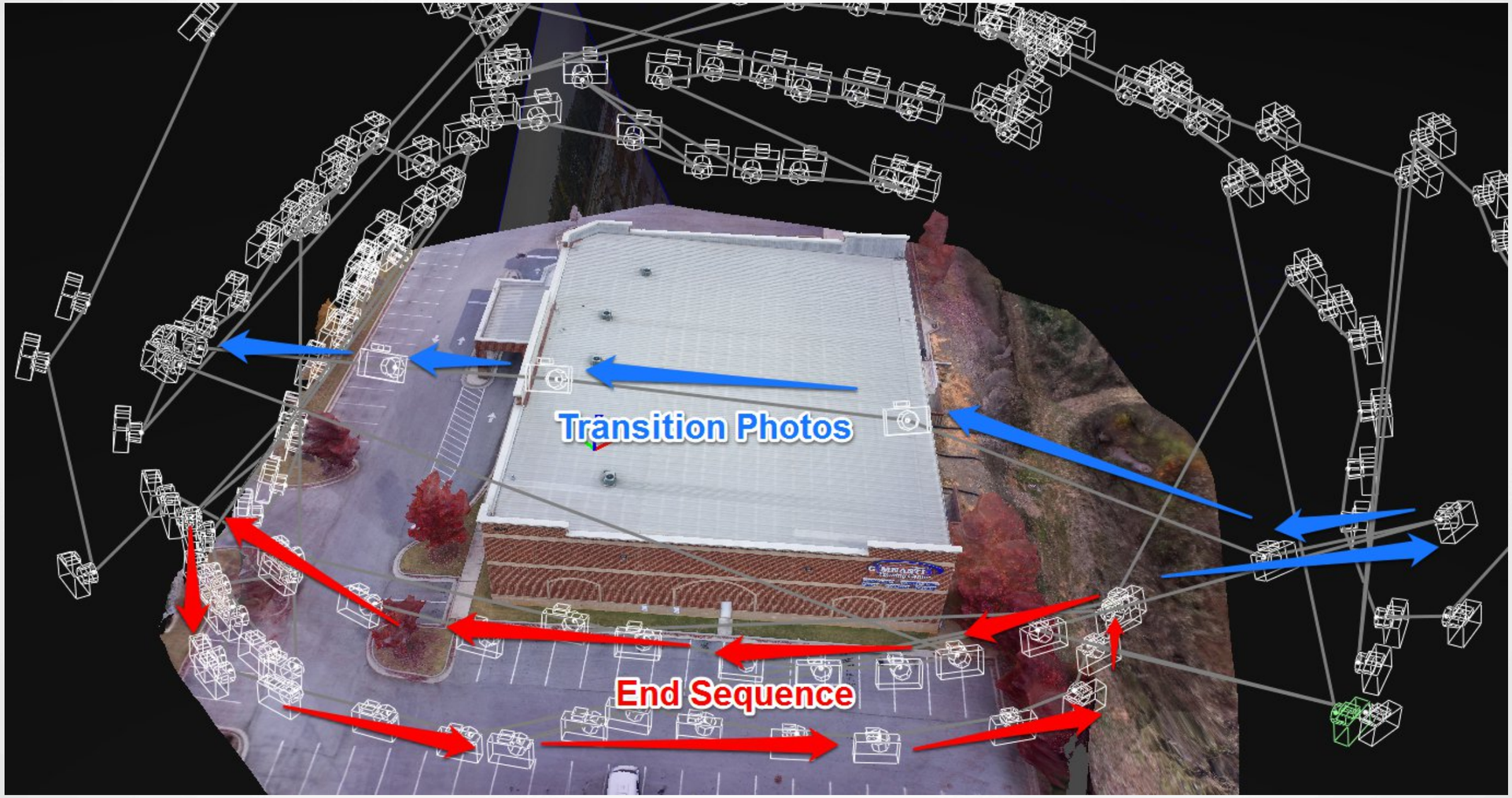


Photo Sequence



Flight Paths – Photo Sequence Shots



Flight Path Video

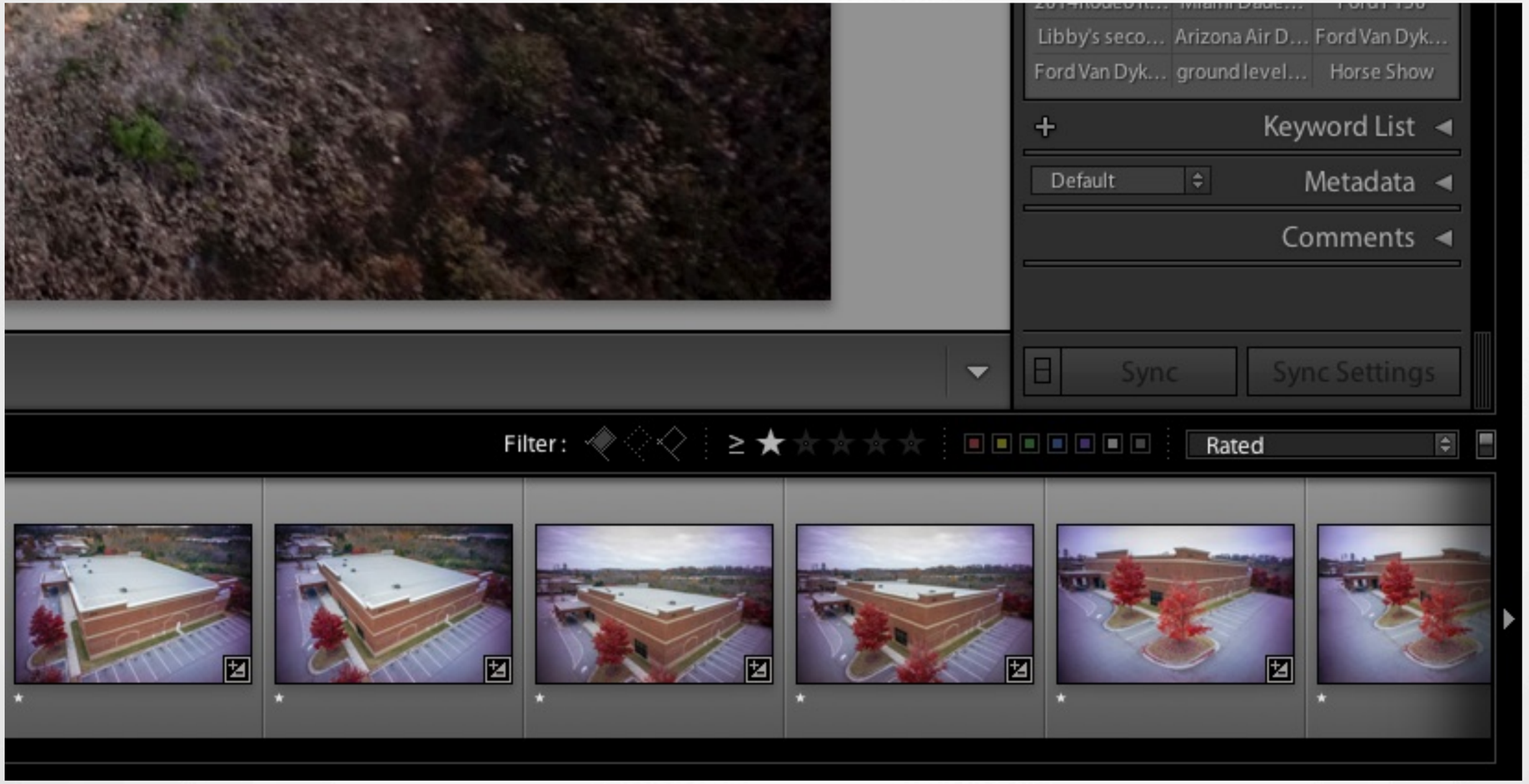


Enhancing Photos with Post Processing

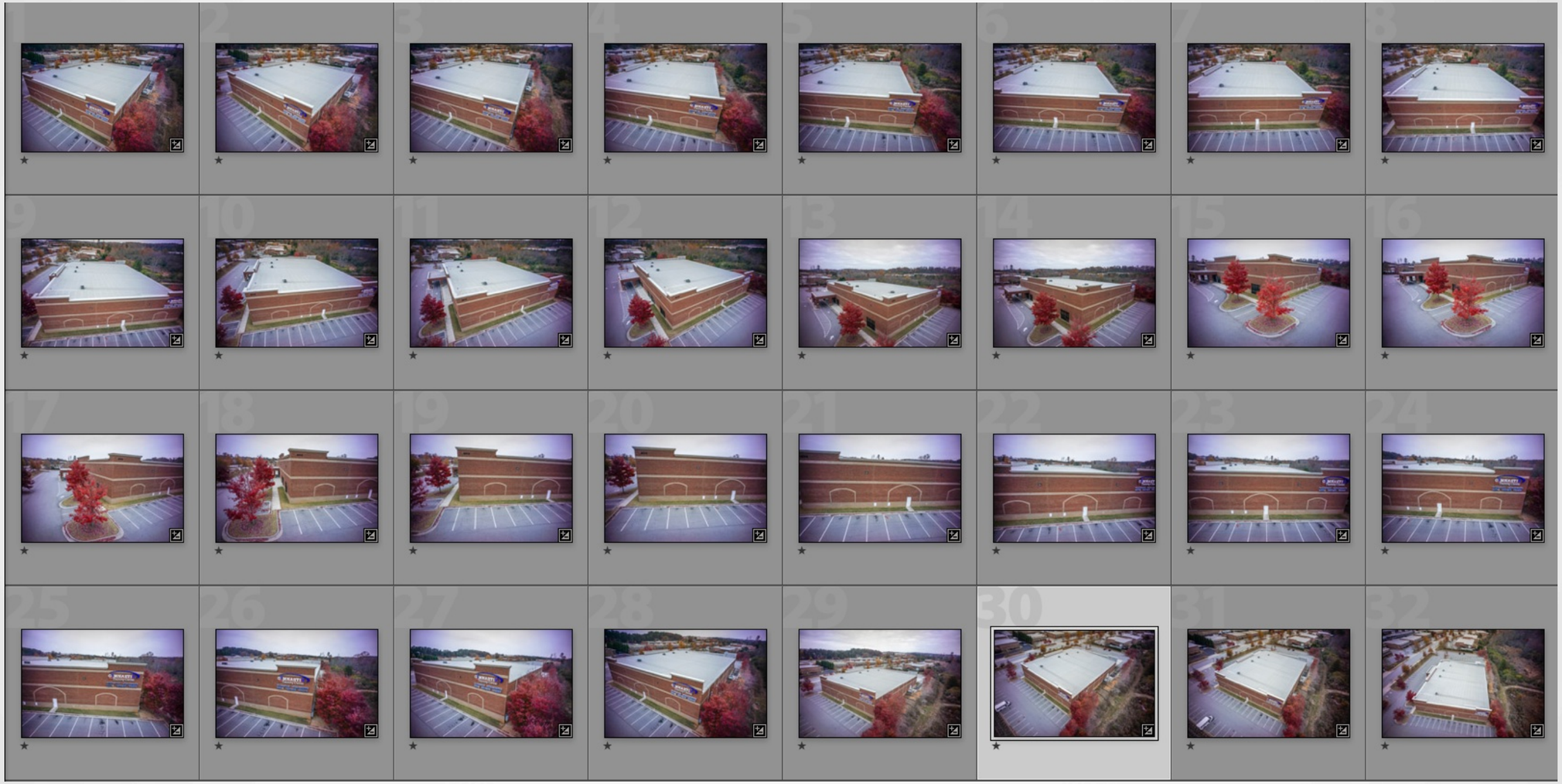
- Shoot in RAW when possible
- Lightroom used to sort & process photos
  - Weed out bad shots
  - Re-order photo sequence for best transitions
  - Revise exposure, clarity, highlights, shadows, blacks, & whites
  - Sync settings to all photos
  - Export to JPEG
- https://www.youtube.com/user/AnthonyMorganti

Weed out bad shots

Use Rating feature in LR

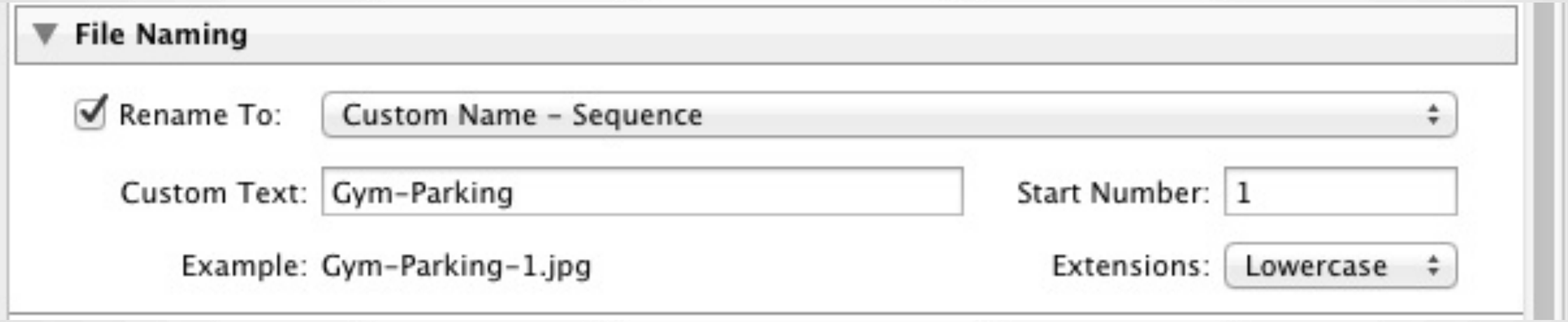


Sequence photos for good overlap



Lightroom photo re-order key

- Save File Naming using ‘Custom Name – Sequence’



Typical Lightroom exposure settings

Order of Edits:

Hightlights

Shadows

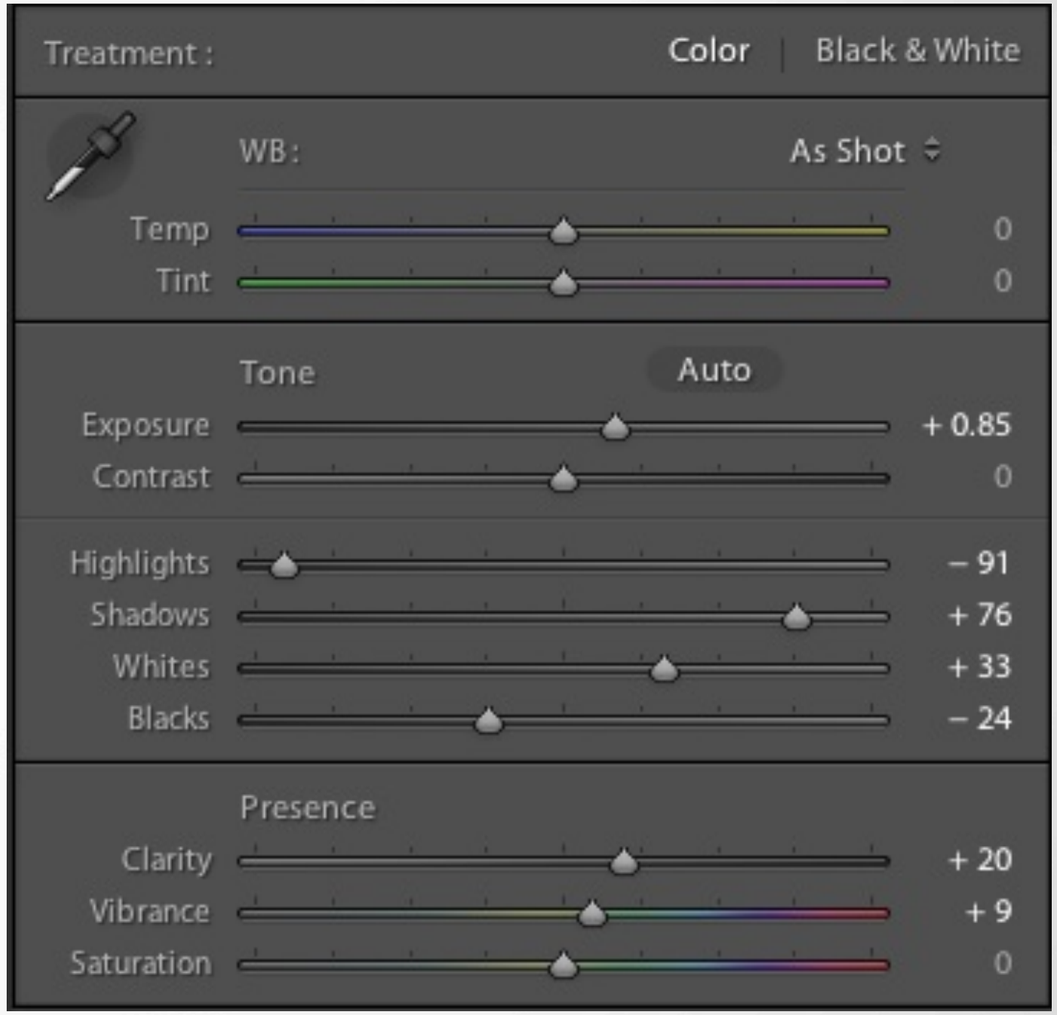
Whites (alt key)

Blacks (alt key)

Exposure

Clarity

Vibrance



Post Process Results



Before

After

Gym Results – Sony a7R vs. Olympus OMD vs. Gopro

Gym Results – Sony a7R

Sony a7R

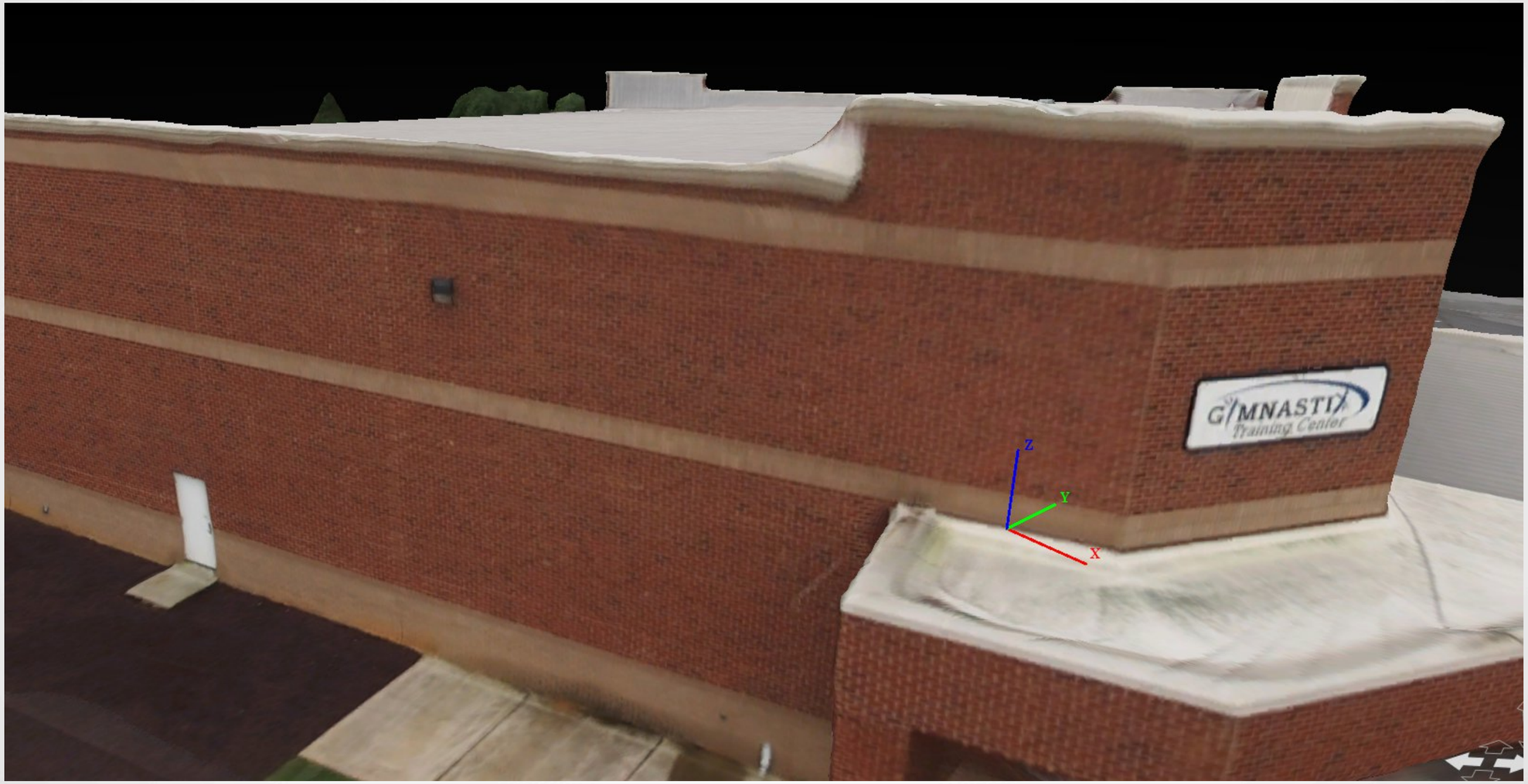


Gym Results – Sony a7R

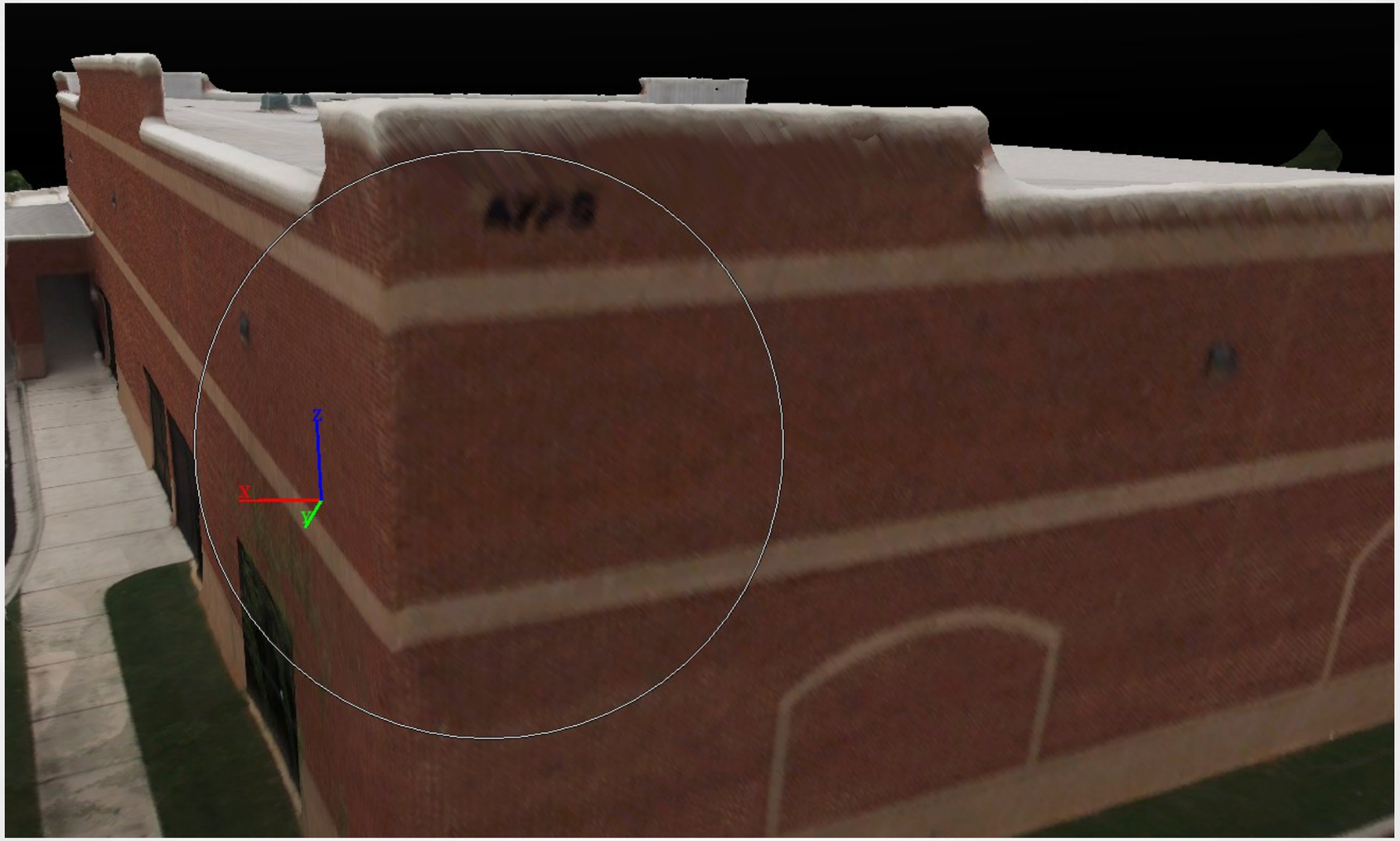
Sony a7R



Gym Results – Olympus OMD



Gym Results – Olympus OMD



Gym Results - GoPro

Bob Hughes
Brilliance Photography



Gym Results - GoPro



Summary: How do I get the best results?

- Use the best camera you can lift with your drone
- Flight Patterns
- Photo sequencing
- Transition Shots
- Photo Post Processing (Lightroom)

How accurate is this?



SKYCATCH

AU 2014

Cutting Edge Reality Capture

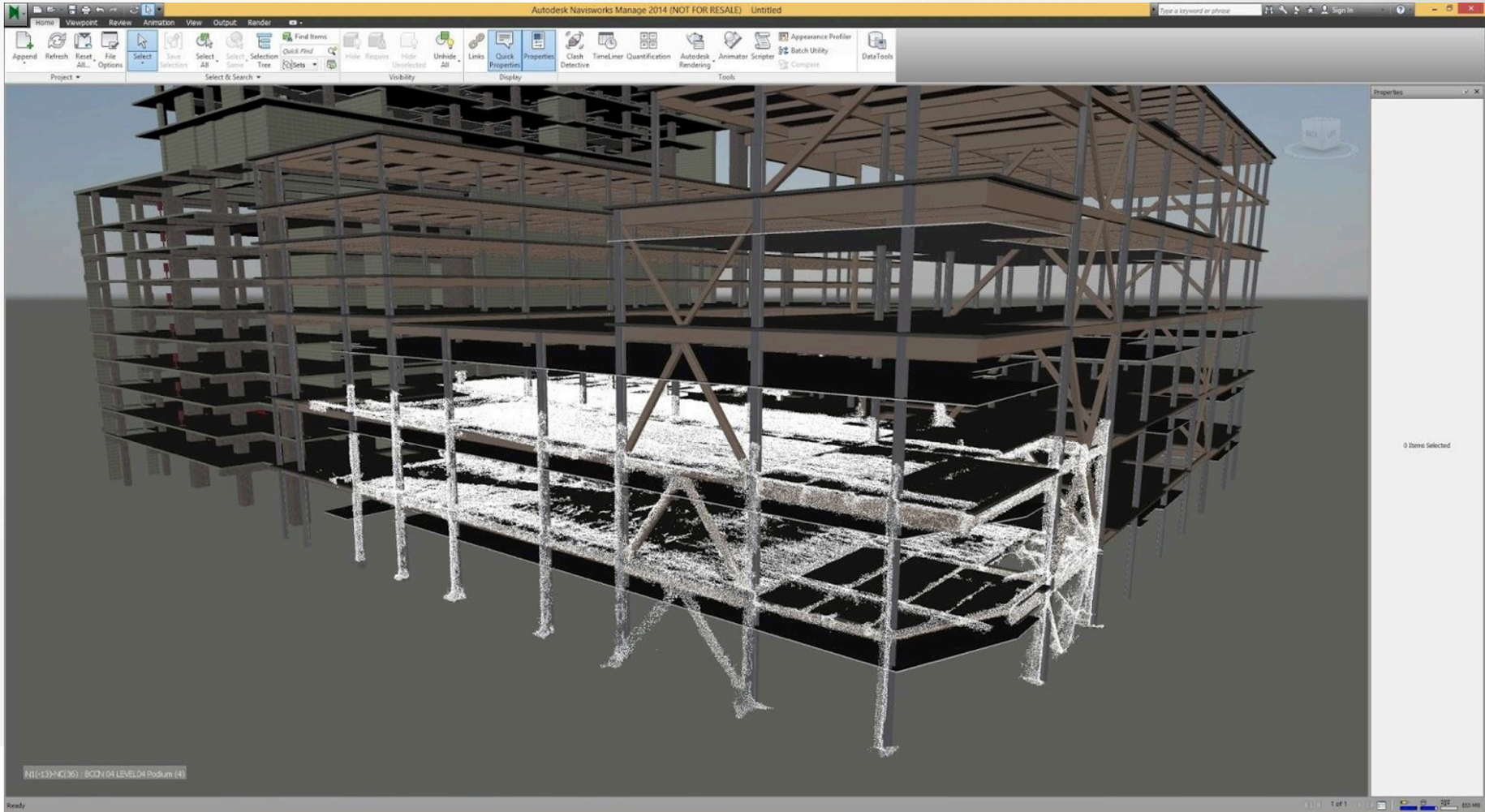


expansive applications...

AUTODESK.

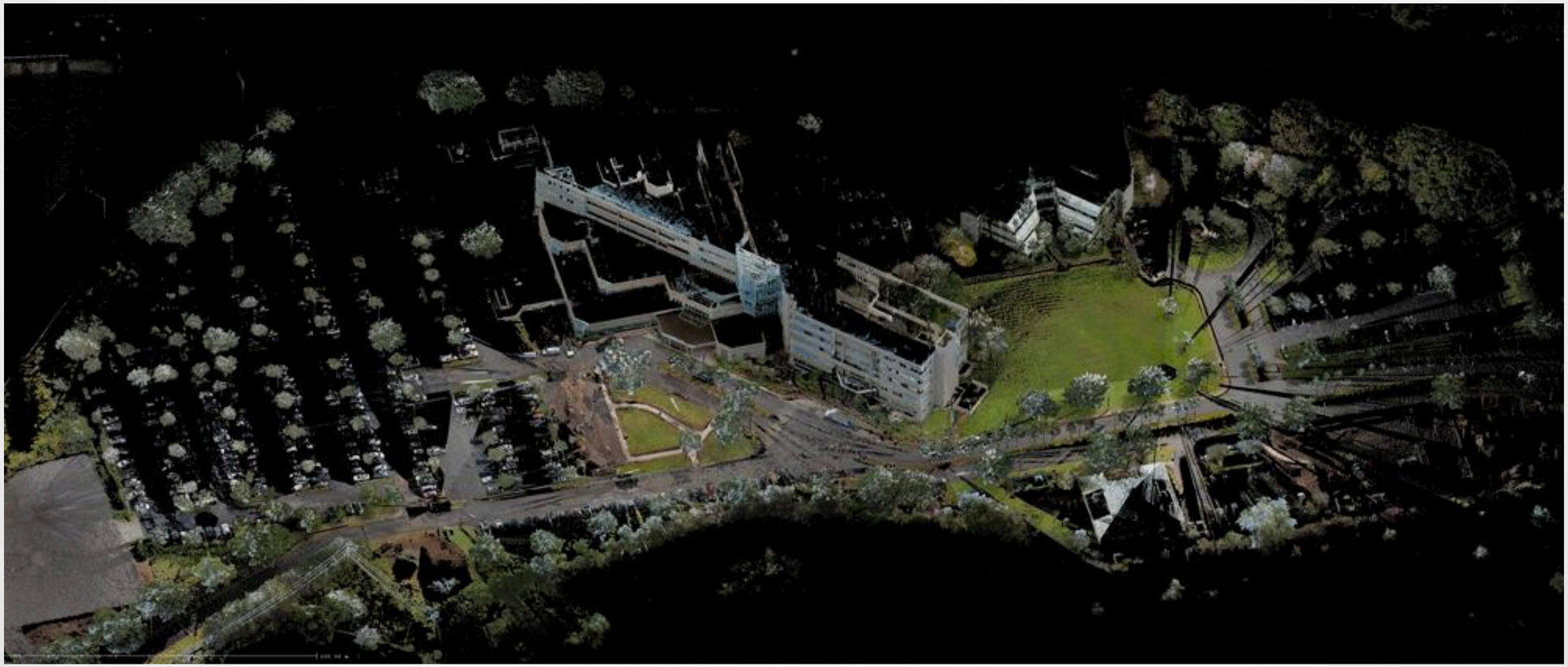
Cutting Edge Reality Capture

precise calculations.



Cutting Edge Reality Capture

Indisputable ground truth



Cutting Edge Reality Capture

Indisputable ground truth



Cutting Edge Reality Capture

Ground truth & built - in context

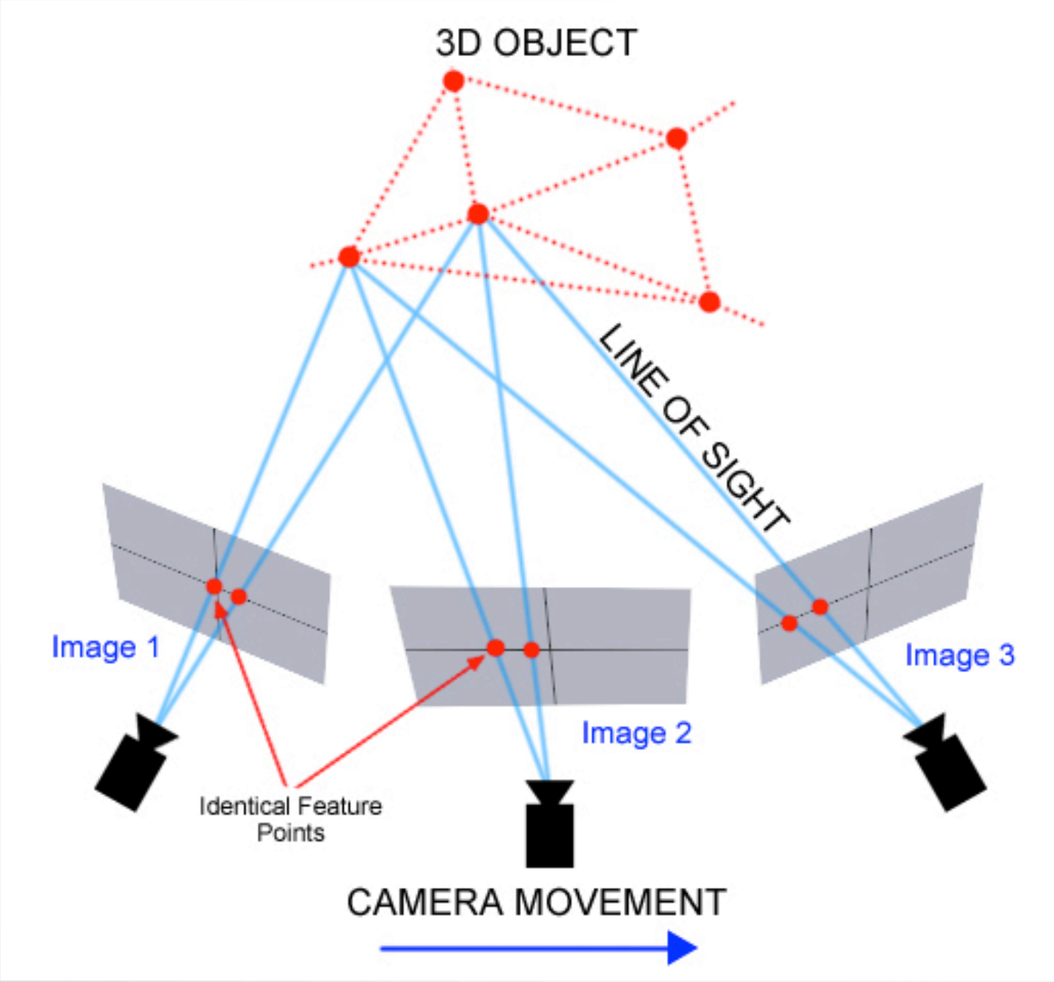


Modern Reality Capture Methods

- Laser Time-of-Flight
- Photogrammetry
- Structured Light

More on Laser TOF?

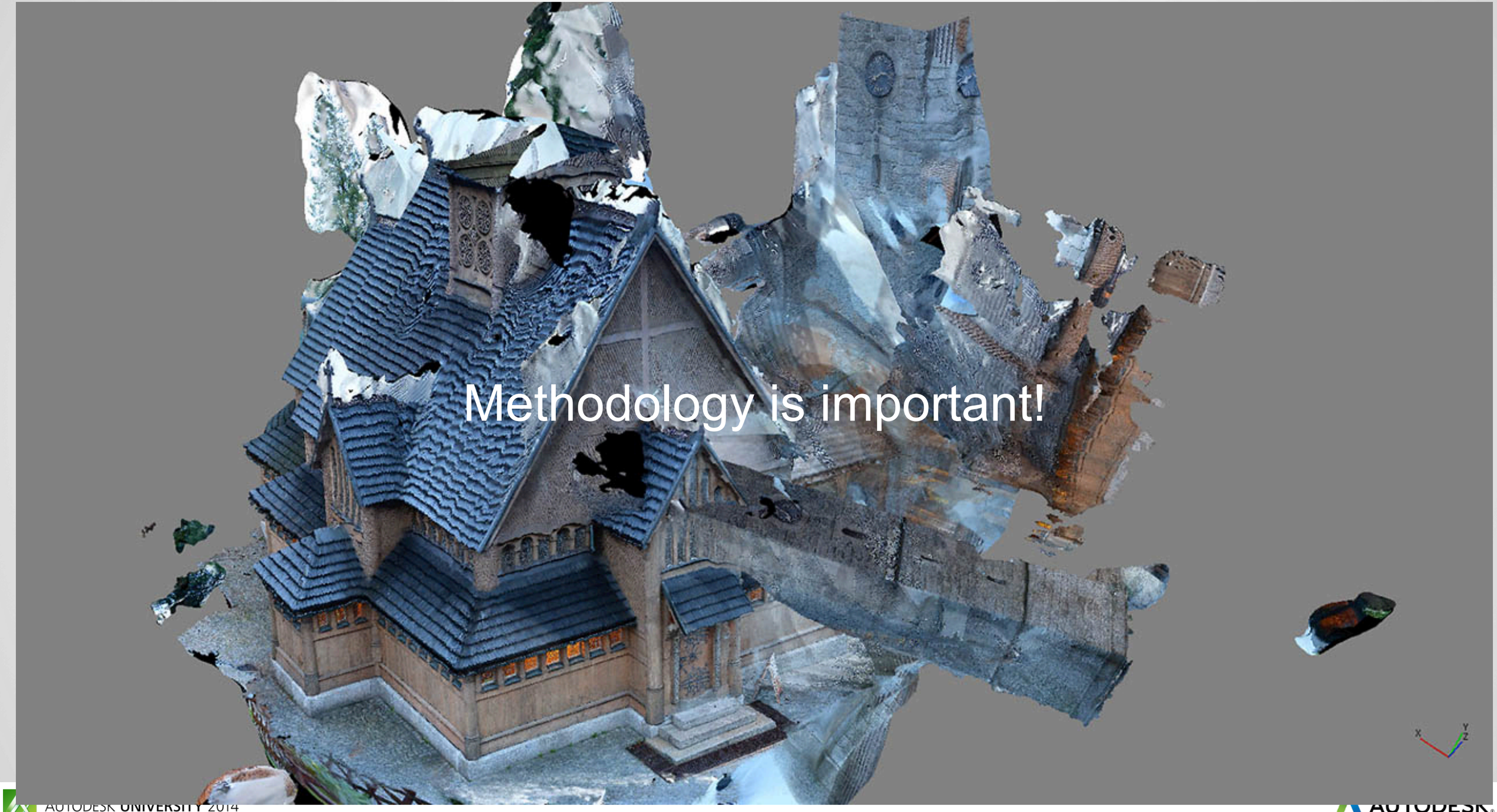
What is photogrammetry?



The application of parallax!

Triangulation of similar points in overlapping imagery. 20,000 - 40,000 points per image.

Sounds easy, right?


Methodology is important!

UAV Reality Capture Methods

Nadir

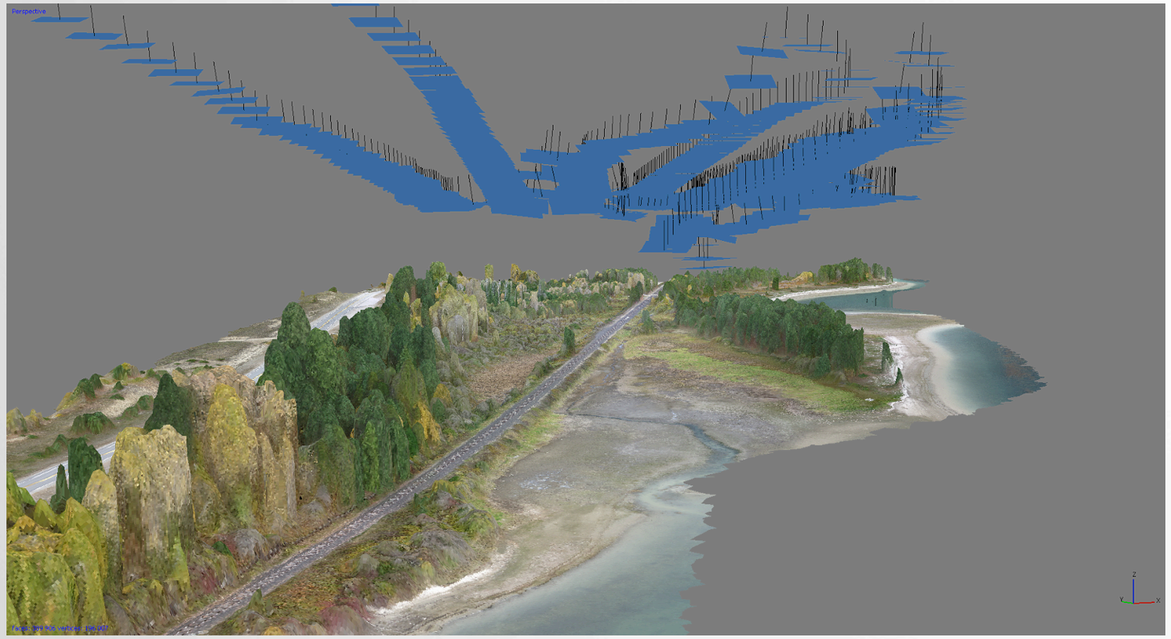
- Large area mapping
- DEM / DSM generation
- Stockpile survey
- Inspection & monitoring

Oblique

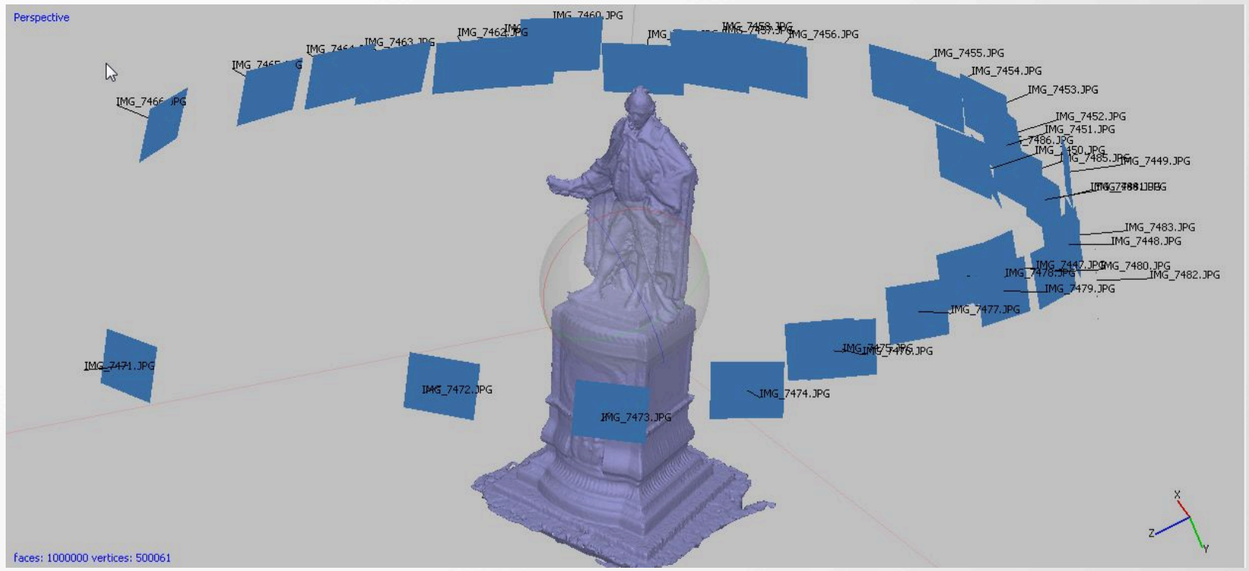
- Architectural modeling
- BIM applications
- Indoor

UAV Reality Capture Methods

Nadir



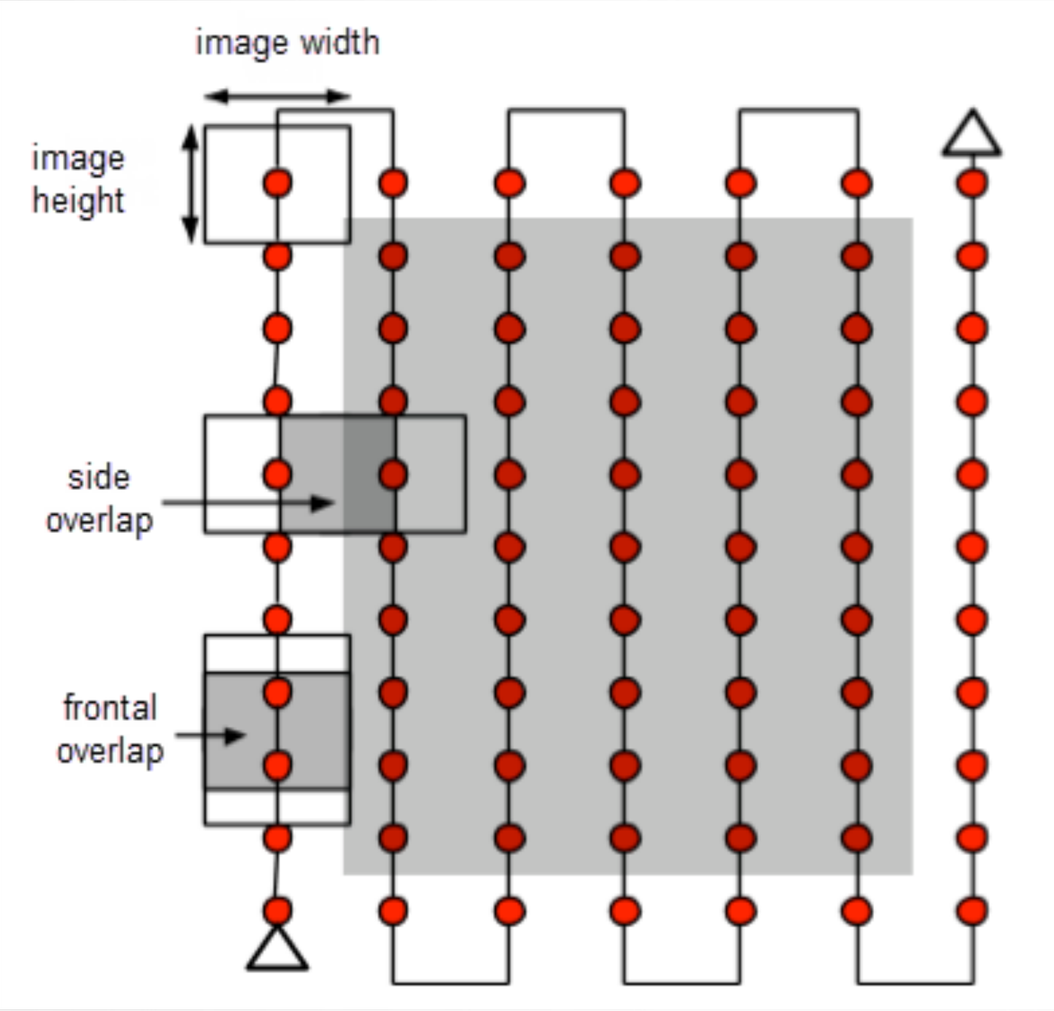
Oblique



ReCap 360



Best Practices for Quality



Nadir

- 80% frontlap
- 60% sidelap
- Within 15° of vertical
- High shutter speed
- Overcast days!

Best Practices for Quality



Oblique

- 80% overlap in all directions
- Hemispherical coverage
- Smooth transitions across vertical surfaces

Hardware Options







- DJI Phantom
- 3DRobotics Iris
- Larger DIY Multicopters

Hardware Options - Commercial



- SenseFly eBee



- Skycatch EVO

Software Options

- ReCap 360
- Agisoft PhotoScan
- Pix4D
- SimActive
- Cloud Processing Services

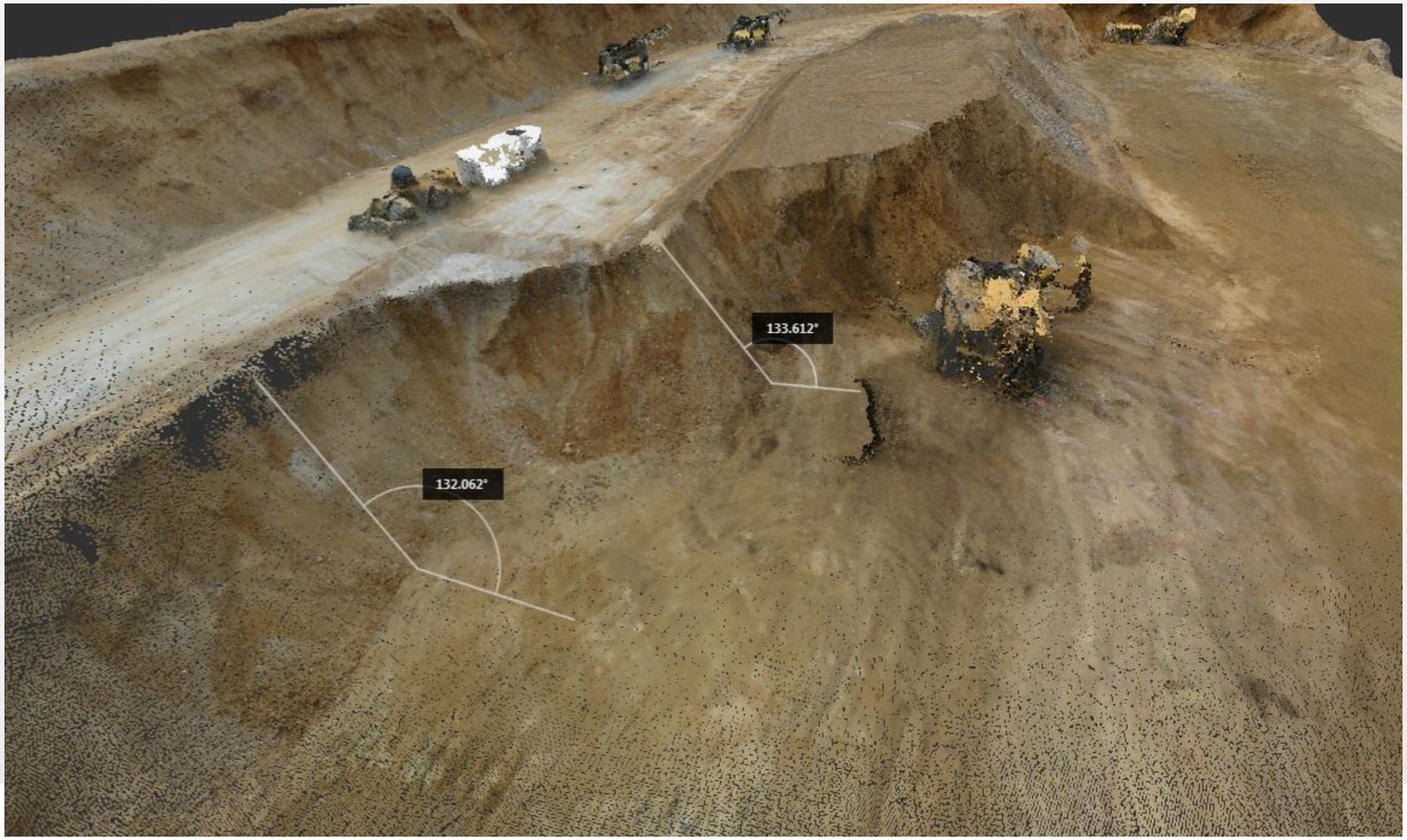
What the Client Wants

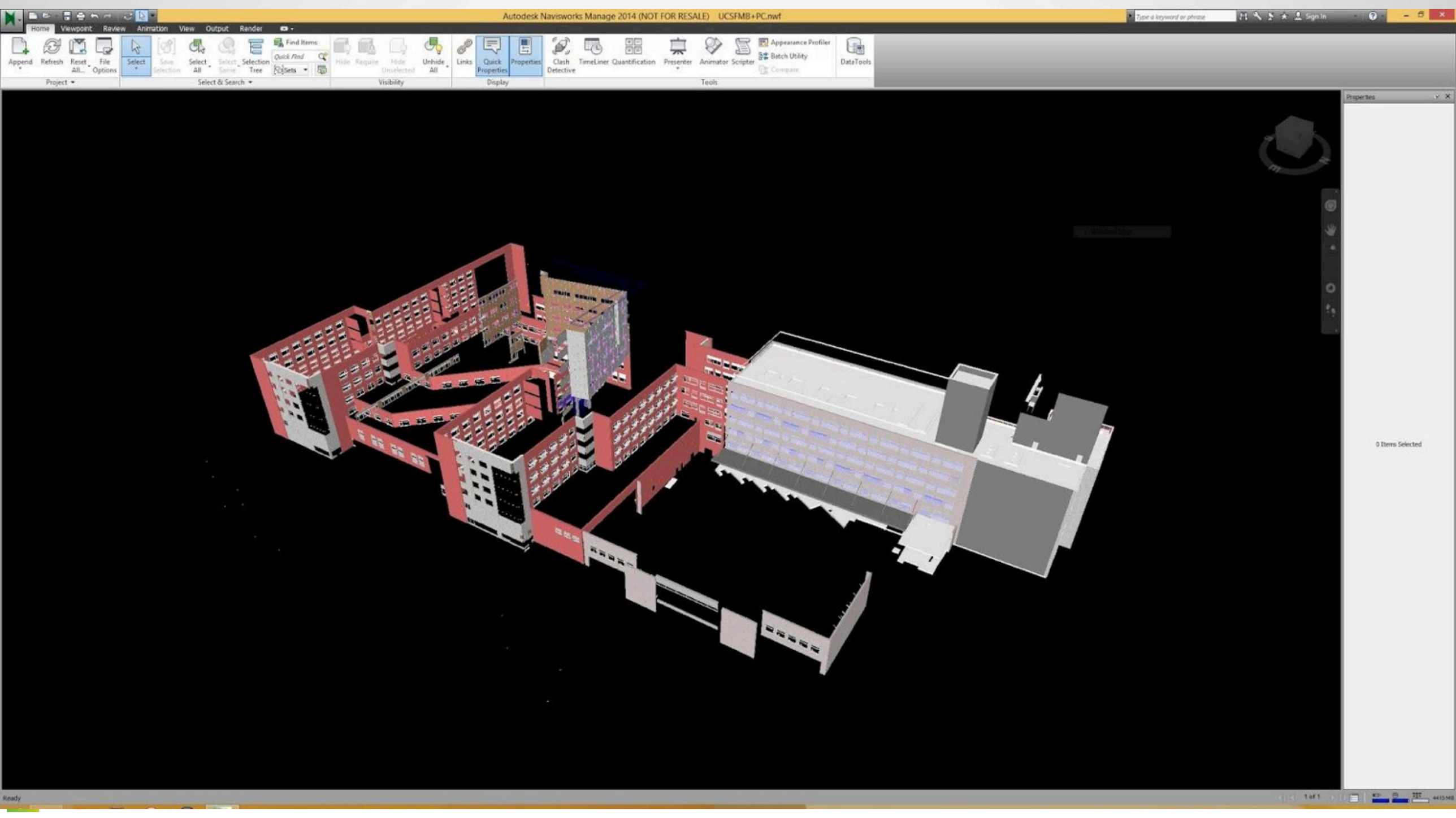
Drones are cool...



What the Client Wants

Data drives decisions.

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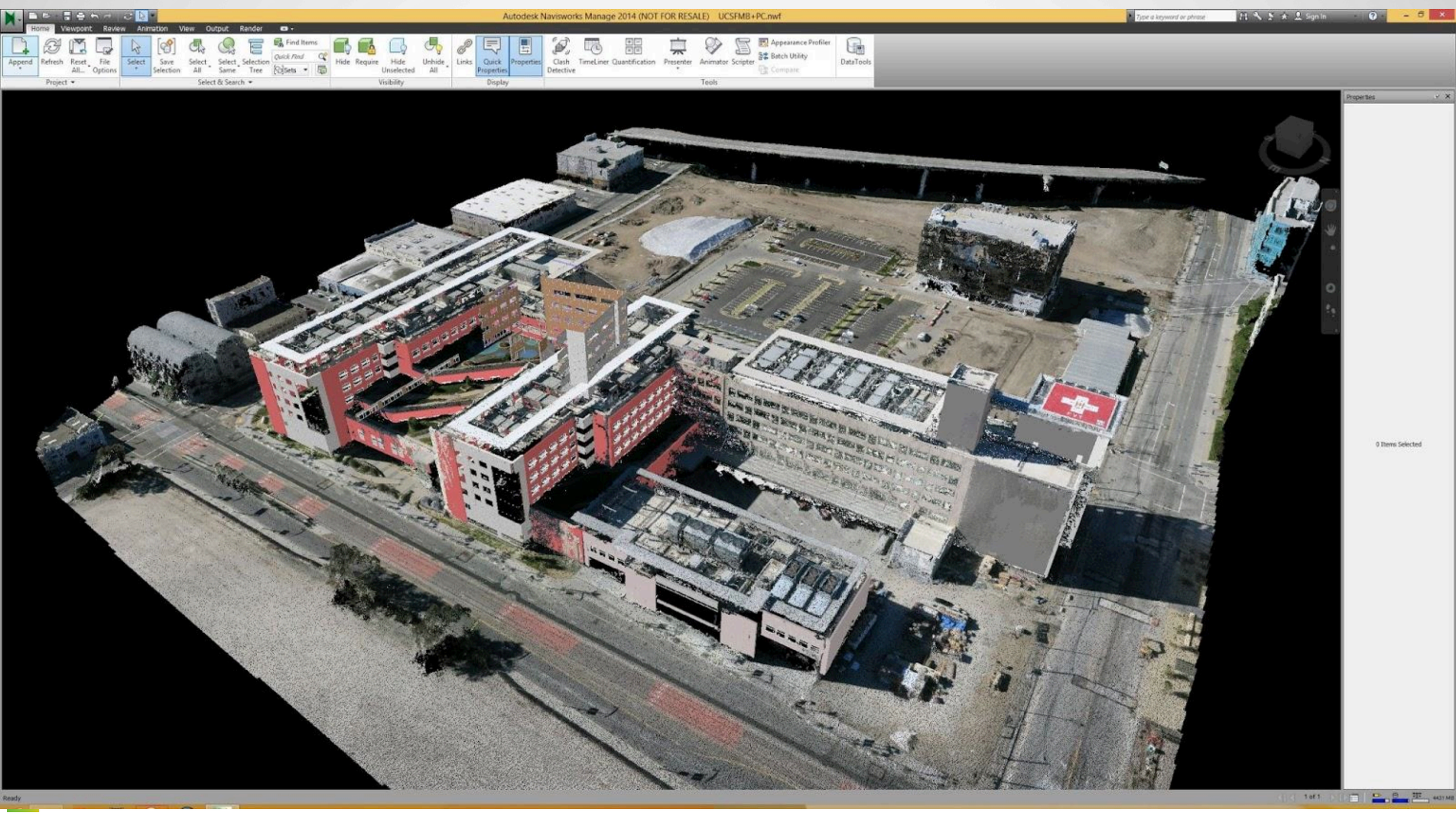
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Quick Find
Sets
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Hide
Require
Hide Unselected
Unhide All
Visibility
Links
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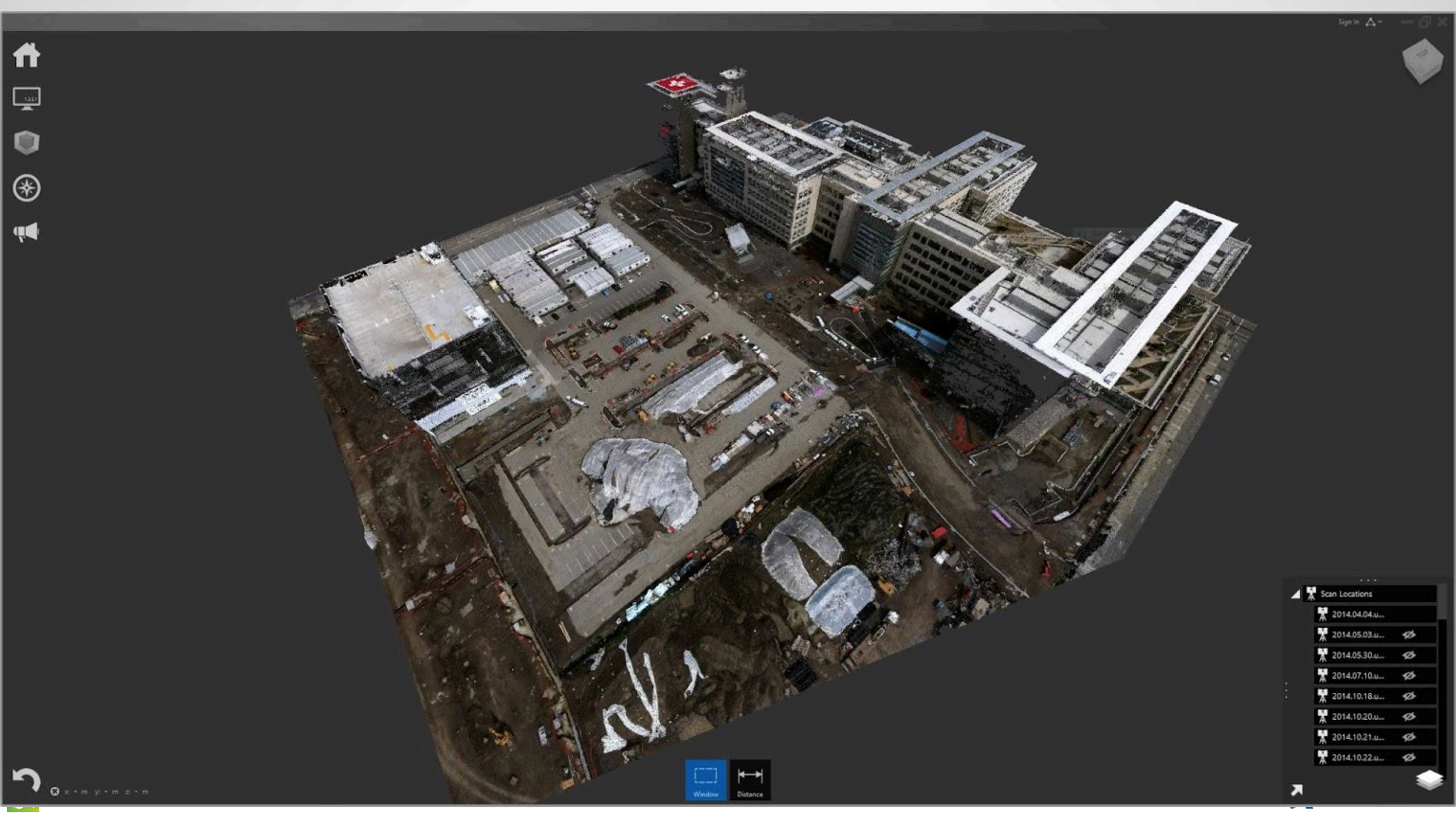
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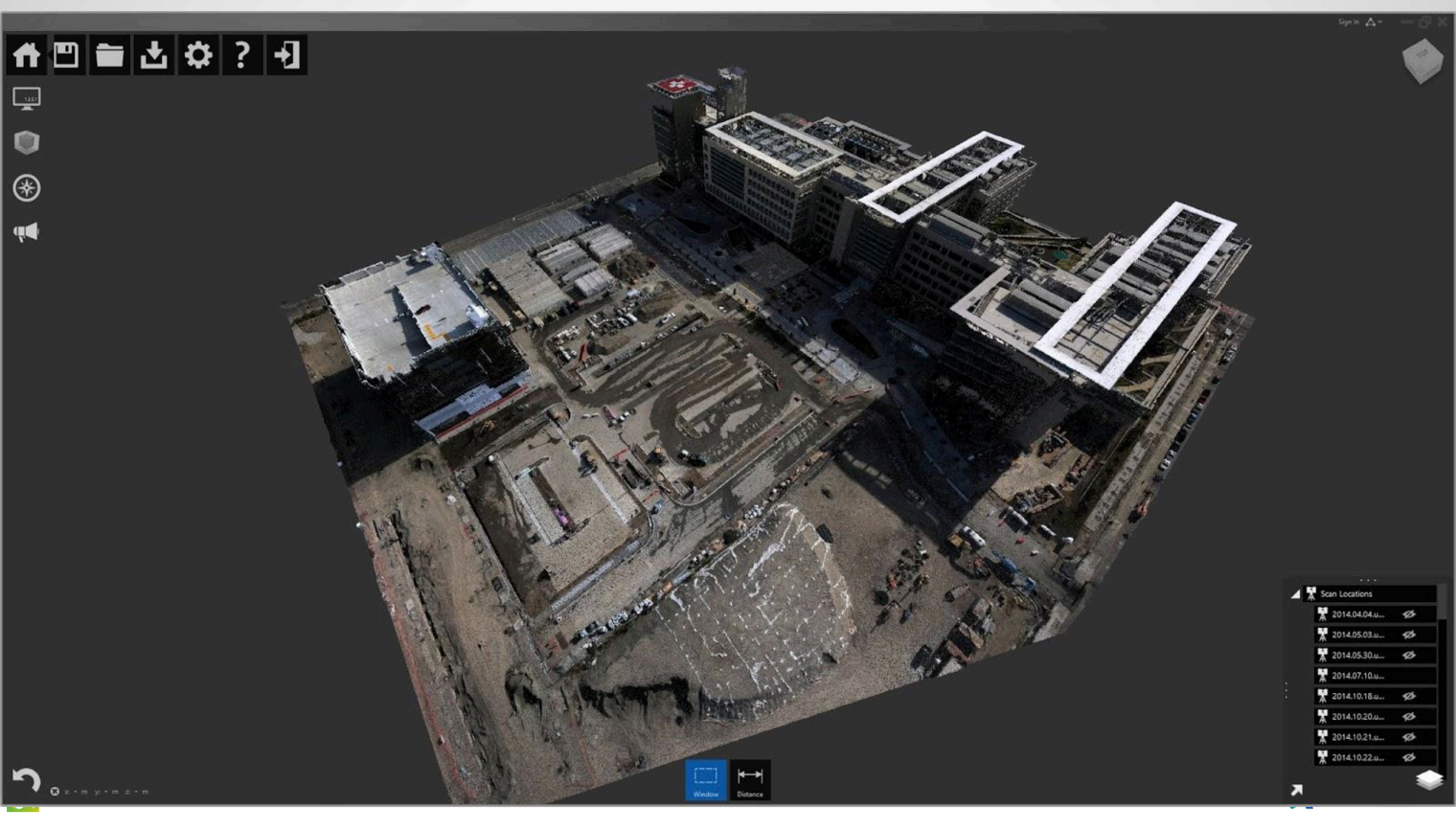
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Maptek Vulcan 8.1.4 64-bit: Envisage M:\05_Hydrology\Vulcan_B - [USB_BORON.DG1(*)]

File Design View Analyse Model Grid Calc Rsvute Block Survey Geology Open Pit Chronos Tools Window Help

Window: USB_BORON.DG1(*) Layer: Z: 2200 W: 0 Grad: 0:1

Windows Explorer

- Block Models
- Design Databases
- Gdcalc
- Grids
- Images
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  - dump0000_0.png
  - dump0001.png
  - dump0002.png
  - dump0003.png
  - dump0004.png
  - dump0005.png
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  - Weight_Percent_Na

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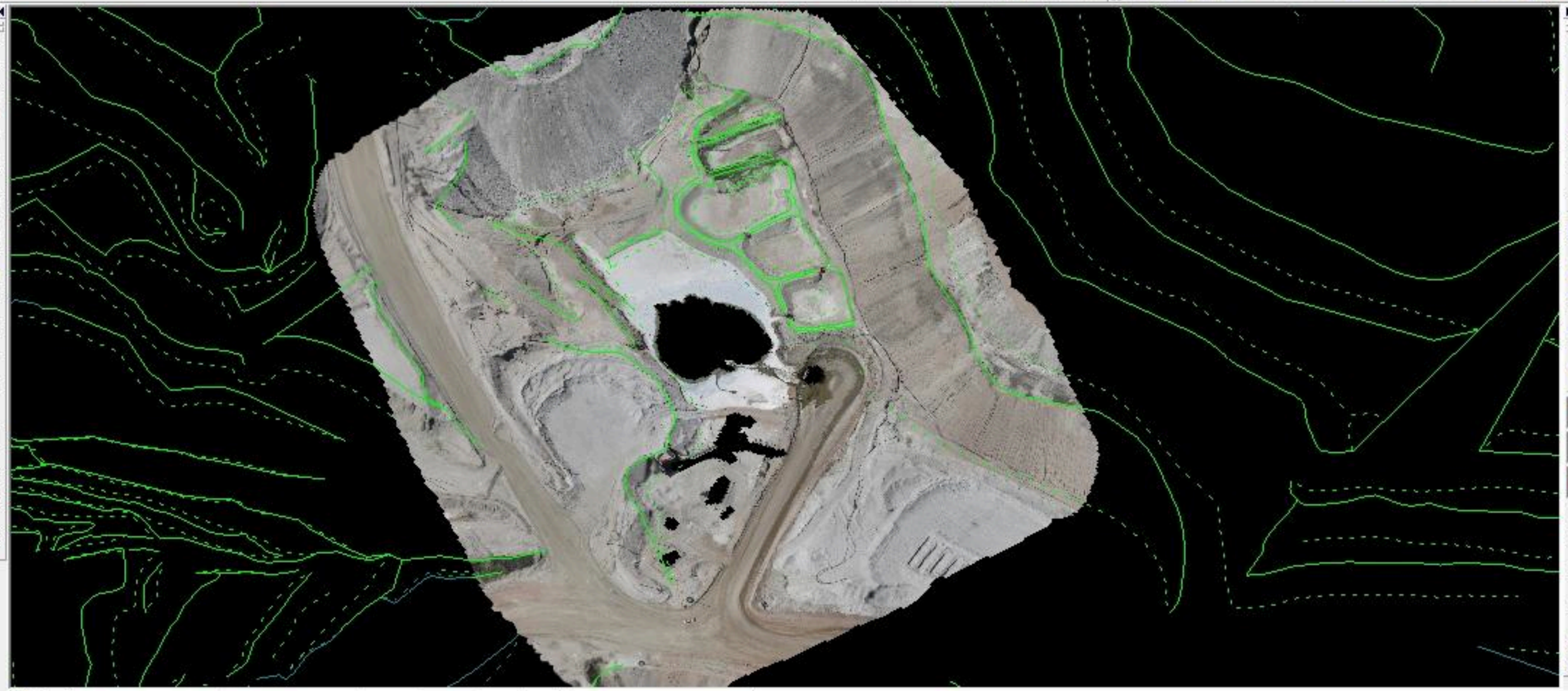

Zoom: 0.8

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Graphics device supports local 3D
Loading fill patterns.....
Line styles initialised.
Graphic device configuration complete
**SEVERE, Image format not supported by this option.
```

Workbench | Envisage Console | Envisage

Select menu option | 21243.47 , 6417.75, 2246.45 | usb2009pondmodeling.dgd.isis

9:40 PM
9/3/2014

Maptek Vulcan 8.1.4 64-bit: Envisage M:\05_Hydrology\Vulcan_B - [USB_BORON.DG1(*)]

File Design View Analyse Model Grid Calc Rsvute Block Survey Geology Open Pit Chronos Tools Window Help

Window: USB_BORON.DG1(*) Layer: Z: 2200 W: 0 Grad: 0:1

Windows Explorer

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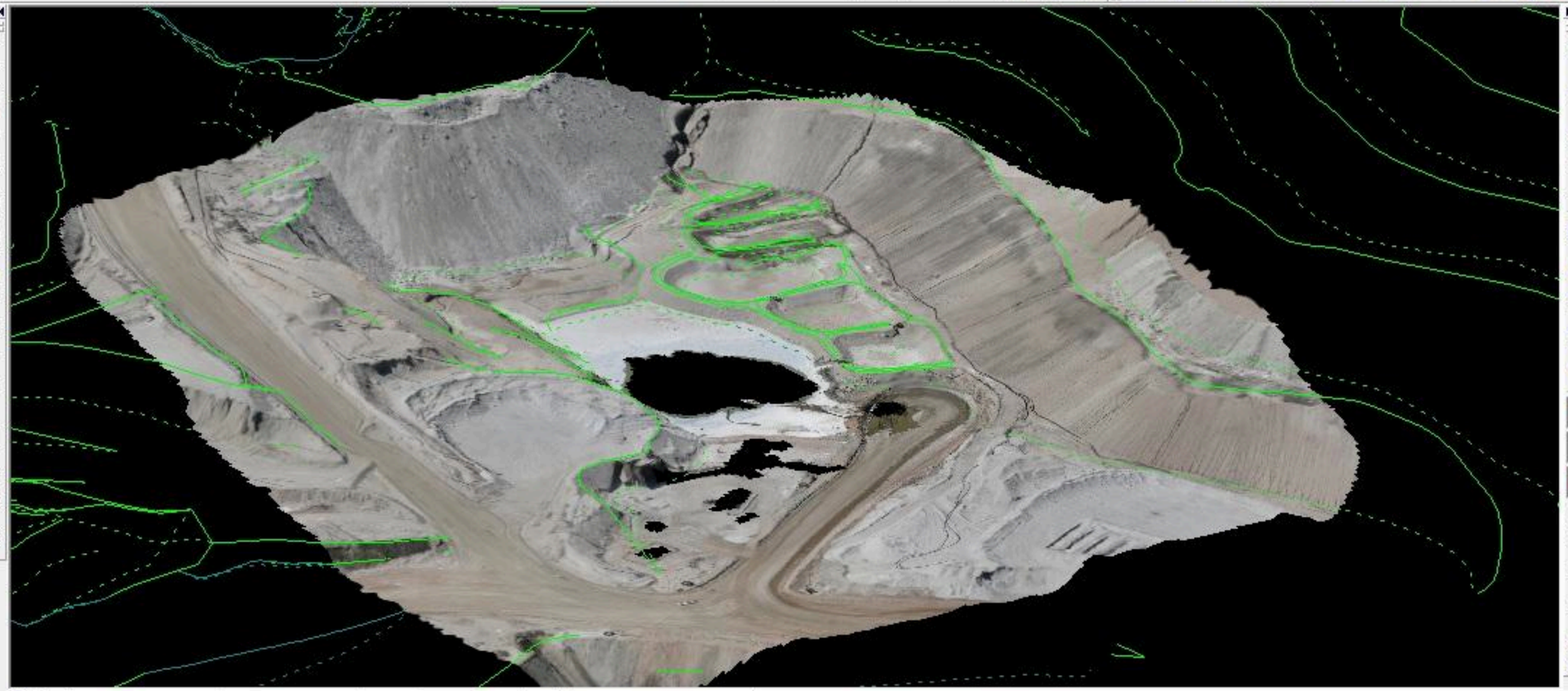
  - thickness_of_Salt.ire
  - Weight_Percent_Na

Data Reso... Envis...



Zoom: 0.8

```
Graphics device supports local 3D
Loading fill patterns.....
Line styles initialised.
Graphic device configuration complete
**SEVERE, Image format not supported by this option.
```

Workbench | Envisage Console | Envisage

Select menu option | 21084.01 , 5446.14, 1745.68 | usb2009pondmodeling.dgd.isis

Start

9:37 PM
9/3/2014





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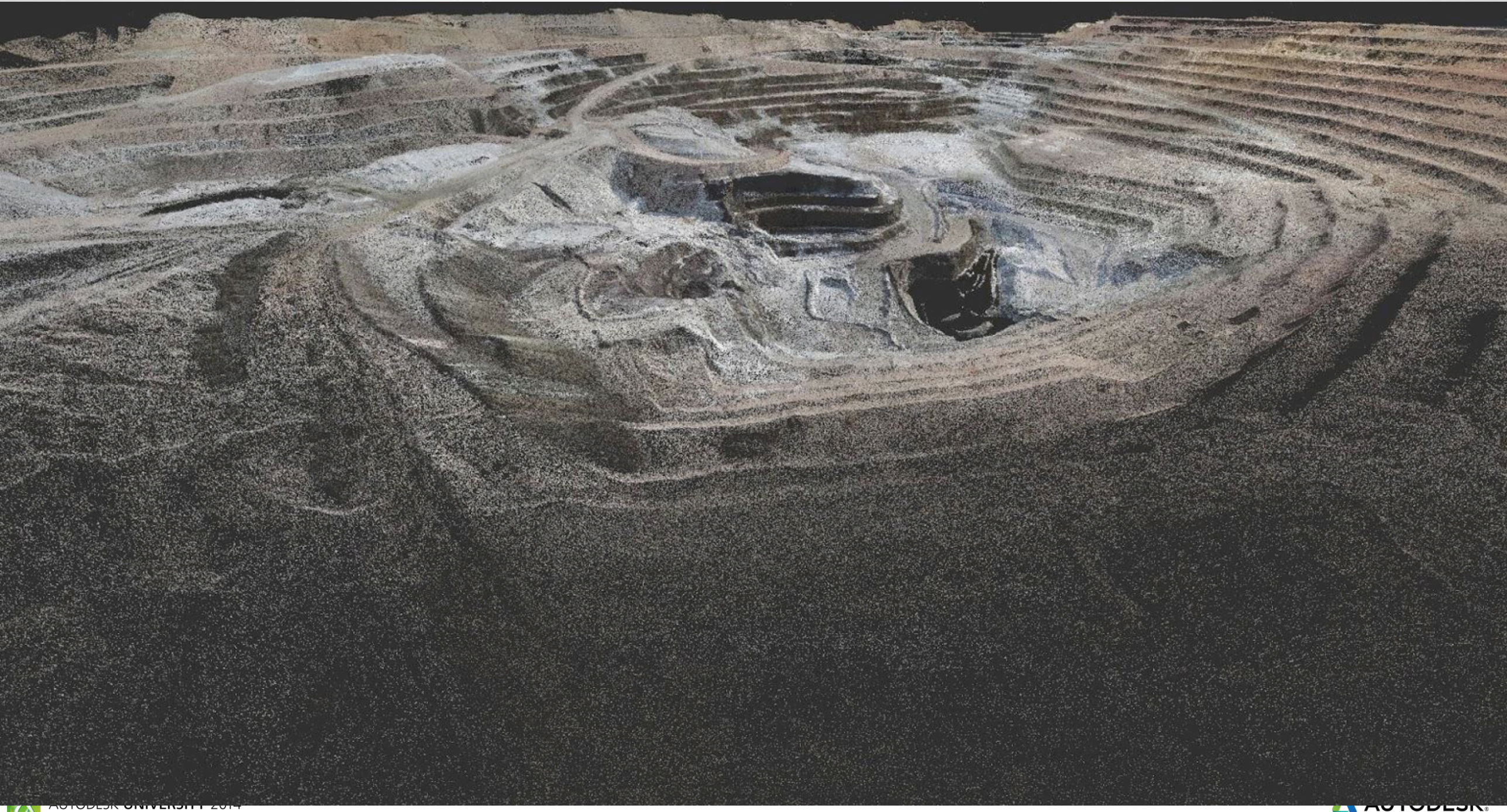
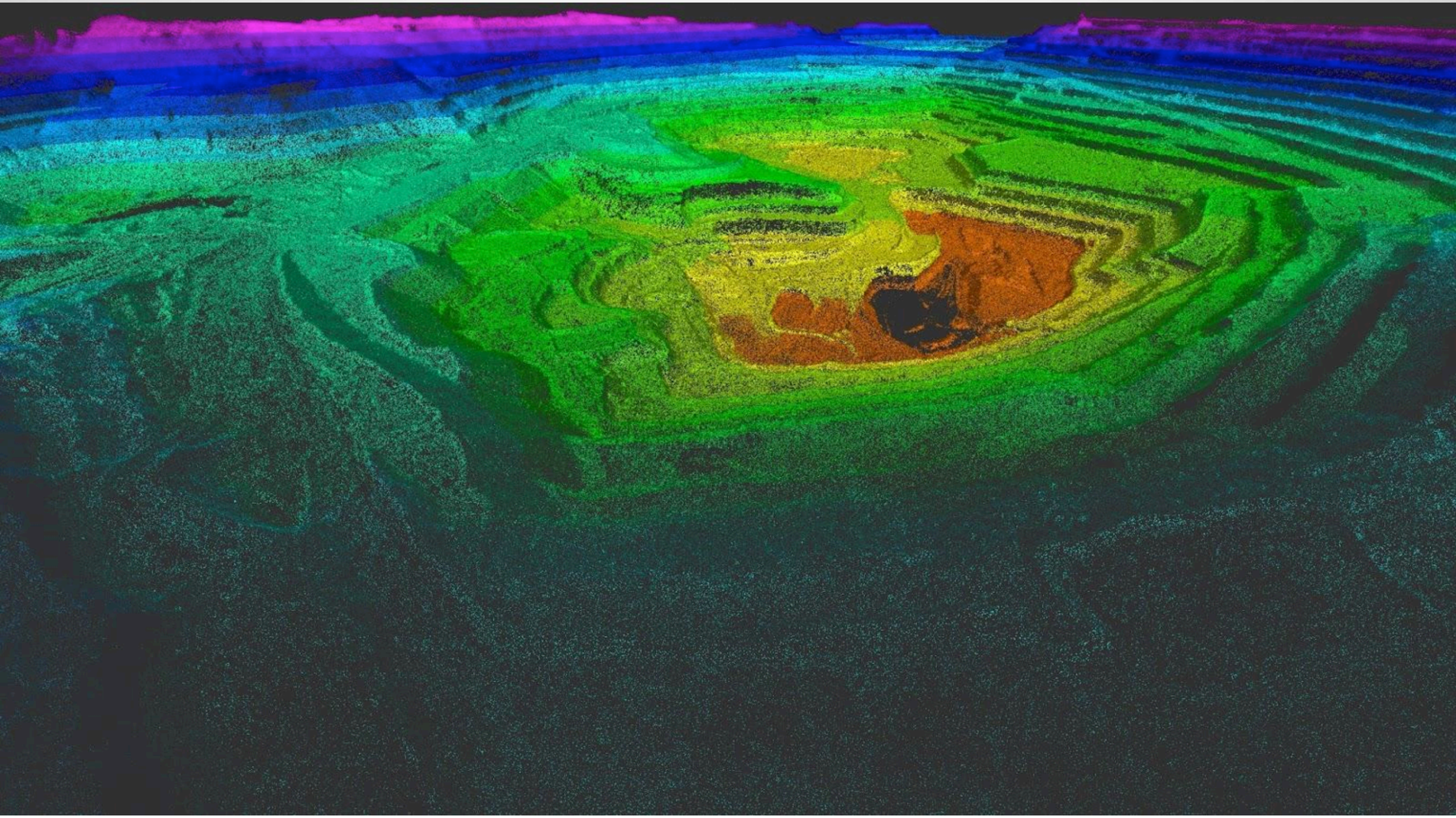
TODESK.





Session Feedback

- Via the Survey Stations, email or mobile device
- AU 2015 passes given out each day!
- Best to do it right after the session
- Instructors see results in real-time





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