UT 20960: Capturing Reality - Incorporating Reality Capture into Utility Design and Use in SUE

Forrest Roy & Aaron Mason

Anchorage Municipal Light and Power

@MLandP

Incorporating Reality Capture for Utility Design and SUE

About us

- Forrest Roy
- Lead Locator
- Reality Capture Technician

- Aaron Mason
- Lead Drafter/CPR engineer
- GIS

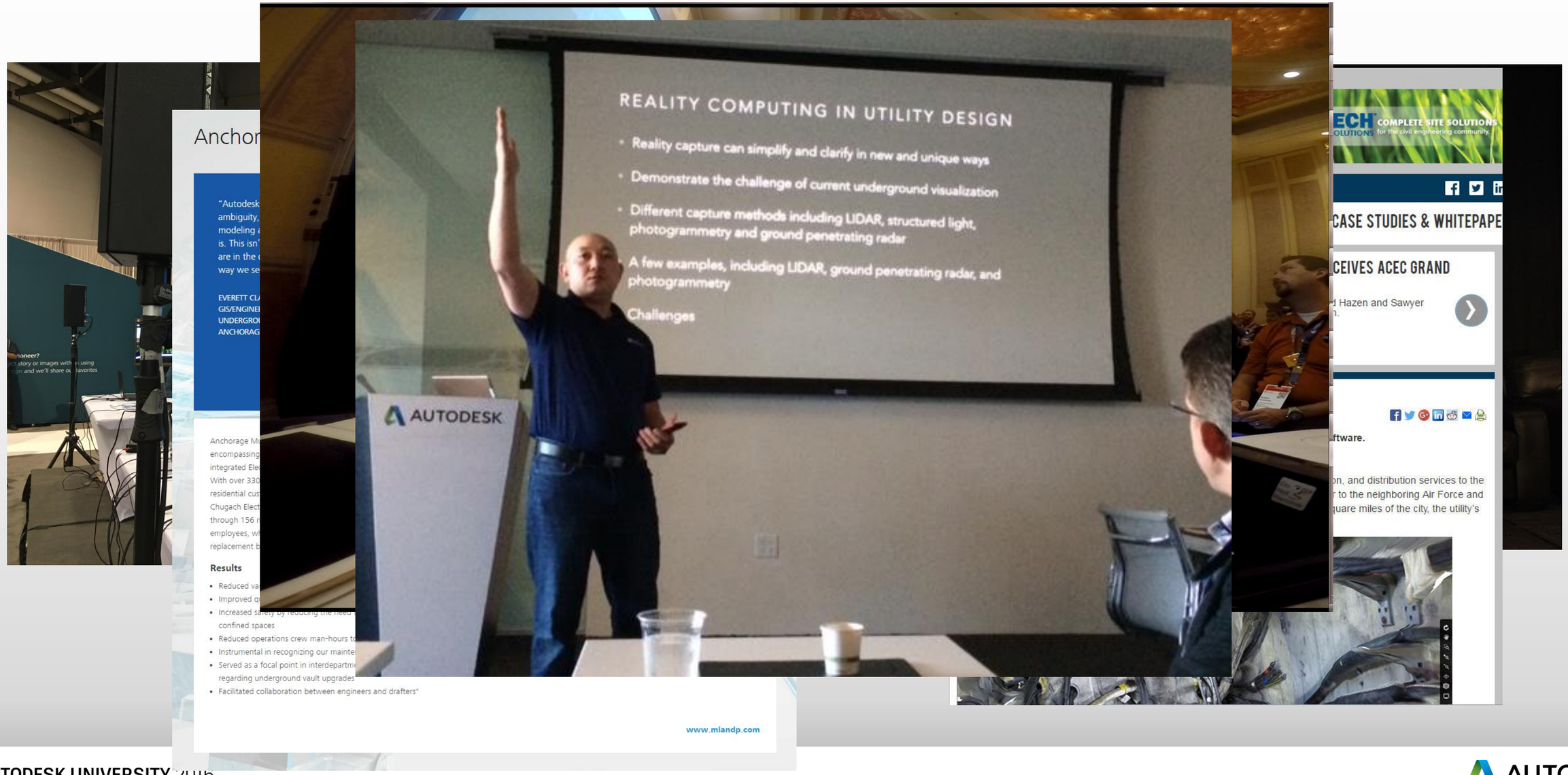
Together, we push, prod, pull, convince, and argue our way into creating new and innovative ways for our company to advance

Anchorage Municipal Light and Power

- 30,000 customers
- Supply JBER military bases, University of Alaska Anchorage, all of Anchorage's hospitals
- New generation coming on line 2017
- Vertically integrated

ALASKA
AERIAL
MEDIA

Big thanks to Autodesk and Autodesk University

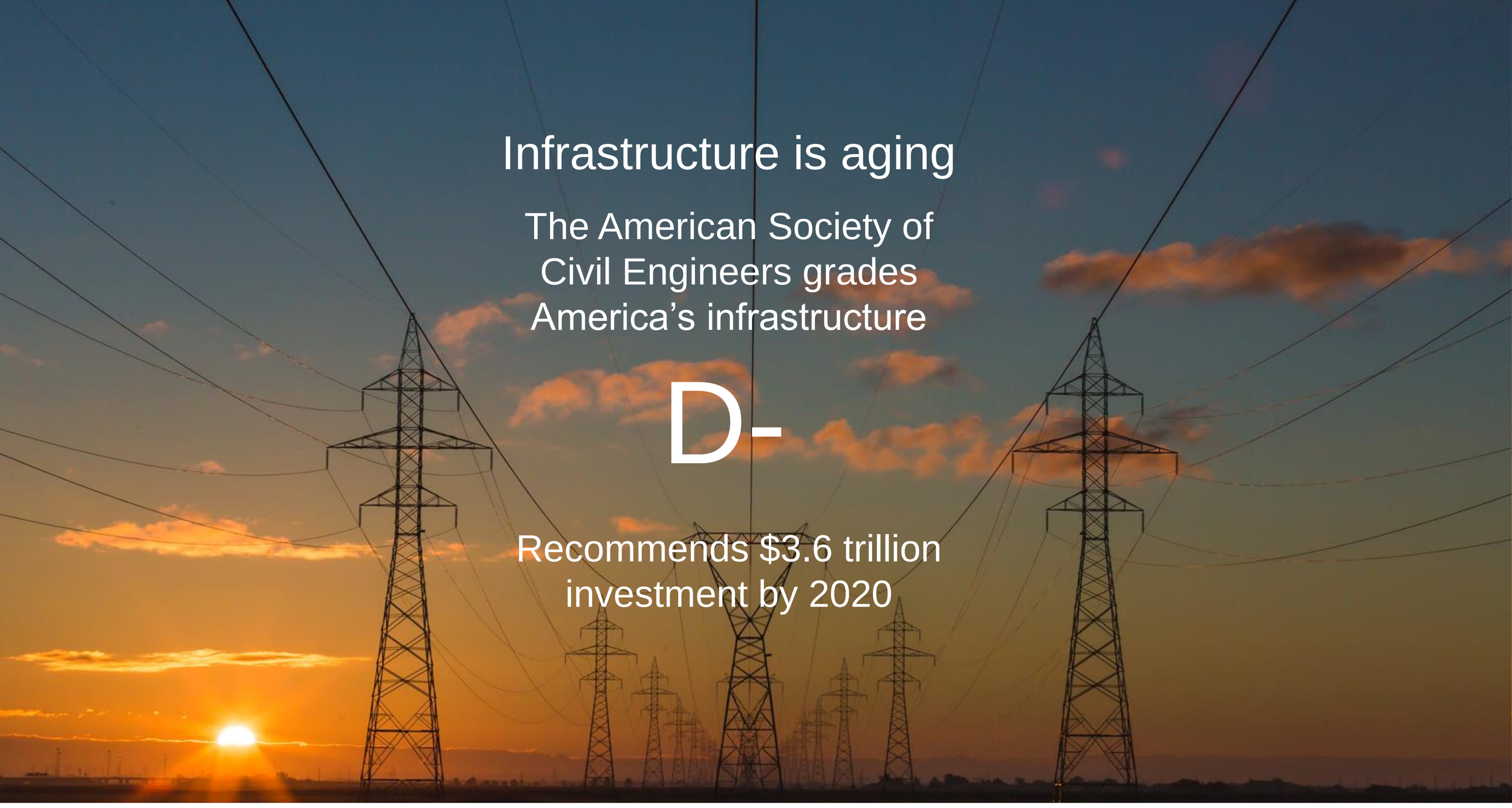


Class summary

Key learning objectives

At the end of this class, you will be able to:

- Discover different use objectives for point clouds and photogrammetry
- Learn how to gather data for a SUE model
- Learn how to use cameras to gather data for photogrammetry
- Learn how to use laser scanners and structured light scanners

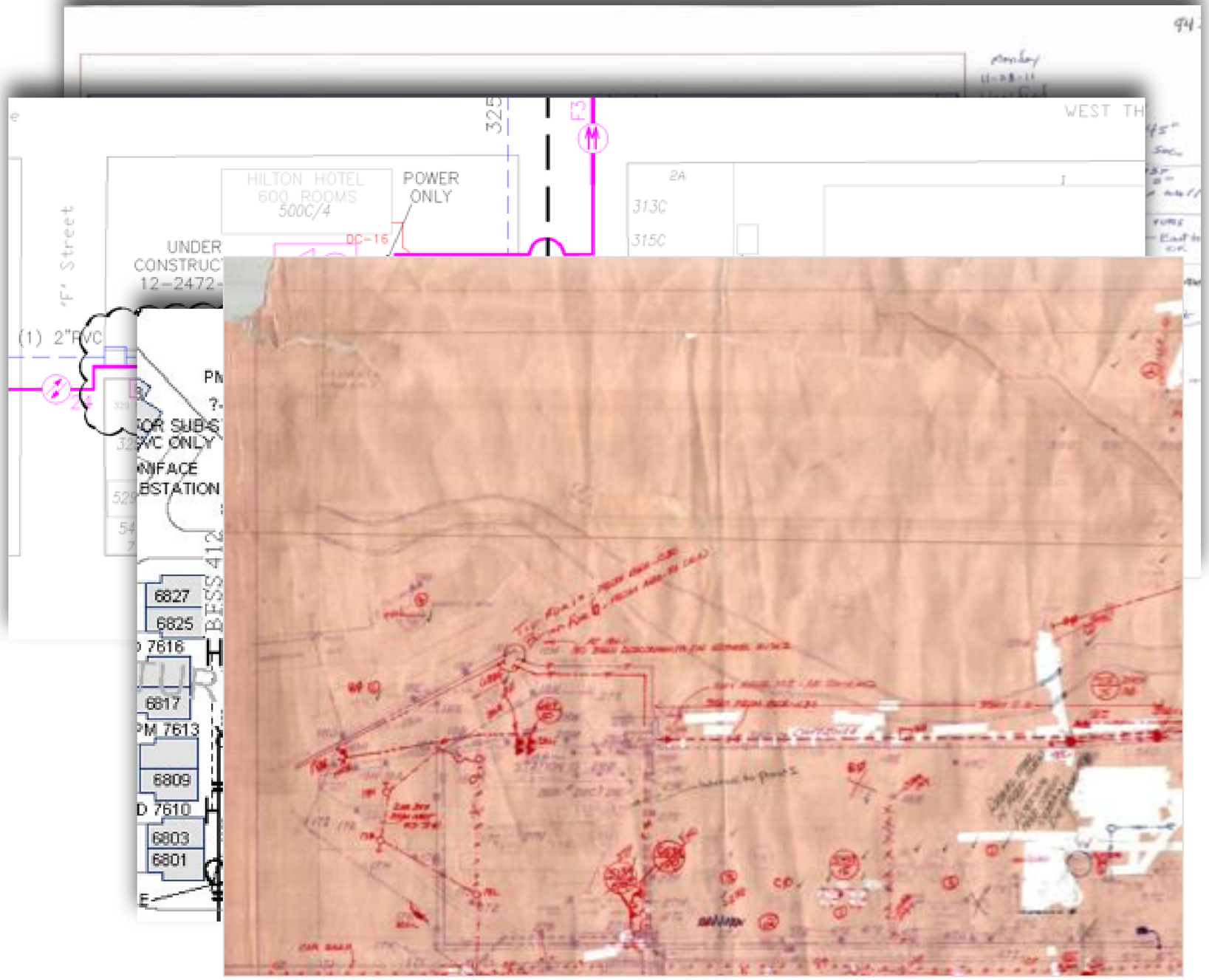

Infrastructure is aging
The American Society of Civil Engineers grades America’s infrastructure
D-
Recommends $3.6 trillion investment by 2020

Aging infrastructure is only part of the problem

- Too often our records are ancient as well
- Or worse, our records are locked up inside someone's mind

Data Quality

- New builds will interface at some level with existing infrastructure
- Old data can be unreliable: incomplete ambiguous, wrong or missing



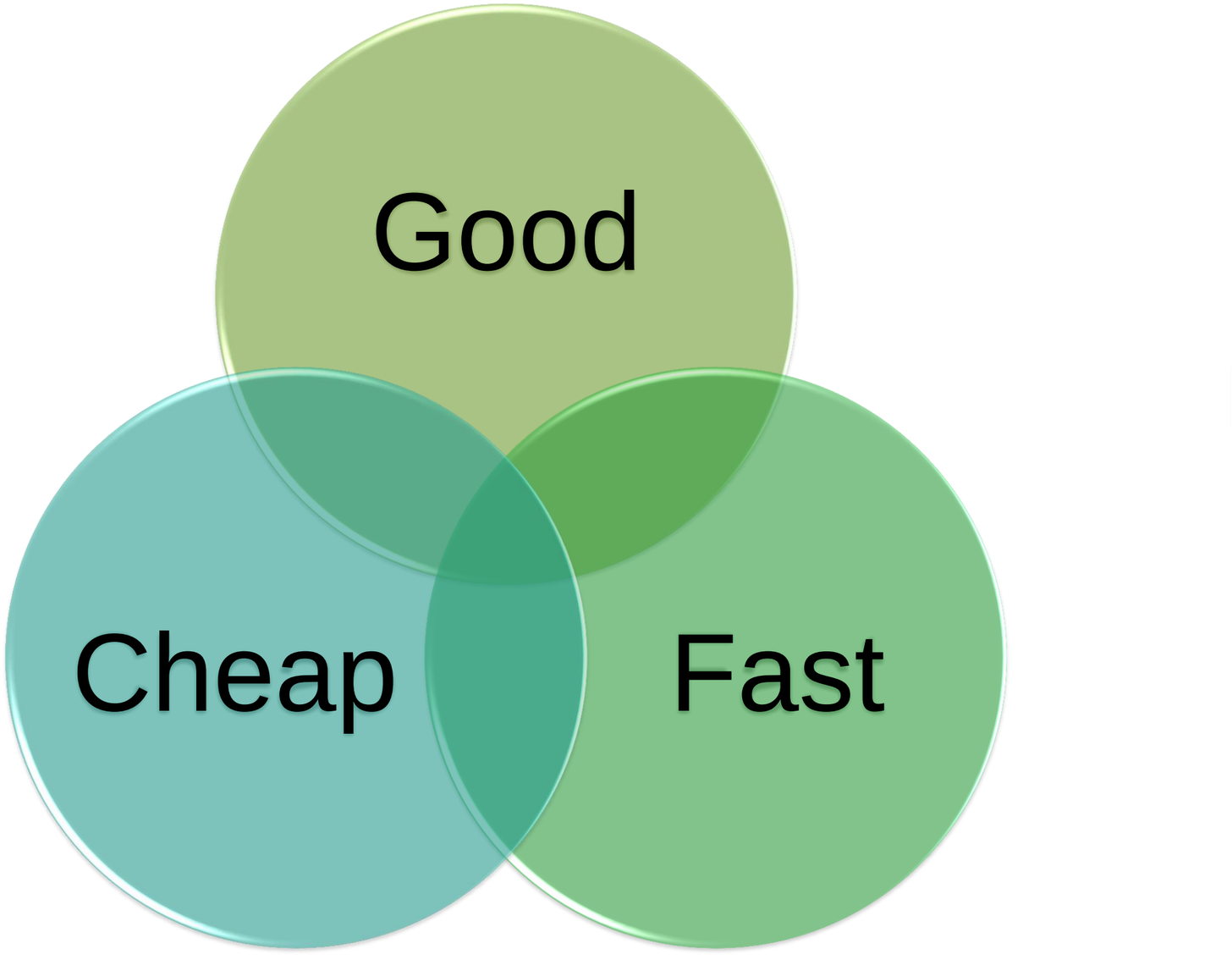
Getting this back from the field

How can reality capture help us build the cities of tomorrow?

- Matching design with build-improved asbuilt process
- Cross checking existing facilities
- Broader understanding between different disciplines and the public

Memory is malleable

- “Luk
- Des
- For
  aga



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Types of capture

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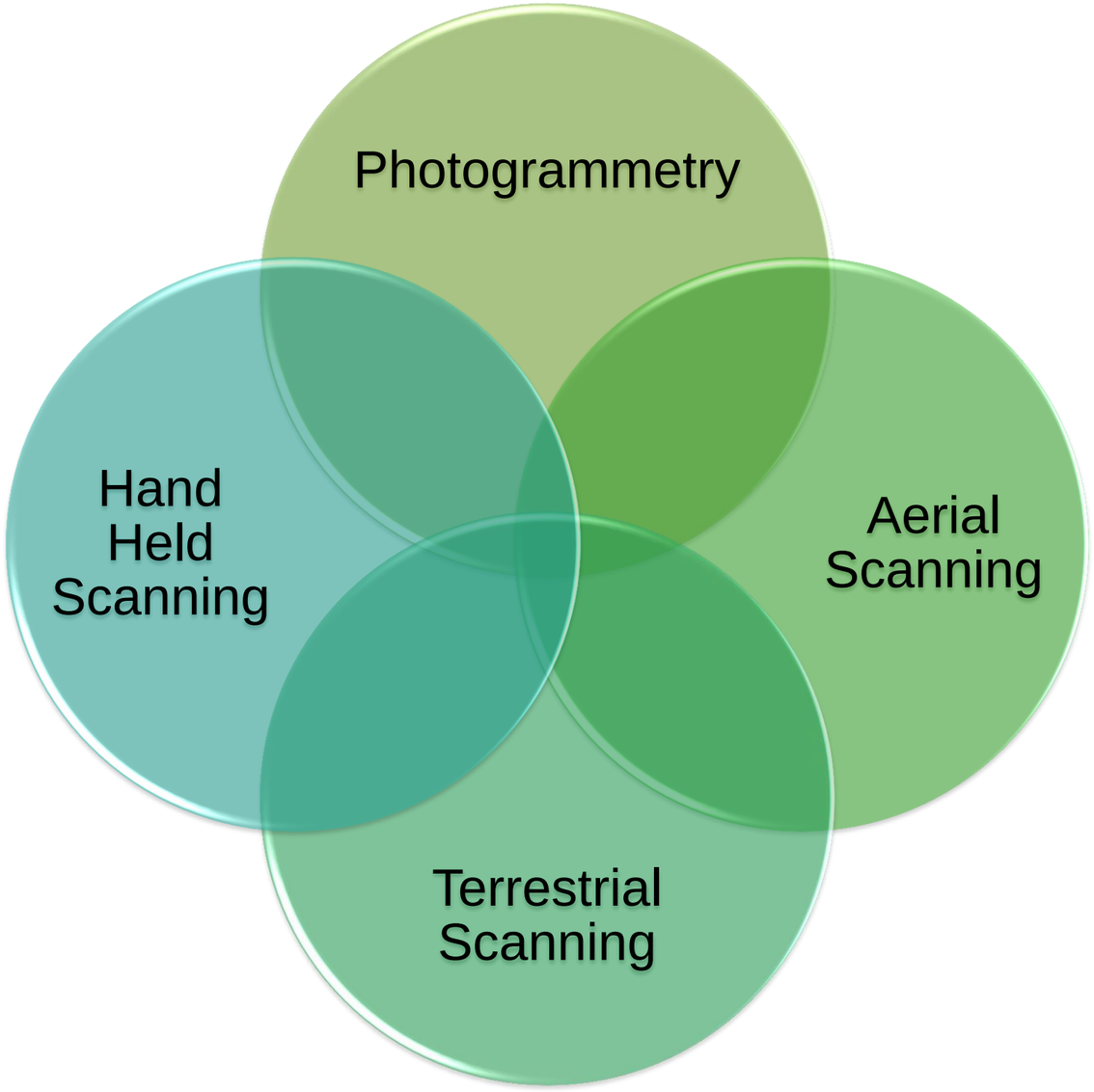
  - H



c

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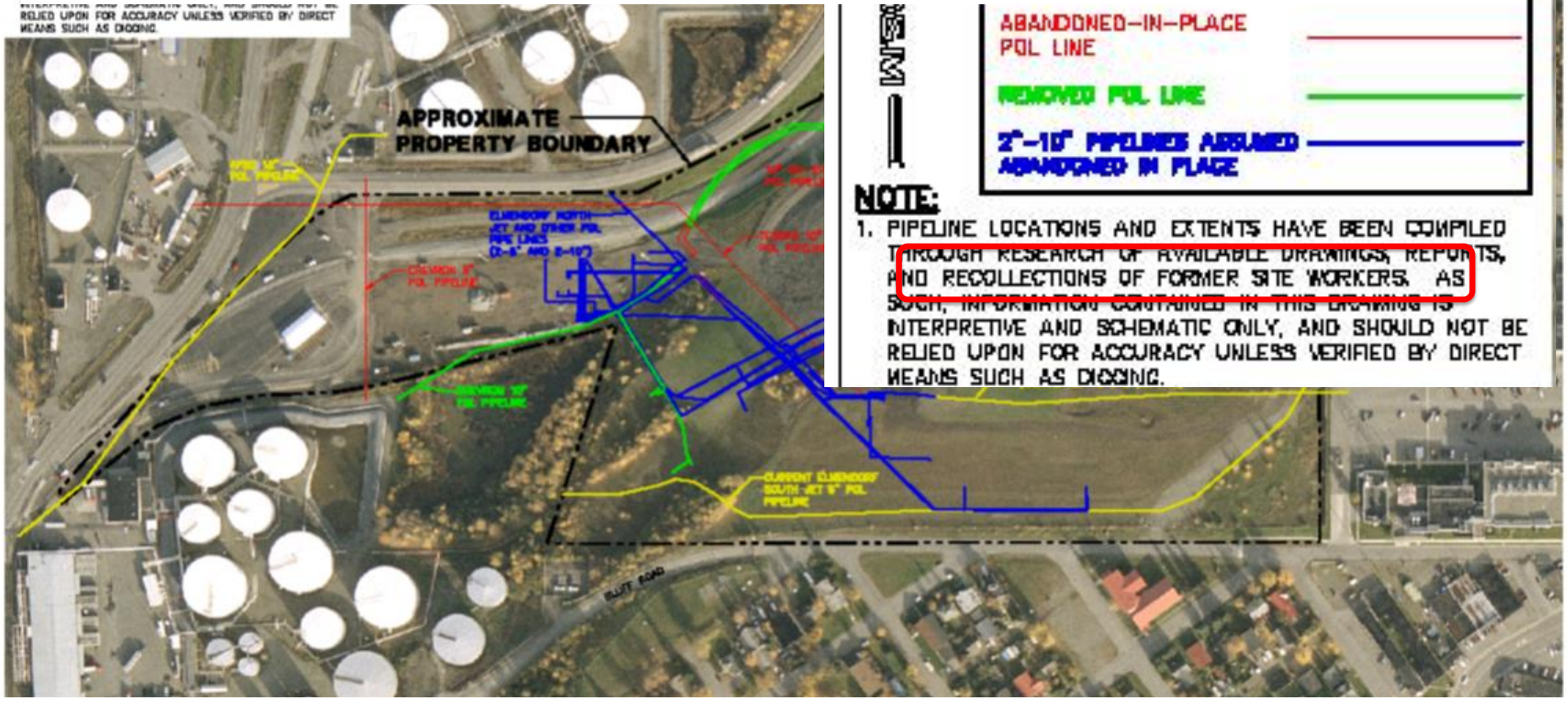
SUE model

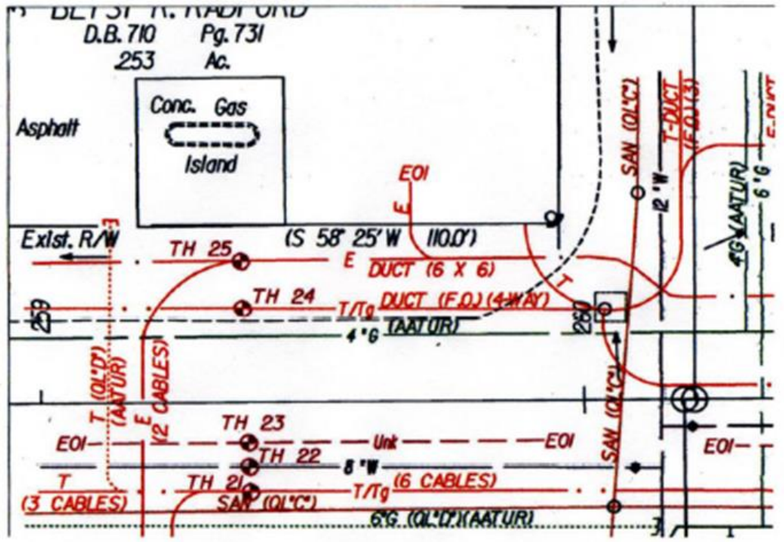
- Level D-records or ‘oral recollections’
- Level C-records obtained from surface data
- Level B-geophysical methods
- Level A-precise measurement at a specific point

Level D records



Grade A data collection

Deliverables



All Utilities depicted at QL B unless otherwise noted.

QL A Data Summary (see QL A Supplemental Data Sheets for additional information):

TH 21: 6 non-encased telephone cables

elevation top of cable configuration: 186.15'
elevation bottom of configuration: 183.43'
Coords: N 441987.8011
E 3640280.1310

TH 22: 8 3/4" C.I. water

elevation top of water line: 184.67'
Coords: N 441992.7925
E 3640280.0092

TH 23: 6 3/4" unknown function steel pipe
elevation top of pipe: 181.12'
Coords: N 441997.3469
E 3640280.8993

TH 24: Fiber Optic concrete telephone duct
elevation top of duct: 184.41'
elevation bottom of duct: 182.22
width of duct: 2.62'
Coords: N 442022.7934
E 3640281.0571

TH 25: concrete encased electric duct
elevation top of duct: 186.87'
elevation bottom duct: 183.55
width of duct: 4.66'
Coords: N 442032.1007
E 3640281.2239

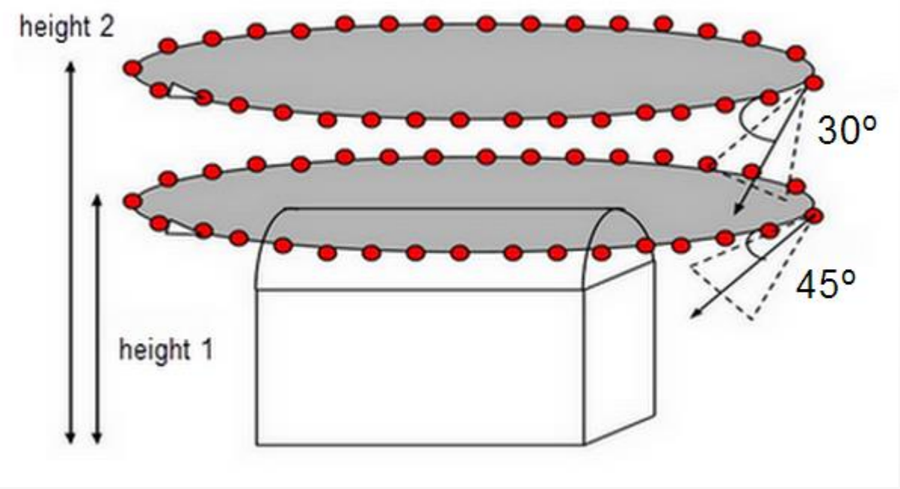
Photogrammetry

AUTODESK® 123D® CATCH

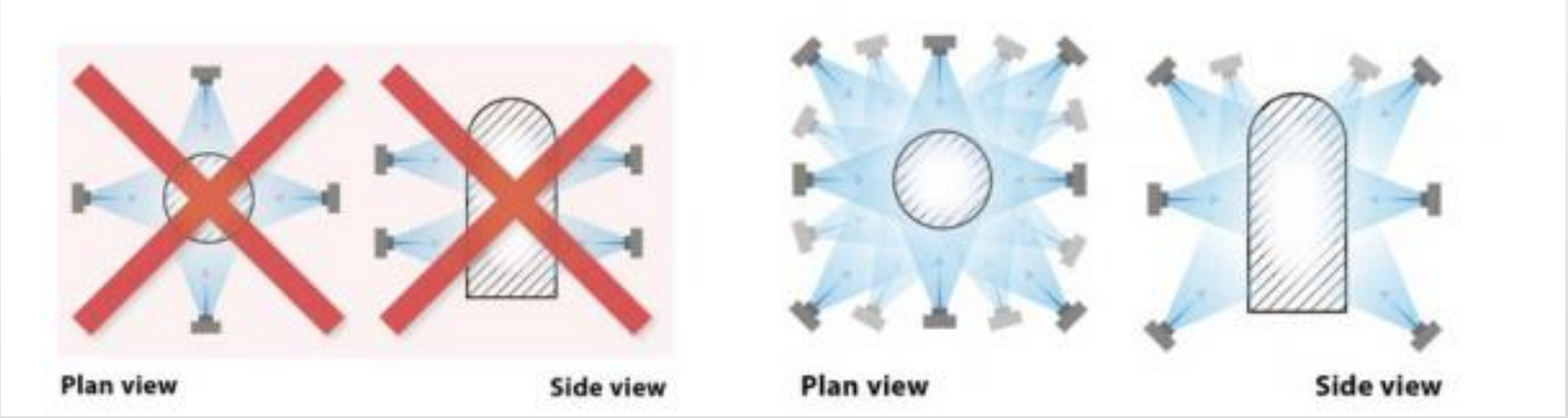
Different ‘methods’ of capture

- Surround method (which you saw above, most common)
- Interior method
- Grid method
- Spiral method
- Corridor method

Photogrammetry Surround



- Lighting
- Camera stability
- Overlap

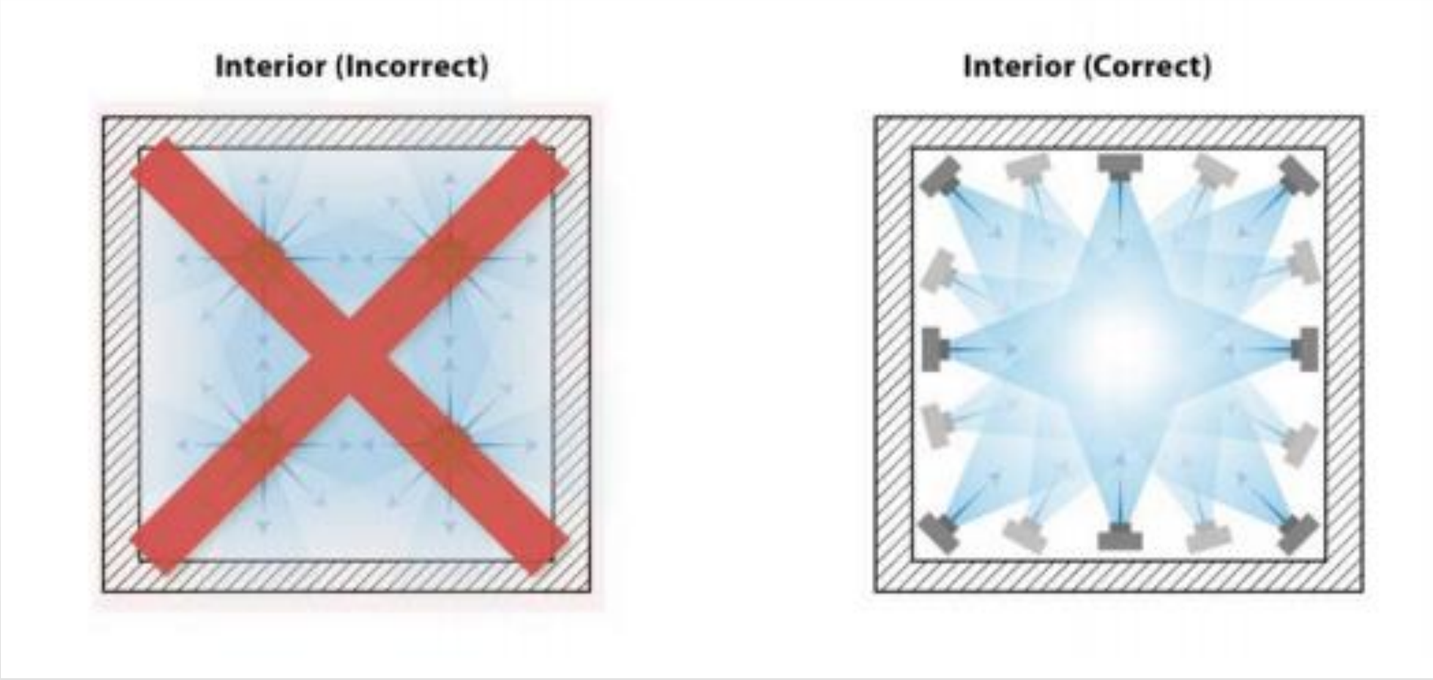


Our first vault

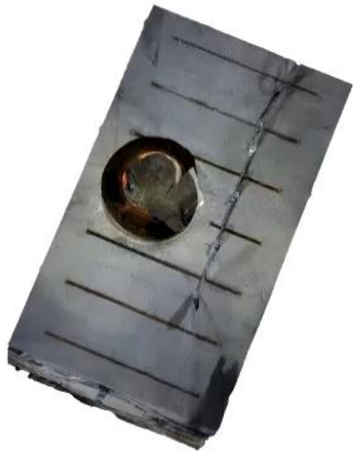
AUTODESK ReMake

Photogrammetry interior

- Autodesk recommends this method for interiors



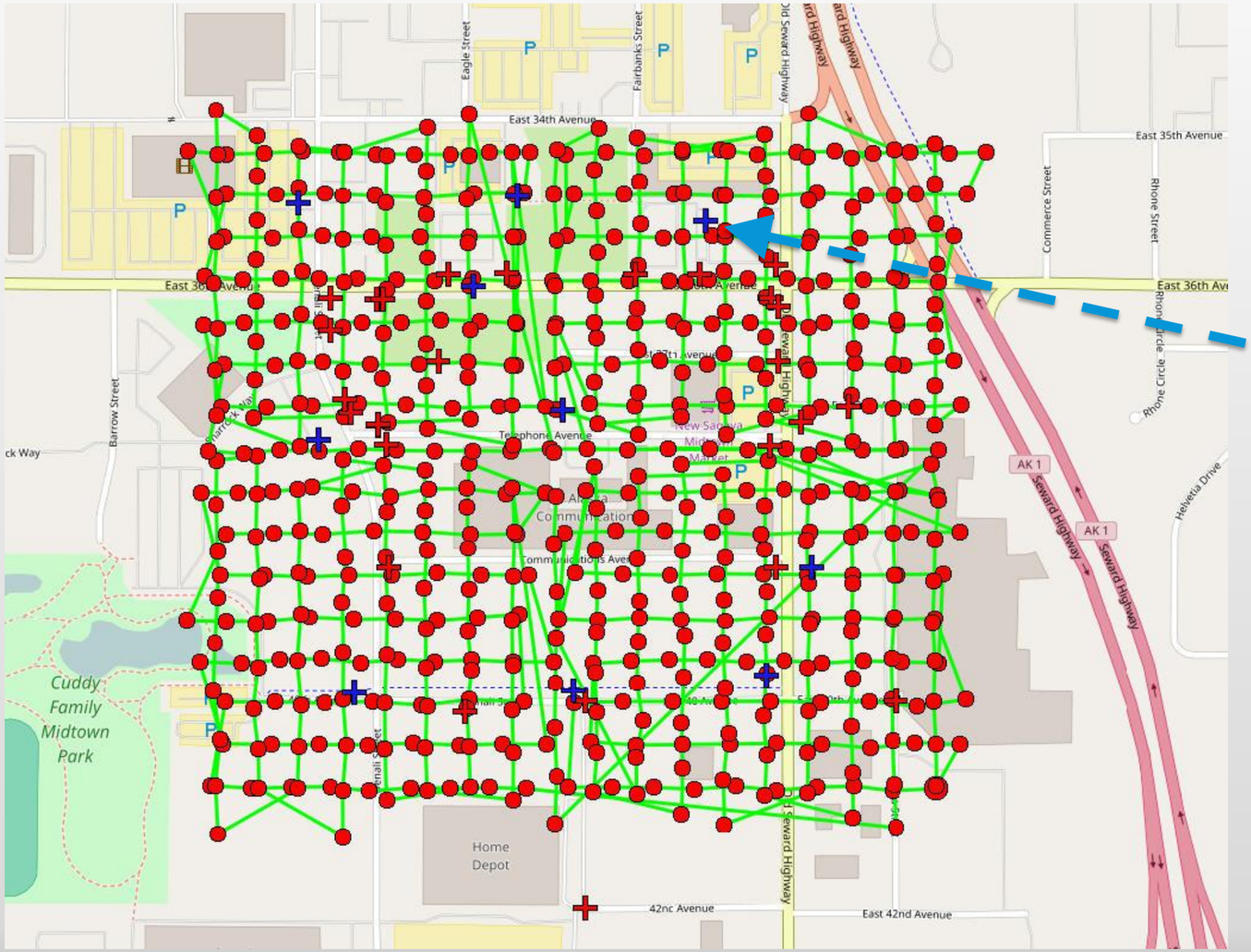
Photogrammetry of interior of vault



Photogrammetry Corridor

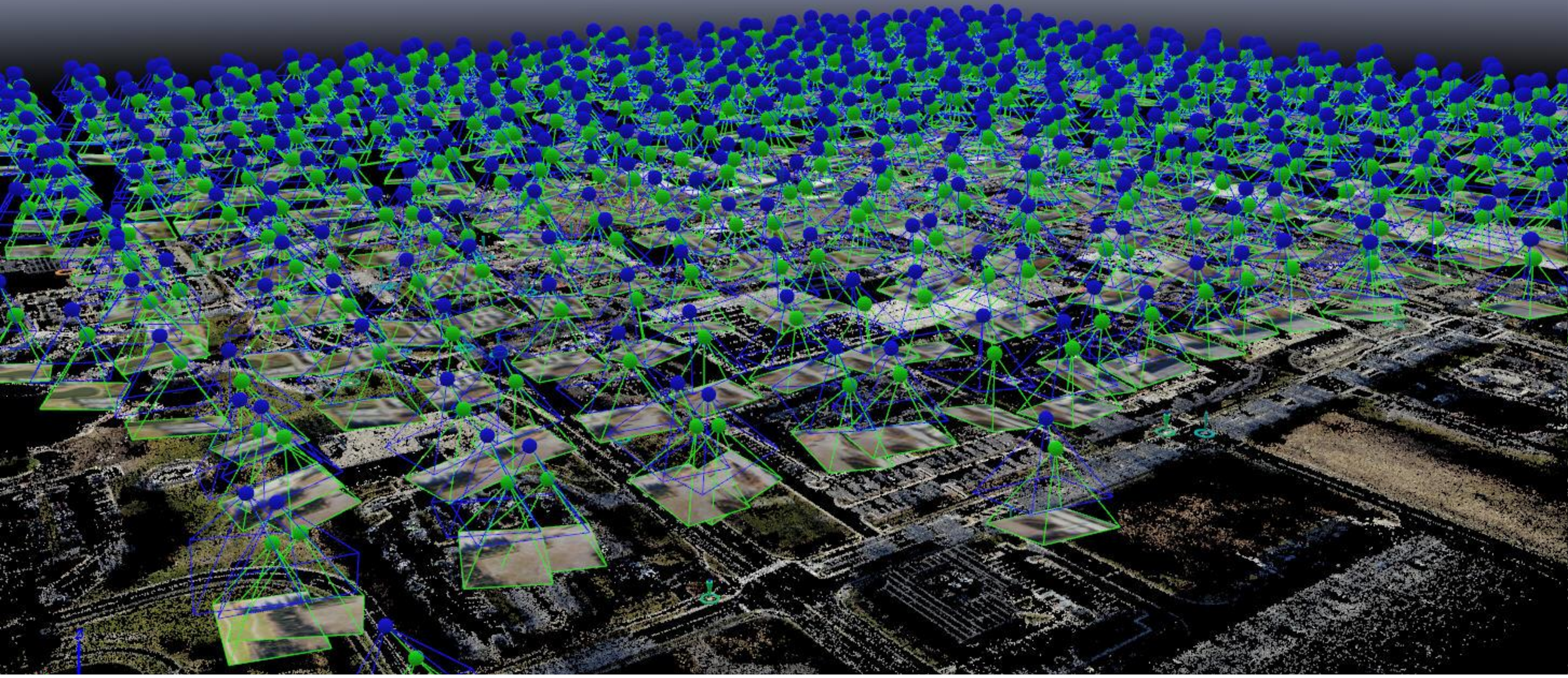
Photogrammetry Corridor Camera Locations

Photogrammetry Grid Method UAV

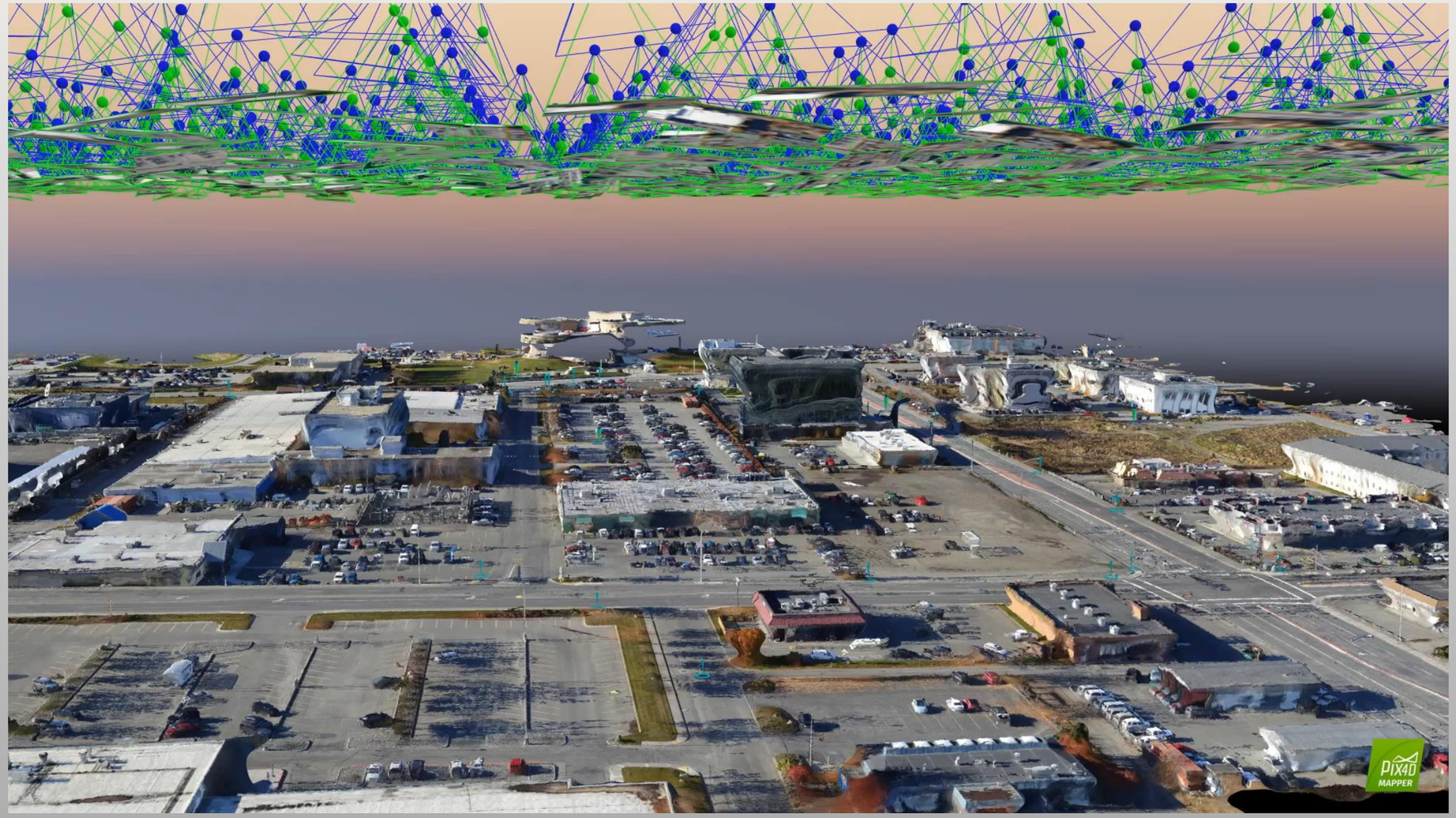


Photogrammetry GCP for UAV

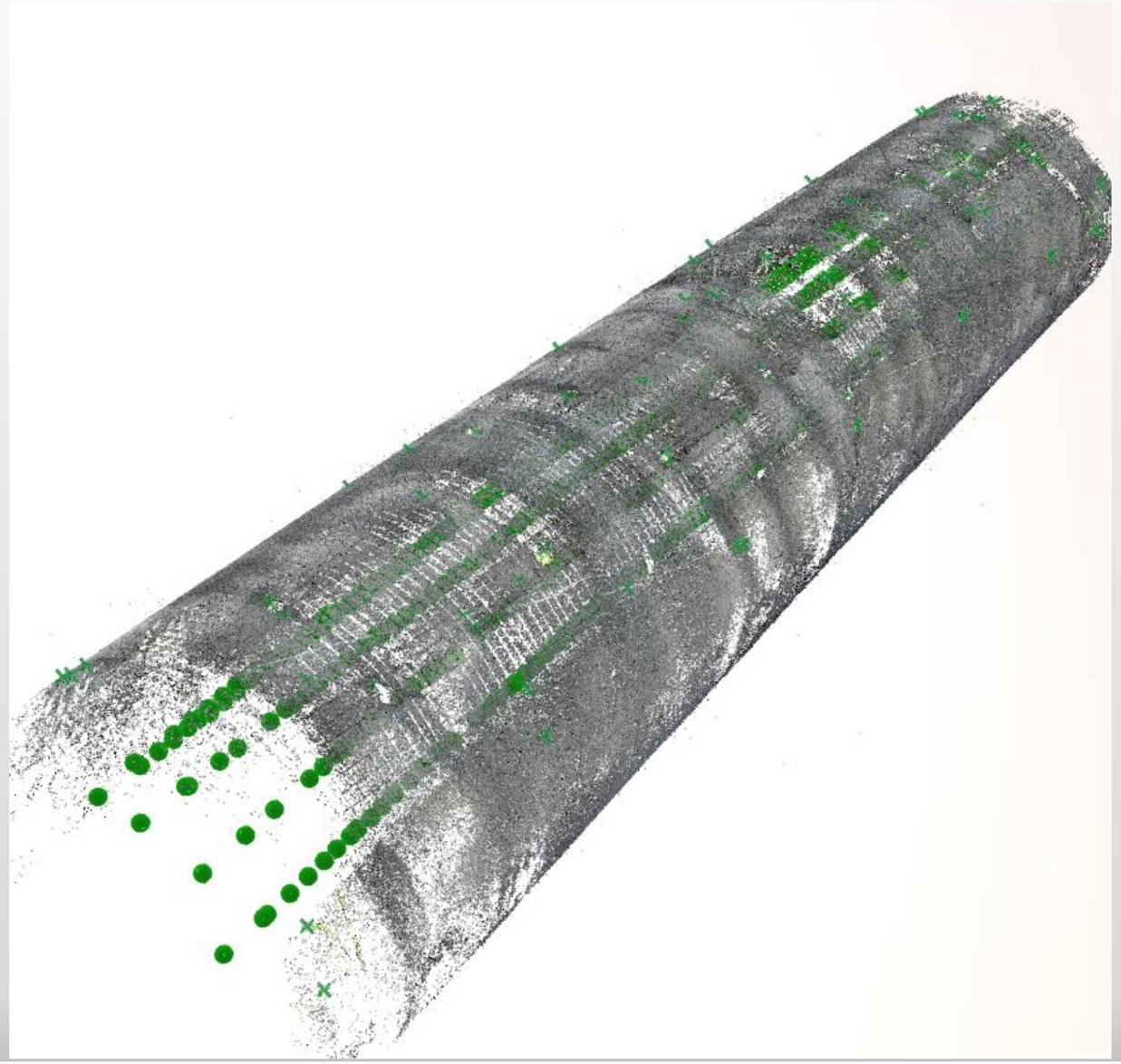
Photogrammetry camera placements

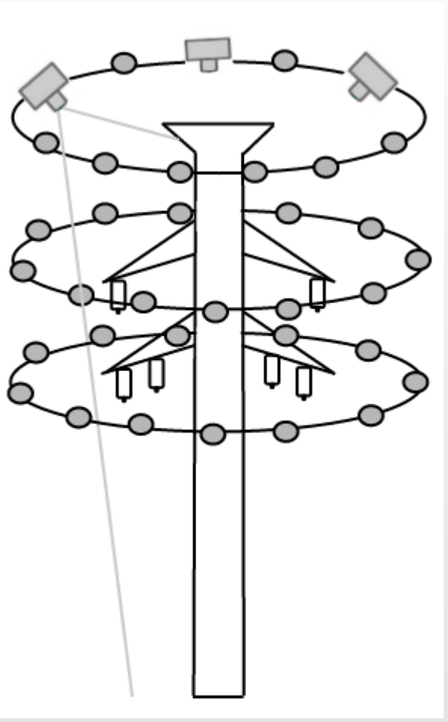


Photogrammetry UAV 36th Ave fly through



Photogrammetry UAV towers and tunnels



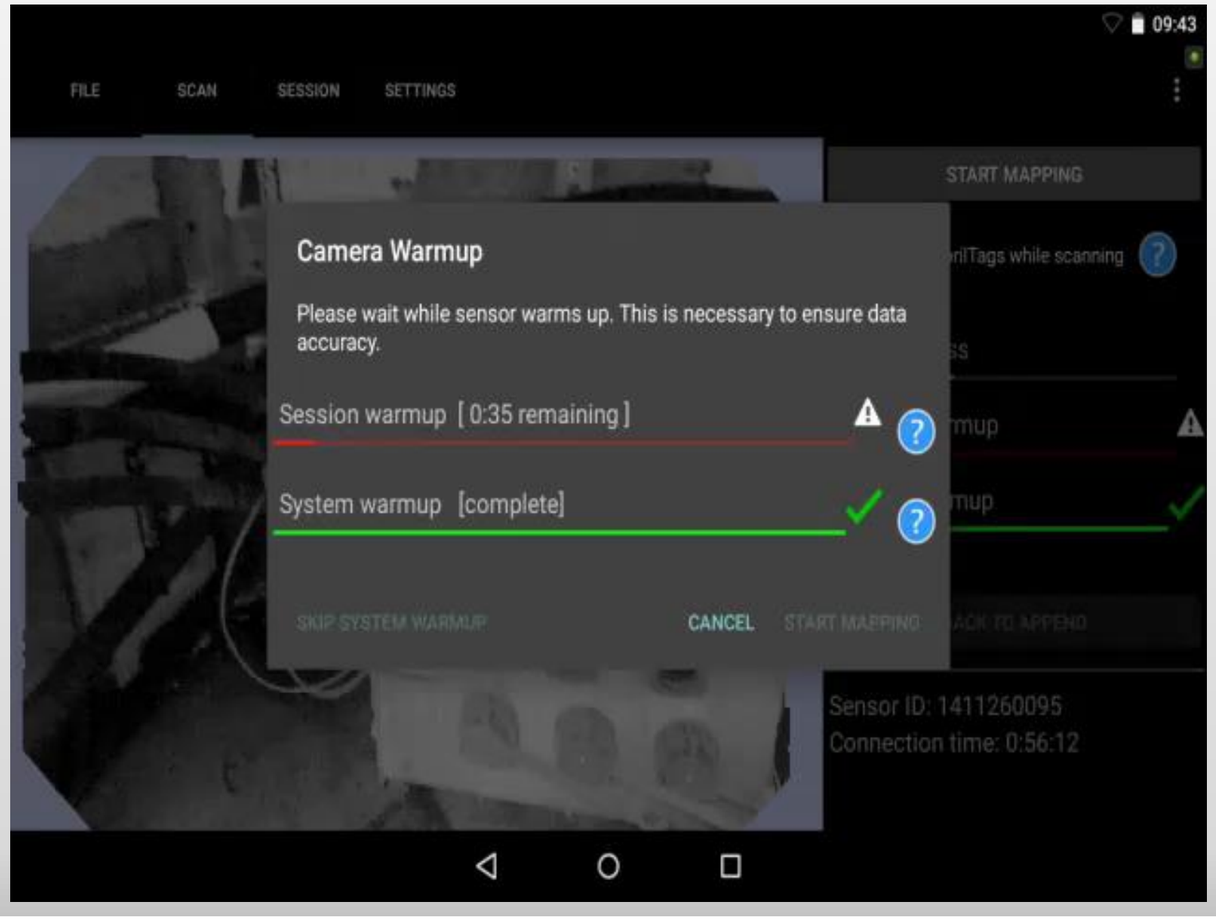


Courtesy Alaska Aerial Media

Lasers

Dot Product DPI-7

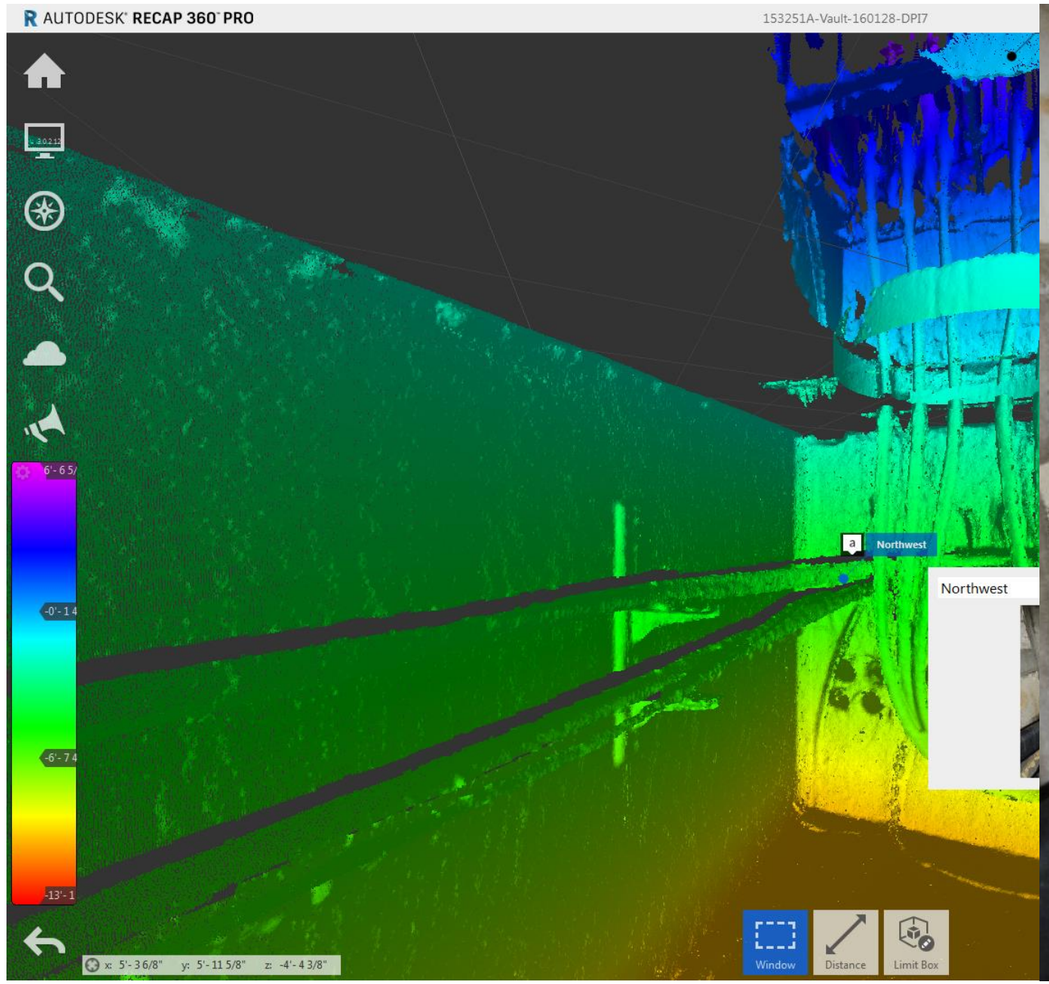
- Dot Product Capture Video



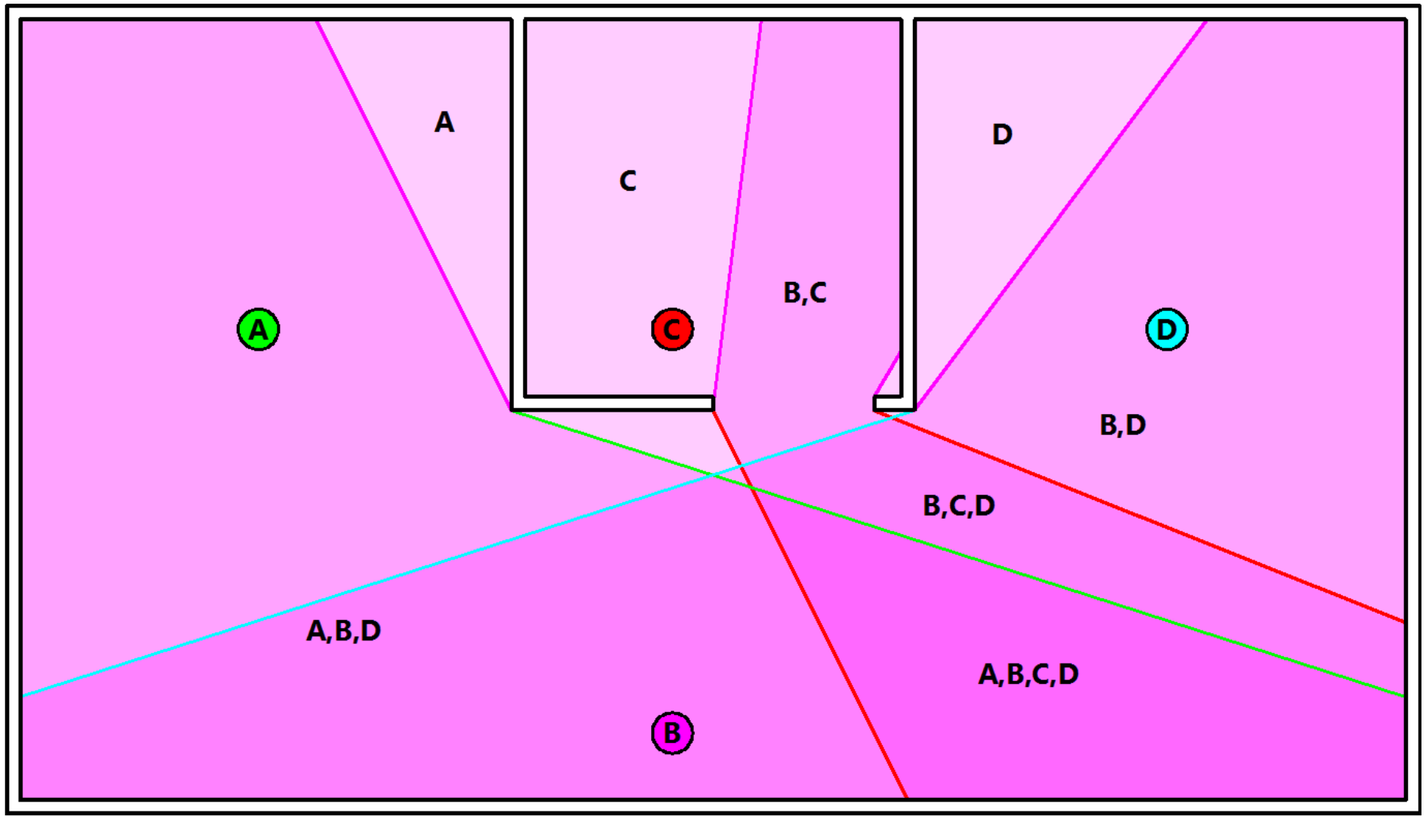
Handheld scanner results

- Final Recap Vault

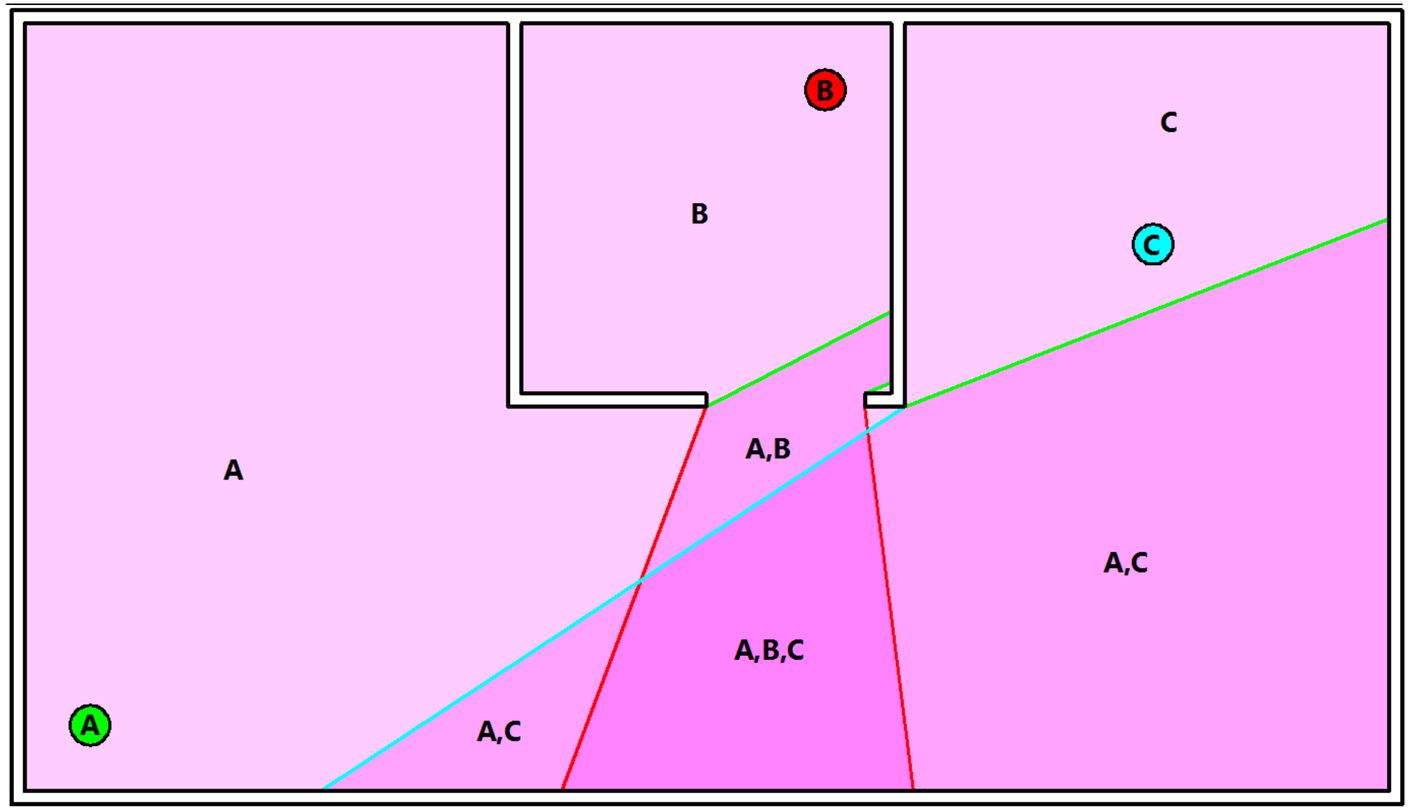
Vault annotated in Recap



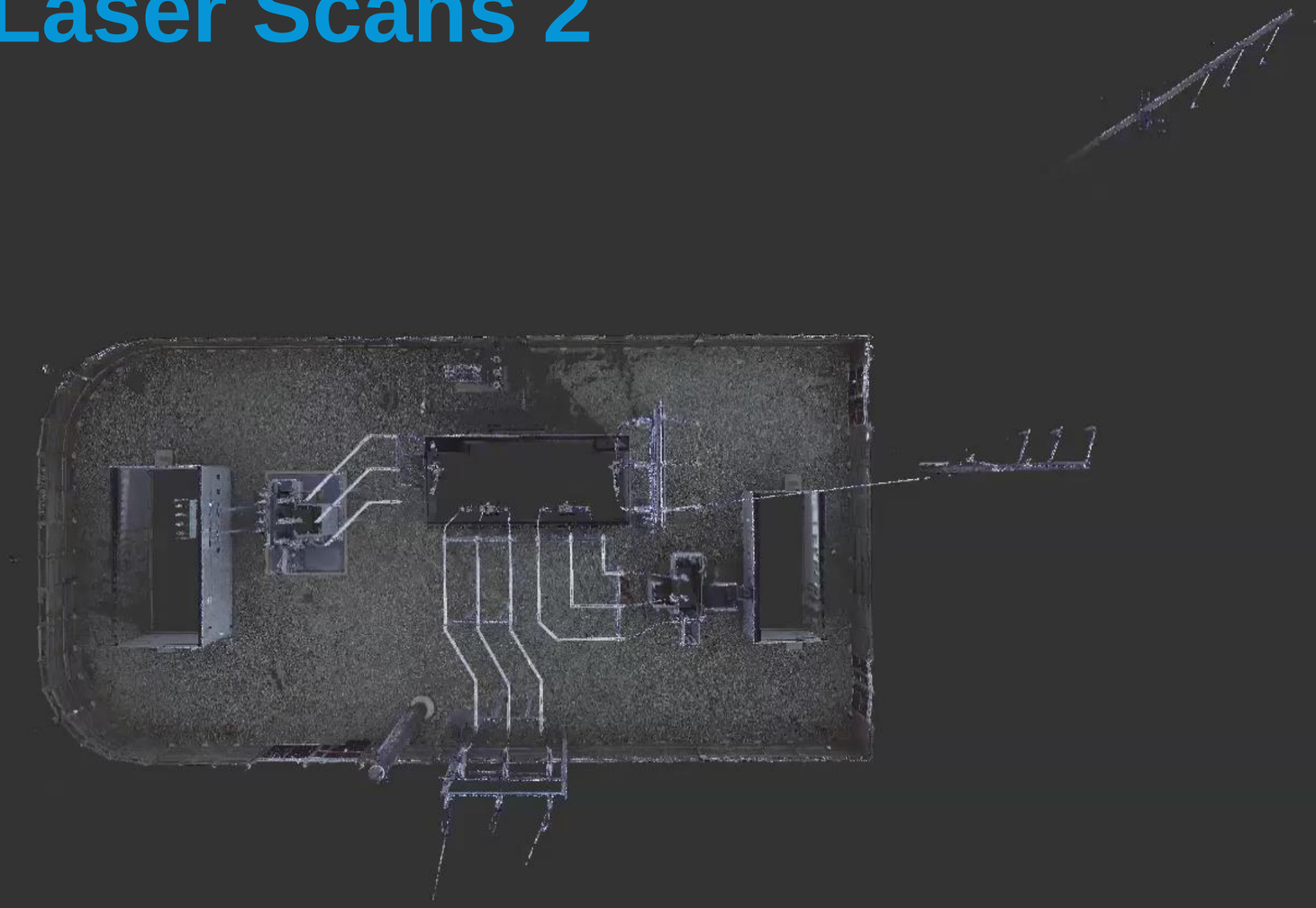
Laser Scanner Layout



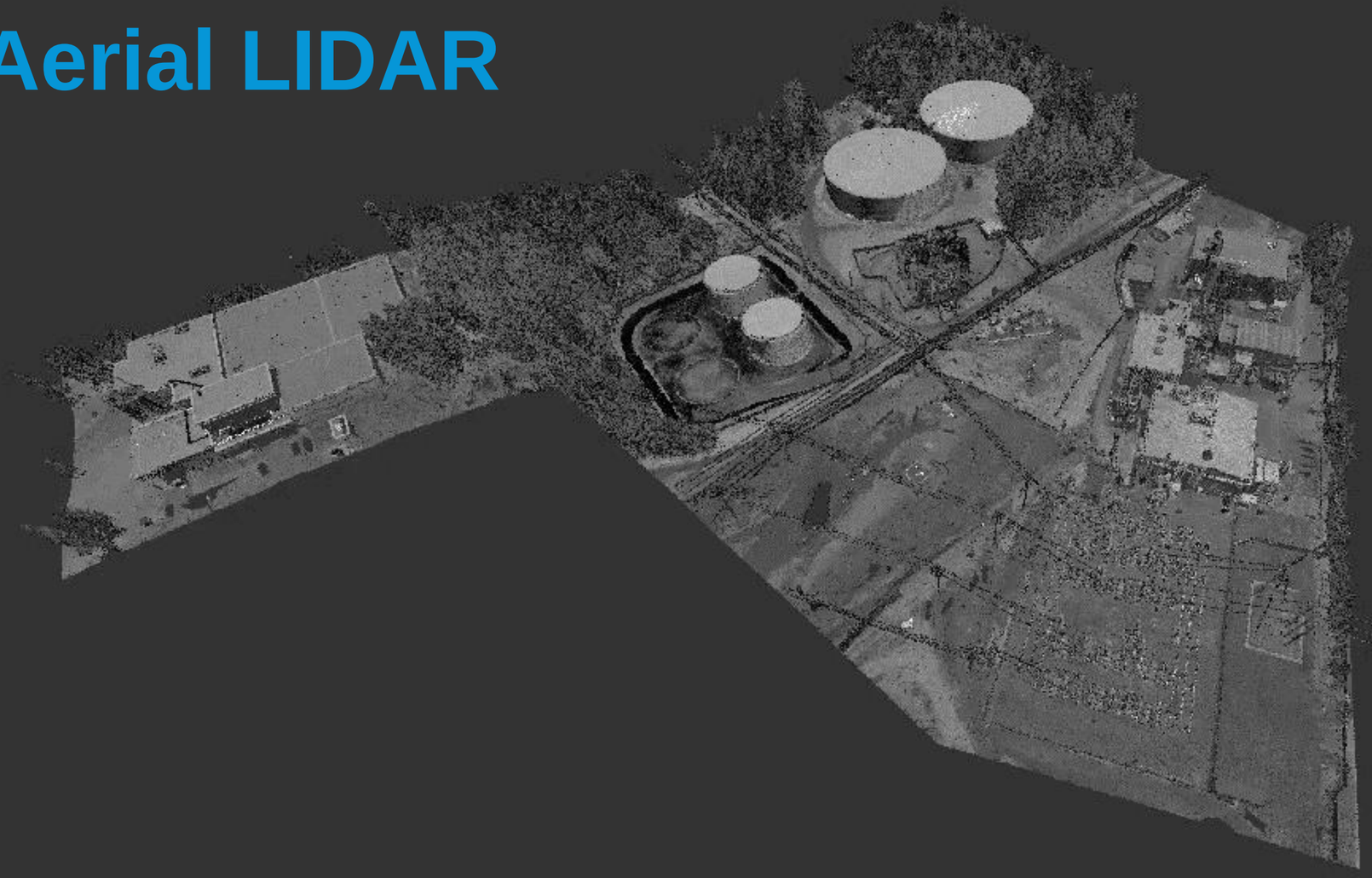
Laser Scanner Layout 2



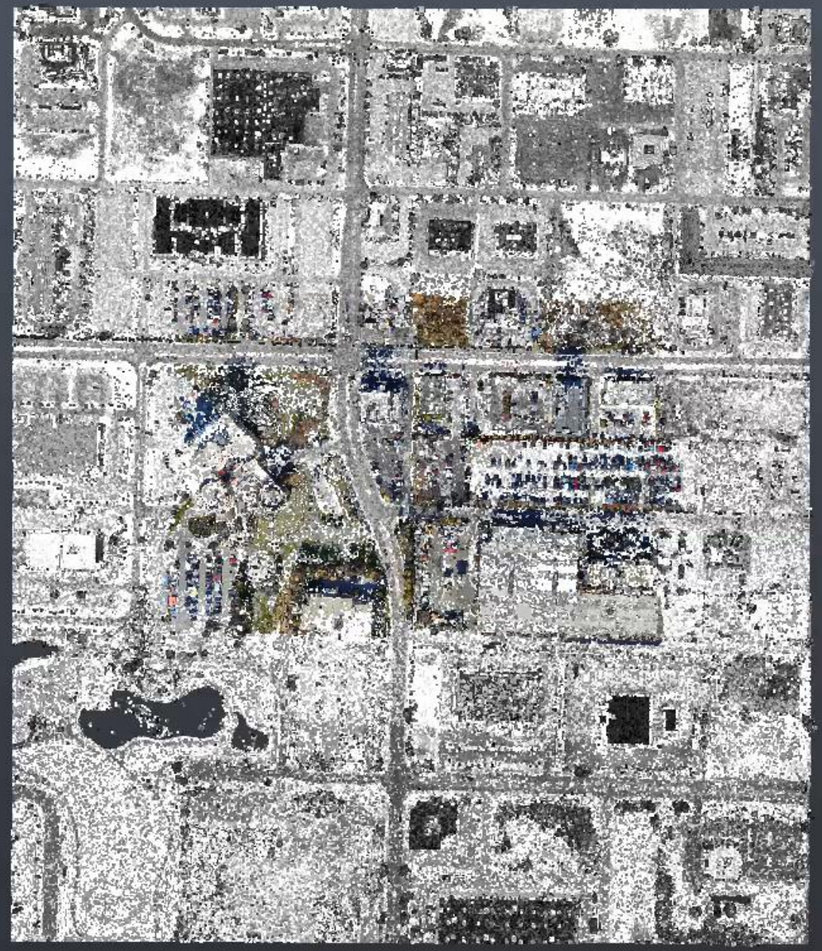
Terrestrial Laser Scans 2



Aerial LIDAR



Aerial LIDAR contrasted with UAV Pointcloud



UAV contrasted with Faro

Using Photography to Capture Data for Utility Work

HOLOBUILDER

Microsoft
Image Composite Editor

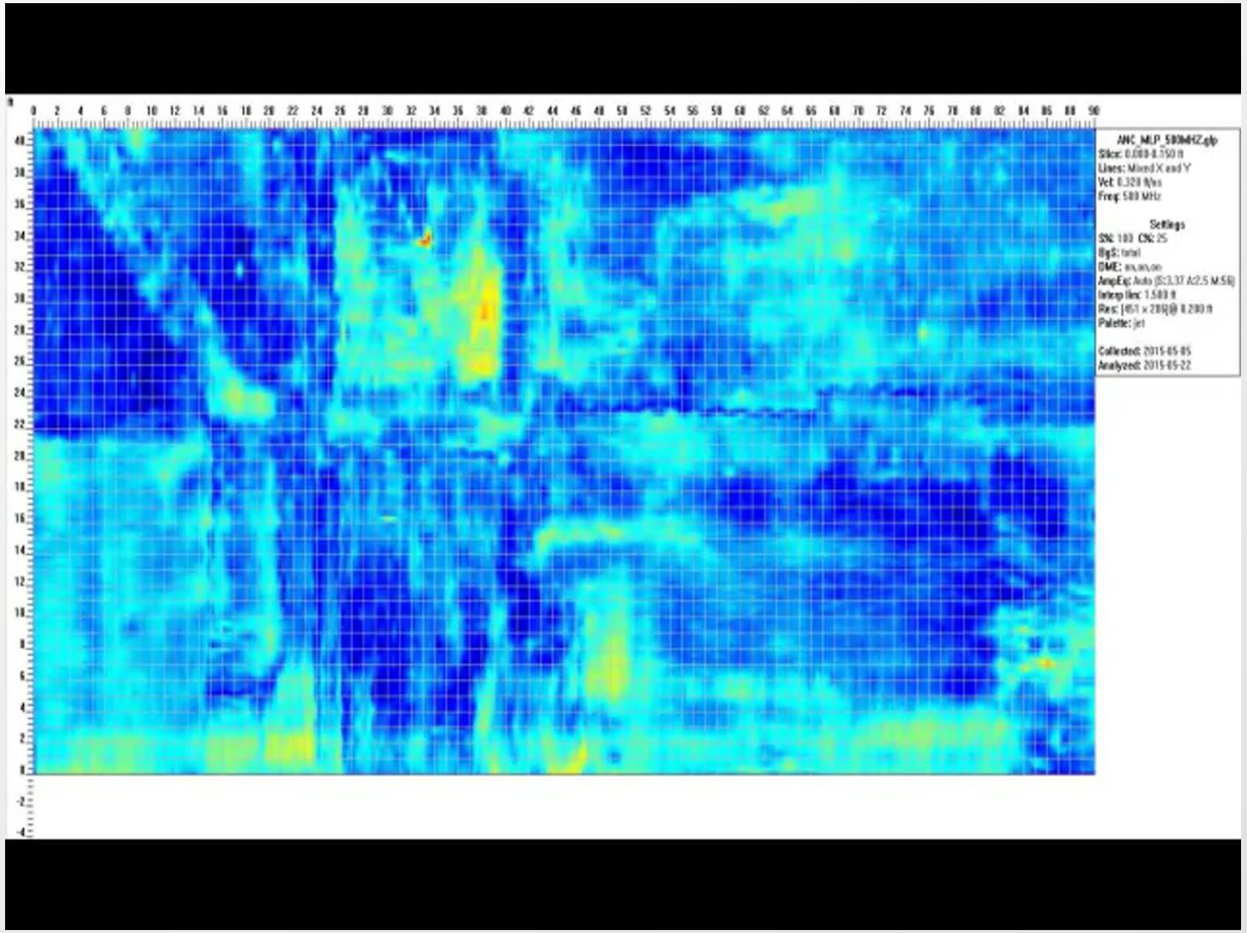
Leverages existing technologies
Easy for anyone to use
Low cost barrier to entry

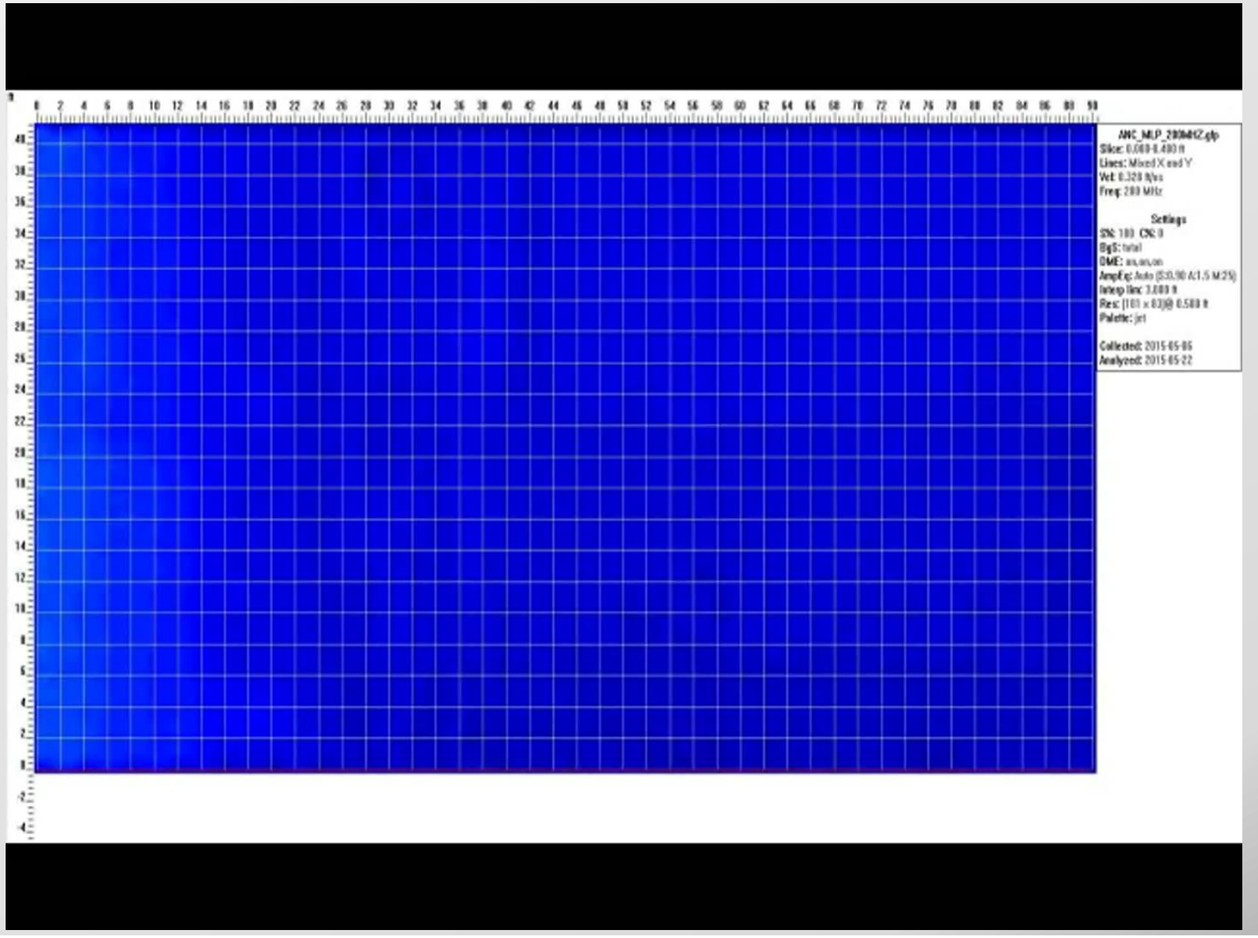
ICE Demo

- Mimic Board

GPR models

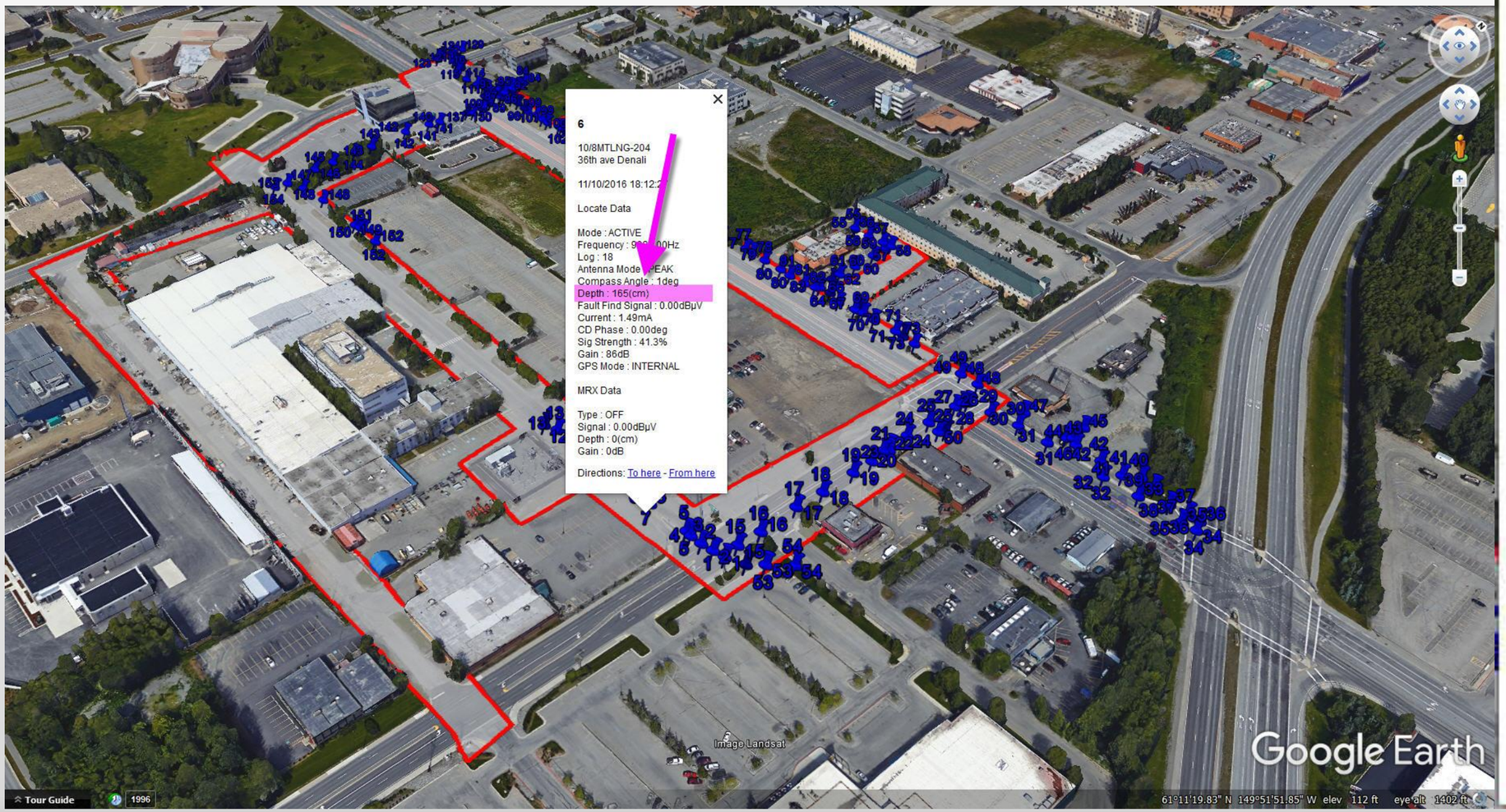
500 mhz left and 200 mhz right





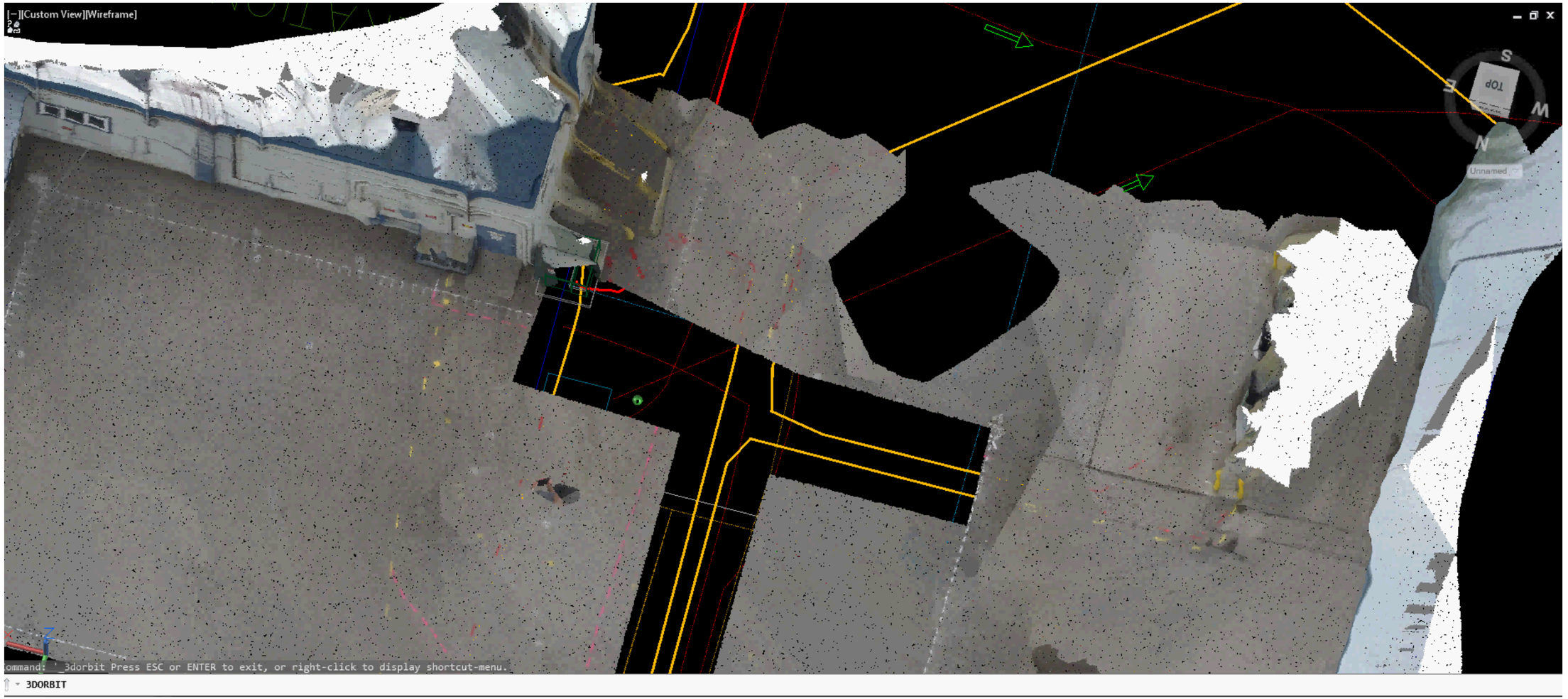
GPR point cloud

Using Underground Locates

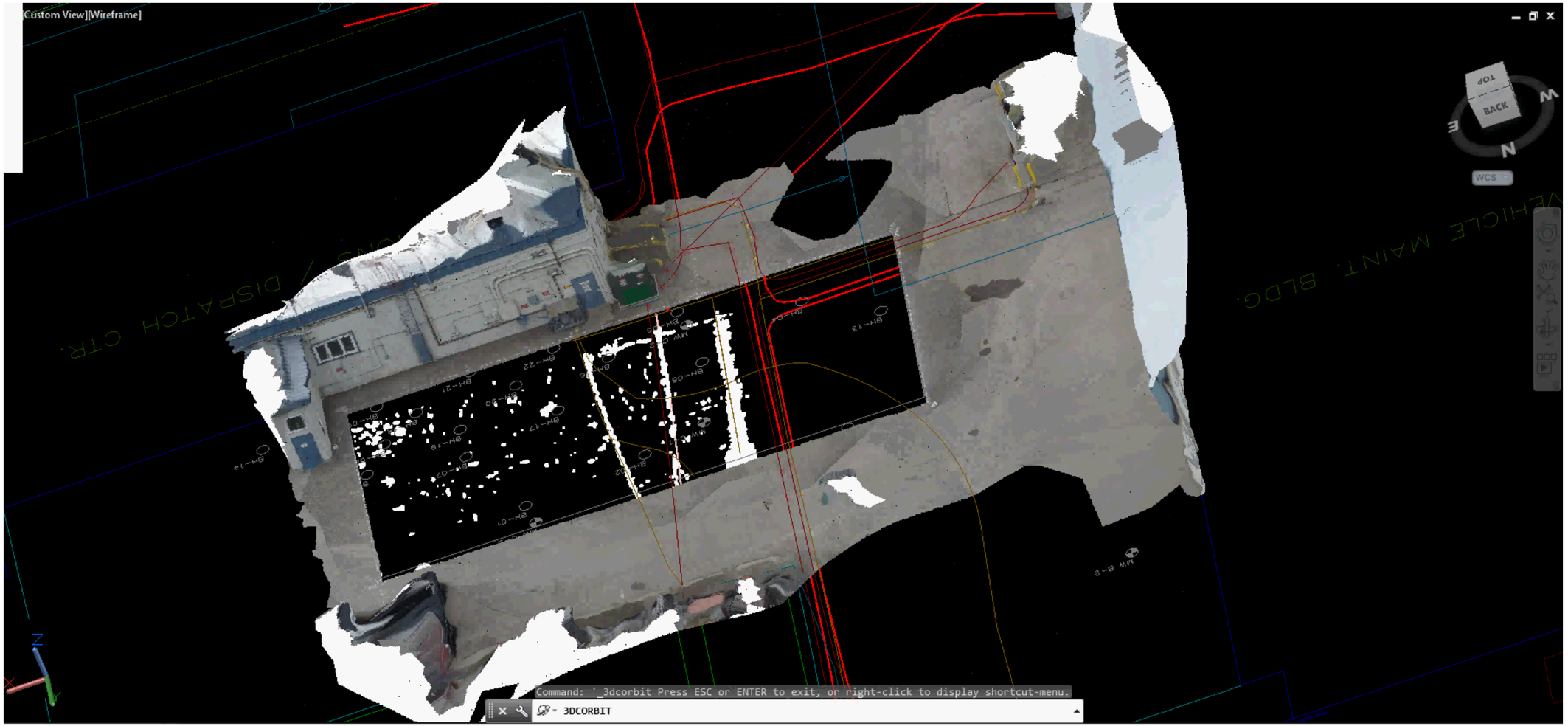


6
10/8MTLNG-204
36th ave Denali
11/10/2016 18:12:2
Locate Data
Mode : ACTIVE
Frequency : 9 00Hz
Log : 18
Antenna Mode : PEAK
Compass Angle : 1deg
Depth : 165(cm)
Fault Find Signal : 0.00dBµV
Current : 1.49mA
CD Phase : 0.00deg
Sig Strength : 41.3%
Gain : 86dB
GPS Mode : INTERNAL
MRX Data
Type : OFF
Signal : 0.00dBµV
Depth : 0(cm)
Gain : 0dB
Directions: To here - From here

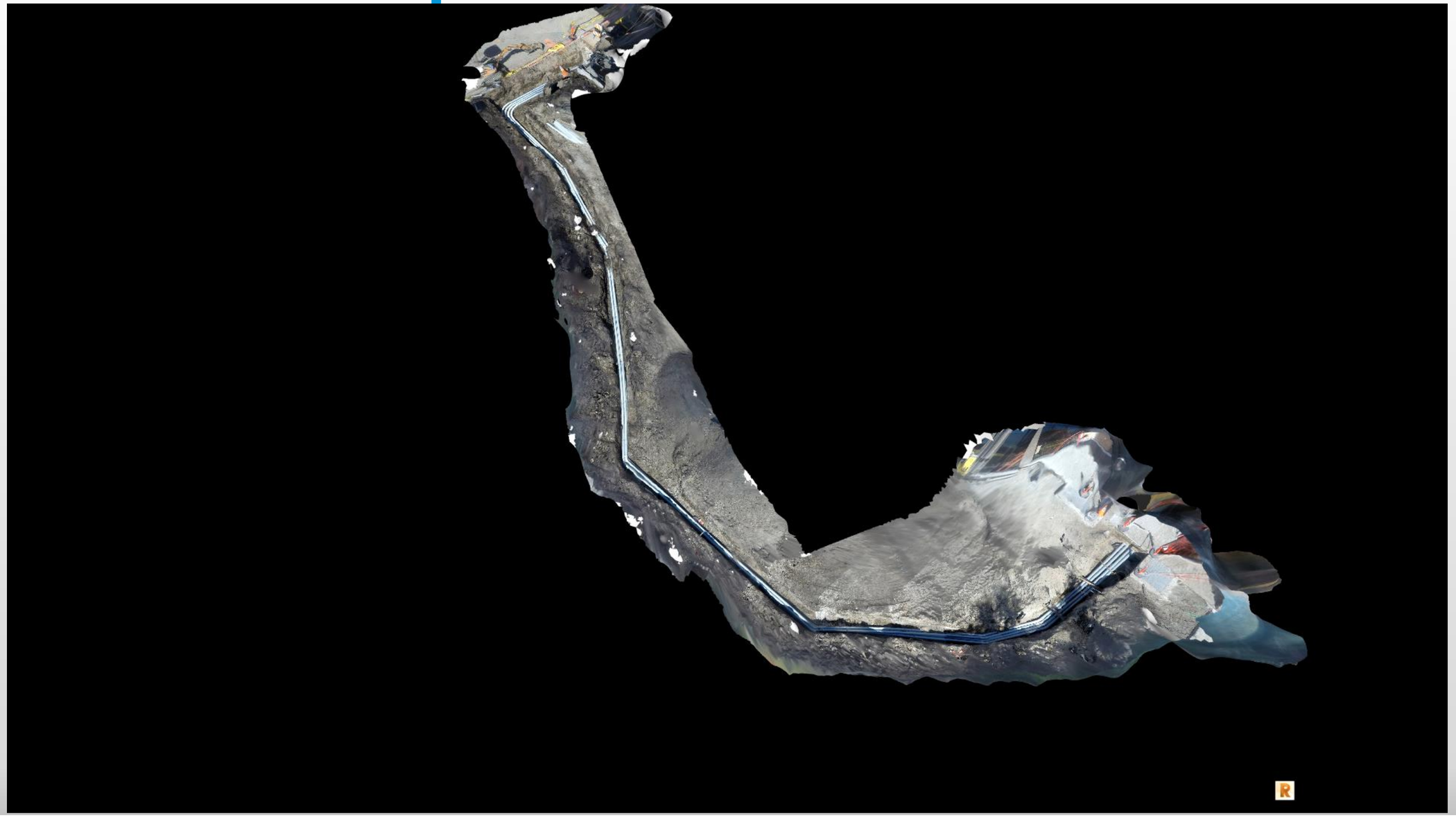
Imported Locates



Underground locates aggregated

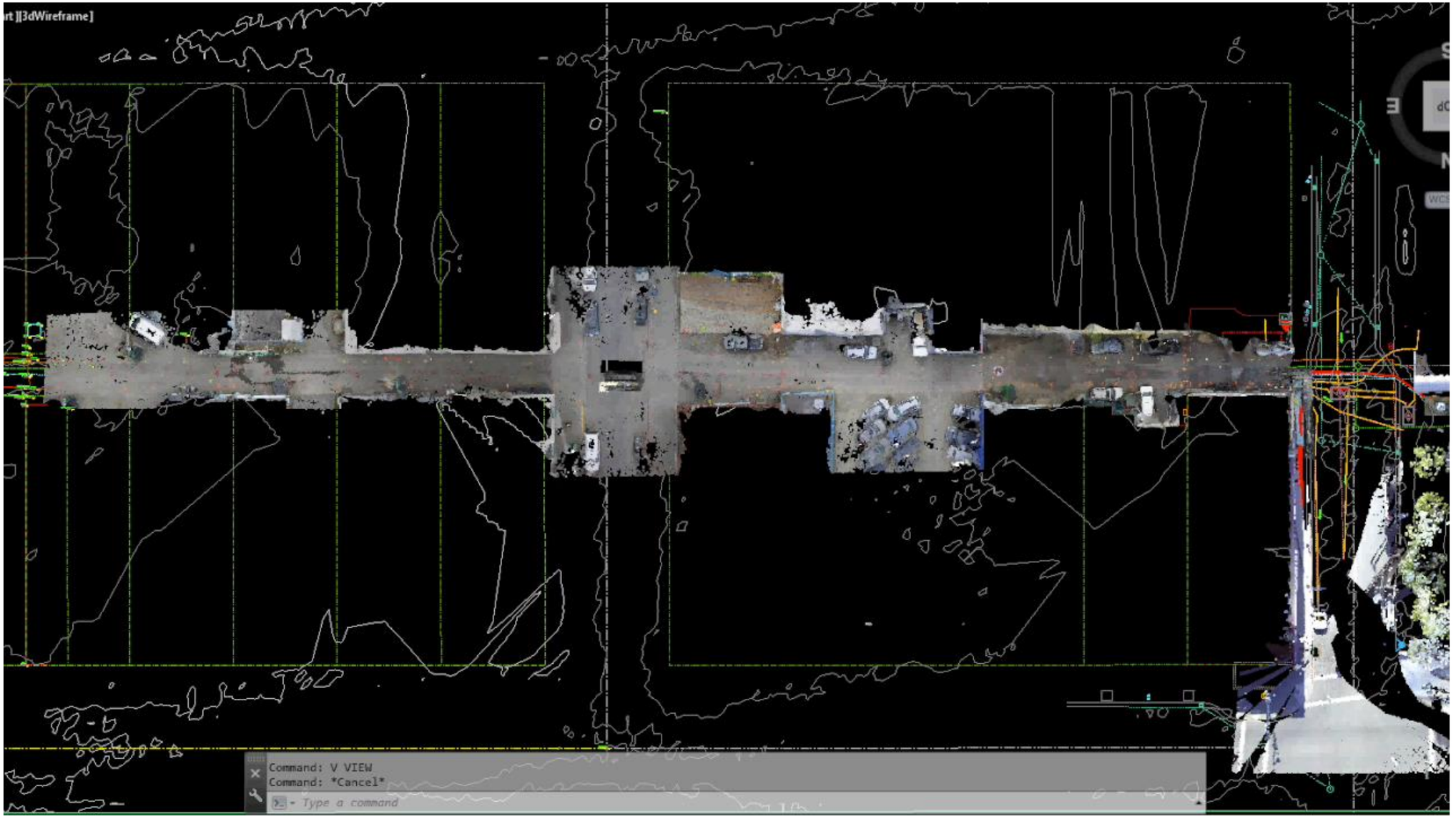


How do we capture it? And how do we use it?

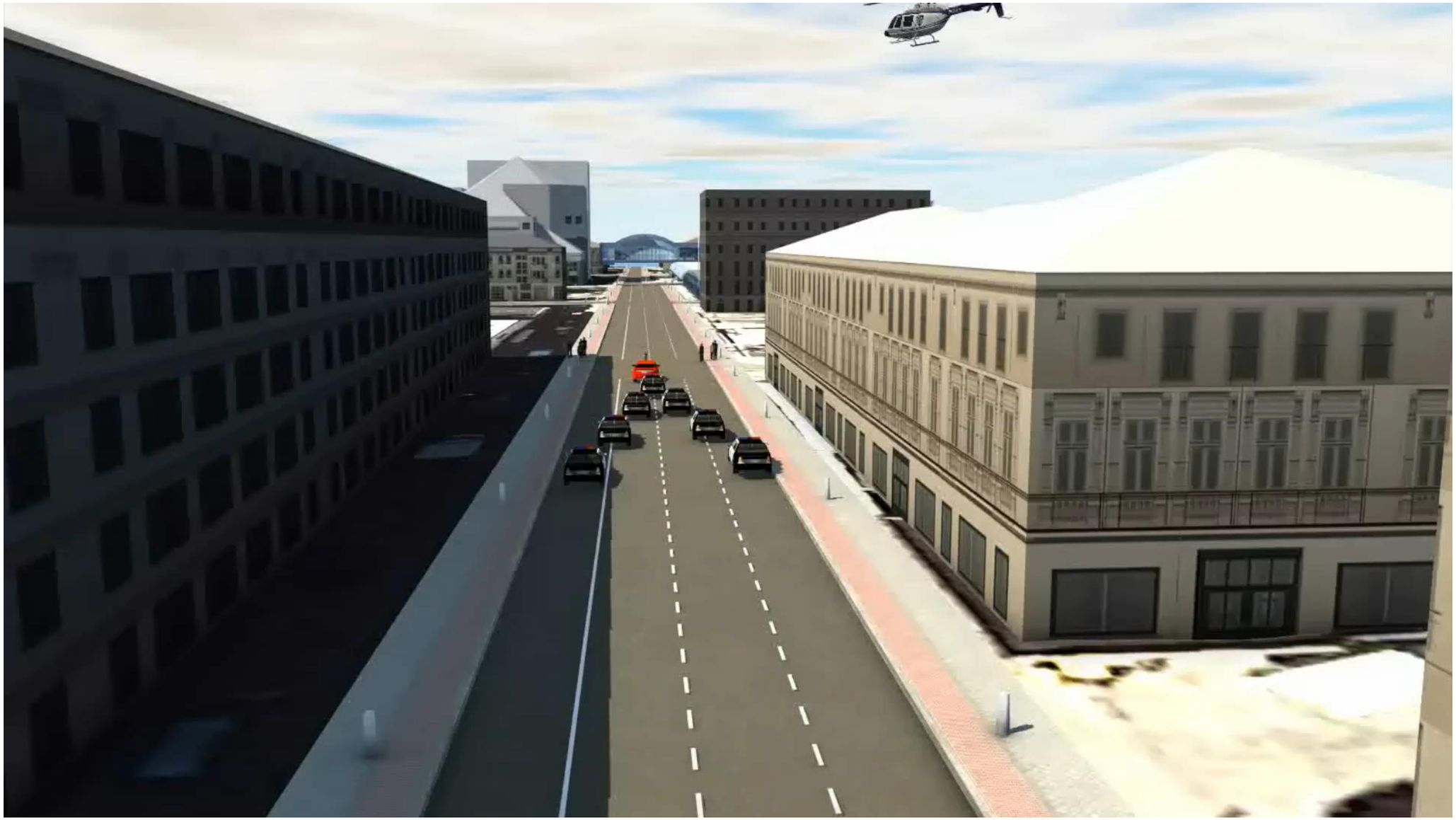


Visualizing design

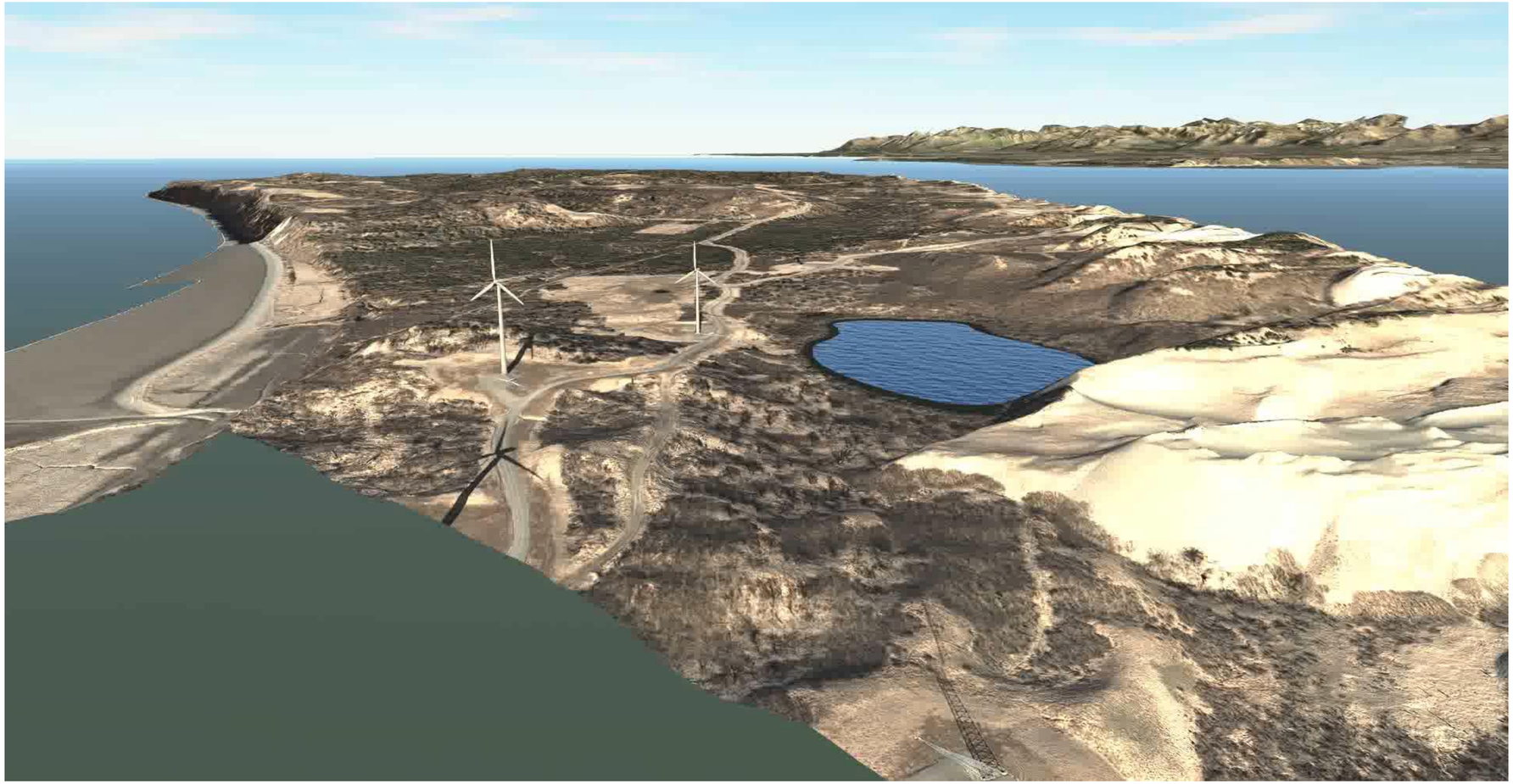
Aggregating point clouds



Use IFW for demonstration

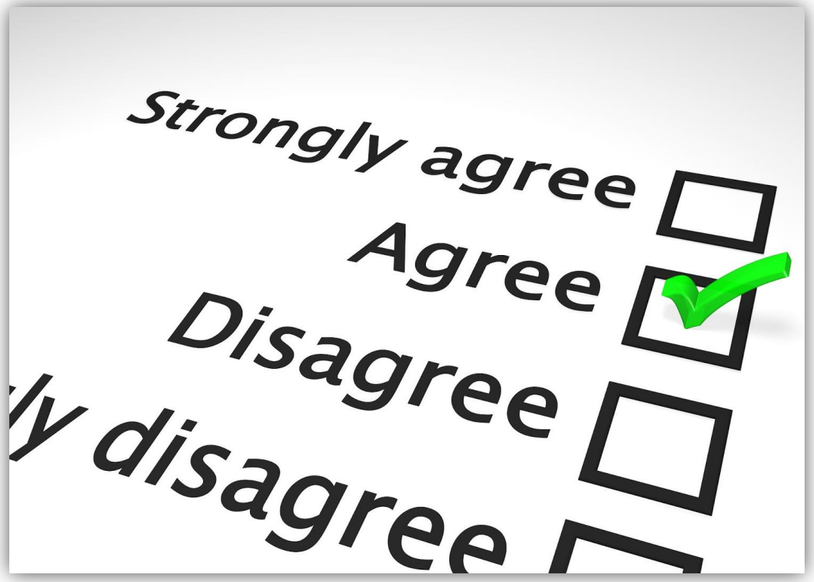


The big picture



How did I do?

- Your class feedback is critical. Fill out a **class survey** now.
- Use the AU mobile app or fill out a class survey online.
- Give feedback after each session.
- AU speakers will get feedback in real-time.
- **Your feedback results in better classes and a better AU experience.**



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