Reality Capture: Make it Work for You

Bringing the Remote World to Your Desktop using Reality Capture Technology

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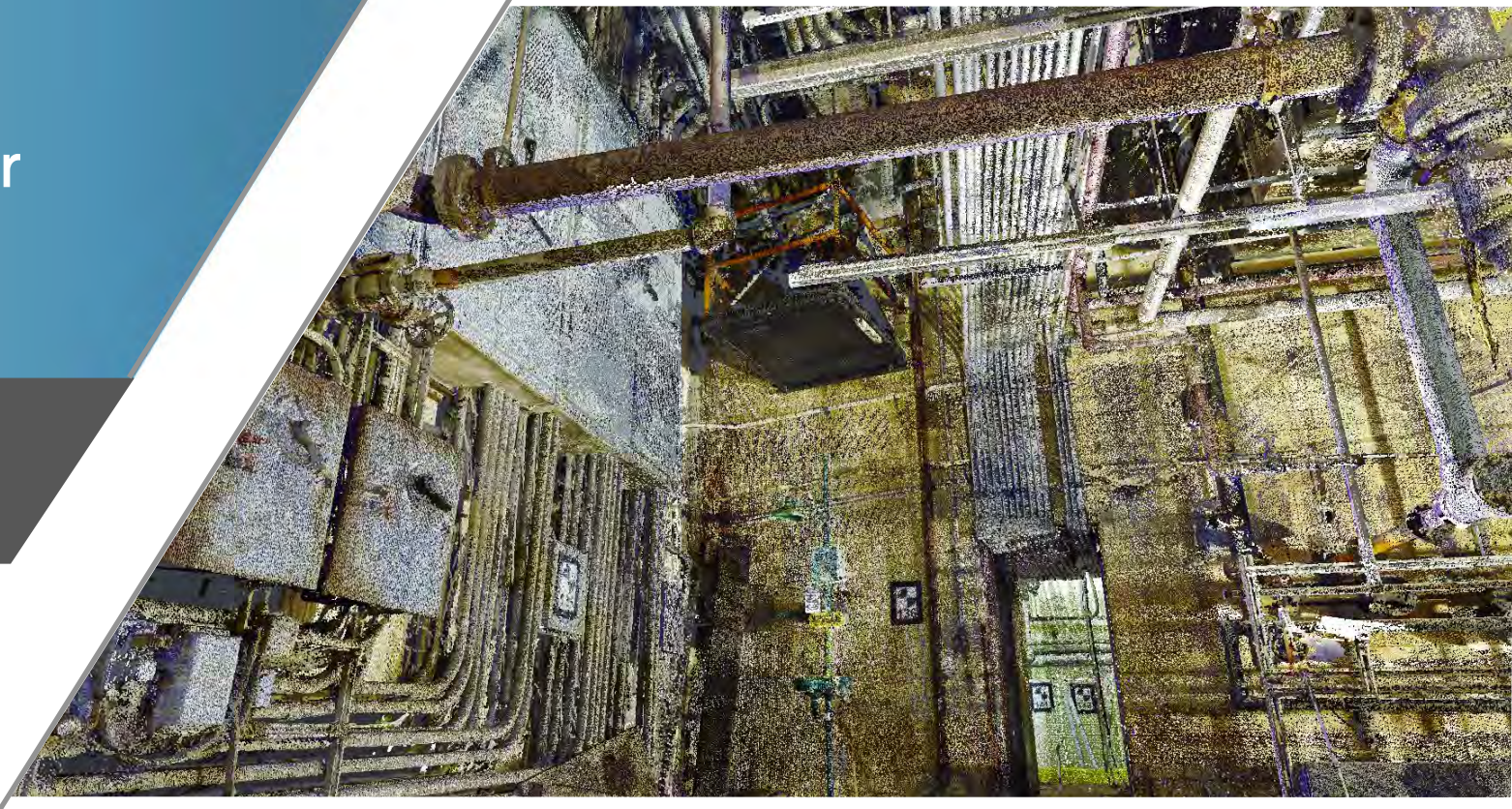


Presentation Overview

Introduction/Context

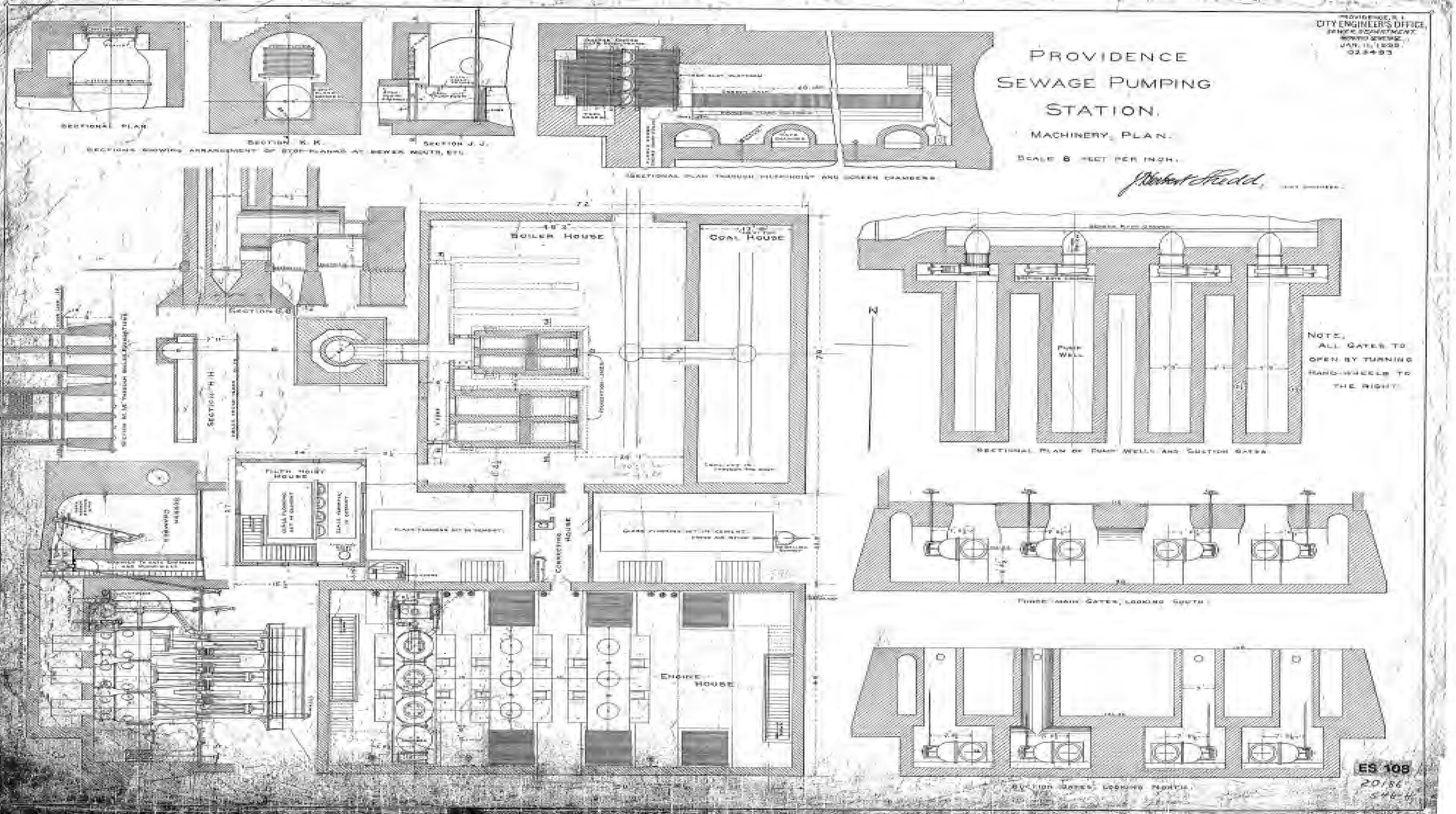
Define “Reality Capture”

Provide overview of Reality Capture technologies

- Terrestrial
- Aerial
- Underwater
- Mobile survey technologies

Present examples of applications of reality capture technologies

Discuss the benefits and uses of the technology on various projects


PROVIDENCE
SEWAGE PUMPING
STATION.
MACHINERY PLAN.
SCALE 8 FEET PER INCH.
CITY ENGINEER'S OFFICE
SECTIONAL PLAN
SECTION K.K.
SECTION J.J.
SECTIONAL PLAN THROUGH FILTH HOIST AND SCREEN CHAMBERS.
BOILER HOUSE
COAL HOUSE
SECTION G.G.
SECTION H.H.
FILTH HOIST HOUSE
CONNECTING HOUSE
ENGINE HOUSE
PUMP WELL
N
NOTE,
ALL GATES TO
OPEN BY TURNING
HAND-WHEELS TO
THE RIGHT.
SECTIONAL PLAN OF PUMP WELLS AND SUCTION GATES.
FORCE MAIN GATES, LOOKING SOUTH.
SUCTION GATES, LOOKING NORTH.
ES 108

What is Reality Capture?

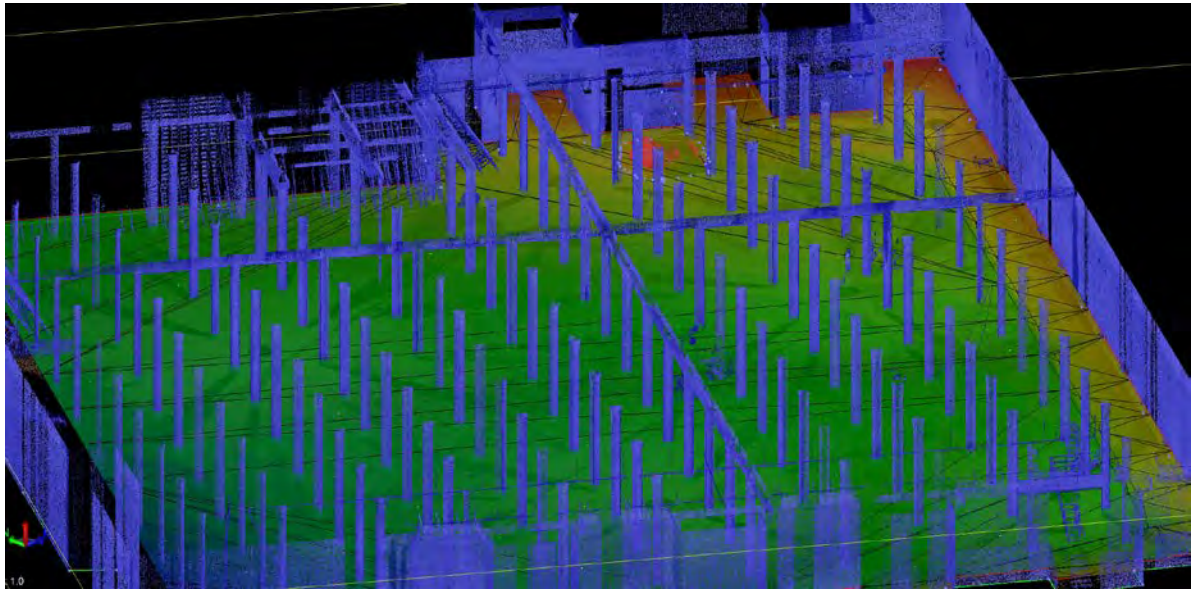
Using digital hardware and software technology to quickly and cost-effectively make an accurate record of existing surroundings for design, construction, and related purposes.

Data Collection

Photos

Videos

Point Clouds



Data Collection

- Topographic mapping
- Orthomosaic mapping
- Thermal Imagery

360° Panorama and Immersive Environments

Capture Technologies

Terrestrial vs Mobile

Terrestrial Capture

- Record existing conditions of vertical structures and their surroundings.
- Requires a team to physically move a unit from point to point
- Obtains detailed X, Y and Z point data

Bridge Scan

Intersection Survey

Mobile Capture Technologies

- Vehicle Mounted Mobile Mapping
- Remote-Controlled Devices “Drones”
  - Aerial
  - Nautical
- Non-Vehicle Mounted Mobile Systems

Vehicle Mounted Mobile Mapping

Remote-Controlled Devices (“Drones”)

Types: Aerial (UAV) and Nautical

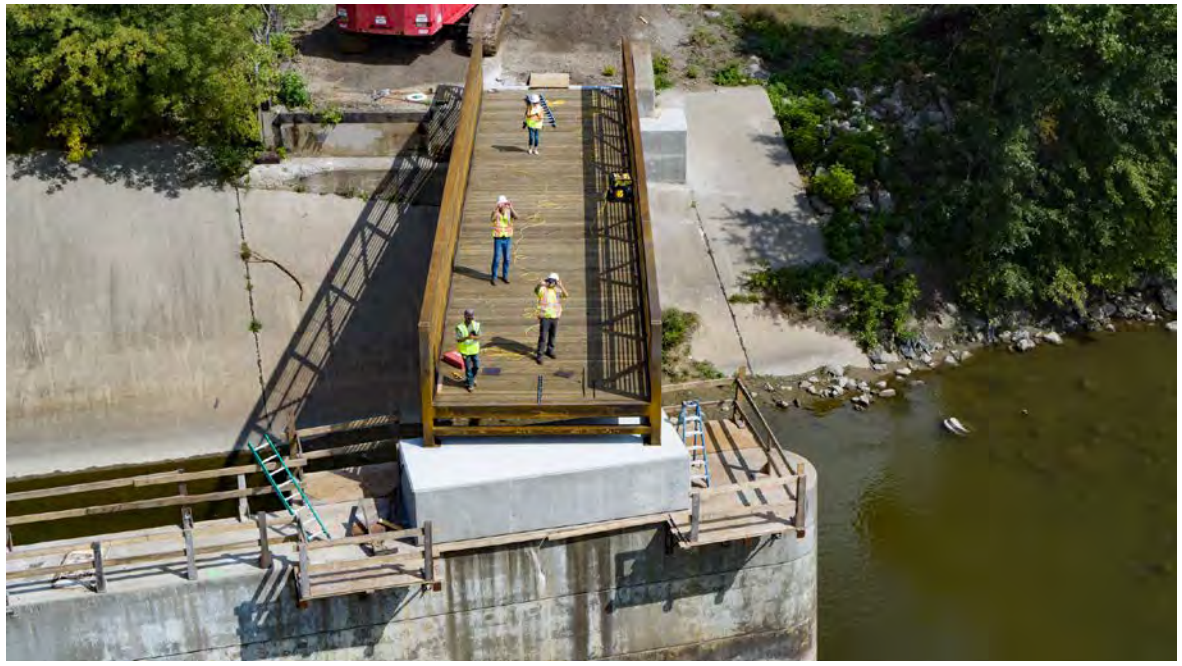
Uses: Inspection, design, mapping

Aerial Drone Equipment

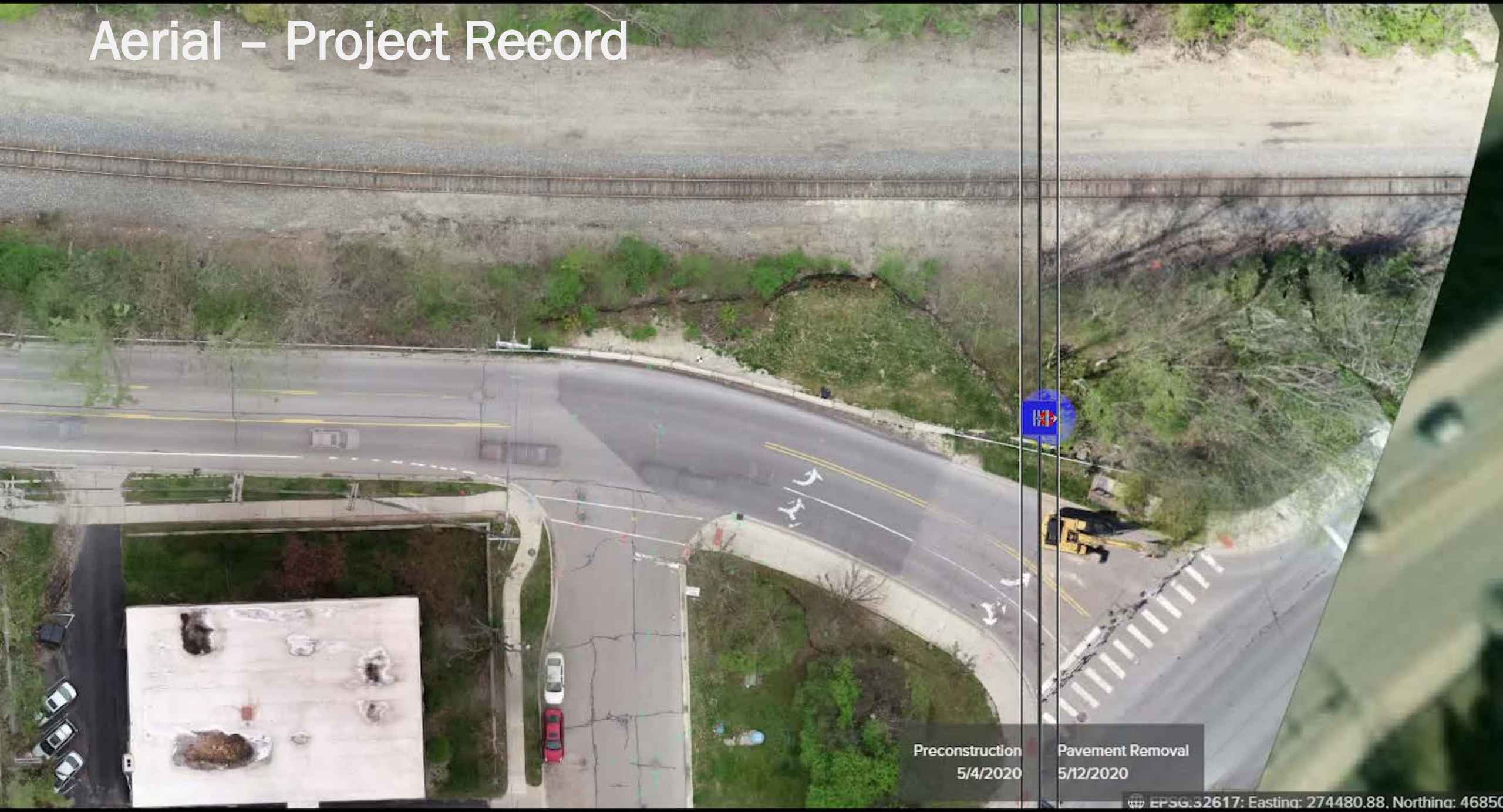
DJI Phantom 4 Pro RTK

Propeller Aeropoints

Aerial Capture

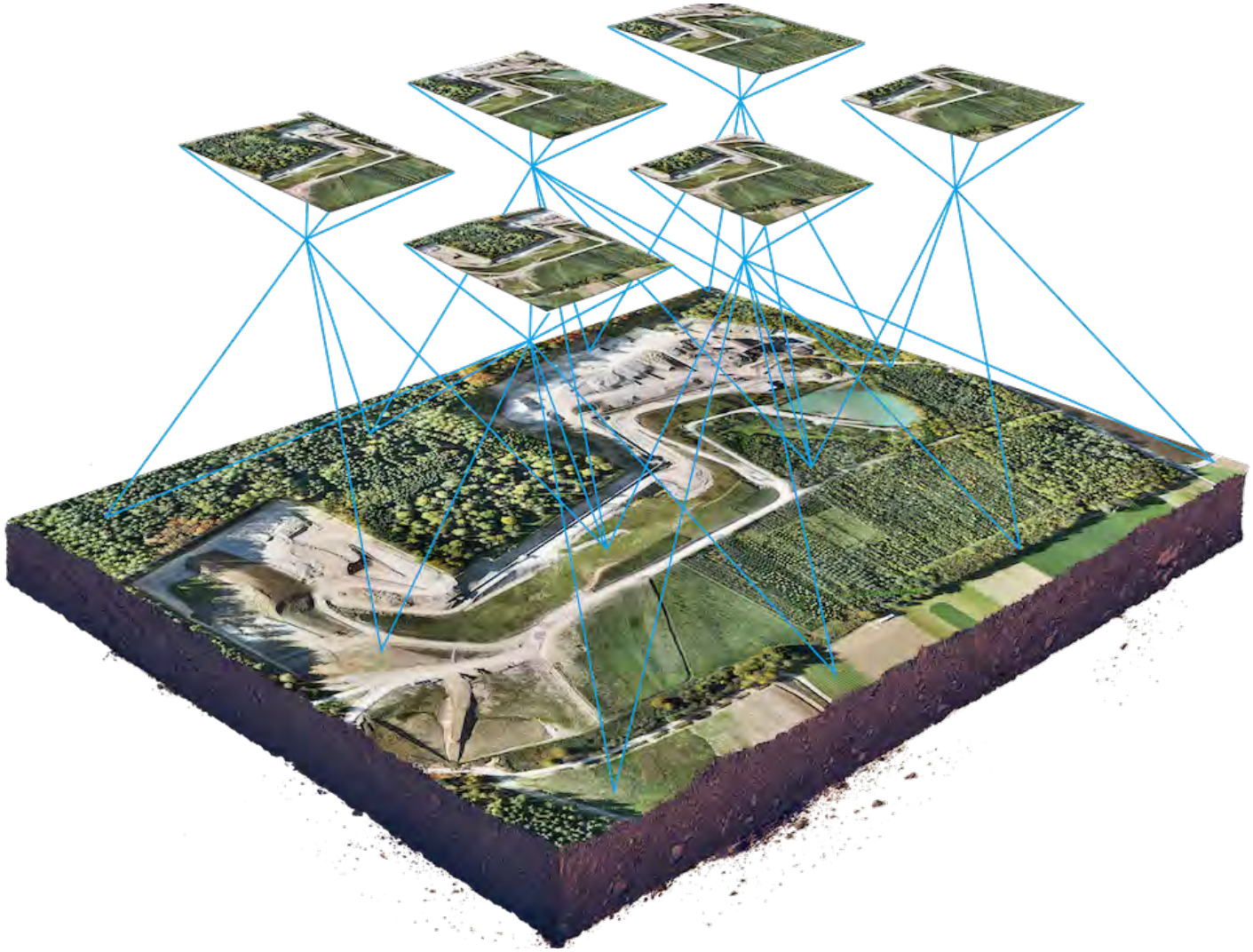


Aerial – Project Record



Aerial Capture – 2D Visual Photogrammetry

- Mapping
- GIS
- Design Applications



Aerial Capture - 3D

- Site Contours
- 3D Point Cloud
- 3D Textured Mesh

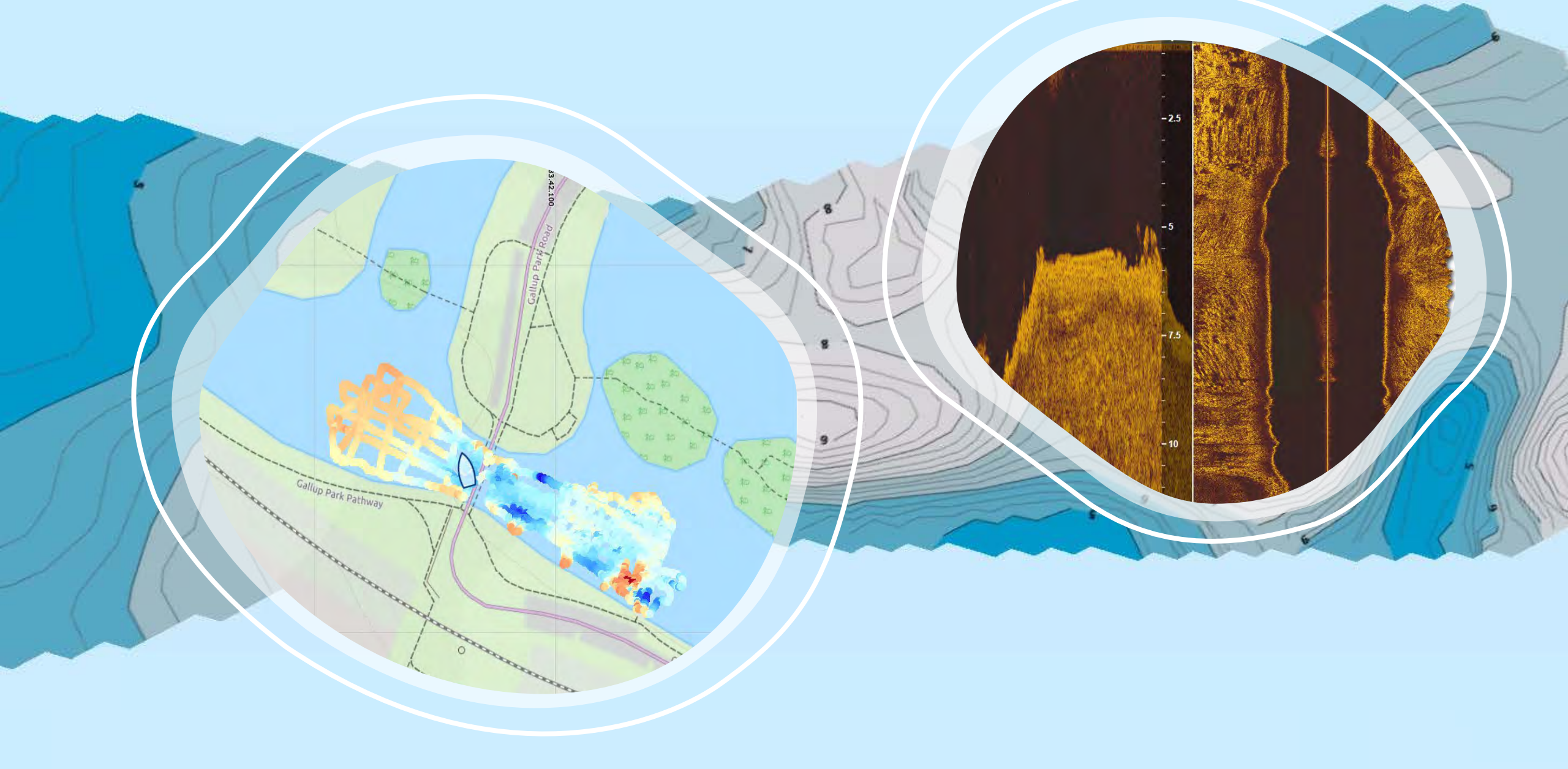
Aerial Capture – 4K

- Project Progress
- Inspection
- Design Consideration
- Community Outreach

Nautical Drones

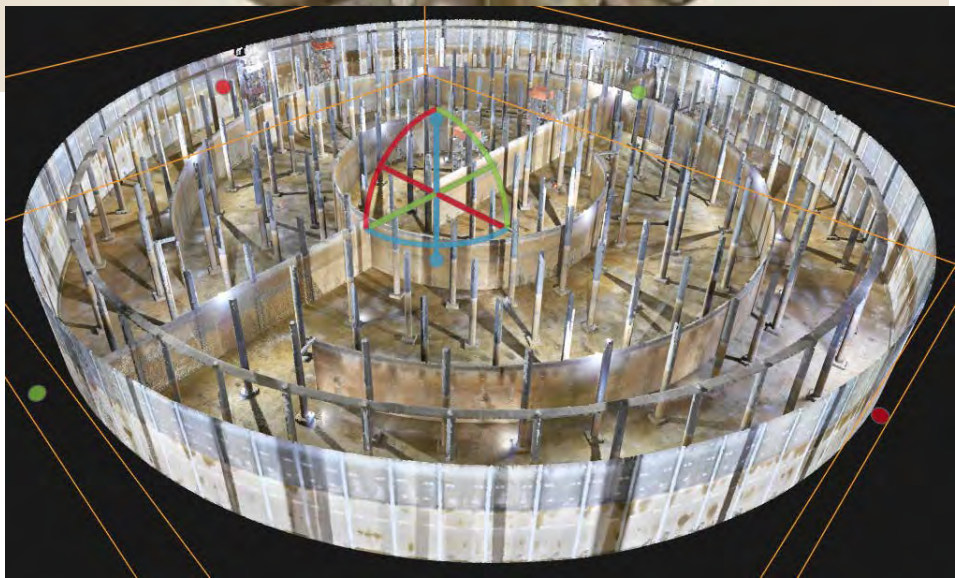
- Capture topographic data below the water surface
- Digitally record depth, distance, temperature
- Bring 3D data into design

Nautical Capture and Investigation



Indoor Non-Vehicle Mounted Mobile Capture

- Devices used to record existing conditions of vertical buildings and their surroundings
- Best for indoor use, though can be used outdoor
- Capture 80,000+ sf in 4 hours



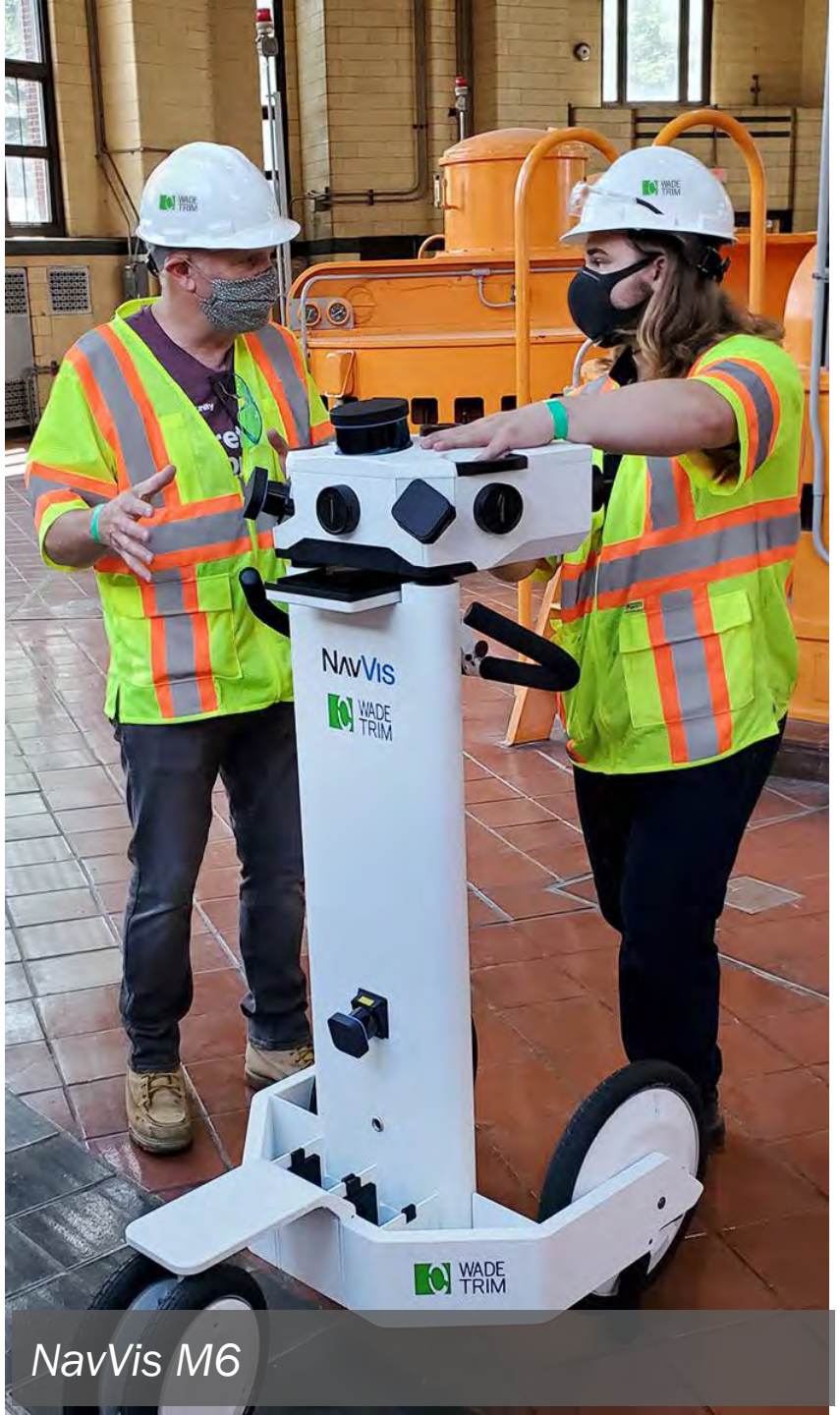
Non-Vehicle Mobile Capture Devices

Cart

- Roll-able capture device
- Facilities larger than 50k sq ft
- Moderate scanning of outdoor facilities

Pack

- Wearable capture device
- Mid-sized facilities
- Complex, narrow environments



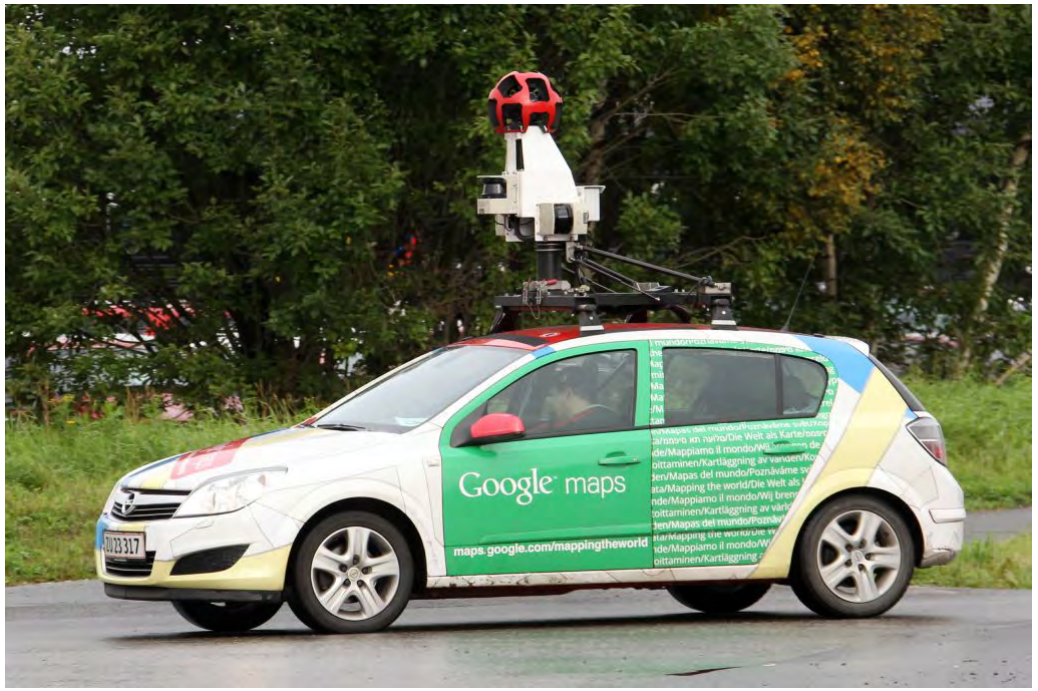
NavVis M6

NavVis VLX

Outdoor Non-Vehicle Mounted Mobile Capture

“Spherical Imagery”

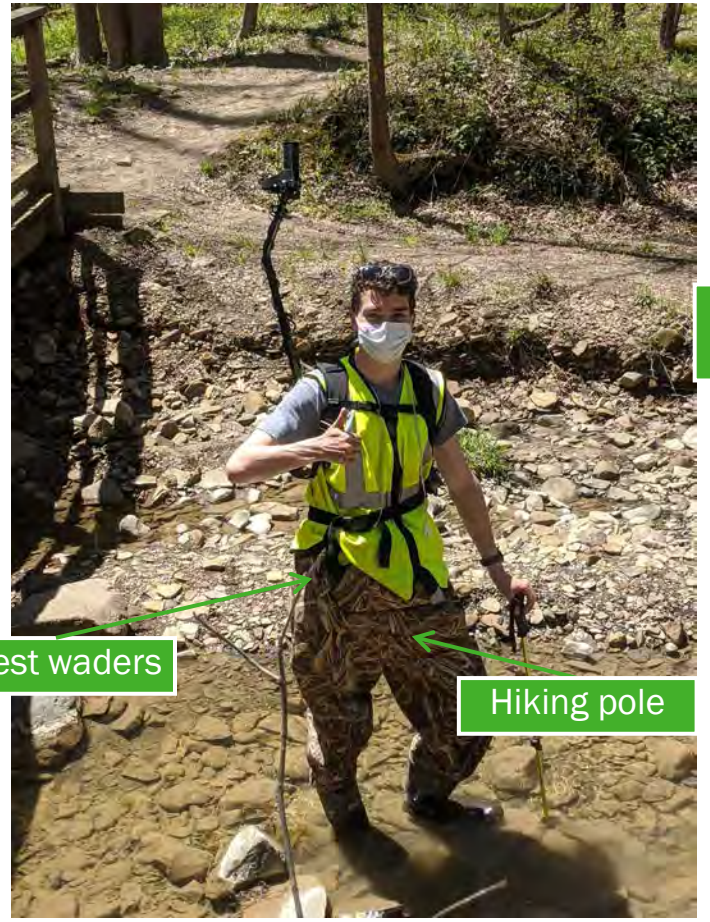
- Modular Immersive Mapping System (MIMS)
- Common data source: Google Streetview
- Linear infrastructure
  - Streams
  - Transmission lines

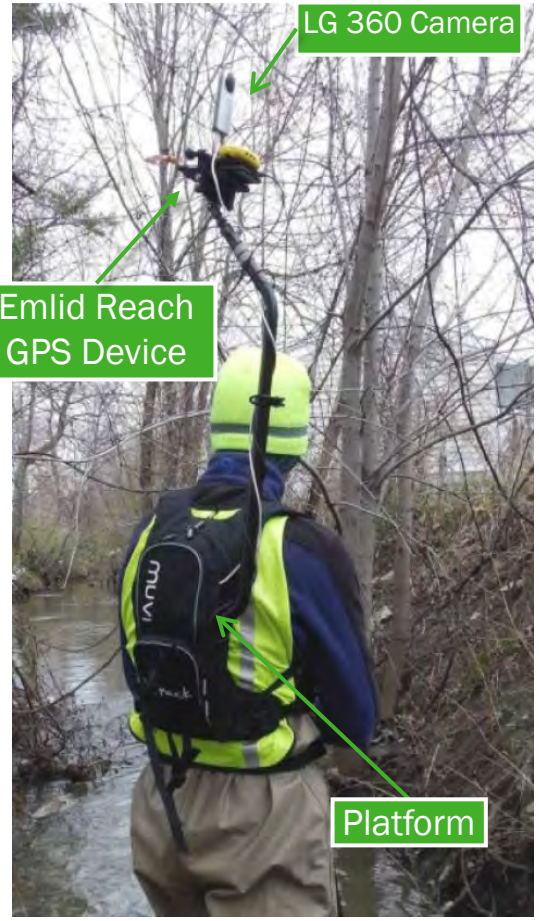


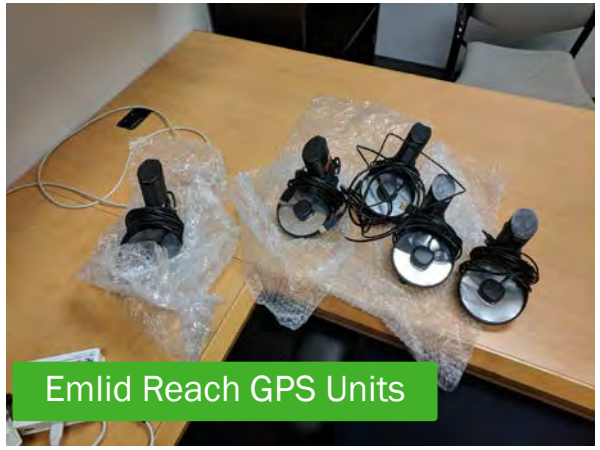
Equipment and Components

Main Components for Data Collection:

- Platform – ‘vehicle’ of collection (backpack, kayak, automobile etc.)
- LG 360 Camera
- Positioning device – GPS antenna/receiver
- Time source – android phone







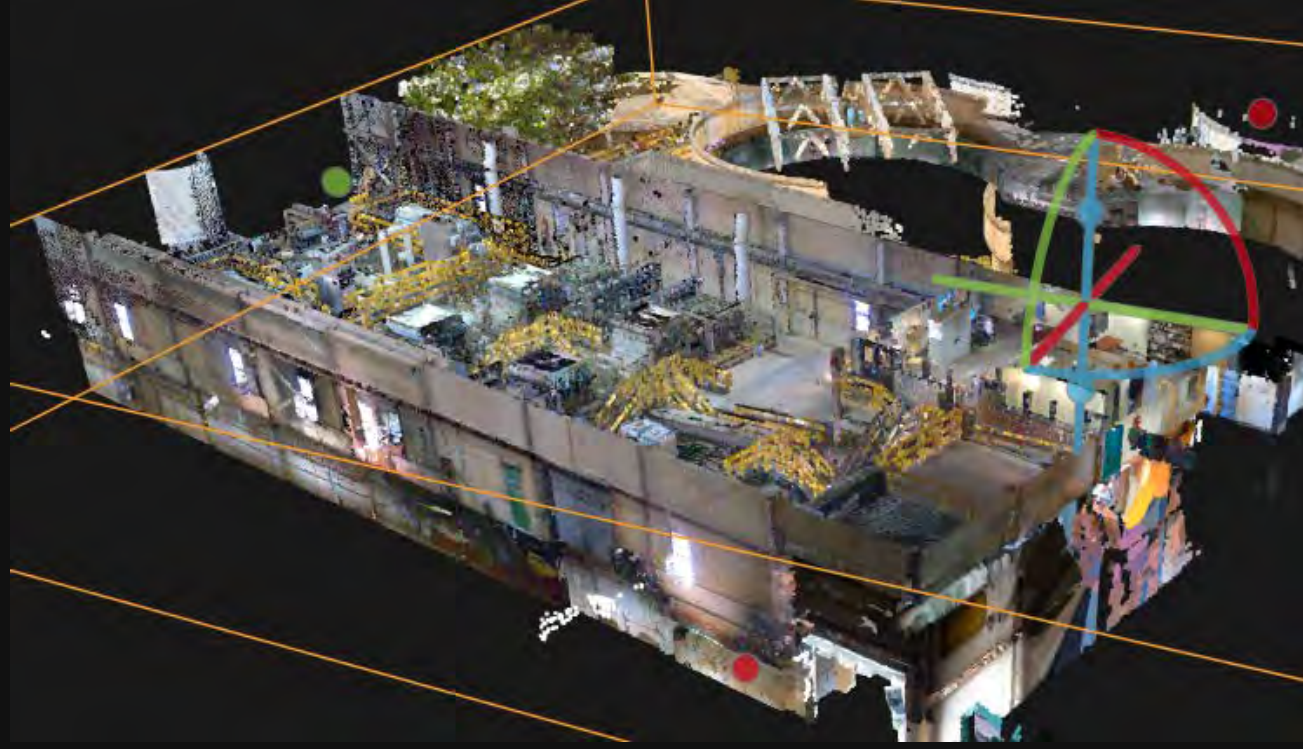
Integrated Reality Capture

Point clouds

High resolution images

Control points for survey grade accuracy

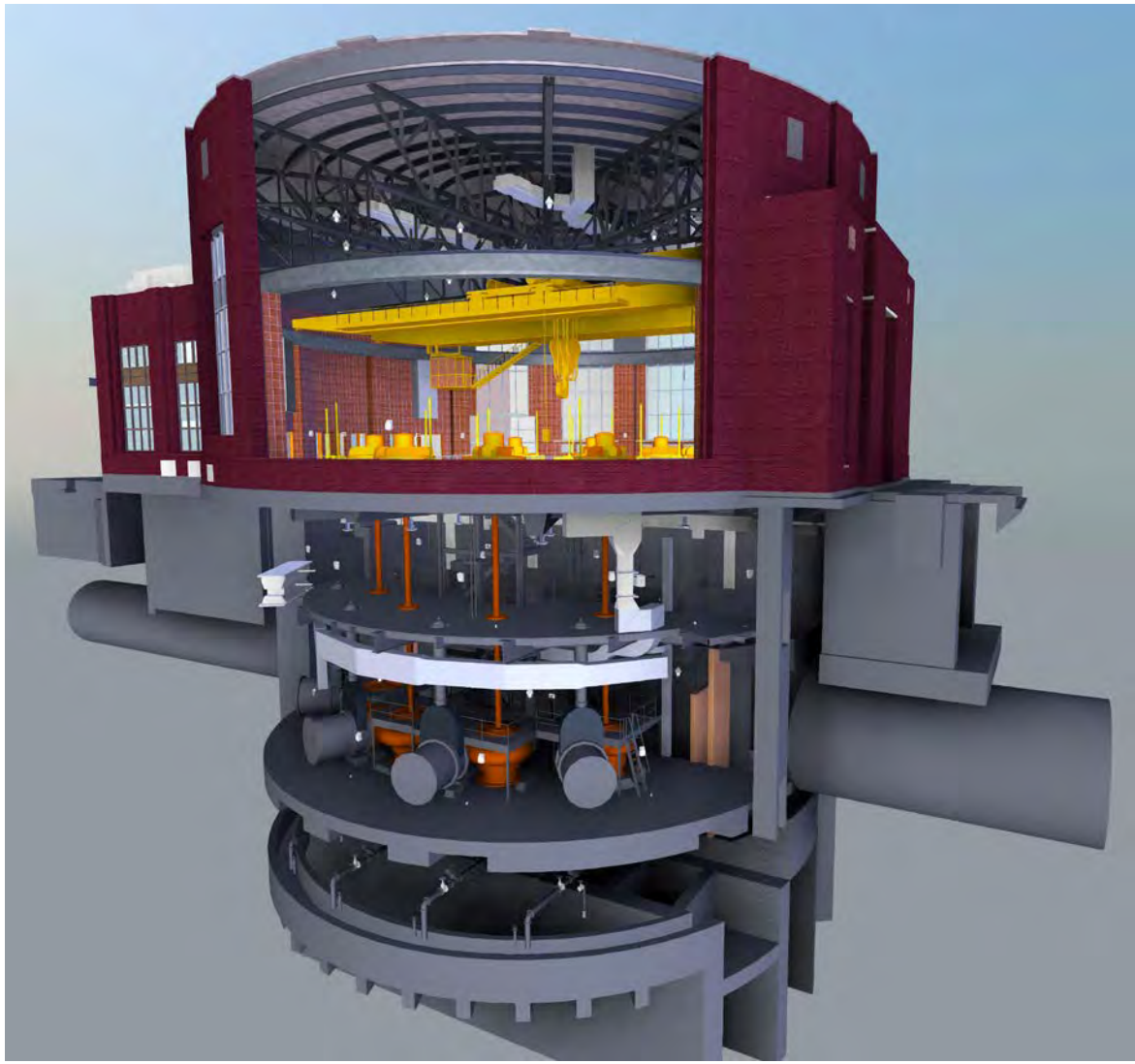
Collaborative software



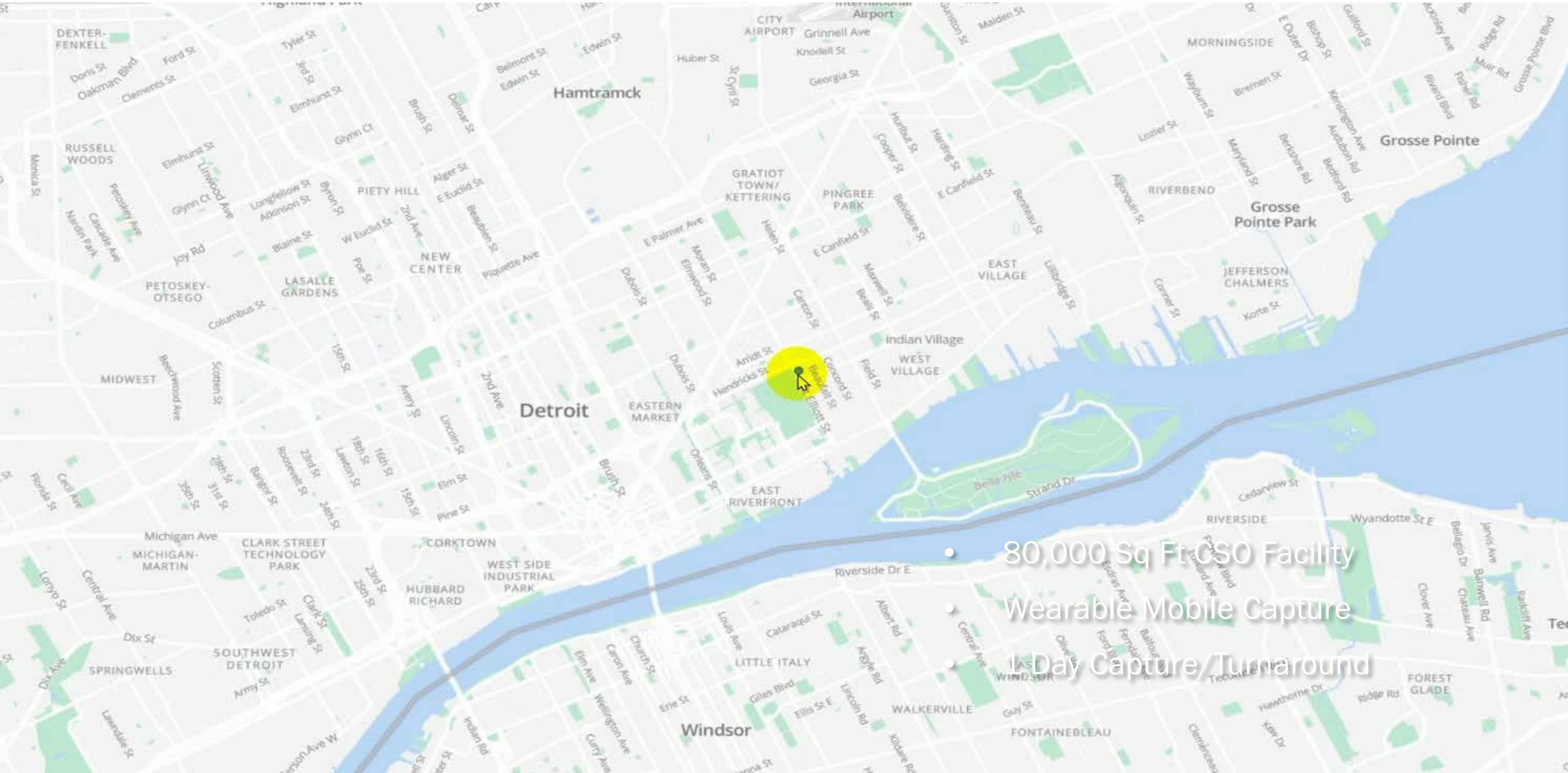
Application Examples

Application Examples

- **Large Sewer / Condition assessment**
- **Water Storage Tank / Concrete repair**
- **Large Pump Station / Interferences**
- WRRF Headworks / Scan to 3D design
- CSO Retention Treatment Basin
  Construction Support
- Stormwater Detention Basin Inspections
  Existing conditions
- Streams – spherical imagery
- CSO Retention Treatment Basin
  Public Outreach

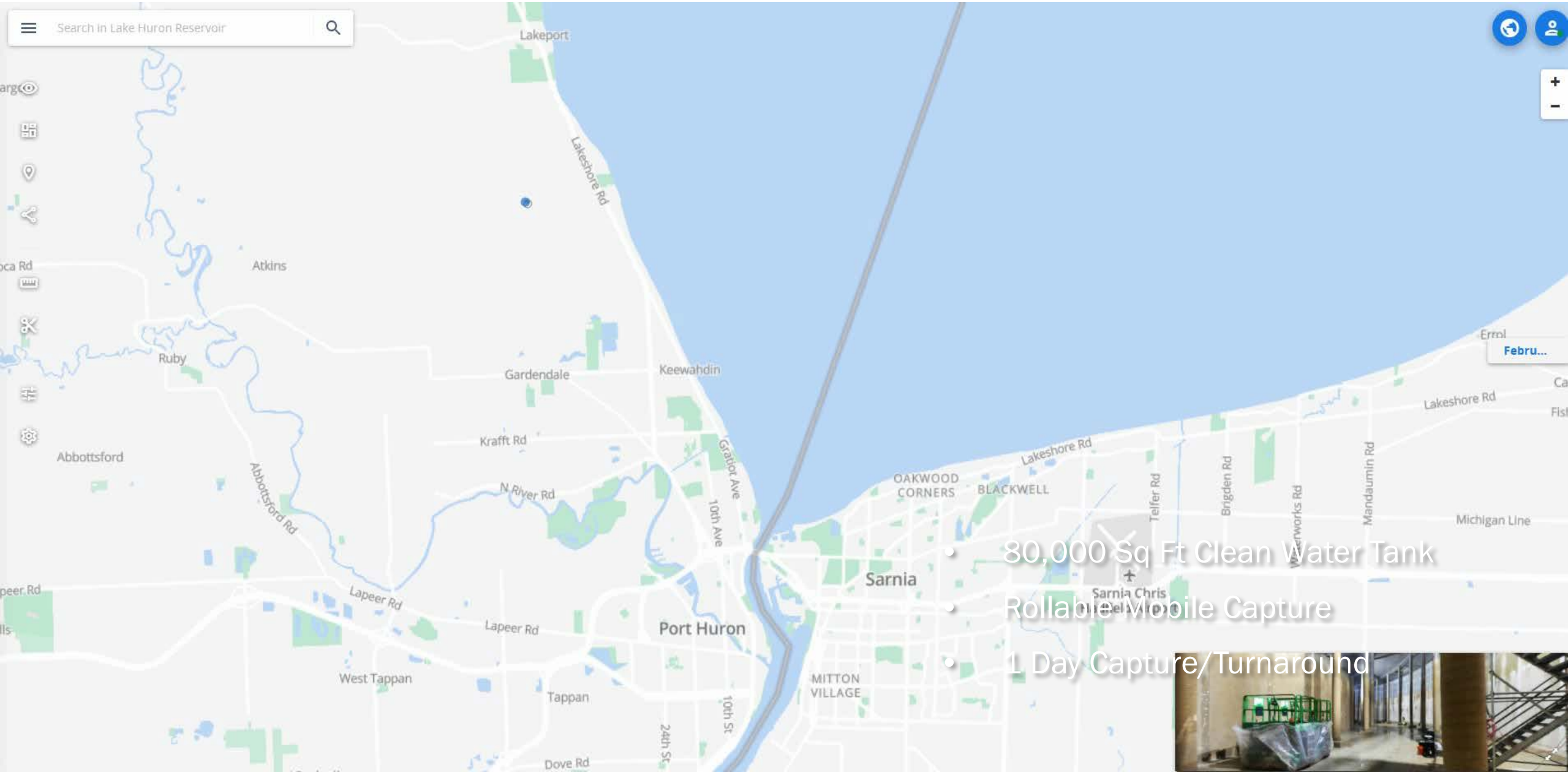


Large Sewer – Condition Assessment



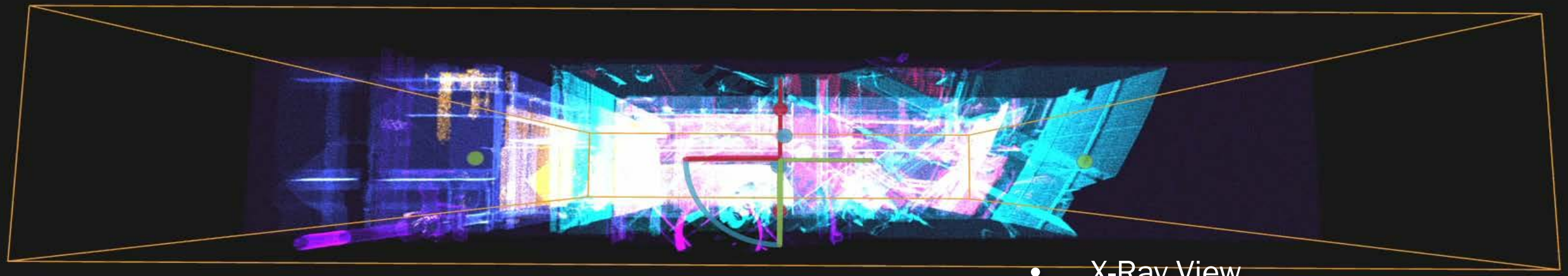
- 80,000 Sq Ft CSO Facility
- Wearable Mobile Capture
- 1 Day Capture/Turnaround

Water Storage Tank – Concrete Repair



- 80,000 Sq Ft Clean Water Tank
- Rollable Mobile Capture
- 1 Day Capture/Turnaround

Large Pump Station - Interferences



- X-Ray View
- 90’ Dia Pump Station
- 2 Day Capture/Turnaround

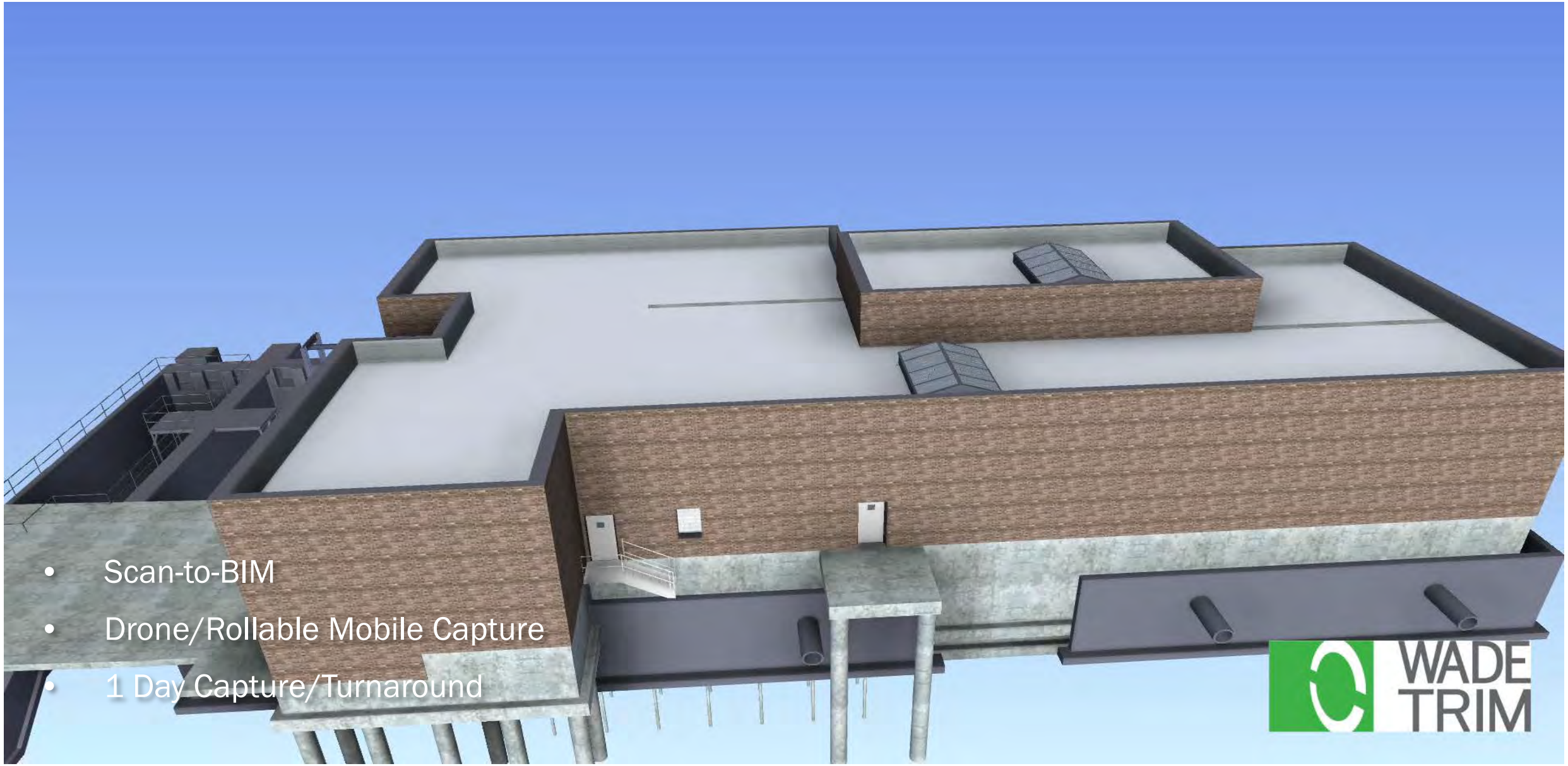
Benefits of Reality Capture Systems

- Indoors or outdoors
- Efficient and speedy capture
- Single, immersive & collaborative cloud environment
- Records in dangerous or difficult to access facilities
- Stakeholder access to “current conditions” remotely
- Asset management and O&M applications

Benefits of Reality Capture Systems

- Yearly subscription to maintain in the cloud
- Download and store offsite for warehousing/archiving
- Data portability

Headworks – Scan to 3D Design Model



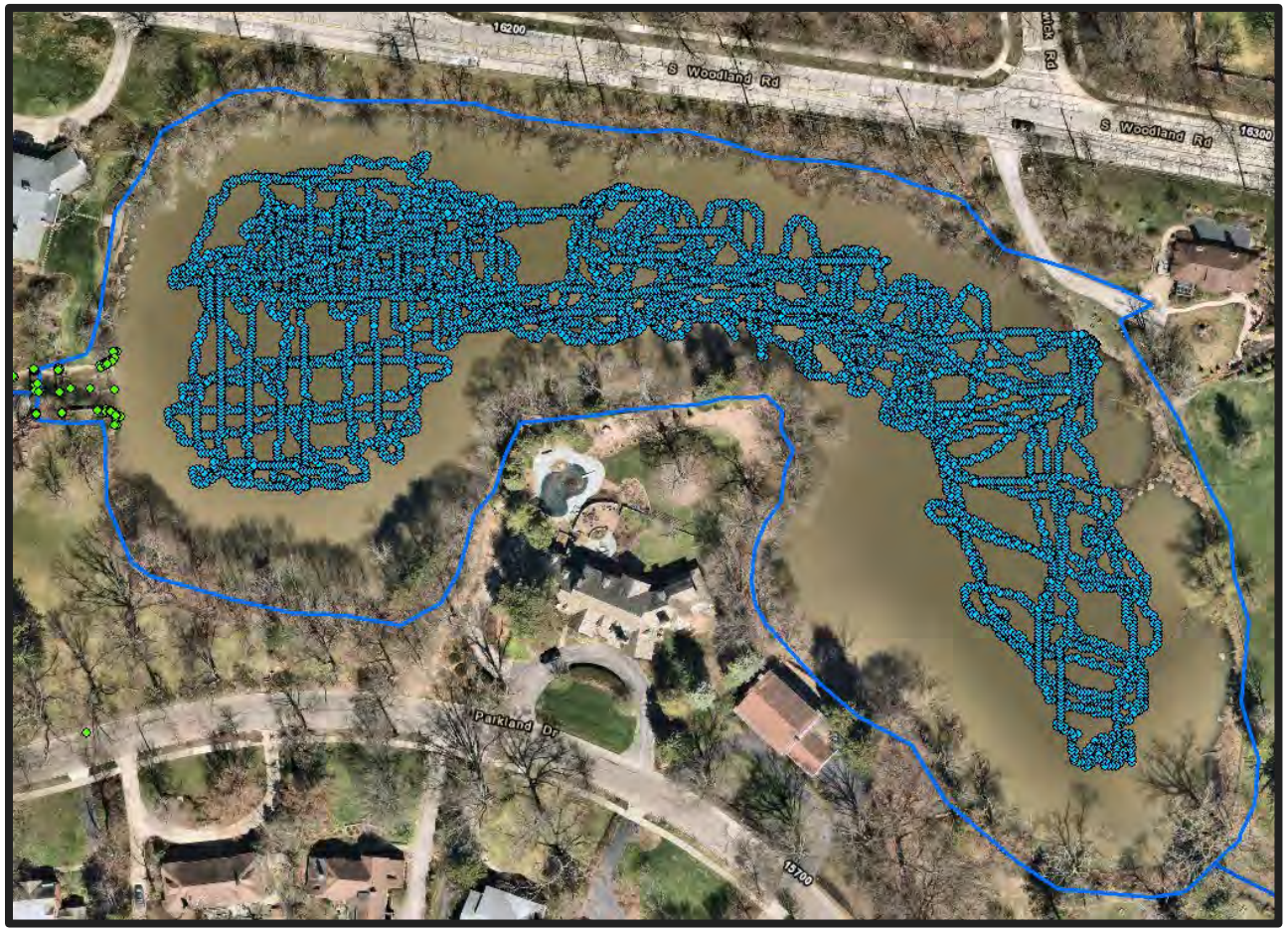
CSO Retention Treatment Basin – Construction Record

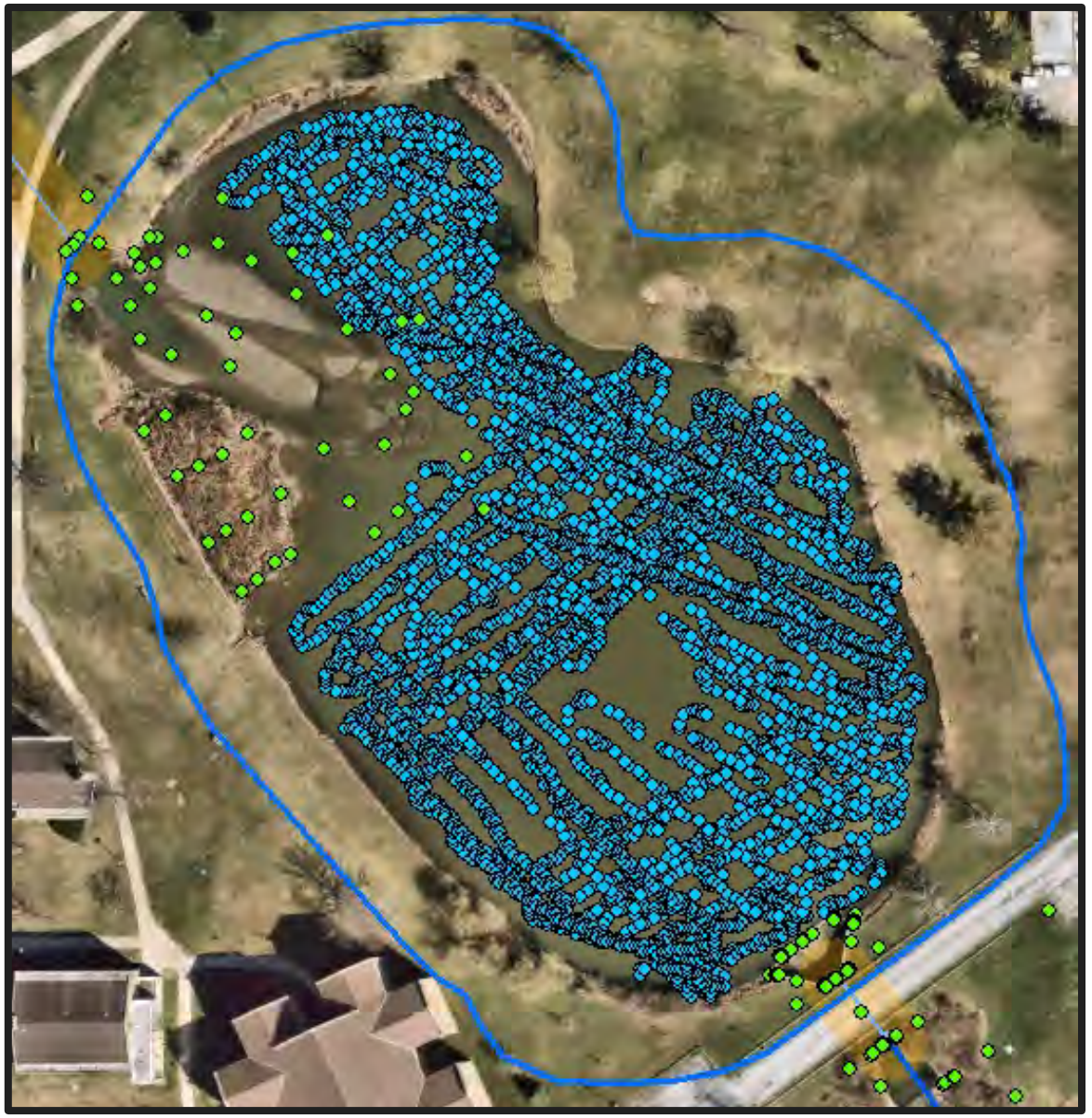
- 3 Million Gallon Basin
- Drone/Wearable Mobile Capture
- 2 Day Capture/Turnaround

Basin Inspections

- Collect bathymetry & aerial data for wet basins

Bathymetry Data Collection





Bathymetry & Aerial Data Delivery

Bathymetry – .csv File

- Comma (or character) separated value

Aerial – LAS converted to Raster file format

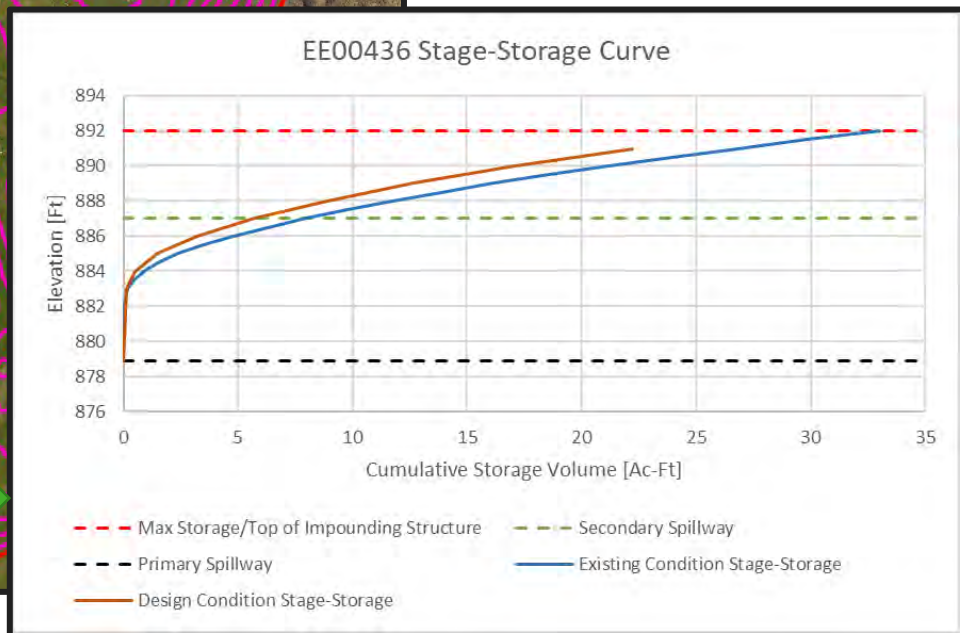
- Examples of Raster file formats can include JPEG and TIFF

Lots of data generated

- Consider “cloud” storage
- Example: www.Pix4d.com

Using Basin Inspection Results

signed” basemap



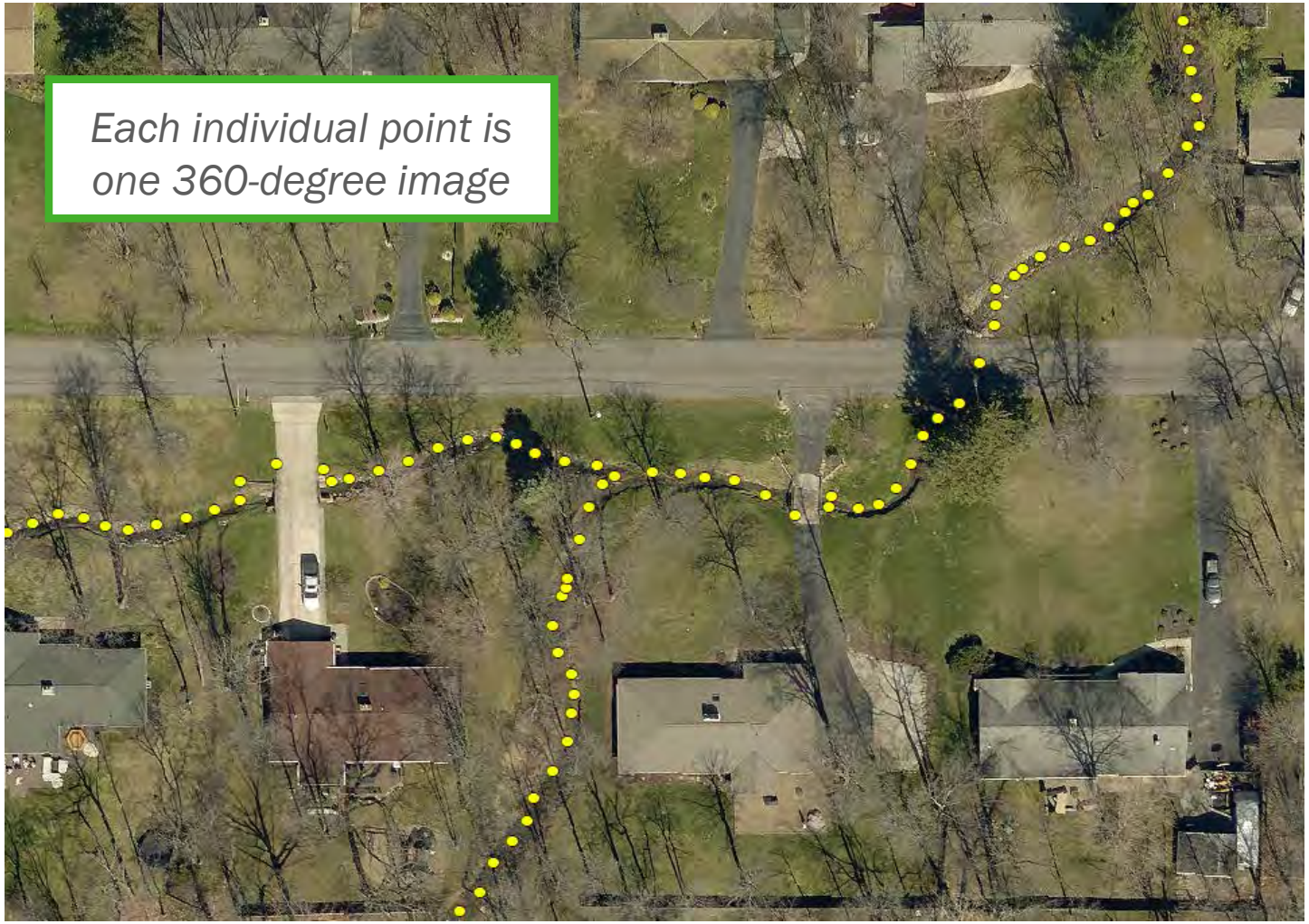
Spherical Imagery

Collection Methods for Streams

- On foot – shallow stream
- UAV Drone – deep streams, high velocities,
- Kayak – deep streams, low velocities

Spherical Imagery Data

- Raw data - individual images and GPS location points
- Final dataset a shapefile
- Images are paired with GPS location data by timestamp

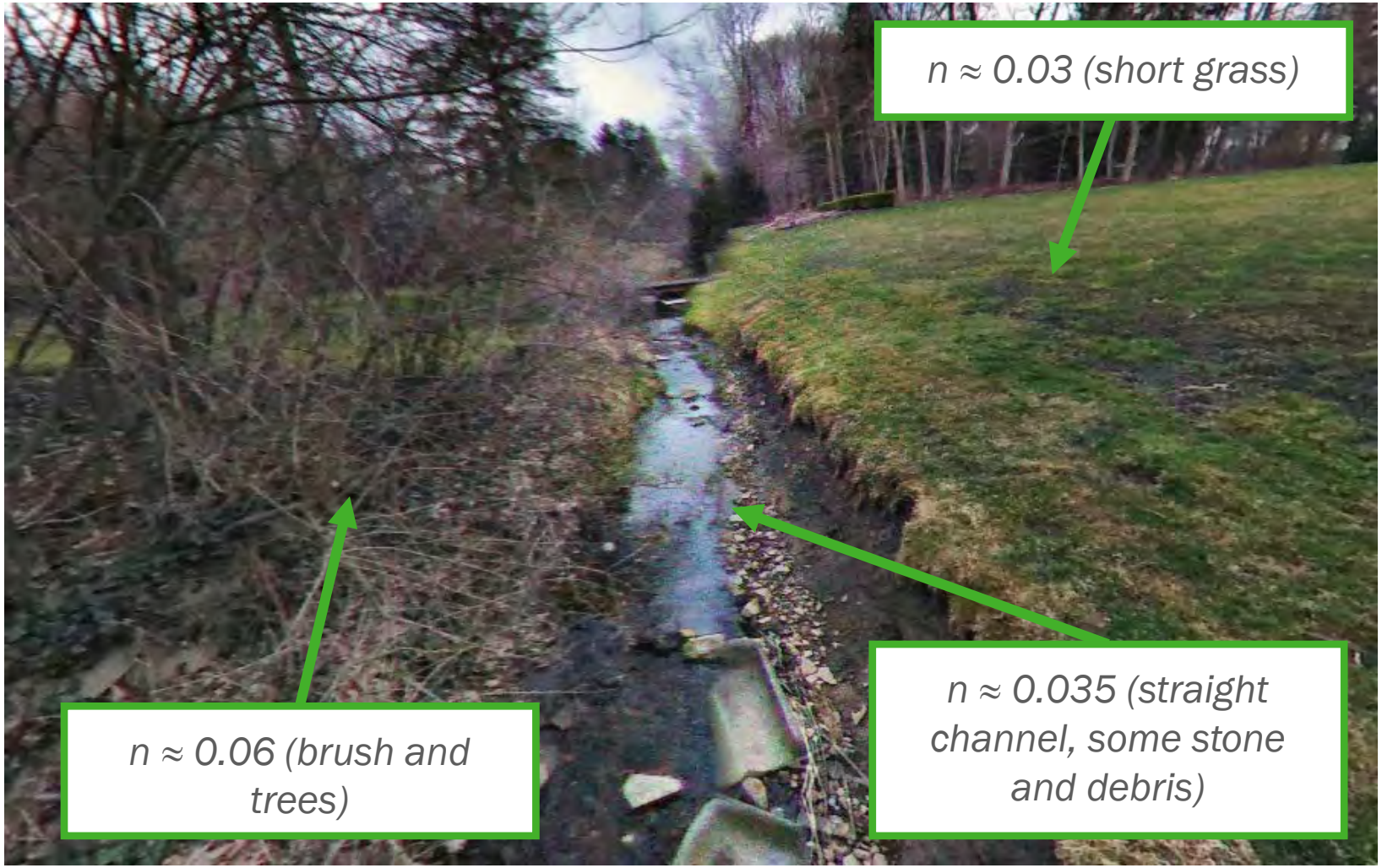


Spherical Imagery Data cont.

- Unprocessed imagery “rolled out” in 2D space
- Processed Imagery hosted online
- Each point has own URL stored in attribute field

Processed imagery: https://dp4479dqtum7u.cloudfront.net/home/WadeTrim/201904/tour1510.html?startscene=313&startactions=lookat(87.47,21.45,140,0,0);

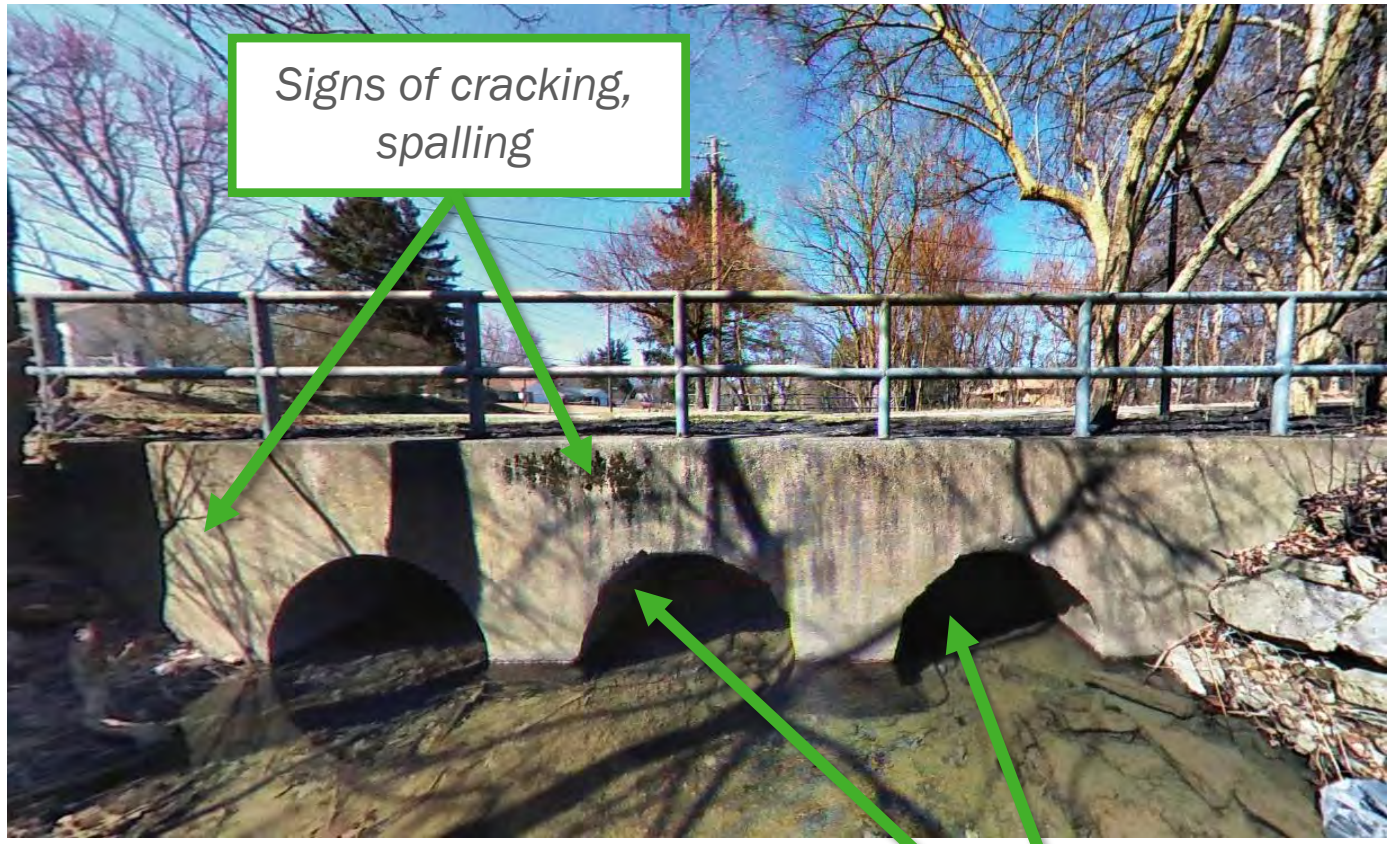
Stormwater Model Development



- Roughness value assignment for stream channel and banks

Asset Inspections

- Preliminary condition assessments for client stormwater assets from desktop



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Questions?

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