



# Ohio UAS Center

UAS Brief

WV Workshop

April 7th, 2022

## Ohio UAS Center

David Gallagher, Flight Operations Manager



# About the UASC

- Formed in 2013
- ODOT
  - Support and conduct UAS operations within ODOT
  - Develop UAS policy and procedures
  - Review proposed UAS operations for ODOT contracts
- External (Shared Resource)
  - Support state and federal agencies as well as state universities
  - Promote the safe and proper use of UAS throughout the state
  - Reduce redundant UAS functions within the state
  - Allow for more efficient use of resources



# Increase Efficiency Save Time & Money

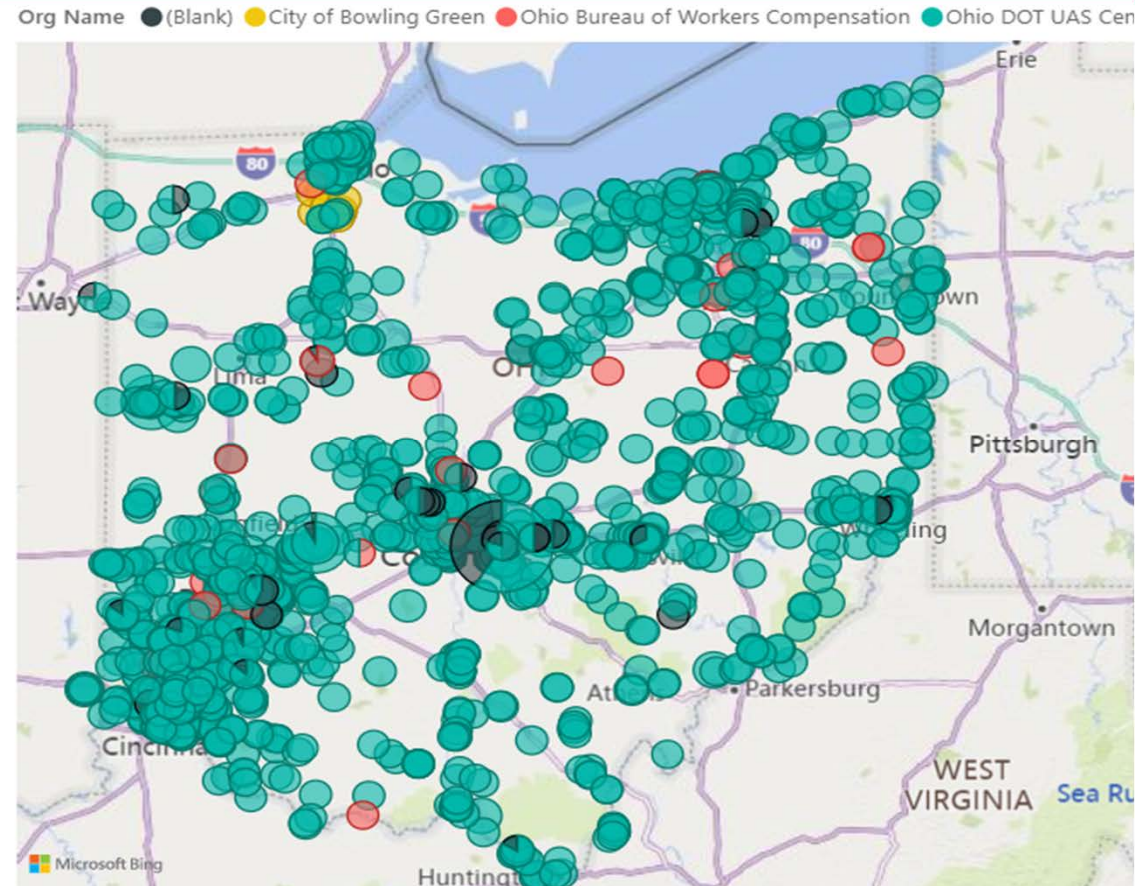
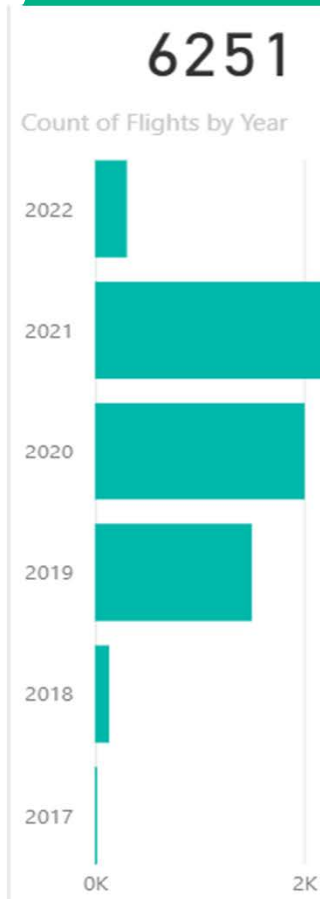
Increase Efficiency

Photos

Increase Safety



# Flight Operations Summary



**2019 Total Logged Flights 1471, 344 Operations**

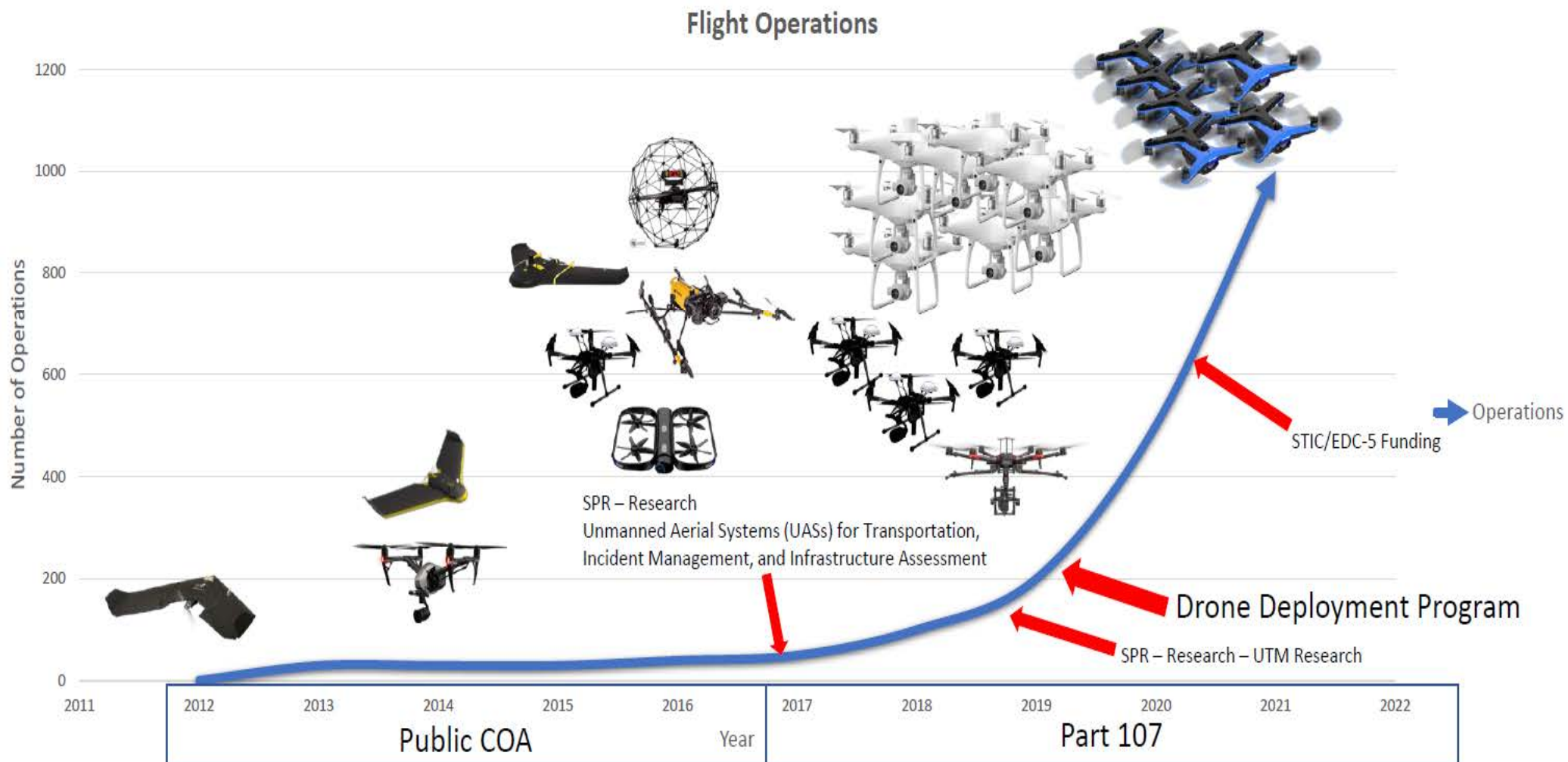
**2020 Total Logged Flights 2,009, 552 Operations**

**2021 Total Logged Flights 2,289, 751 Operations**

**Total Logged Flights 6251, 1,781 Operations**



## Data Collection Operations



# Aircraft Fleet

- Aerial Photography/GIS
- Exterior/interior Inspections
- Construction Monitoring
- Traffic Monitoring
- Natural Disasters/ Emergency Management
- Communications/Promotional Videos
- Work Zone





# District Deployment

- Remote Pilot Certificate 107
- 2 Days of training at UASC
- 3 Hour Minimum of training on UAS Platform (Phantom 4 Pro)
- 10 Hours of Solo time – SMS, Risk Assessment, Flight Planning
- Check out with UASC Staff

5 Bridge Inspectors, 5 Surveyors, 1 Engineer, 2 Communications, 2 Construction, 1 CADD & Mapping. 15 District, 4 UASC.



# Construction Progress Monitoring





# Construction Work Zone

**WORK  
ZONE**

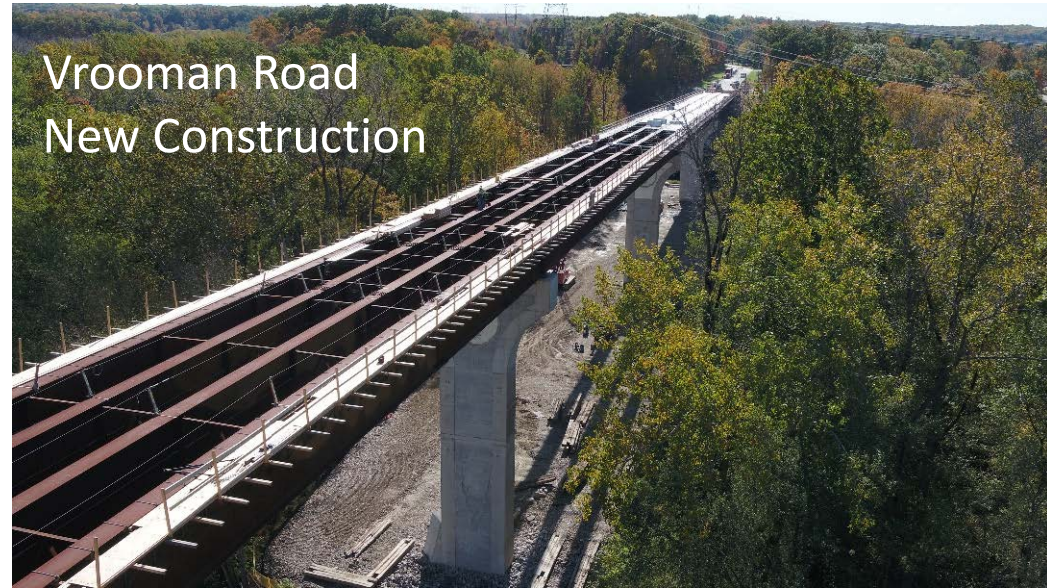




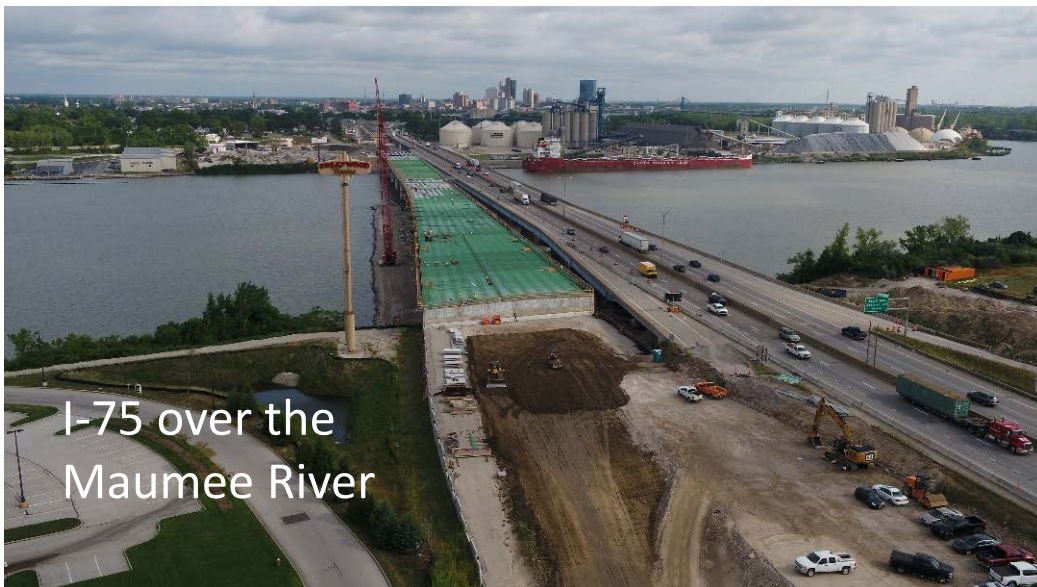
# Bridge Construction Projects



I-480 Valley  
View Bridge



Vrooman Road  
New Construction



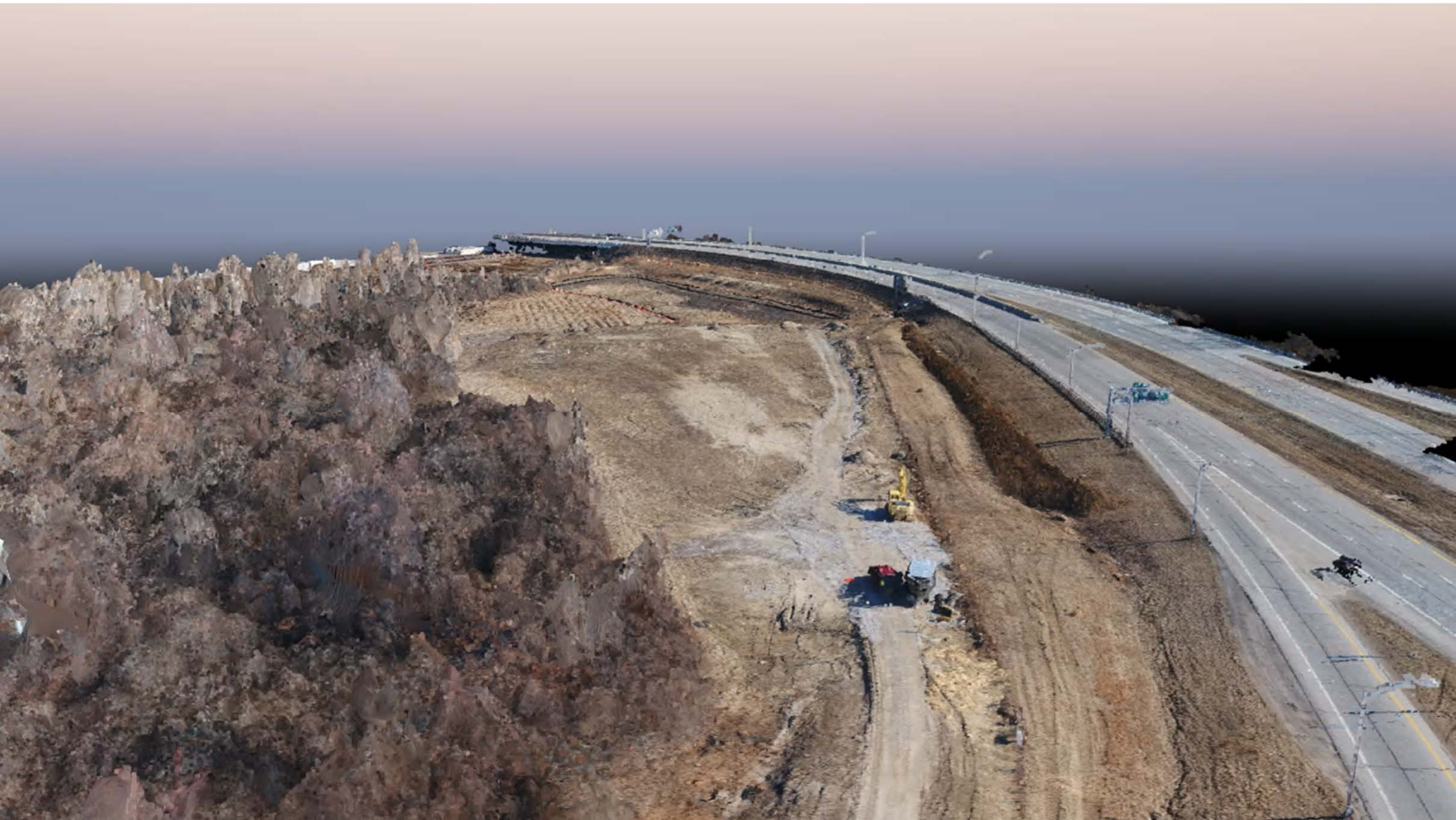
I-75 over the  
Maumee River



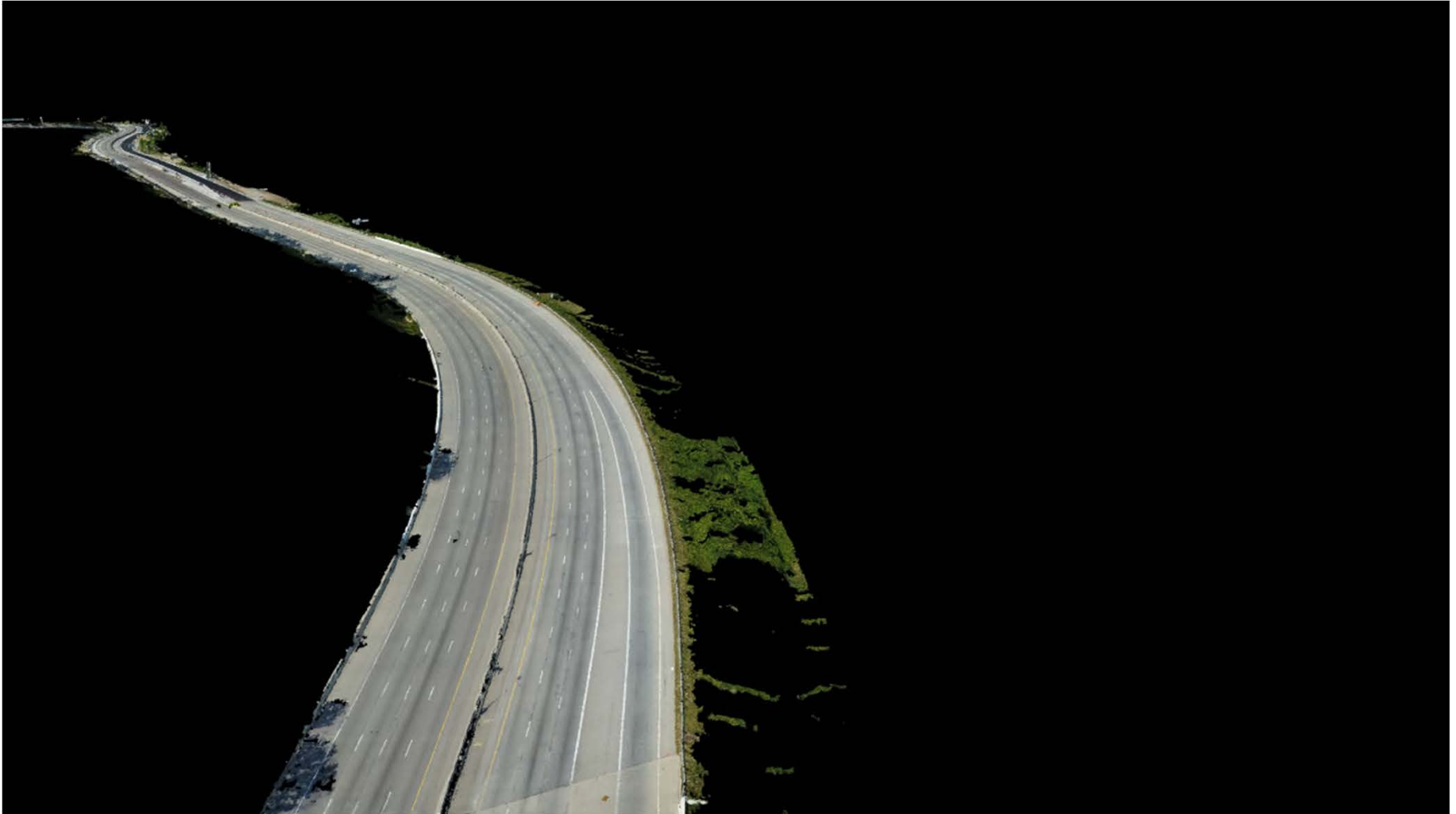
I-74 & 175  
Interchange



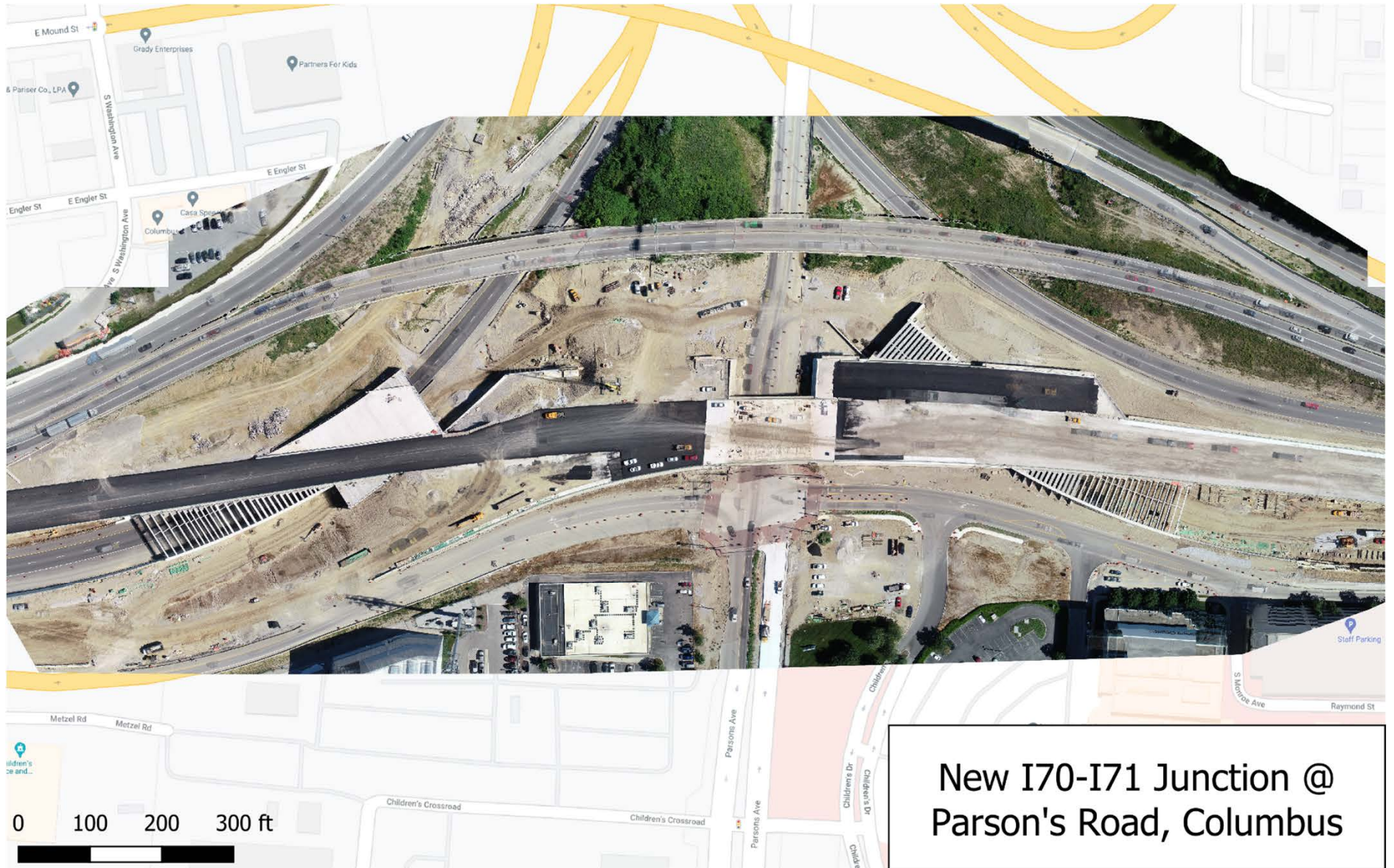
# Attorney General Property I-75



# D8 Pavement



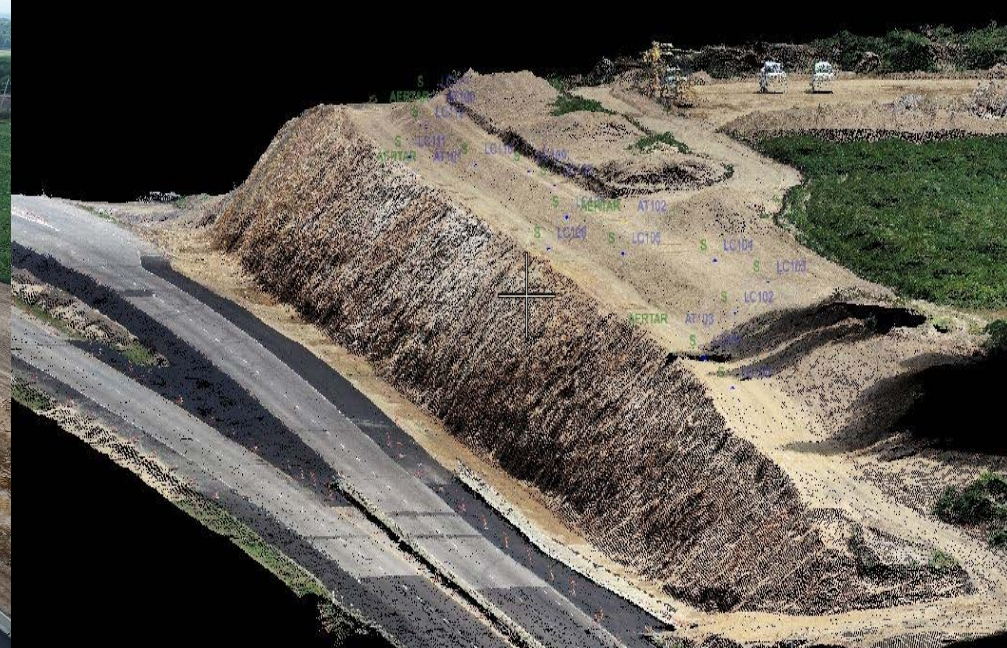
# Construction Volume



# UAS Operations



# Construction for Design



# Road Widening







# Rubbleizing Concrete Pavement



# Smart Lane

**RED X: SmartLane is closed**

**GREEN ARROW: SmartLane is open**



# RCUT Traffic



**Improvement**  
Straight Ahead

# Lane Closure & Lane Shift





# Traffic Monitoring

## ODOT drone survey brings signal timing changes to area around Pearl Road, I-480

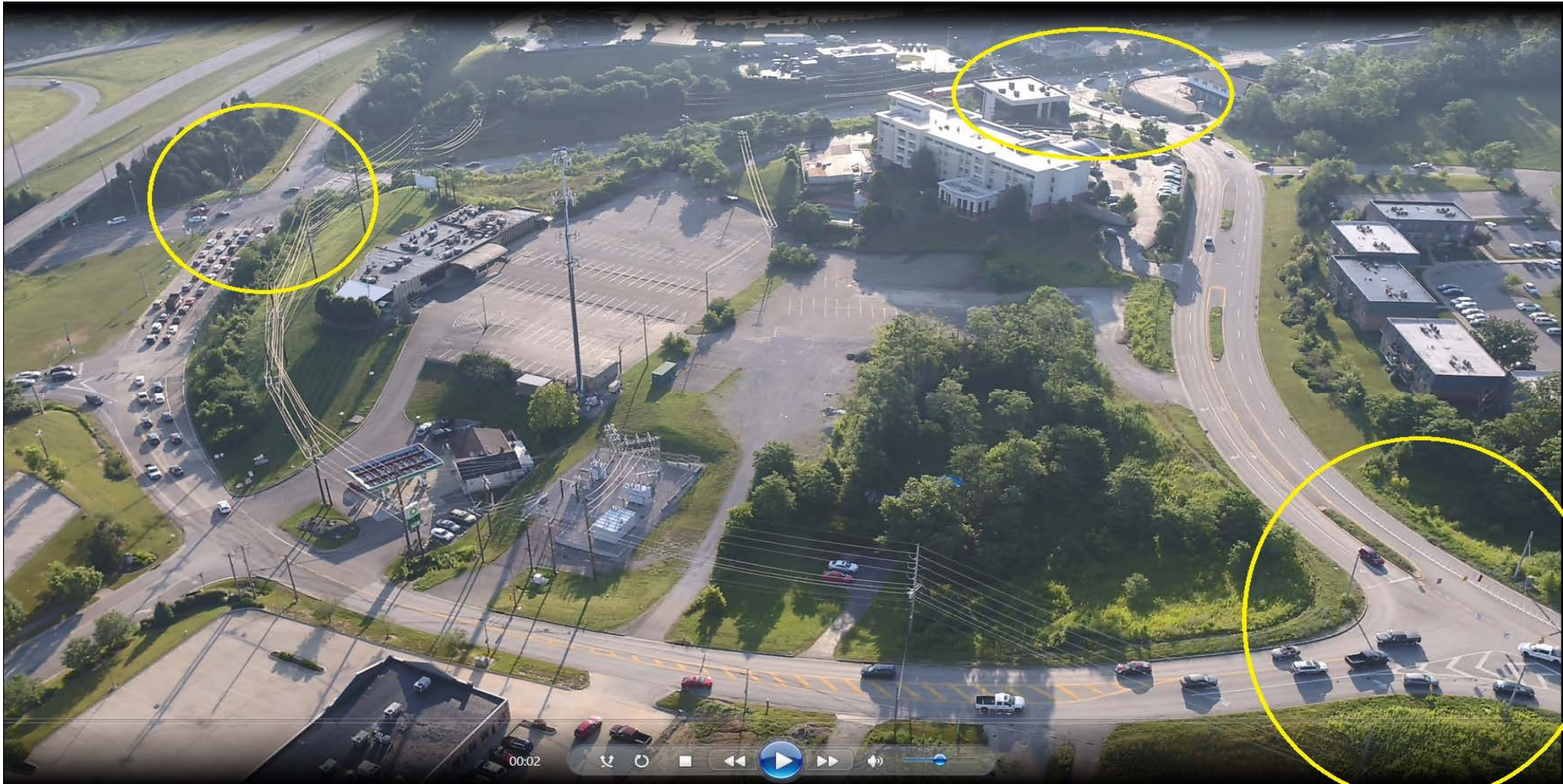


By: Jordan Vandenberg

*Posted at 2:24 PM, Nov 28, 2019 and last updated 6:18 PM, Nov 28, 2019*

BROOKLYN, Ohio — A recent drone survey by the Ohio Department of Transportation's Unmanned Aircraft Systems Center (UAS) led to traffic signal changes done by the City of Brooklyn in an effort to mitigate frequent traffic logjams in the area, especially around peak times.





“A drone can get that bird’s eye view, an aerial view, of what’s really going on in that intersection and what’s going on with the traffic signals

# Traffic Hotspots



## Springboro Layout, April 24

- Vehicle UC Matrice 210 w/UC Z30 & UC X5S



Springboro Intermediate

- UAS Inspire 2 w/UAS X5S or UAS X4S

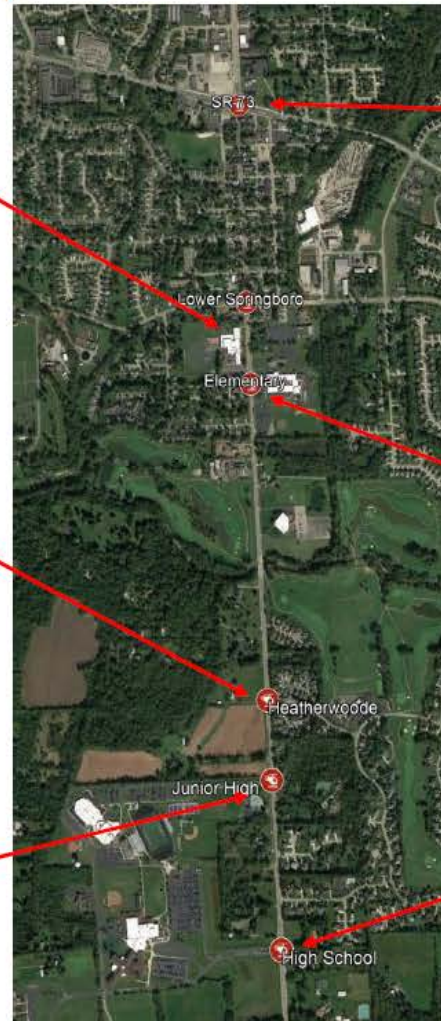


Heatherwood Blvd

- UAS Matrice 210 w/UAS Z30



Springboro Junior High



Corner of SR73 and SR741

- UC Matrice 100 w/UC Z3



Clear Creek Elementary

- UAS Matrice 210 w/UAS Z30 & UAS X5S



Springboro High School

- UC Matrice 100 Tether System w/UC Z30

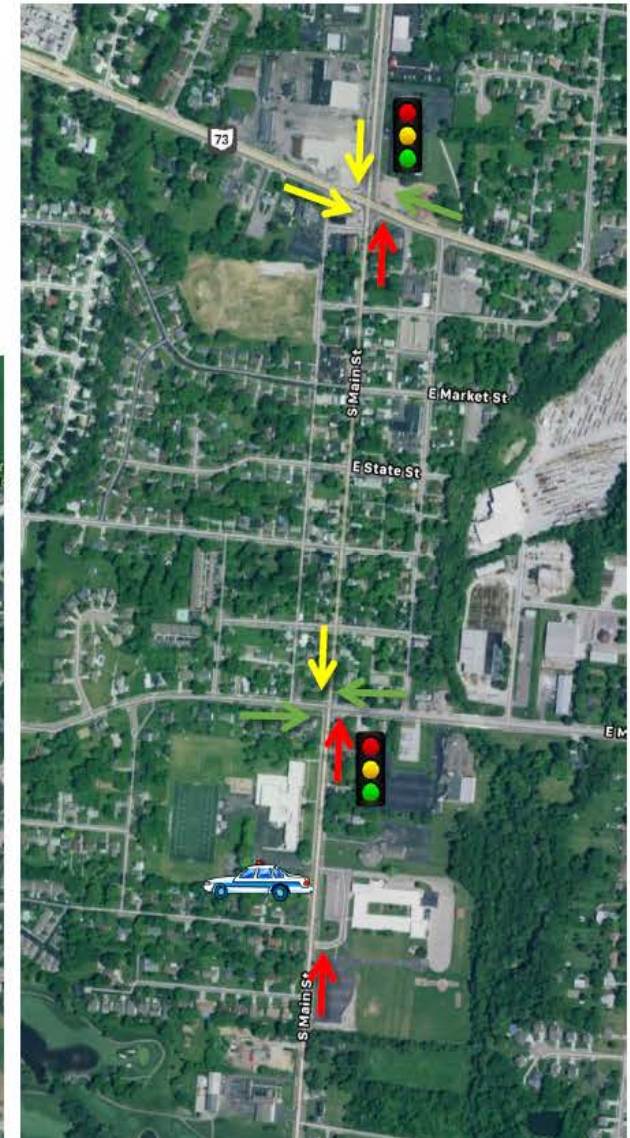
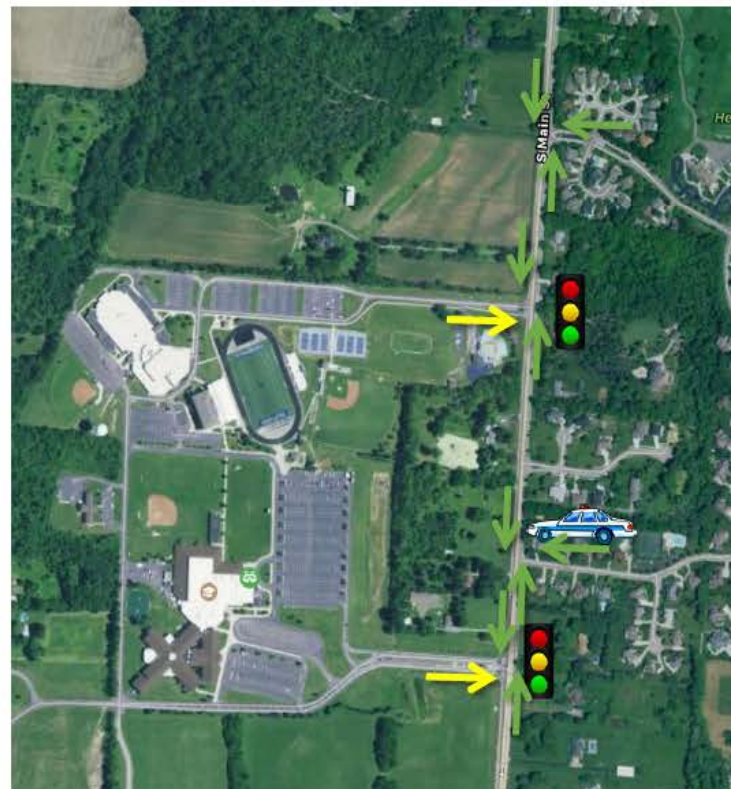


## Overall Observations and Results

Largely free moving traffic with minimal queues

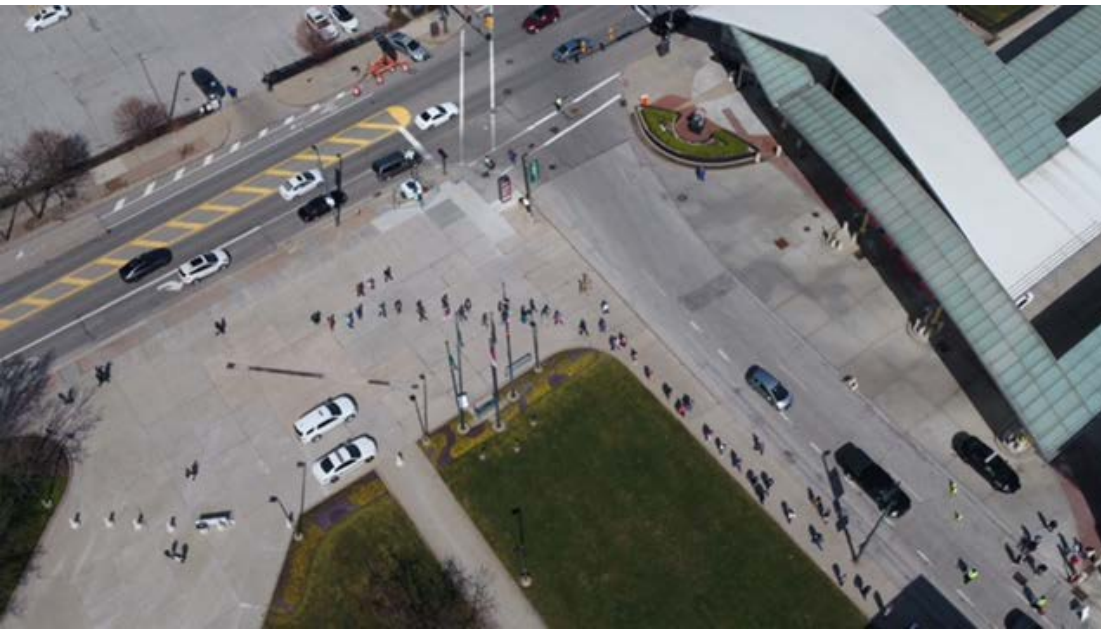
Traffic view not easily observed, likely minimal queues

Significant traffic/queues observed, but did not last more than 2 light cycles





# Mass Vaccination Site





# Special Events Traffic

**BLACK  
FRIDAY**





# Special Events





# Traffic Monitoring

Left total count: 0 | Cars: 0 | Trucks: 0  
Right total count: 0 cars: 0 trucks: 0  
Total vehicles: 0

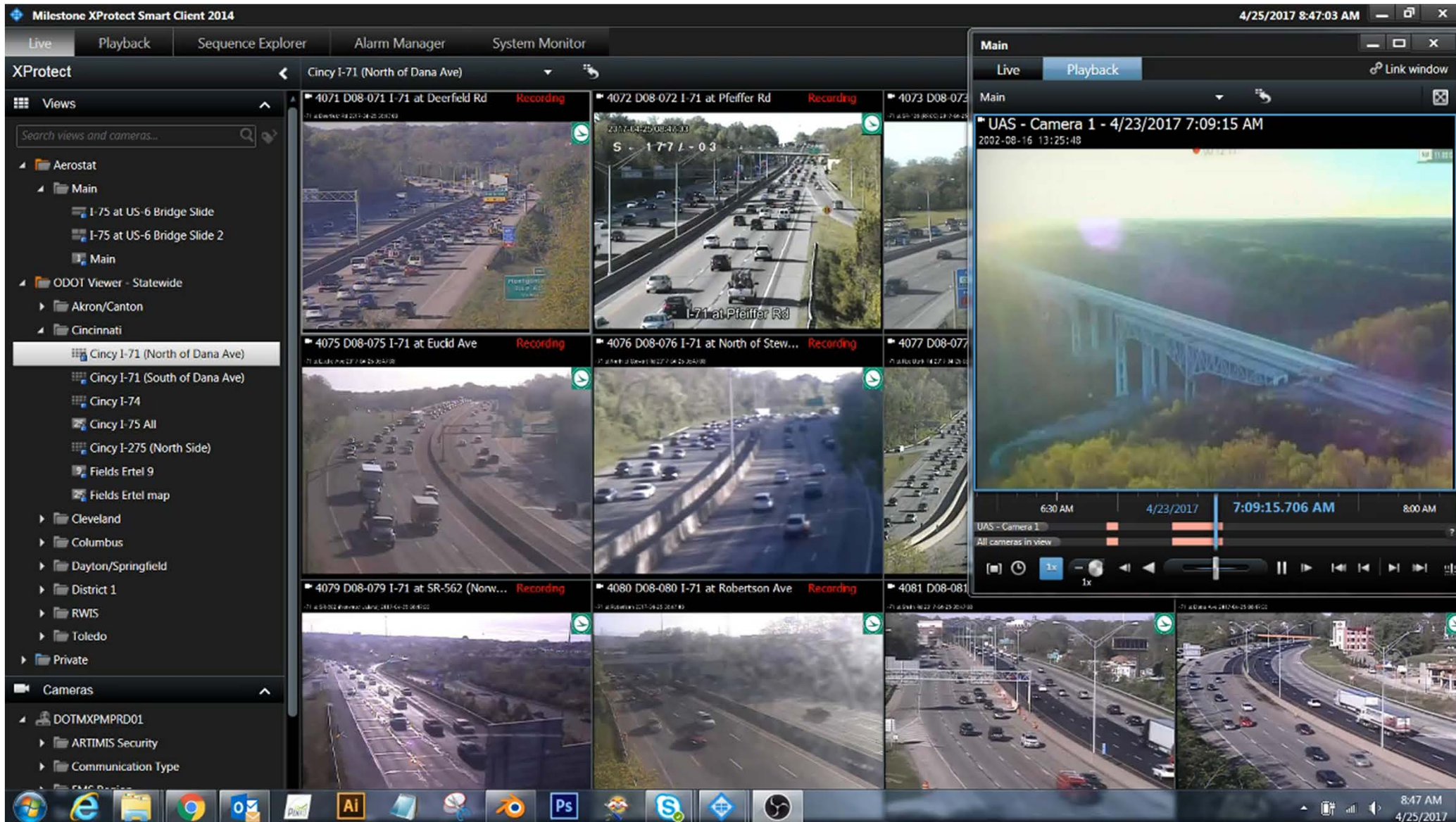


# Milestone Box

- Share data with local and remote users in real-time
- Stream Video to the ODOT Video Servers (Milestone)
- Watch Drone Video on your phone/Laptop
- Watch Video Drone feed on Goggles



# Traffic Monitoring



The screenshot displays the Milestone XProtect Smart Client 2014 interface. The main window shows a grid of camera feeds for 'Cincy I-71 (North of Dana Ave)'. The feeds are labeled with camera IDs and locations, such as '4071 D08-071 I-71 at Deerfield Rd', '4072 D08-072 I-71 at Pfeiffer Rd', '4075 D08-075 I-71 at Euclid Ave', and '4080 D08-080 I-71 at Robertson Ave'. Each feed shows a live view of traffic on a multi-lane highway. A 'Recording' status is visible for several feeds.

On the left side, there is a 'Views' pane with a search bar and a tree view showing the system hierarchy:
 

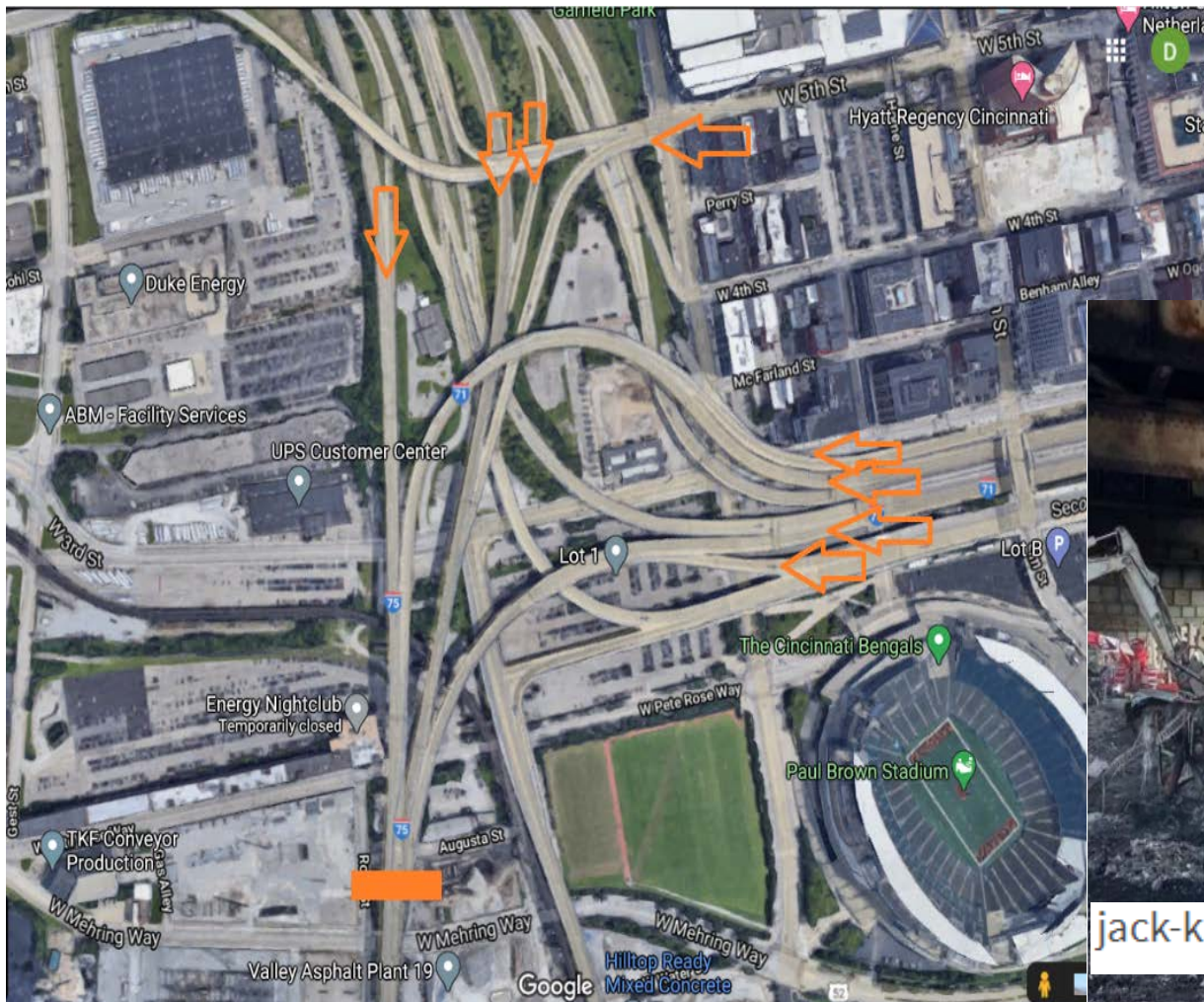
- Aerostat
  - Main
    - I-75 at US-6 Bridge Slide
    - I-75 at US-6 Bridge Slide 2
    - Main
  - ODOT Viewer - Statewide
    - Akron/Canton
    - Cincinnati
      - Cincy I-71 (North of Dana Ave)
      - Cincy I-71 (South of Dana Ave)
      - Cincy I-74
      - Cincy I-75 All
      - Cincy I-275 (North Side)
      - Fields Ertel 9
      - Fields Ertel map
    - Cleveland
    - Columbus
    - Dayton/Springfield
    - District 1
    - RWIS
    - Toledo
    - Private
- Cameras
  - DOTMXPMPRD01
    - ARTIMIS Security
    - Communication Type
    - CMC Services

On the right side, a 'Main' window is open, showing a playback view of 'UAS - Camera 1 - 4/23/2017 7:09:15 AM'. The playback window includes a timeline with a playhead at 7:09:15.06 AM on 4/23/2017. The video shows a view of a bridge over a river.

The Windows taskbar at the bottom shows the system clock as 8:47 AM on 4/25/2017, along with various application icons including Internet Explorer, Chrome, Outlook, and Photoshop.

# Emergency Shutdown

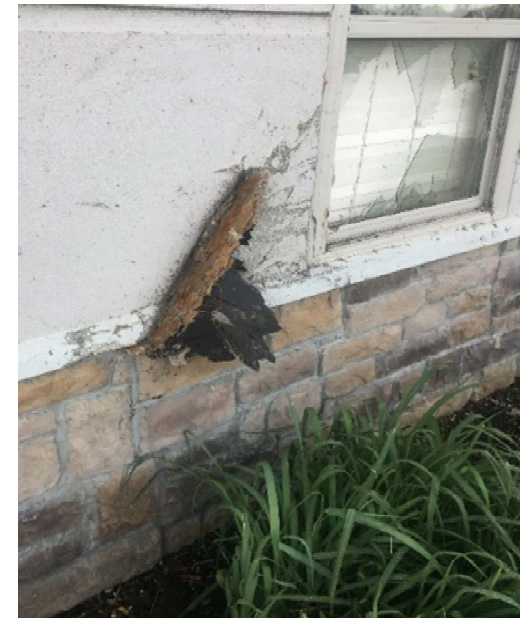
Brent Spence Bridge crash reveals little-known Kentucky ban on hazmat shipments



jack-knifed semi was carrying potassium hydroxide.



# Natural Disasters



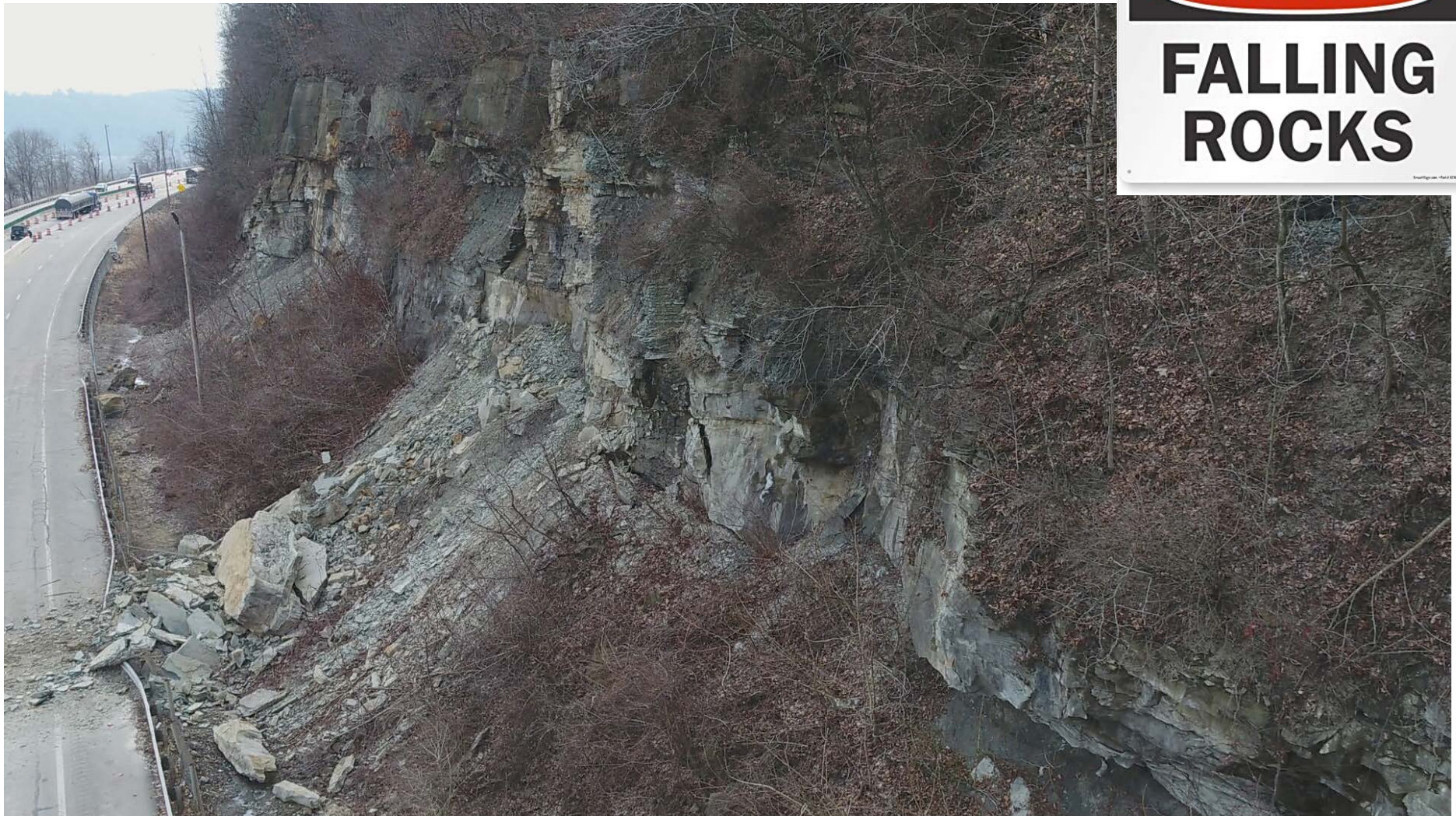
# Tornado Response



# Flooding



# Landslides



**DANGER**  
**FALLING  
ROCKS**



# Bridge Inspection

## Using Available Technology Traditional Snooper Inspection



Source:  
[www.co.goodhue.mn.us/CivicAlerts.aspx?AID=248&ARC=553](http://www.co.goodhue.mn.us/CivicAlerts.aspx?AID=248&ARC=553)

VS

## UAV Inspection



DJI Matrice 210



Inspector Remote



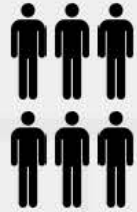
Pilot Remote

## Bridge Inspections - ROI Calculations



### Snooper Inspections

LABOR



6 Employees



48 Total Labor Hours



\$2,018 Total Payroll

EQUIPMENT



\$625 for Snooper



\$500 for Other



\$1,125 for Total Cost

# \$3,143

(\$4,182 nights/weekends)



### Drone Inspections

LABOR



2 Employees



8 Total Labor Hours



\$427 Total Payroll

EQUIPMENT



\$45 for Drone



\$50 for Pickup



\$95 for Total Cost

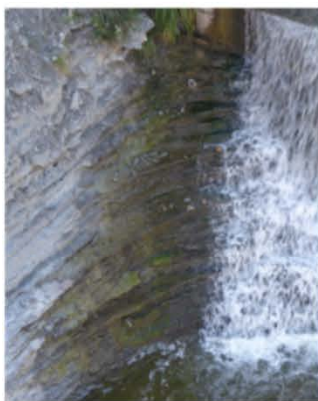
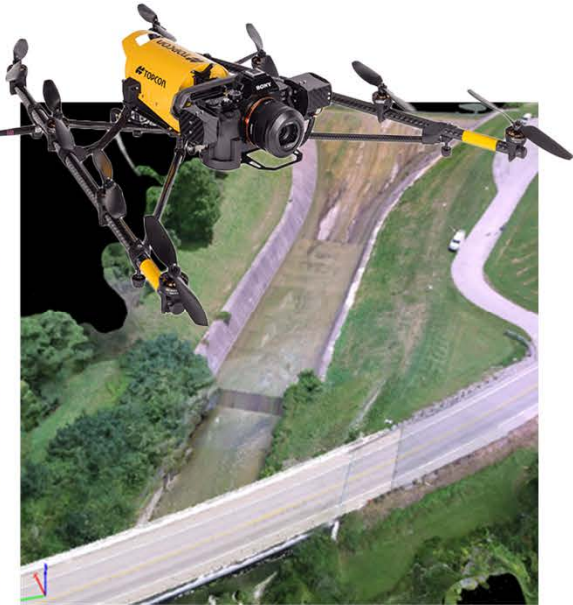
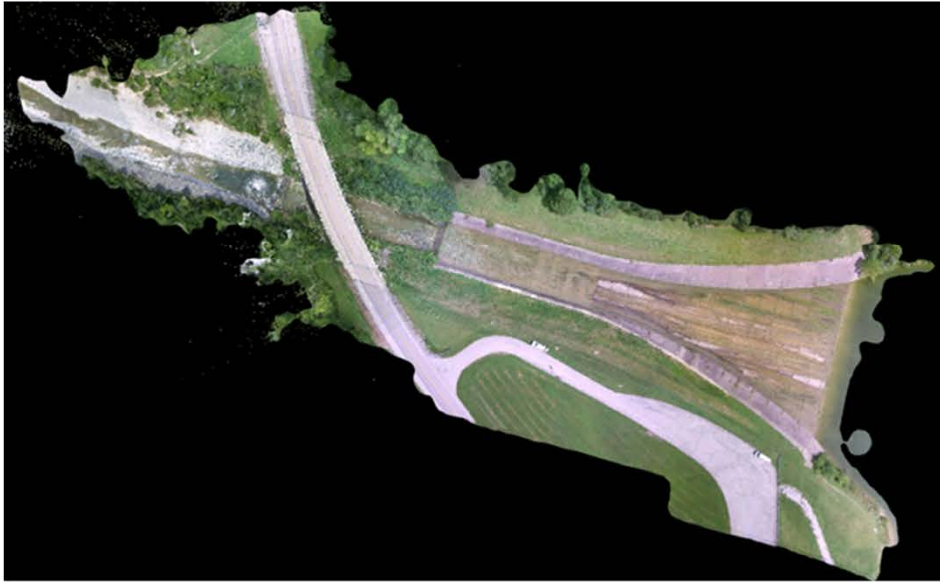
# \$522

(\$735 nights/weekends)

# \$2,621 in Savings

(\$3,417 nights/weekends)

# Bridge Inspection



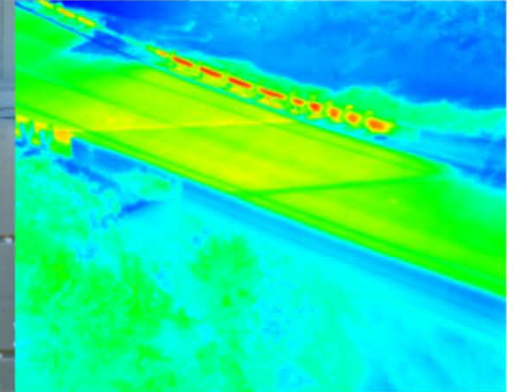
Scour  
Assessment



Footing  
Detail



Cracking



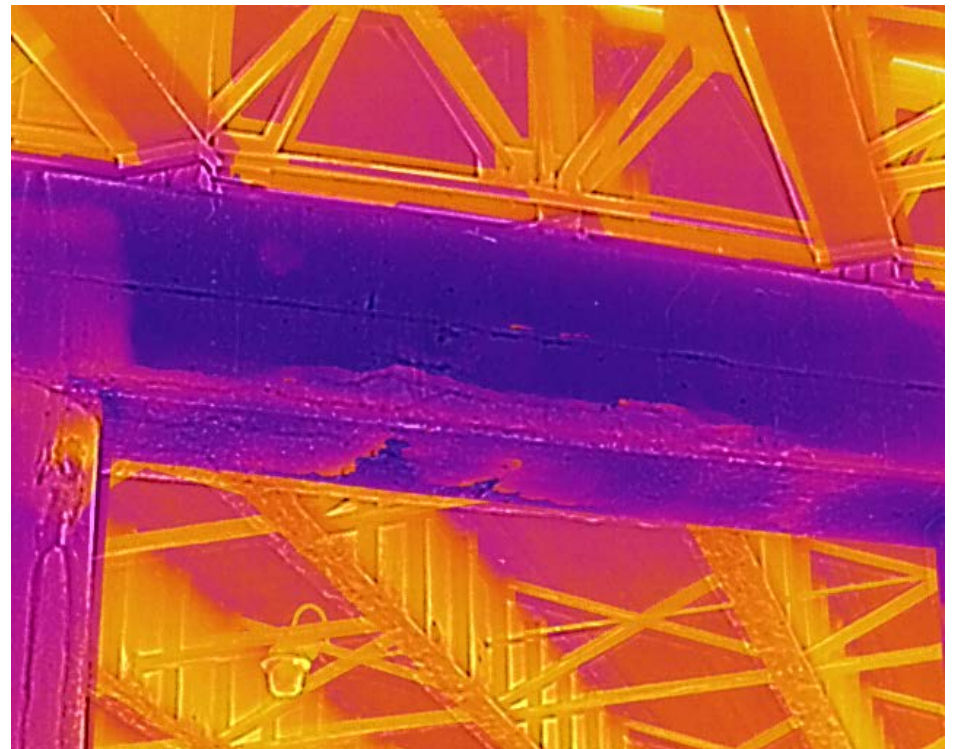
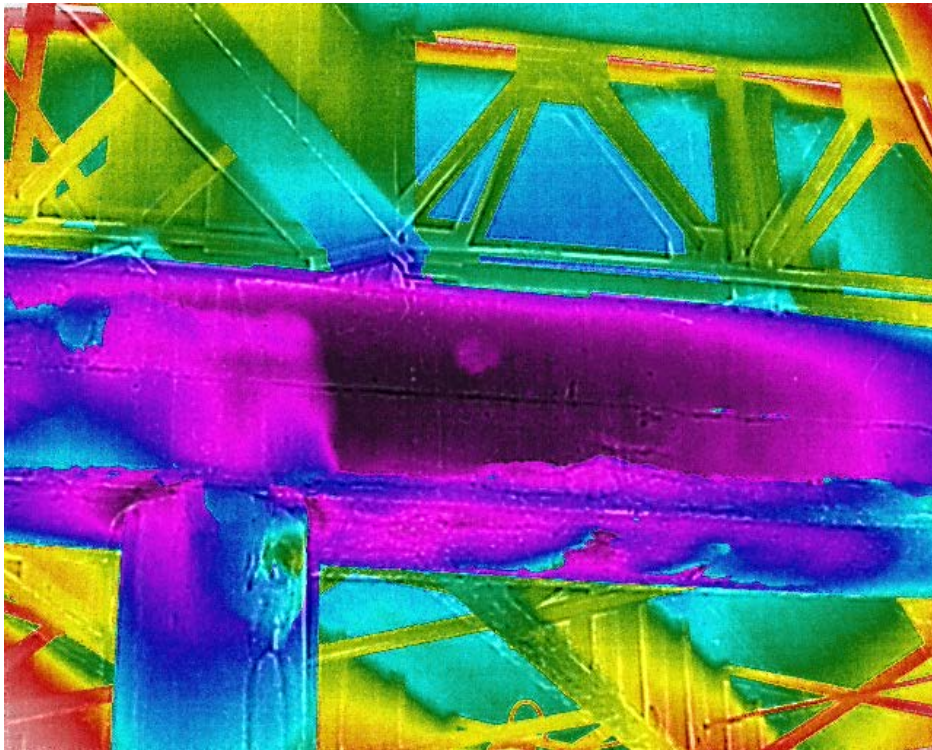
Delamination  
Assessment

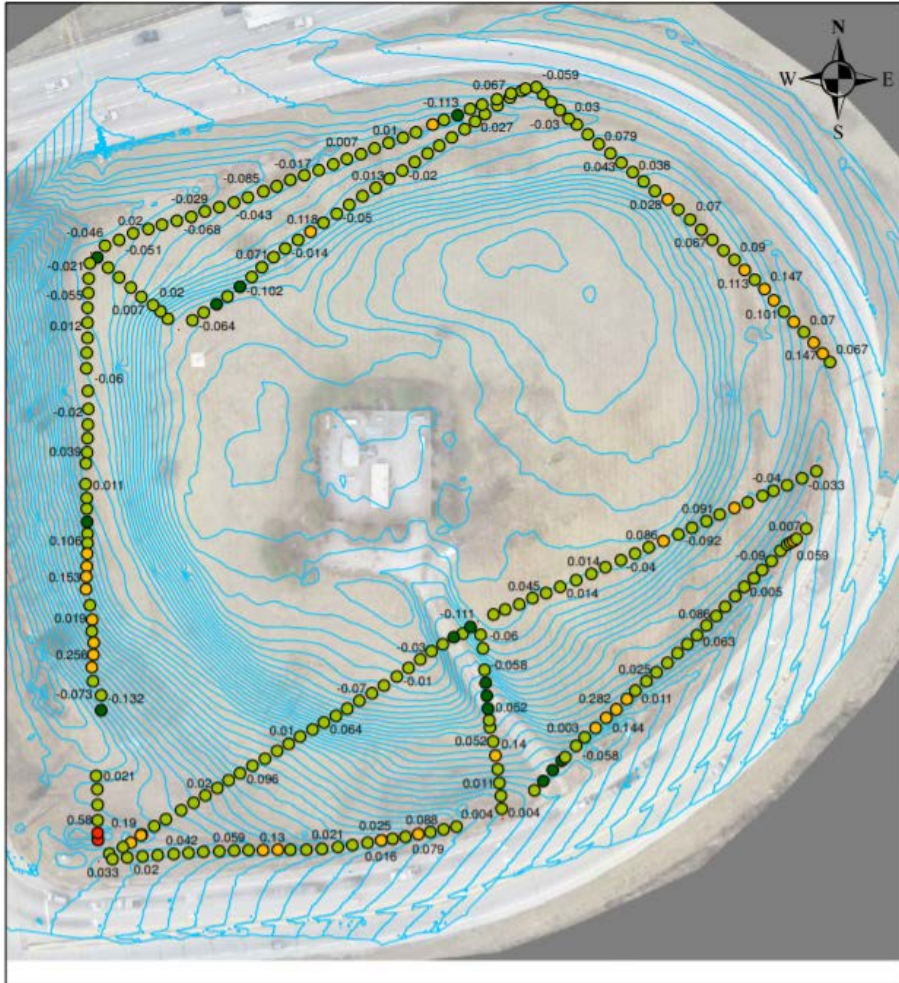


# Bridge Inspection



# Bridge Delamination



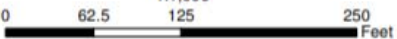


## FAI-170 AT SR256 EB OFF RAMP

Equipment: DJI Phantom 4 RTK, Trimble R6-2 TSC3, Trimble S6 Robotic total station, Topcon Digital Level  
 Procedure: ODOT S&M spec, compliant Control Point observation Topographic observation with S6 total station  
 Point cloud and orthomosaic processing by Pix4dMapper - GCPs incorporated.  
 Point cloud manual processing and datum adjustment (similar to all District scans)  
 Terrascan, Dz report similar to S&M spec control report.

Result: Class B maintained vegetated surfaces within compliance inside study area.

1:1,000



### 25436\_values\_US\_FT

#### Dz

- under -0.1
- -0.1-0.1
- 0.1- 0.3
- over 0.3

# Survey Project

20211110\_114378\_AsFiled.pdf



SITE MAP

LIC-16-16.57

3  
20

I:\ProjectData\LIC\16178\Design\Roadway\Sheet\16178\_01002.dgn Sheet 1/10/2021 10:57:28 PM ACHDZK

## Photogrammetry Survey - ROI Calculations

Current Cost for Terrestrial Laser Scan  
1.5 Miles of Road

**\$19,000**

Cost to Scan 1.5 Miles  
of Road with Drones

**\$2,264.65**

Cost to Scan 8 Miles  
of Road with Drones

**\$3,881.70**



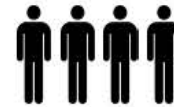
4 Employees



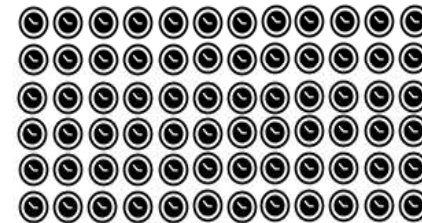
40 Hours Total Labor



Equipment



4 Employees



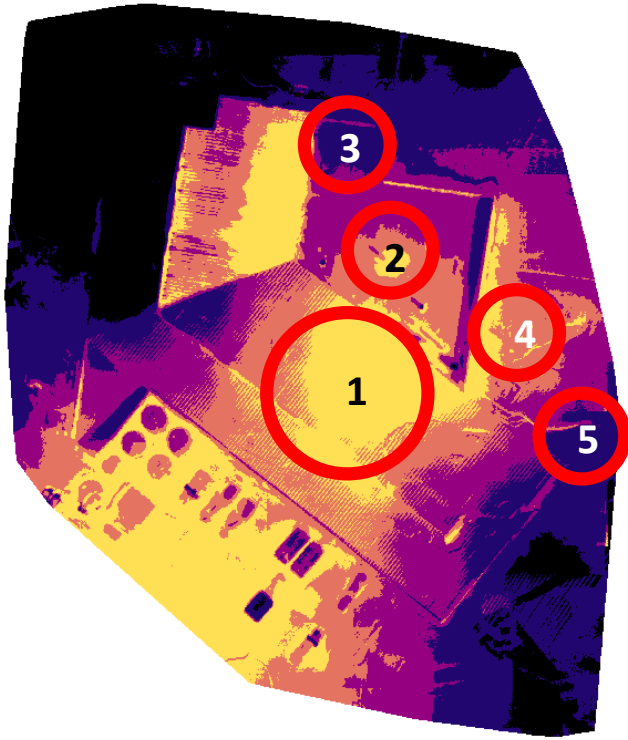
72 Hours Total Labor



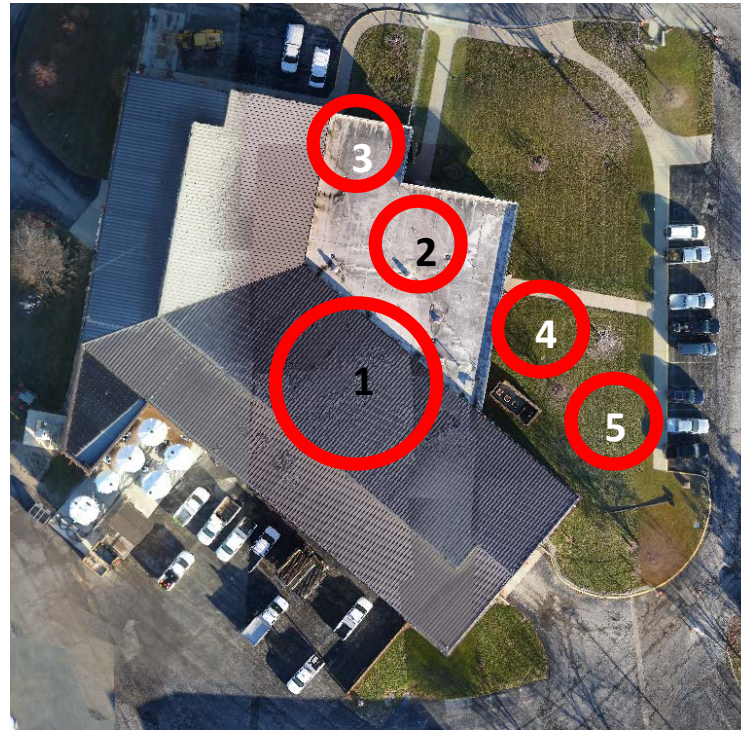
Equipment

**Save \$15,118.30**  
**Scan 6.5 More Miles**





Thermal Map of the Northwood Garage



Optical Orthomosaic of the Northwood Garage

**Weather Information:**

The thermal images were captured on December 28, 2017, at 12:45PM. Weather was sunny with a high of 12°F.

**Thermal Map:**

Dark blue spots are the relative cold temperature spots. Lighter yellow are the relative high temperature spots.

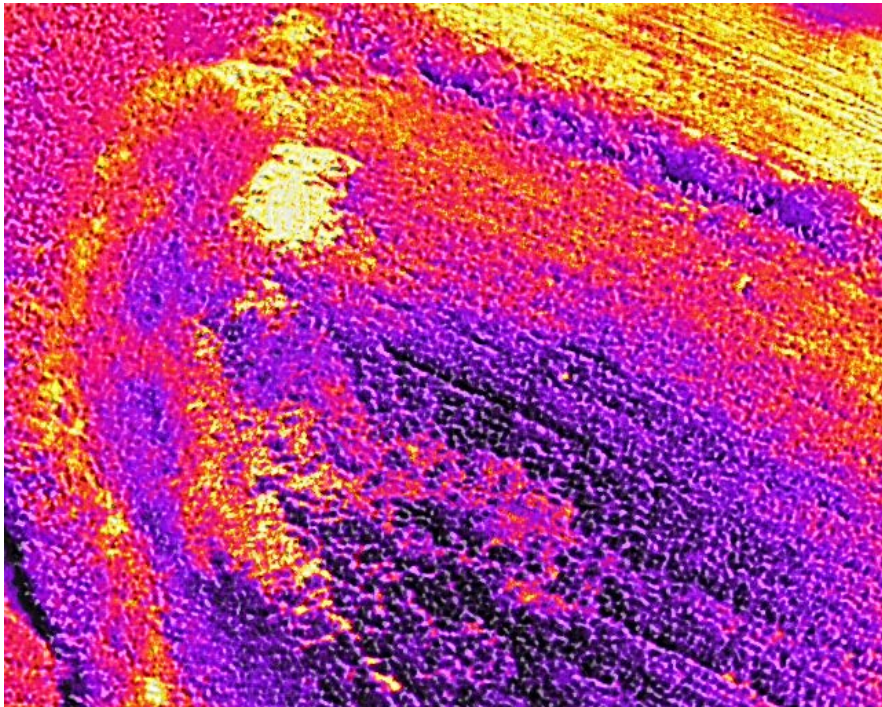
**Observations:**

1. Moisture present/Highly emissive surface.
2. Moisture present in the concrete structure
3. No presence of moisture
4. Grass with moisture
5. Grass without moisture

# Light pole

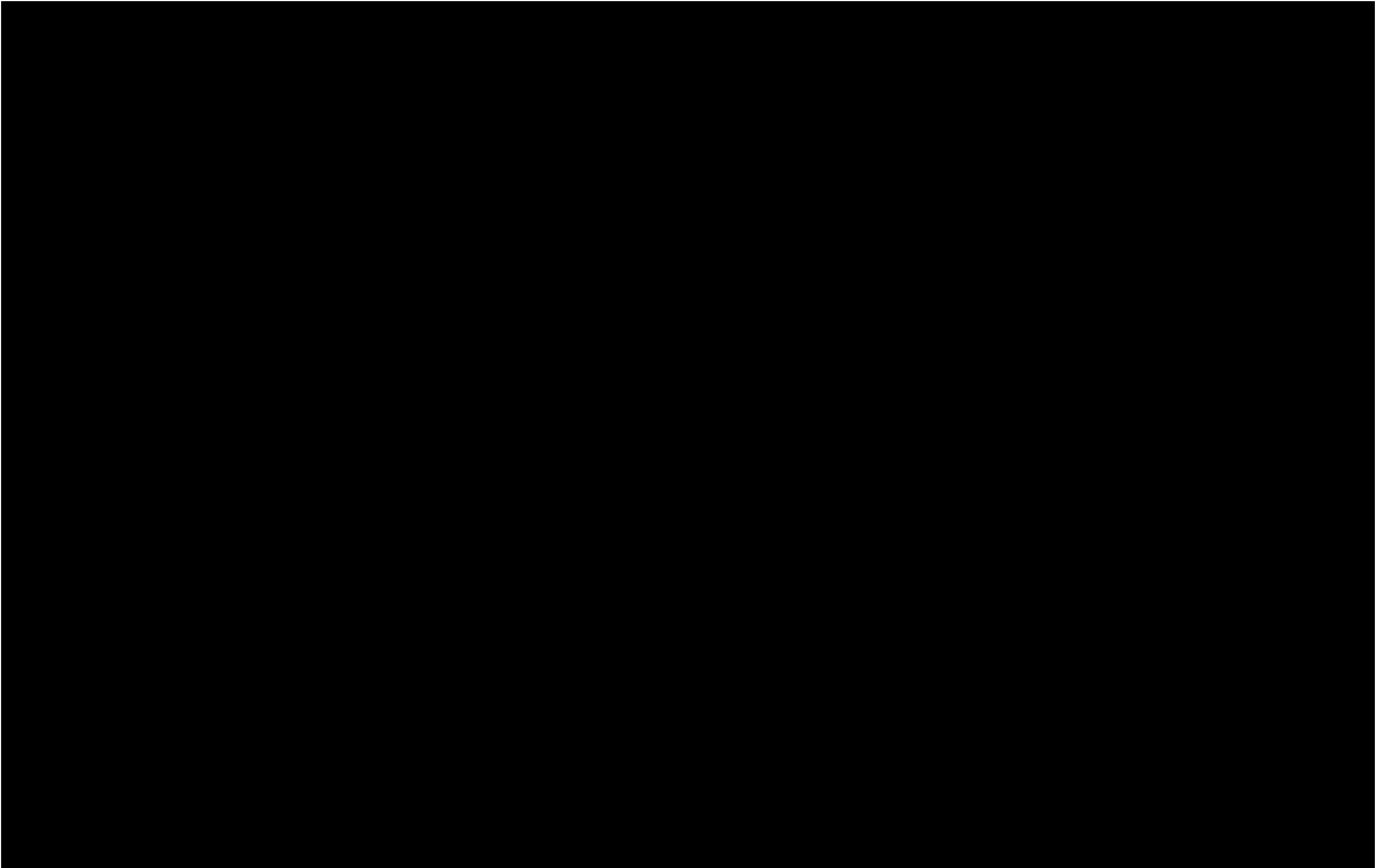


# Light pole





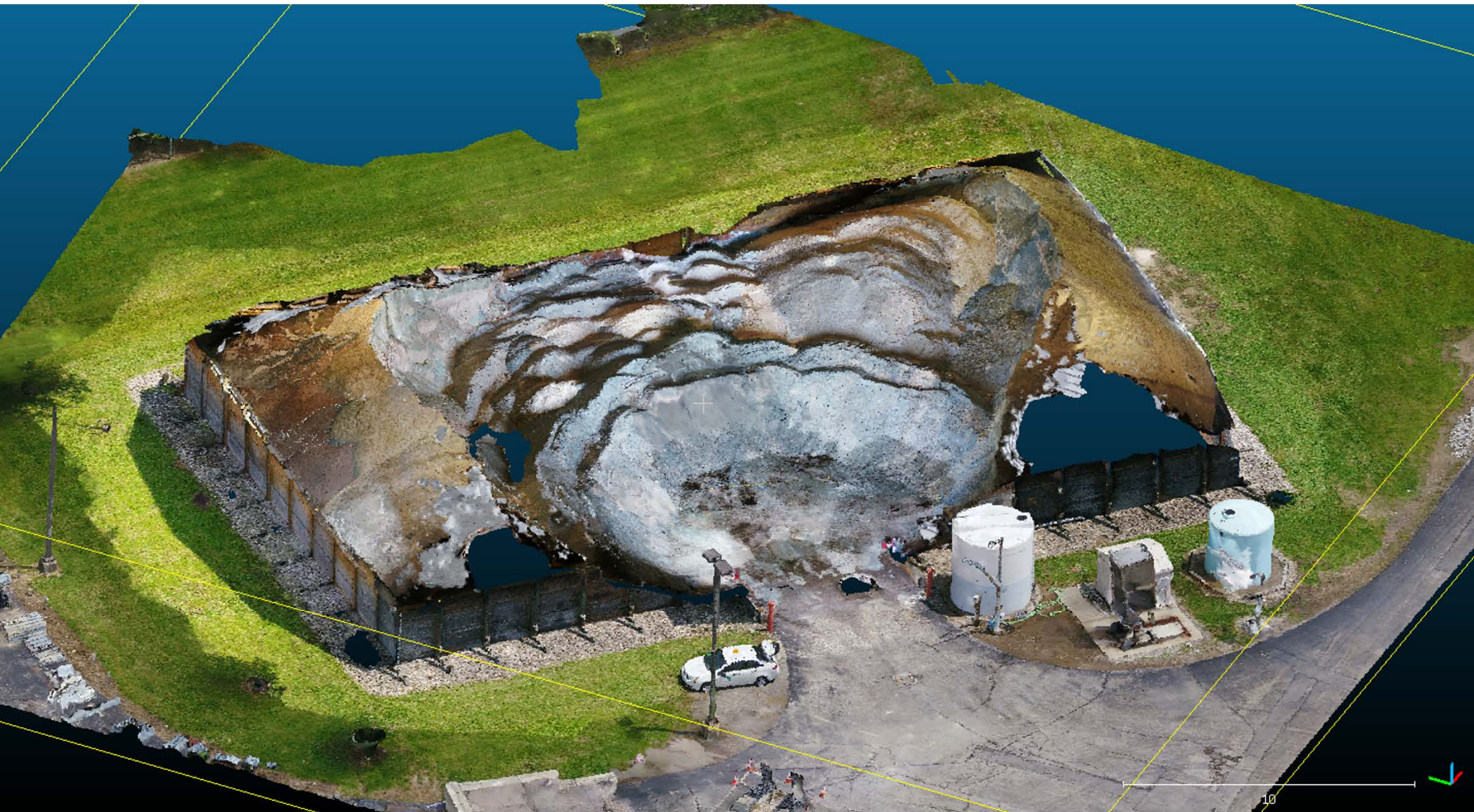
# Roundabouts

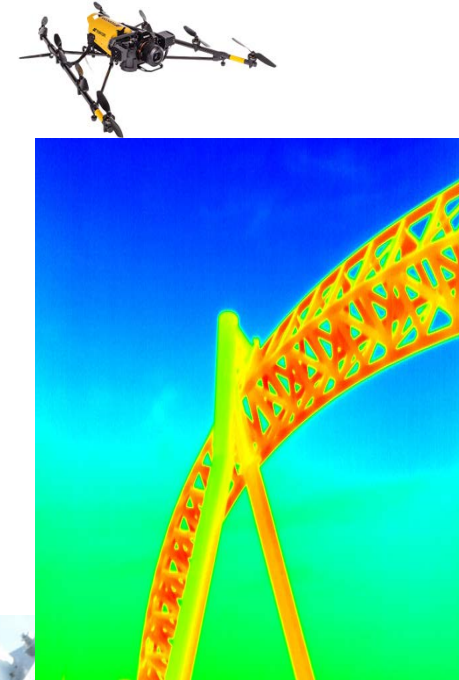
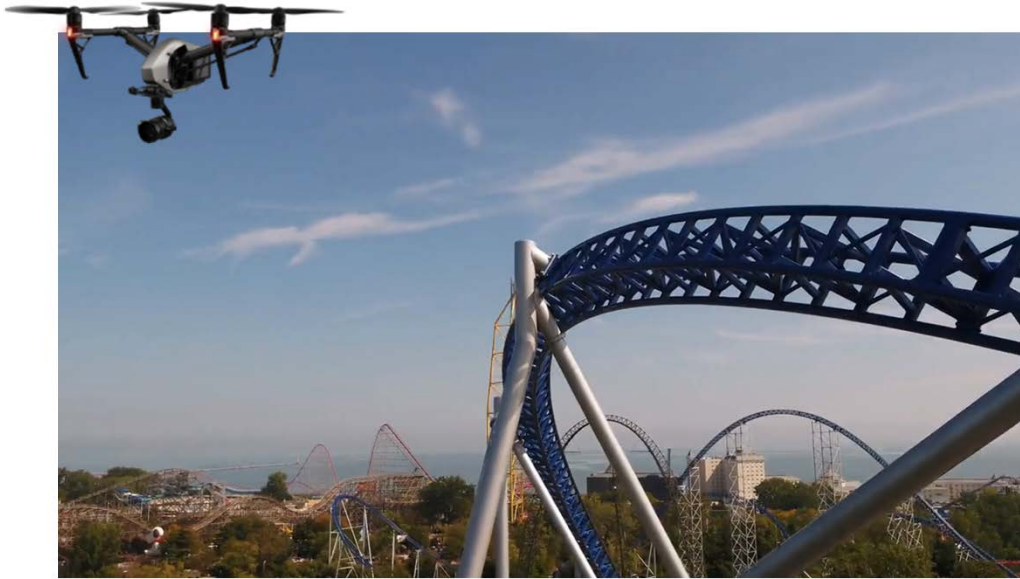


# UAS Data Examples



# UAS Data Examples





Previous Repairs

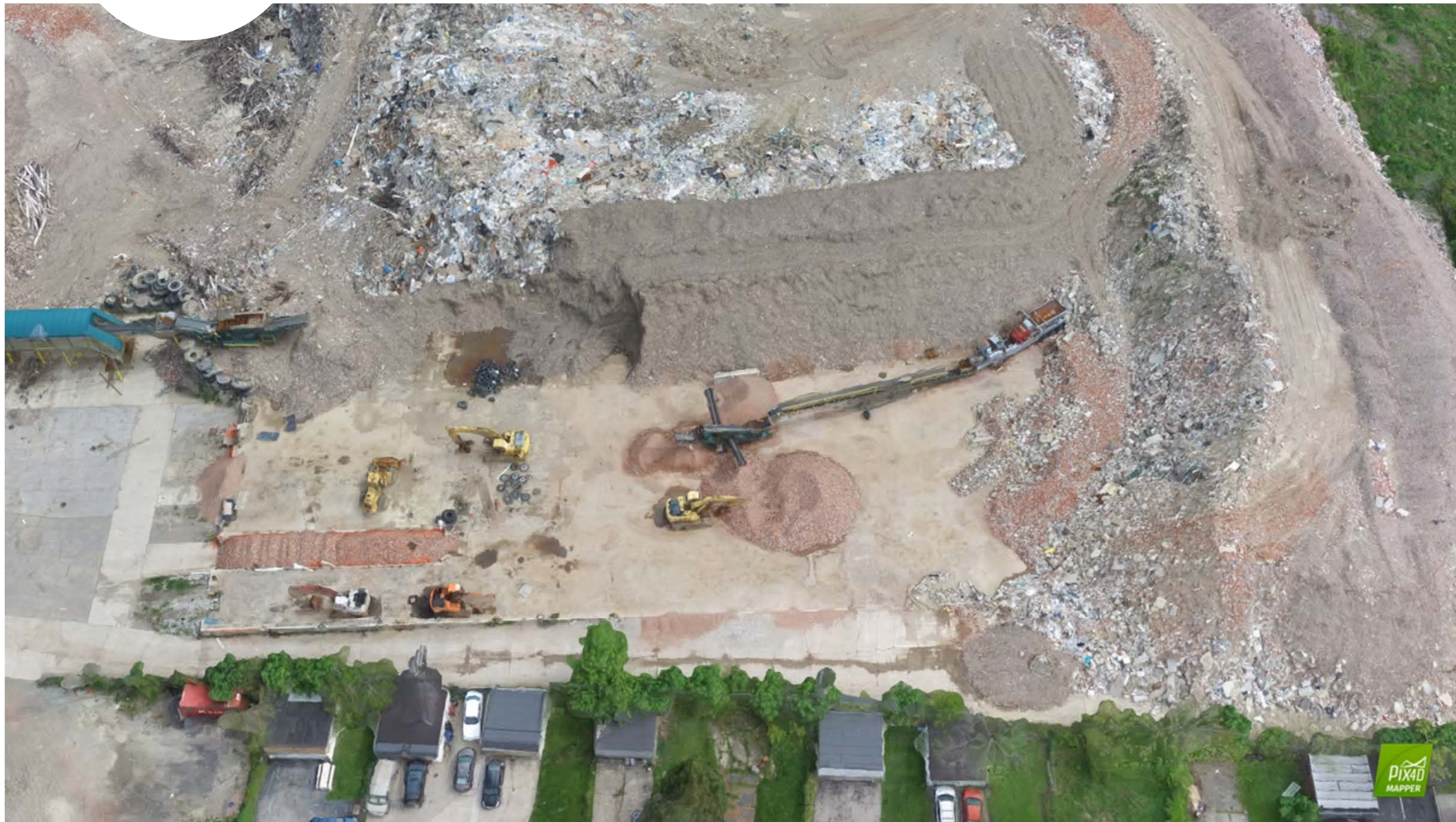


Connections



Flagged Locations

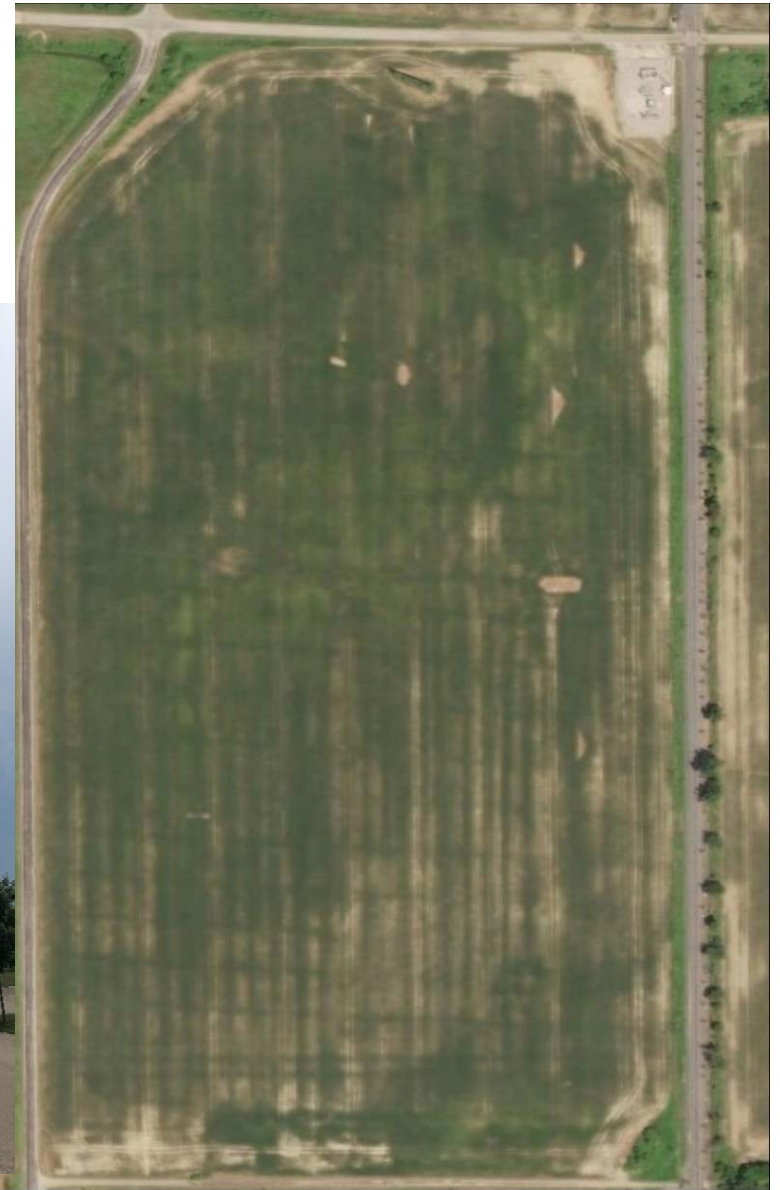
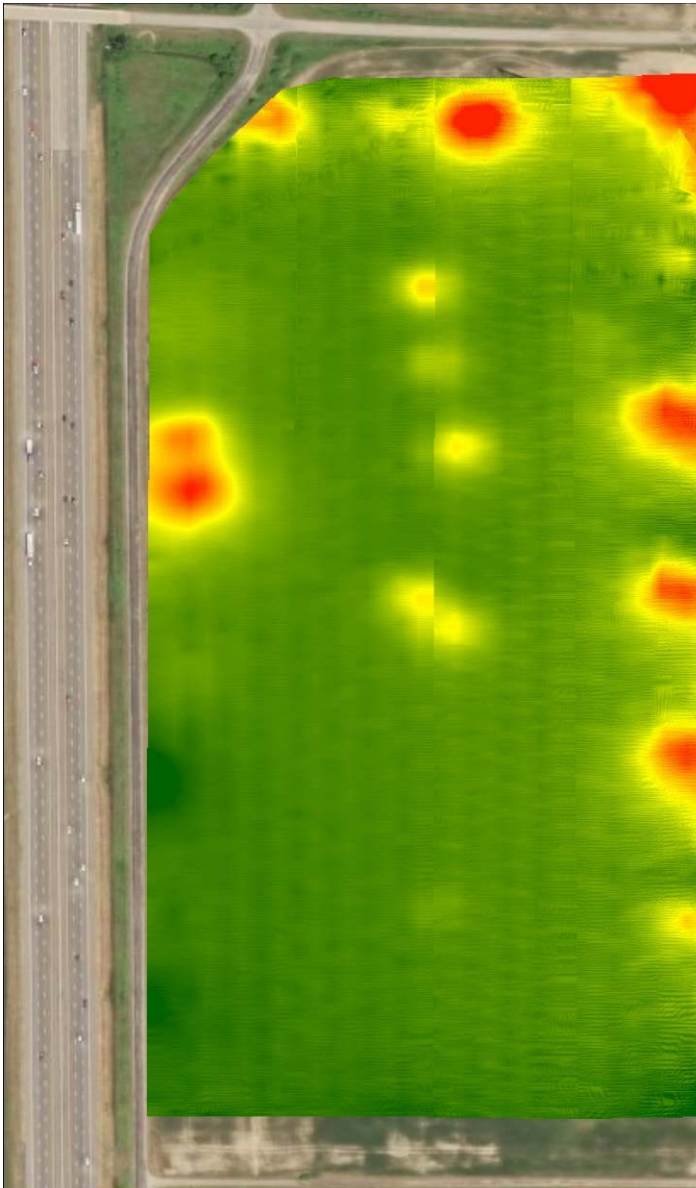




# BLOS - Chemical Spill



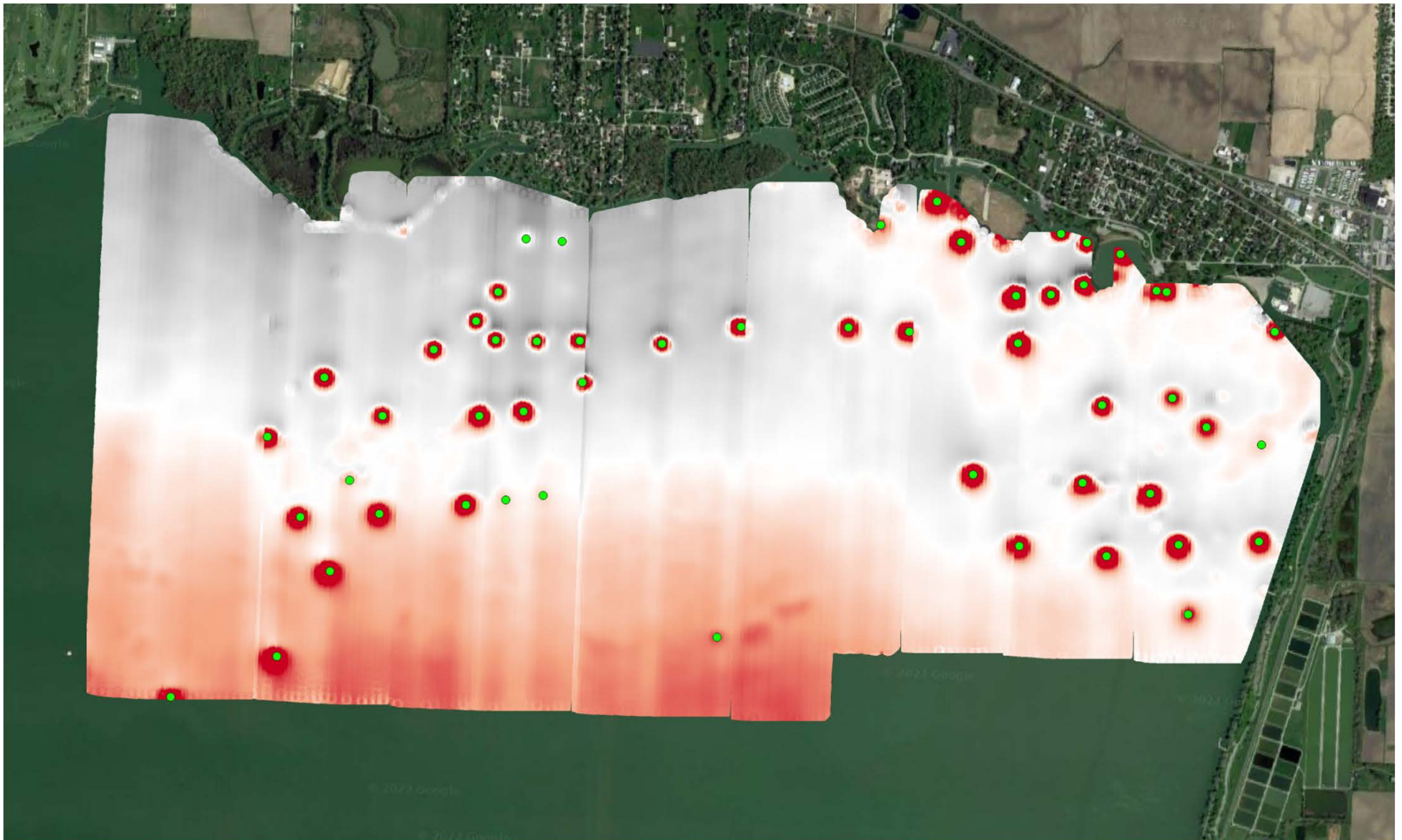
# Magnetometer ODNR





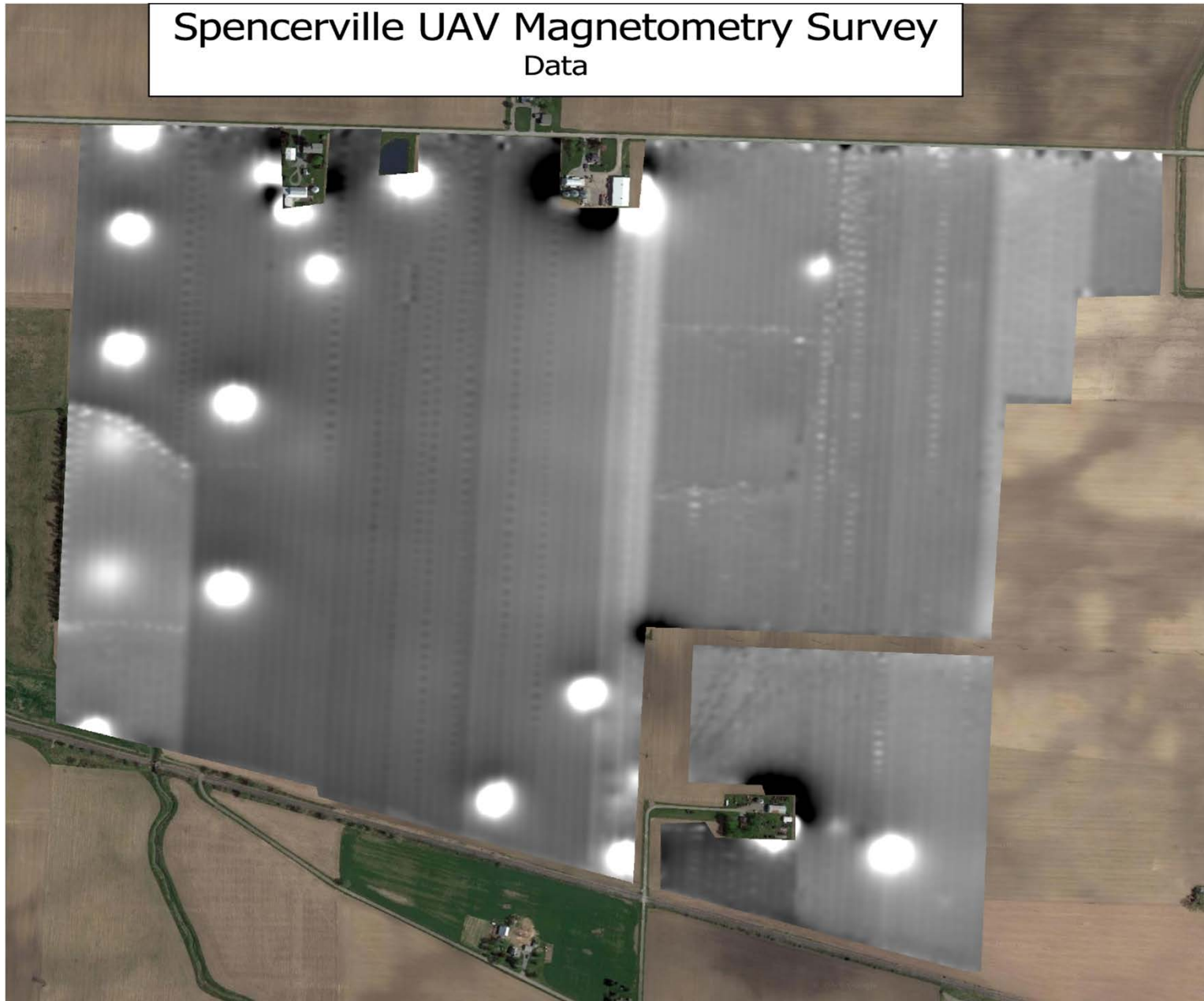


# Magnetometer ODNR



# Magnetometer ODNR

Spencerville UAV Magnetometry Survey  
Data



# Radiation Detection



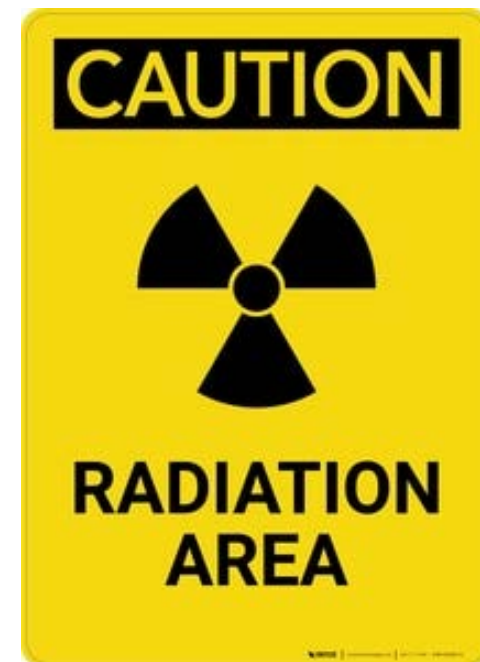
Delivery expected July 2021

Electronics payload re-designed to accommodate measurements from three detectors.

The Search Tube (ST), NaI 2x2 detector, is the tube pictured.

The small vacant mount is for the low and high range GM tubes

Testing for compatibility with RadResponder will be done in Ohio.



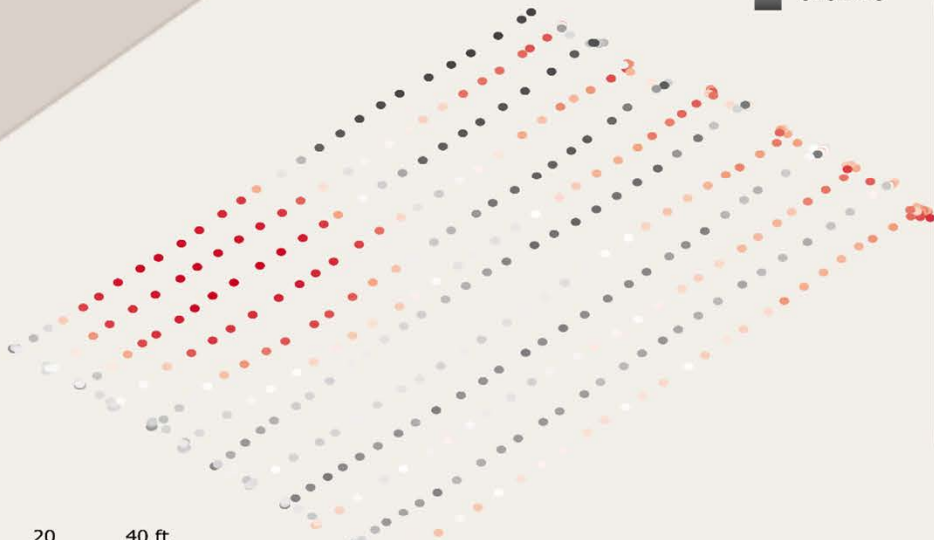
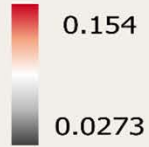




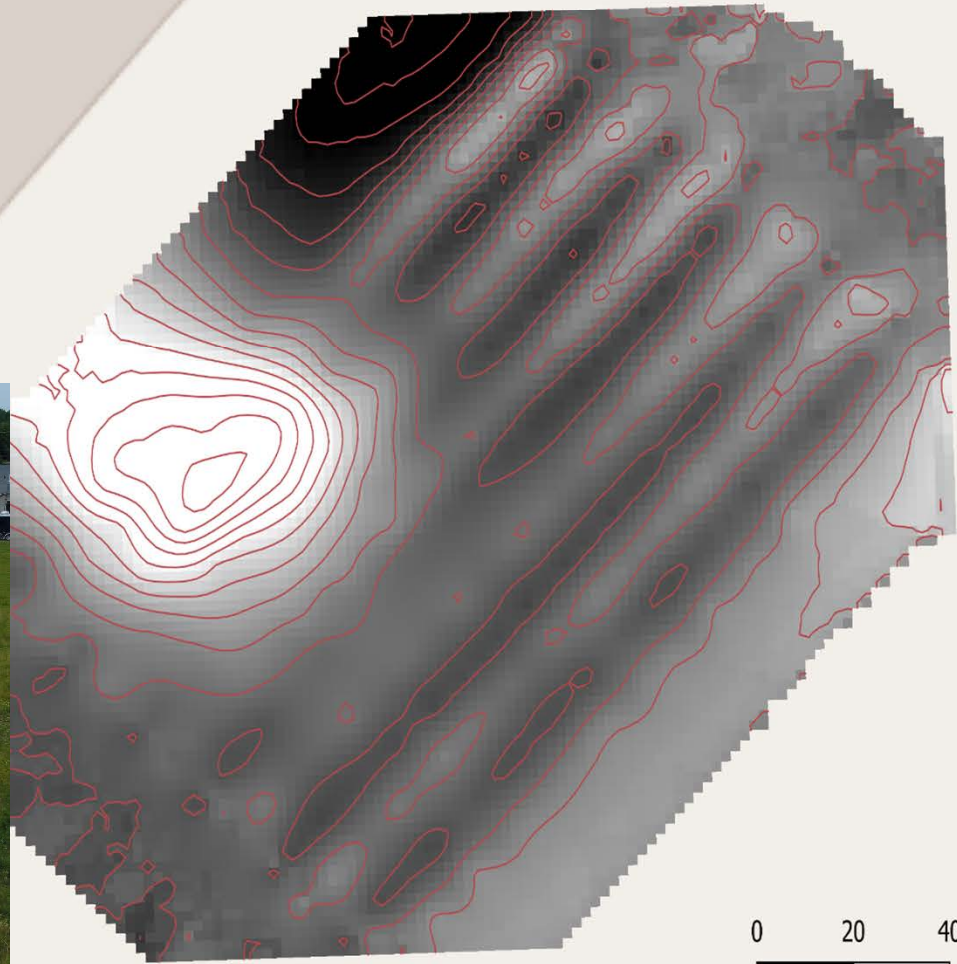




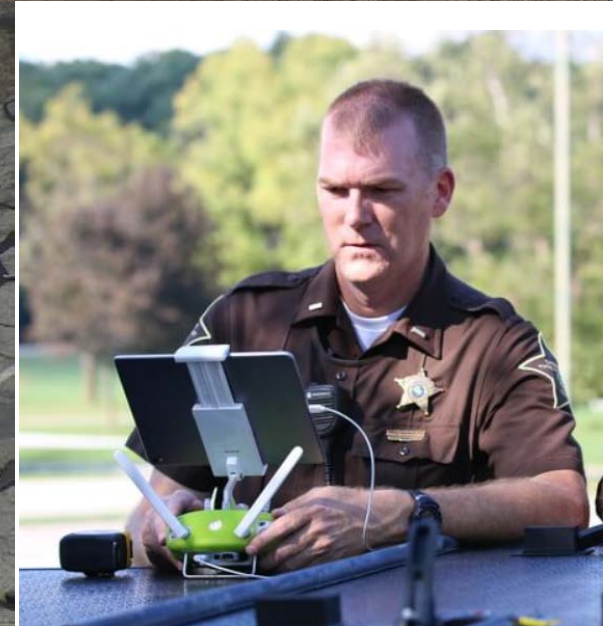
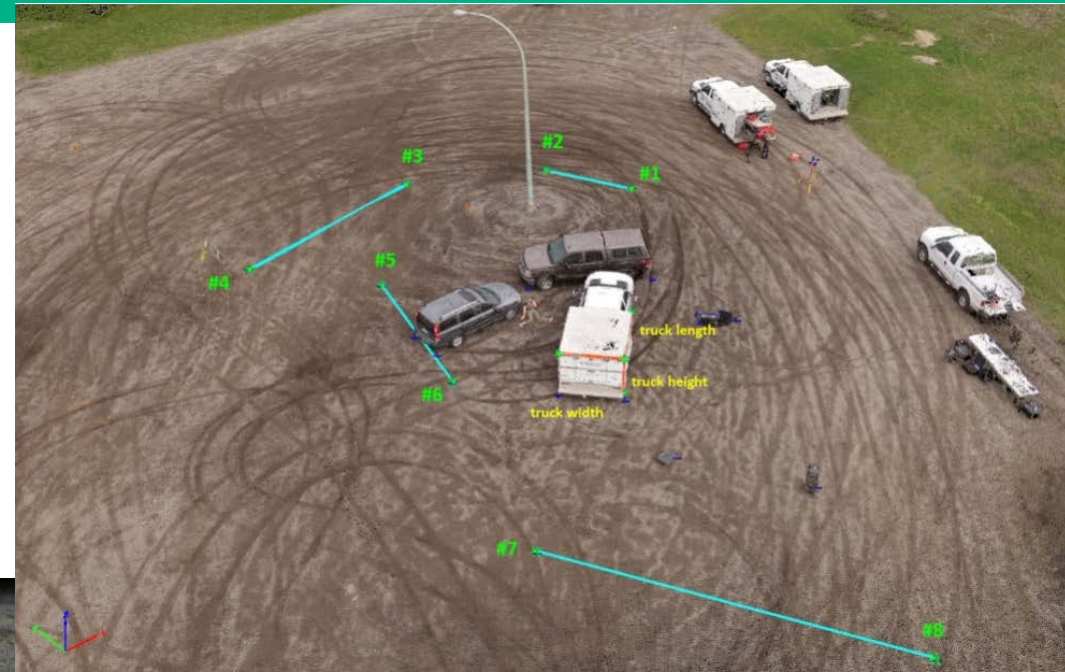
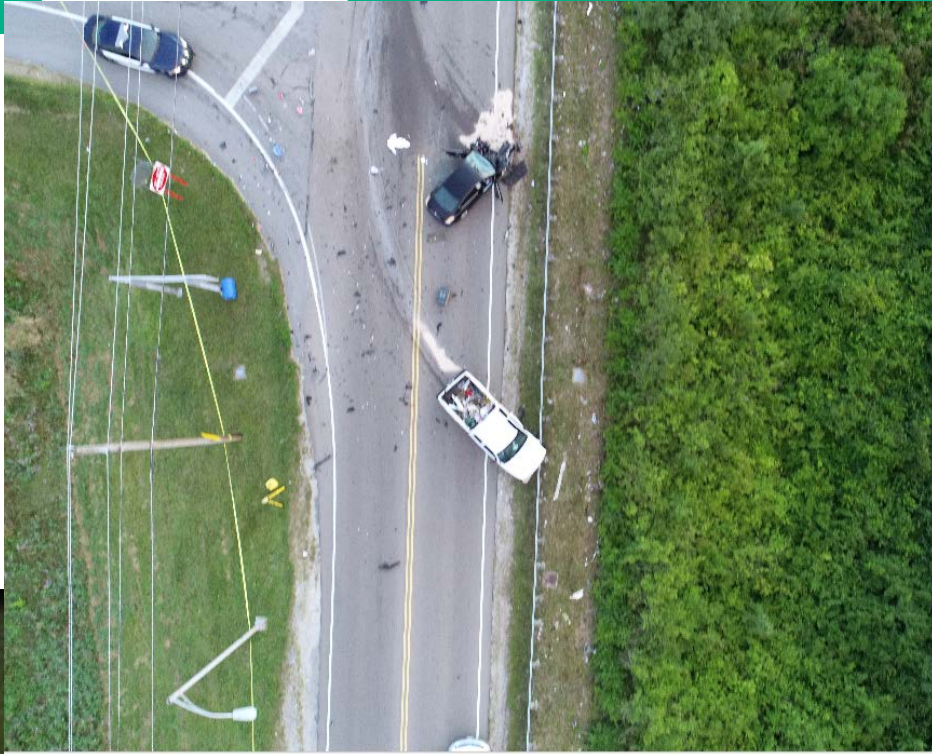
Calamityville  
Radiation Exercise



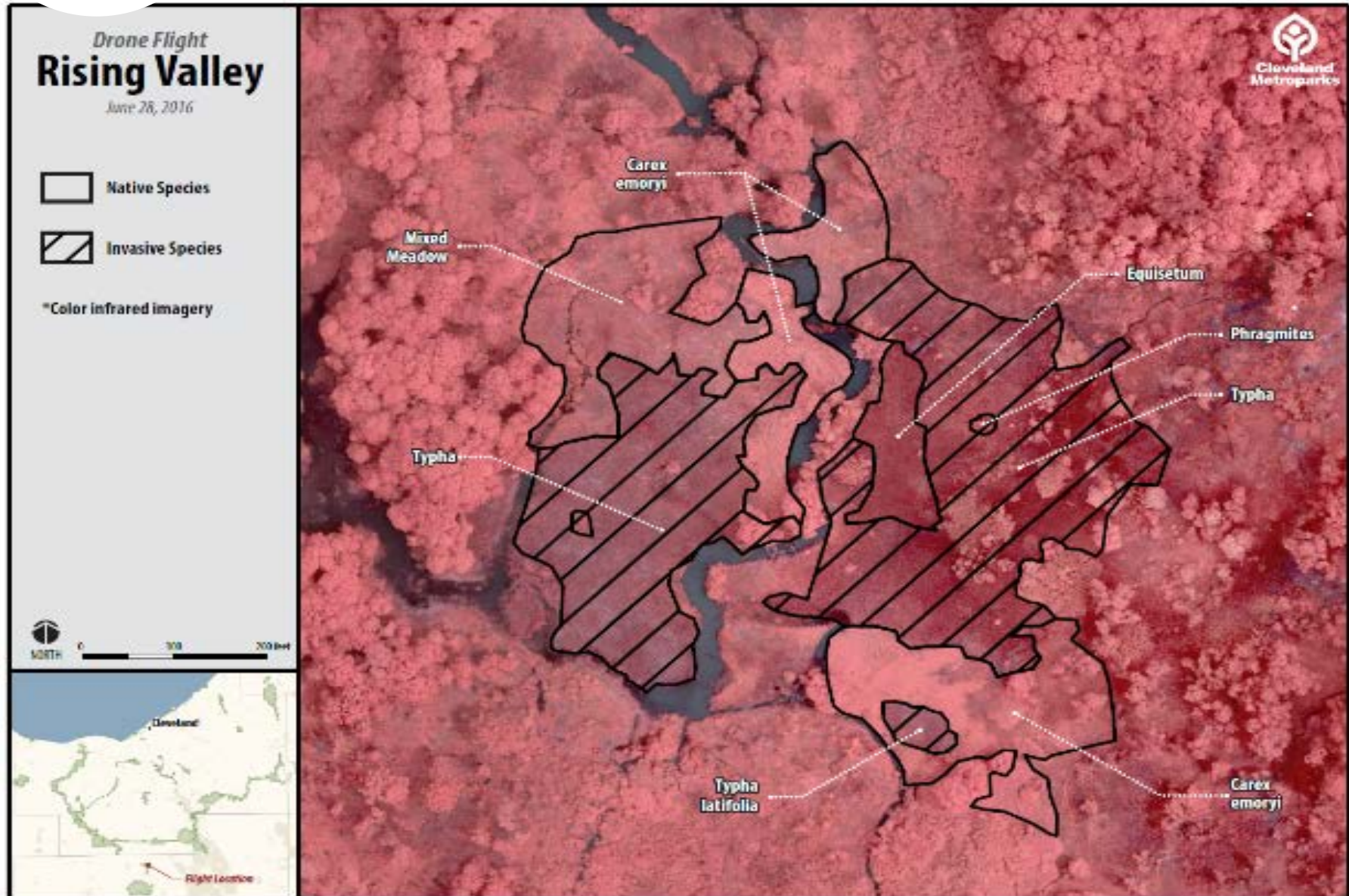
Calamityville  
Radiation Exercise



# Accident Reconstruction







# Flight Planning

Ohio DOT UAS Center > Operations > 2021\_Jan\_4\_LW

2021\_Jan\_4\_LW  
QUINBSBFP1

NEEDS REVIEW MODERATE 0 Save

Operation Flights 0 Documents Customer



Airspace  
Flight Area



On-Site Date & Time\*  
01/04/2021 00:00:00 to 01/05/2021 18:00:00

Total on-site time: 42 hours

Add Travel Time

Pilot In Command\*  
Walker (740-403-1464), Luke

Crew

Aircraft  
Phantom 7 - Yellow Leader

Add Battery

Add Payload

Notes

Notes text area

Custom Fields

Custom Fields table with Label and Value columns

\*Required for LAANC

LAANC

LAANC is not available in this area. Please view the map to determine if you need authorization to fly here. Be aware of Prohibited areas, Restricted areas, and the D.C. FRZ.

Weather

January 4th, 2021, 00:00

37° 32°  
Overcast throughout the day.  
16% chance of precipitation

3 MPH  
WSW (238°)  
Gusts: 10 mph

9 SM

7:51 AM 5:17 PM

Daily Weather

Sun 3rd	Mon 4th	Tues 5th	Wed 6th	Thurs 7th
42° 35° 5 mph 0%	37° 32° 3 mph 16%	38° 29° 4 mph 15%	38° 31° 5 mph 14%	39° 27° 6 mph 14%

Data provided by StarGizky

PIC

Aircraft

Weather



# Risk Assessment



Map Operations Flights Live Insights Manage



Ohio DOT UAS Center

< Operation

Last updated on January 4th, 2021 at 9:13:36 am by Luke Walker (740-403-1464)

## Risk Assessment

Export PDF

Summary		MODERATE		28 / 28 complete
<b>Crew</b>				
1.1	Is the pilot certified and qualified for this mission? <small>Add Mitigation</small>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
1.2	Is the pilot qualified to fly this aircraft? <small>Add Mitigation</small>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
1.3	Days since last flight greater than 30 days <small>Add Mitigation</small>	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
1.4	Is any crew member affected by fatigue or other factors that could impact performance? <small>Add Mitigation</small>	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
1.5	Have all crew members been briefed on the operation? <small>Add Mitigation</small>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
<b>Aircraft</b>				
2.1	Has the aircraft been inspected and determined to be airworthy? <small>Add Mitigation</small>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
2.2	Have Return-to-Home and Maximum Altitude values been checked? <small>Add Mitigation</small>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
2.3	Has the area been checked for Geo-fencing? <small>Add Mitigation</small>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
2.4	Is the aircraft carrying a heavy or cumbersome payload (ie. magnetometer, LIDAR, etc.)? <small>Add Mitigation</small>	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
<b>Weather</b>				
3.1	Are cloud cover and ceiling within acceptable limits? <small>Add Mitigation</small>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
3.2	Is visibility within acceptable limits? <small>Add Mitigation</small>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
3.3	Are wind conditions within aircraft limits or less than 20 mph? <small>Add Mitigation</small>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
3.4	Is precipitation forecast during the scheduled operation? <small>Add Mitigation</small>	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/>	LOW
<b>Location</b>				



# Ohio UAS Center

David Gallagher  
937-497-6767  
david.Gallagher@dot.ohio.gov

