



UNMANNED AERIAL SURVEYING & INSPECTION



County
Commissioners
Association of Ohio

12/6/2016



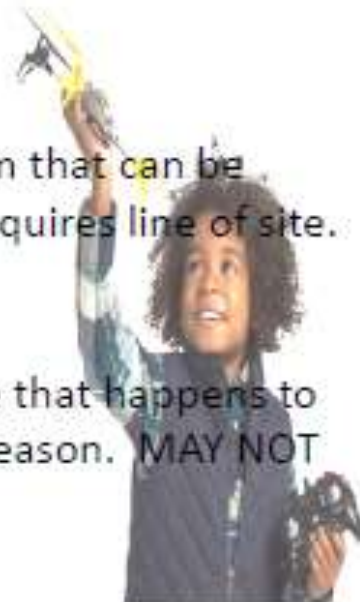
County
Commissioners
Association of Ohio

COMMON MISSUNDERSTANDINGS

DRONE Military Unmanned fully autonomous platform that can be flown without line of site.

sUAS Commercial Small Unmanned Aircraft System that can be controlled both manually and autonomously but requires line of site. Can fly within Class G without a FAA waiver.

Hobbyist Remote controlled helicopter or airplane that happens to have a video camera. Limited range and for good reason. **MAY NOT FLY 5 MILES FROM ANY AIRPORT!**



FAA RULES AND REGULATIONS



Current FAA Regulations

Different Types of UAS Operations

[Public Operations](#) (Governmental)

[Civil Operations](#) (Non-Governmental)

[Model Aircraft](#) (Hobby or Recreation *only*)



[Section 333 Exemption](#) – a grant of exemption in accordance with Section 333 AND a civil Certificate of Waiver or Authorization (COA); this process may be used to perform commercial operations in low-risk, controlled environments.

Small Unmanned Aircraft Regulations (Part 107)

Operations in Class G airspace are allowed without air traffic control permission. Operations in Class B, C, D and E airspace need ATC approval.

You can fly during daylight or in twilight (30 minutes before official sunrise to 30 minutes after official sunset, local time)

The maximum allowable altitude is 400 feet above the ground, and higher if your drone remains within 400 feet of a structure.

Current FAA Regulations

Small Unmanned Aircraft Regulations (Part 107)

Weighing less than 55 pounds

The maximum speed is 100 mph (87 knots).

You can't fly a small UAS over anyone who is not directly participating in the operation, not under a covered structure, or not inside a covered stationary vehicle. No operations from a moving vehicle are allowed unless you are flying over a sparsely populated area.

The maximum allowable altitude is 400 feet above the ground, and higher if your drone remains within 400 feet of a structure.

You may pass an initial aeronautical knowledge test at an FAA-approved knowledge testing center.

If you already have a Part 61 pilot certificate, other than a student pilot certificate, you must have completed a flight review in the previous 24 months and you must take a small UAS online training course provided by the FAA.

Respecting Privacy



FAA PART 107



To Start Operating for Commercial Purposes A Individual or Company will Need

1. an aircraft registered with the FAA
2. a pilot with an Remote Pilot Part 107 airman certificate or a current Part 61 Pilot

3. Insurance Coverage





UAV FLIGHT KNOWLEDGE REQUIREMENTS (FAA-G-8082-22)

- AIR SPACE CLASSIFICATION
 - FLIGHT RESTRICTIONS
 - AVIATION WEATHER MINUMS
 - SMALL UNMANNED AIRCRAFT LOADING
 - EMERGENCY PROCEDURES
 - CREW RESOURCE MANAGEMENT (Pilot in Command (PIC), Visual Observer (VO), and Operator)
 - RADIO COMMUNICATION PROCEDURES
 - UNMANNED AIRCRAFT PERFORMANCE
 - PHYSIOLOGICAL FACTORS
 - AERONOUTICAL JUDGMENT
 - AIRPORT OPERATIONS (INCLUDING TRAFFIC PATTERNS)
 - MAINTENANCE & PREFLIGHT INSPECTION PROCEDURES
 - REGISTRATION & MARKING REQUIRMENTS
-





UAV BEFORE YOU FLY (FAA-G-8082-22)

- VISUAL FLIGHT RULES (VFR)
 - CHECK (NOTAMSs) NOTICES TO AIRMEN
 - AVAITION FORECASTS
 - STRUCTUAL ICING
 - CEILING & CLOUDS
 - Wi-Fi SCAN
 - UAV GPS IS UP
-



PART 107 WAIVERS

- Operation from a moving vehicle or aircraft (§ 107.25)
- Daylight operation (§ 107.29)
- Visual line of sight aircraft operation (§ 107.31)
- Visual observer (§ 107.33)
- Operation of multiple small unmanned aircraft systems (§ 107.35)
- Yielding the right of way (§ 107.37(a))
- Operation over people (§ 107.39)
- Operation in certain airspace (§ 107.41)
- Operating limitations for small unmanned aircraft (§ 107.51)

***Processing time depends on the complexity of the request;
however the agency strives to respond within 90 days.***



SAFE FLYING WITH UAV'S



I FLY SAFE



All drones are aircraft—even the ones at the toy store.
So when I fly a drone I am a pilot.
Before I fly I always go through my pre-flight check list.
I regularly check the safety guidelines at faa.gov/uas



Federal Aviation
Administration

FLY SMART, FLY SAFE, AND HAVE FUN!

knowbeforeyoufly.org | faa.gov/uas

PRE-FLIGHT CHECKLIST

- 1 I fly below 400 feet
- 1 I always fly within visual line of sight
- 1 I'm aware of FAA airspace requirements: faa.gov/go/uas/tfr
- 1 I never fly over groups of people
- 1 I never fly over stadiums and sports events
- 1 I never fly within 5 miles of an airport without first contacting air traffic control and airport authorities
- 1 I never fly near emergency response efforts such as fires
- 1 I never fly near other aircraft
- 1 I never fly under the influence



STAY ON TOP OF
WWW.FAA.GOV/UAS

Latest News & Updates



FAA Air Traffic Report

December 5, 2016 – Get a heads-up on any daily impacts to normal air traffic operations.



New FAA Video Stresses Holiday Drone Safety

November 25, 2016 – A new FAA video offers tips on flying your drone safely this holiday season—and all year around.



Fly Safe: Prevent Loss of Control Accidents

November 16, 2016 – This month, FlySafe looks at how to maintain a stabilized approach.



FAA Evaluates Drone Detection Systems Around Denver

November 16, 2016 – Denver research is one of six planned technical evaluations.



FAA Offers Air Travel Safety Tips

November 15, 2016 – FAA Administrator Michael Huerta asks passengers to Fly Smart this holiday season.



AIRSPACE REGULATIONS

CONTROLLED AIRSPACE

ATC SERVICE IS PROVIDED

- CLASS A
- CLASS B
- CLASS C
- CLASS D
- CLASS E

UNCONTROLLED AIRSPACE

UNCONTROLLED OR CLASS
G AIRSPACE IS THE
PORTION OF THE AIRSPACE
THAT HAS NOT BEEN
DESIGNATED AS CLASS A,
B, C, D, OR E.

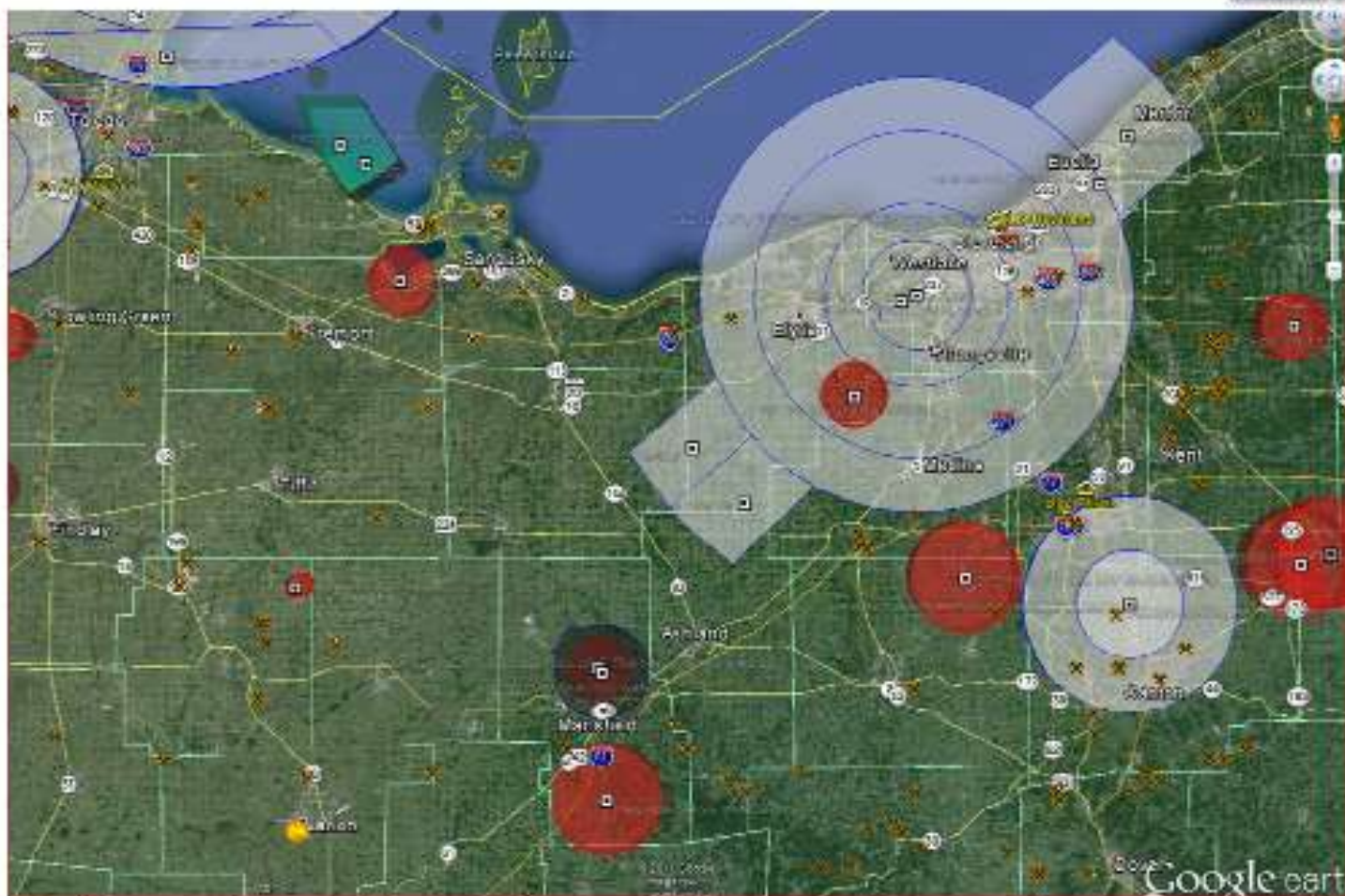




CONTROLLED AIRSPACE

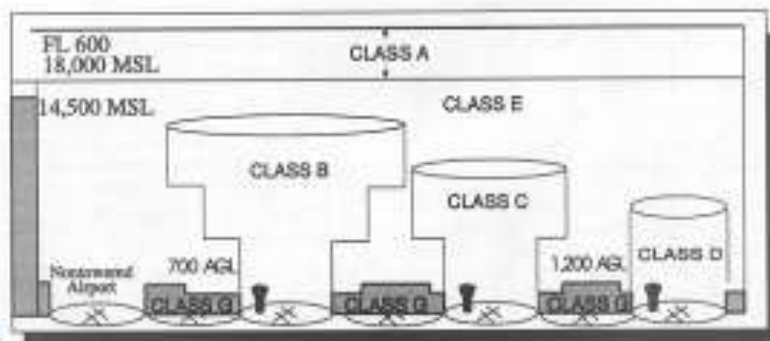


County
Commissioners
Association of Ohio





CONTROLLED AIRSPACE



MSL - mean sea level
AGL - above ground level
FL - flight level



SCALE 1:500 000

Insurance holding Companies (Towers are shown in Blue; all others in Magenta). Consult Airport/Fly Direct (A-FD) for details including airport facilities, regulations, rules, and services. For additional medical information refer to the Client Care's Guide.

AIRPORT TRAFFIC SERVICE AND AIRSPACE INFORMATION

TOPOGRAPHIC INFORMATION

Only the restricted and marginal groups of the system have 10,000 or less, and their worth of all 30 items is low.

- Class 4 Average
- Class 5 Average (mode 2)
See PAR 5.1.1 (3.50%)
- Class 6 Average

40
 Only 4 of Class 6. No point in looking for it. On average, the 10,000 or less is a little bit better than the 10,000 or less.

- **Practical Book, Notebook, and Writing Aids:** Calculators, Conversion Charts, and other handy tools.
- **Field Aids and BOM:** Military Operations Plans
- **Specialty Paper:** Drafting Paper (See FAR Part 83 for more info)
- **WALL - A:** A collection of wall charts and posters
- **WALL - C:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - D:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - E:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - F:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - G:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - H:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - I:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - J:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - K:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - L:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - M:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - N:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - O:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - P:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - Q:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - R:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - S:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - T:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - U:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - V:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - W:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - X:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - Y:** Draft FAR 83.22(a)(4)(i) and (ii)
- **WALL - Z:** Draft FAR 83.22(a)(4)(i) and (ii)

FRANCIS Green Stations

Train path

Plasma Train embankment Lines

App at Guide

- Lanchester Features - structure, location, gull, access, etc.
- Outline: The area
- (1) Lanchester Tower (with Stevenson Box of Tides)
- + CC Coast Line of Stations

FDNY — Fire Service Support

[illegible]

Question 10 **10/10** **100%** **Correct**

Which of the following is a characteristic of the *Chlamydomonas reinhardtii* cell wall?

☐ It is composed of cellulose.

☐ It is composed of chitin.

☐ It is composed of peptidoglycan.

☒ It is composed of a cell wall made of a single layer of cellulose.

Feedback: The cell wall of *Chlamydomonas reinhardtii* is composed of a single layer of cellulose.

MISCELLANEOUS

T⁺E = Targeted Live (20-30% VLE)

- Life support Activity
- Heavy armor Activity
- Mobile Operations
- Deep ground threat's Activity

1. Indicators of change
 2. On left + Value Mod
 3. More or fewer
 4. Absolute Pos.
 5. Total Count on left
 6.

(From symbol does not indicate a resource used alone or distinct affix and pass a rule on data not indicate a resource used elsewhere with affix)
 (Mass noun flight conditions may exist outside and cause resource (passive))



[illegible][illegible]


-  ProjectTalk: Jumping Aboard (See Airport Plan by David Jay)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)
-  [WFOHS \(2011\)](#)




INSTRUCTIONS

[illegible]


 1 antenna: about 100mW only


 2 antennas: 100mW to 10W

 4 antennas: 10W to 100W

 8 antennas: 100W to 1000W

 16 antennas: 1000W to 10000W

 32 antennas: 10000W to 100000W

 64 antennas: 100000W to 1000000W

 128 antennas: 1000000W to 10000000W

 256 antennas: 10000000W to 100000000W

 512 antennas: 100000000W to 1000000000W

 1024 antennas: 1000000000W to 10000000000W

 2048 antennas: 10000000000W to 100000000000W

 4096 antennas: 100000000000W to 1000000000000W

 8192 antennas: 1000000000000W to 10000000000000W

 16384 antennas: 10000000000000W to 100000000000000W

 32768 antennas: 100000000000000W to 1000000000000000W

 65536 antennas: 1000000000000000W to 10000000000000000W

 131072 antennas: 10000000000000000W to 100000000000000000W

 262144 antennas: 100000000000000000W to 1000000000000000000W


 524288 antennas: 1000000000000000000W to 10000000000000000000W

 1048576 antennas: 10000000000000000000W to 100000000000000000000W

 2097152 antennas: 100000000000000000000W to 1000000000000000000000W

 4194304 antennas: 1000000000000000000000W to 10000000000000000000000W

 8388608 antennas: 10000000000000000000000W to 100000000000000000000000W

 16777216 antennas: 100000000000000000000000W to 1000000000000000000000000W

 33554432 antennas: 1000000000000000000000000W to 10000000000000000000000000W

 67108864 antennas: 10000000000000000000000000W to 100000000000000000000000000W

 134217728 antennas: 100000000000000000000000000W to 1000000000000000000000000000W

 268435456 antennas: 1000000000000000000000000000W to 10000000000000000000000000000W

 536870912 antennas: 10000000000000000000000000000W to 100000000000000000000000000000W

 1073741824 antennas: 100000000000000000000000000000W to 1000000000000000000000000000000W

 2147483648 antennas: 1000000000000000000000000000000W to 10000000000000000000000000000000W

 4294967296 antennas: 10000000000000000000000000000000W to 100000000000000000000000000000000W

 8589934592 antennas: 100000000000000000000000000000000W to 1000000000000000000000000000000000W

 17179869184 antennas: 1000000000000000000000000000000000W to 10000000000000000000000000000000000W

 34359738368 antennas: 10000000000000000000000000000000000W to 100000000000000000000000000000000000W

 68719476736 antennas: 100000000000000000000000000000000000W to 1000000000000000000000000000000000000W

 137438953472 antennas: 1000000000000000000000000000000000000W to 10000000000000000000000000000000000000W

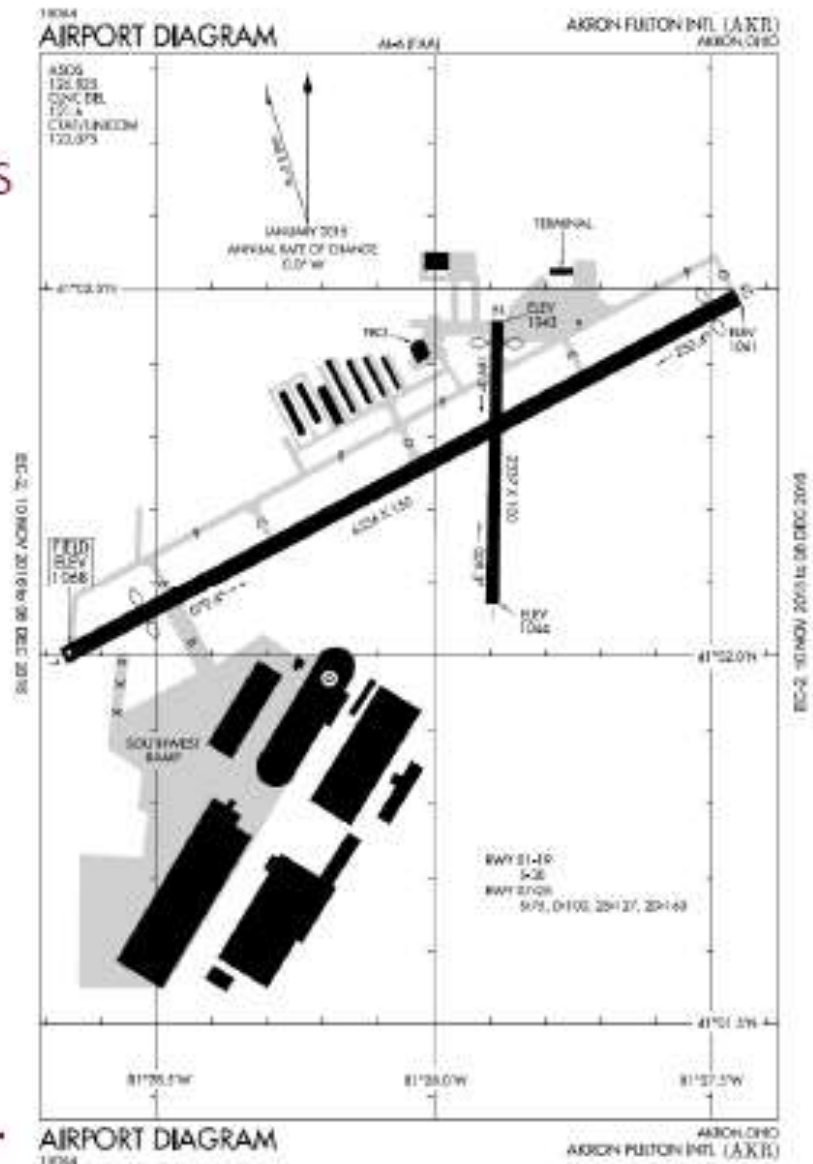
 274877906944 antennas: 10000000000000000000000000000000000000W to 100000000000000000000000000000000000000W

 549755813888 antennas: 100000000000000000000000000000000000000W to 1000000000000000000000000000000000000000W

 1099511627776 antennas: 1000000000000000000000000000000000000000W to 100W

 2199023255552 antennas: 100W to 1000W

 4398046



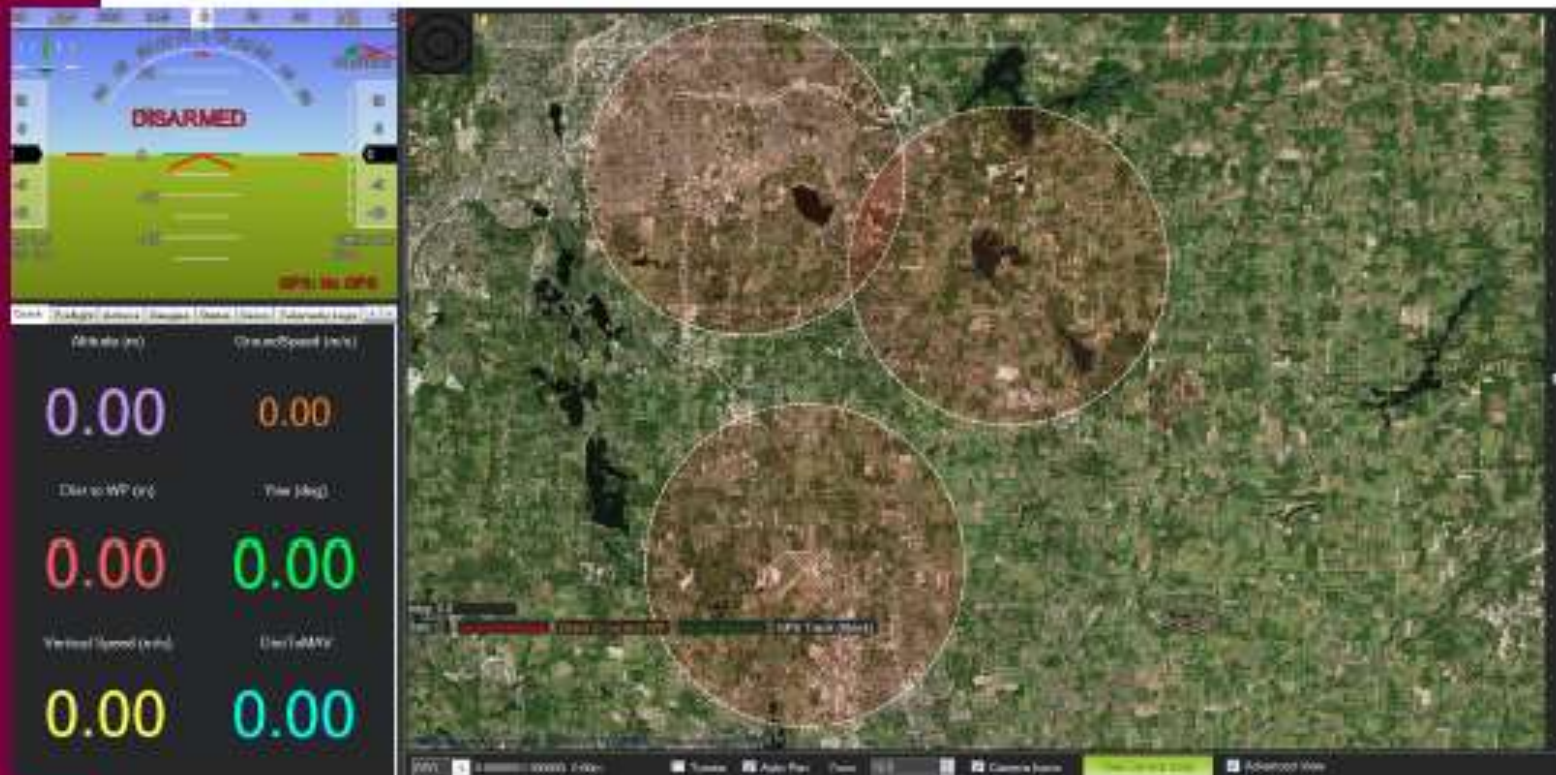


OTHER AIRSPACE CONSIDERATIONS





TELEMETRY SOFTWARE



UAS PLATFORMS & FLIGHT OPERATIONS



FLIGHT OPERATIONS MANUAL

sUAS Aircraft Operations



This Flight Operations Manual outlines the policies and procedures for all of DLZ Engineering's sUAS Flight Operations.

DLZ UAS AIRCRAFT OPERATIONS

Pilot In Command (PIC) having certified FAA sport pilot license or grater will conduct all UAV Flights.

-Prior to an operation, the PIC shall identify and communicate a location from which the Observer(s) will perform his/her duties.

-The PIC shall ensure the field operation is conducted within the tolerances of the DLZ Operations Manual and within the tolerances of the Aircraft manufacturer's operations. -

-Communication Procedures PIC shall establish appropriate ATC facilities anytime the aircraft is being operated in Class B, C, or D airspace.

Observer shall maintain a proximity to the PIC to exercise "see-and-avoid" (also known as *Detect Sense-and-Avoid*) by scanning the area around the aircraft for potentially conflicting traffic and shall visually maintain contact with the Aircraft and keep a diligent look out for airborne and ground based threats.

-The Observer shall assist the PIC in not allowing the aircraft to operate beyond the visual line-of-sight limit, Direct voice communication, Cellular phone, Audible voice device (*i.e.*, megaphone), Handheld radio

Qualifications:

Demonstrate and maintain

- Knowledge of all operational aspects of the Aircraft.
- Knowledge of the airspace in which the work detailed in the DLZ Manual will be performed.
- Knowledge of the details of this Manual.
- Knowledge of basic FAA weather minimums.





UAV PRE AND POST FLIGHT CHECK LIST

PREFLIGHT

- ☐ Check local regulations, airport proximity, and altitude restrictions before you arrive in the field.
- ☐ When relevant, work with local community members to describe what you will be doing and to answer questions.
- ☐ Ensure a spotter can come to the field site with you.
- ☐ When applicable, create your autonomous mission in the relevant software and perform a simulation.
- ☐ Check the planned flight area for obstacles, animals, and people.
- ☐ Evaluate wind speed, visibility conditions, and potential for inclement weather.
- ☐ Ensure adequate room for the UAV to safely take off and land.
- ☐ Inspect airframe and ensure propellers, engine, gimbal, and camera are attached.
- ☐ Test electrical connections.
- ☐ Check batteries to ensure they are fully charged and functional.
- ☐ Ensure camera or sensor batteries are also fully charged.
- ☐ Check that camera or sensor memory is present and has capacity.
- ☐ Ensure RC and telemetry systems are functioning.
- ☐ Perform brief test flight before starting intended mission.

POSTFLIGHT

- ☐ Power down UAV.
 - ☐ Remove and safely store batteries.
 - ☐ Check camera or sensor to ensure all required data have been collected.
 - ☐ Make logbook entry.
-



DLZ UAV PLATFORMS



DJI Phantom 3 Professional



senseFly Albris



E386 by Event 38

APPLICATIONS USING UAS

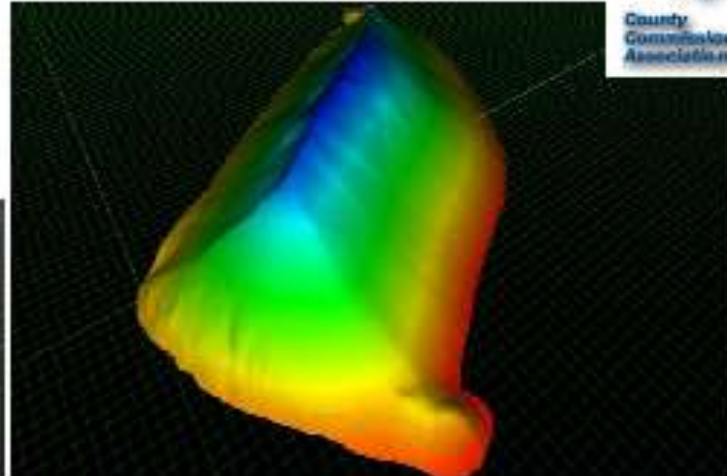


DLZ'S INTEREST WITH SUAS



County
Commissioners
Association of Ohio

- Surveying & Mapping
 - Topographic Surface Modeling
 - Volumetric Quantities
 - Industrial
 - Mining
 - Power
 - Asset management
- Inspection
 - Bridges
 - Dams
 - Buildings
 - Wind turbines
 - Cellular towers
- Architectural Rendering





DLZ'S INTEREST WITH SUAS

- Construction As-Built
 - During Construction
 - After Construction
- Disaster relief
- Traffic Count Monitoring
- Data/Imagery In a Can



PARIS AVENUE/EASTON
STREET

ROUNDBOUT

American Society of
Highway Engineers,
Cuyahoga Valley Section
"2015 Outstanding Highway
Project Award" Under \$3
million





CONSTRUCTION



EDLZ STRUCTURAL INSPECTION



County
Commissioners
Association of Ohio

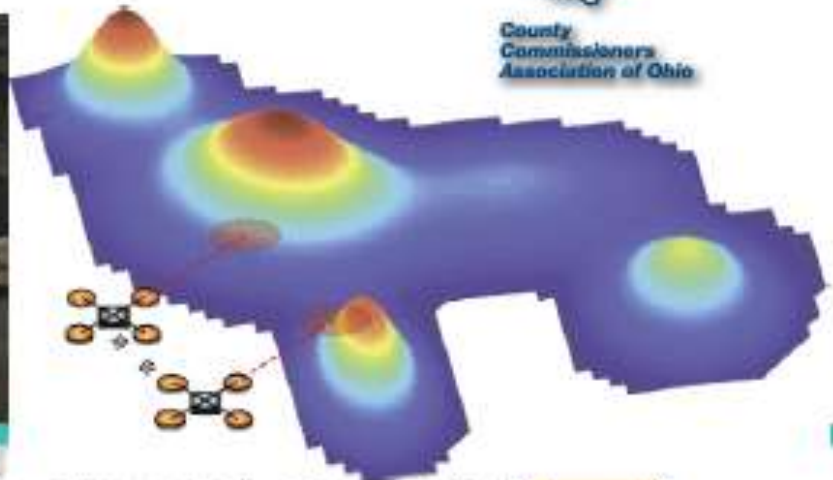
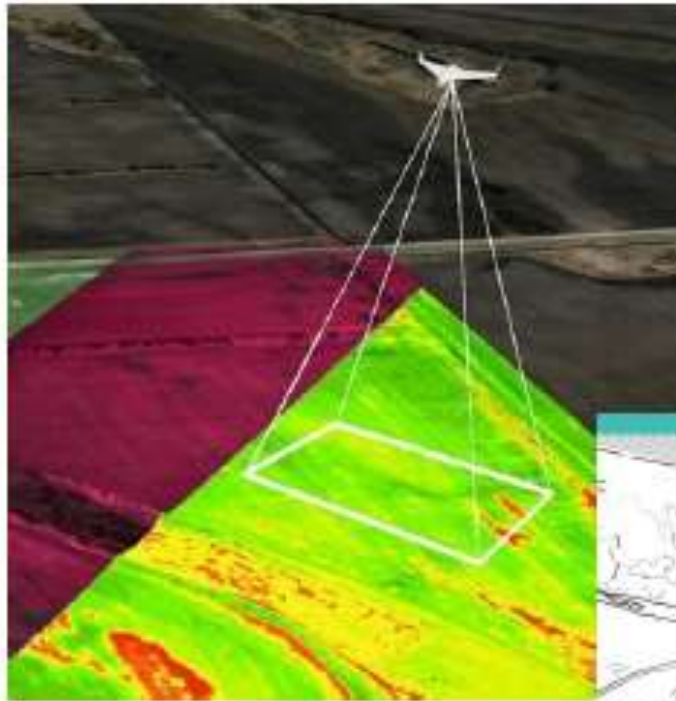
- Chimney & Aerial Inspection
- Oil and Gas Asset Infrastructure Assessments
- Environmental Monitoring for Oil, Gas and Mining
- Pipeline Aerial Inspection Survey
- Storage Tank Inspection for Tank Farms
- Storage Vessel Tank Inspection
- Save Down Time
- Reduce Occupational Risk



EDLZ MAPPING



County
Commissioners
Association of Ohio





THERMAL (USING FLIR IR CAMERAS)

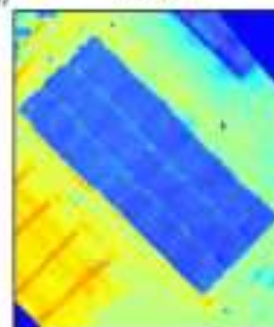
Inspecting pipe insulation



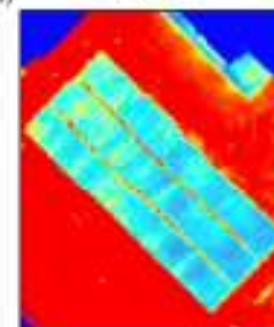
County
Commissioners
Association of Ohio



(a) 8:50 GMT

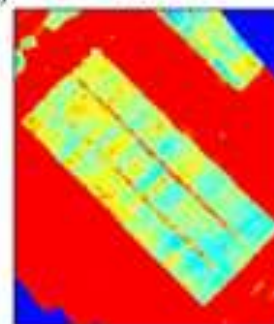


(b) 11:15 GMT

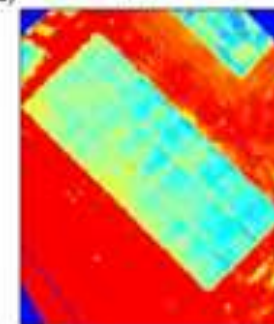


Tc-Ta
10 K
8 K

(c) 13:00 GMT



(d) 15:00 GMT



LIABILITIES & LEGAL RAMIFICATIONS



LIABILITIES

- Insurance coverage for UAS/UAVs:
- Manufacturer product liability
- Aircraft physical damage
- UAS/UAV equipment damage
- Medical payments
- Fire legal liability
- Personal injury
- Advertising injury
- Terrorism coverage
- Non-owned UAS/UAV coverage
- Privacy Issues

EDLZ Limitations



Limitations

- Weather
 - Winds
 - Rain
 - Snow
 - Lightening
- Protected Airspace
 - must maintain 400' or less above ground
 - NOTAMS Prior to the operation, check for Flight Restrictions and GPS NOTAMS
 - 500' from any airport
- Privacy
- Not allowed to fly at night
- Must maintain line of site
- Must maintain (500) feet or one hundred Participants, vessels, vehicles, and structures
- Brush Lines and Tree Cover

Solutions to Limitations

- Knowing when conventional Surveying is needed
- Contingency Plans
- Filing for Part 107 Waivers



The Five Hazardous Attitudes

Anti-authority: "Don't tell me."

This attitude is found in people who do not like anyone telling them what to do. In a sense, they are saying, "No one can tell me what to do." They may be resentful of having someone tell them what to do, or may regard rules, regulations, and procedures as silly or unnecessary. However, it is always pilot prerogative to question authority if it seems to be in error.

Impulsivity: "Do it quickly."

This is the attitude of people who frequently feel the need to do something—anything—immediately. They do not stop to think about what they are about to do; they do not select the best alternative, and they do the first thing that comes to mind.

Invulnerability: "It won't happen to me."

Many people believe that accidents happen to others, but never to them. They know accidents can happen, and they know that anyone can be affected. They never really feel or believe that they will be personally involved. Pilots who think this way are more likely to take chances and increase risk.

Macho: "I can do it."

Pilots who are always trying to prove that they are better than anyone else are thinking, "I can do it. I'll show them." Pilots with this type of attitude will try to prove themselves by taking risks in order to impress others. While this pattern is thought to be a male characteristic, women are equally susceptible.

Resignation: "What's the use?"

Pilots who think, "What's the use?" do not see themselves as being able to make a great deal of difference in what happens to them. When things go well, the pilot is apt to think that it is good luck. When things go badly, the pilot may feel that "someone is out to get me," or attribute it to bad luck. The pilot will leave the action to others, for better or worse. Sometimes, such pilots will even go along with unreasonable requests just to be a "nice guy."

Figure 8-8. Pilots should examine their decisions carefully to ensure that their choices have not been influenced by a hazardous attitude.



Figure 9-9. Prior to flight, pilots should assess their fitness, just as they evaluate the aircraft's airworthiness.

PAST DLZ PROJECTS



SENECA UR HYDRO ELECTRIC PUMP STORAGE FACILITY





Prepping senseFly Ebee



Flight from 400'



Site **EDLZ**

Take off



Flight Controls

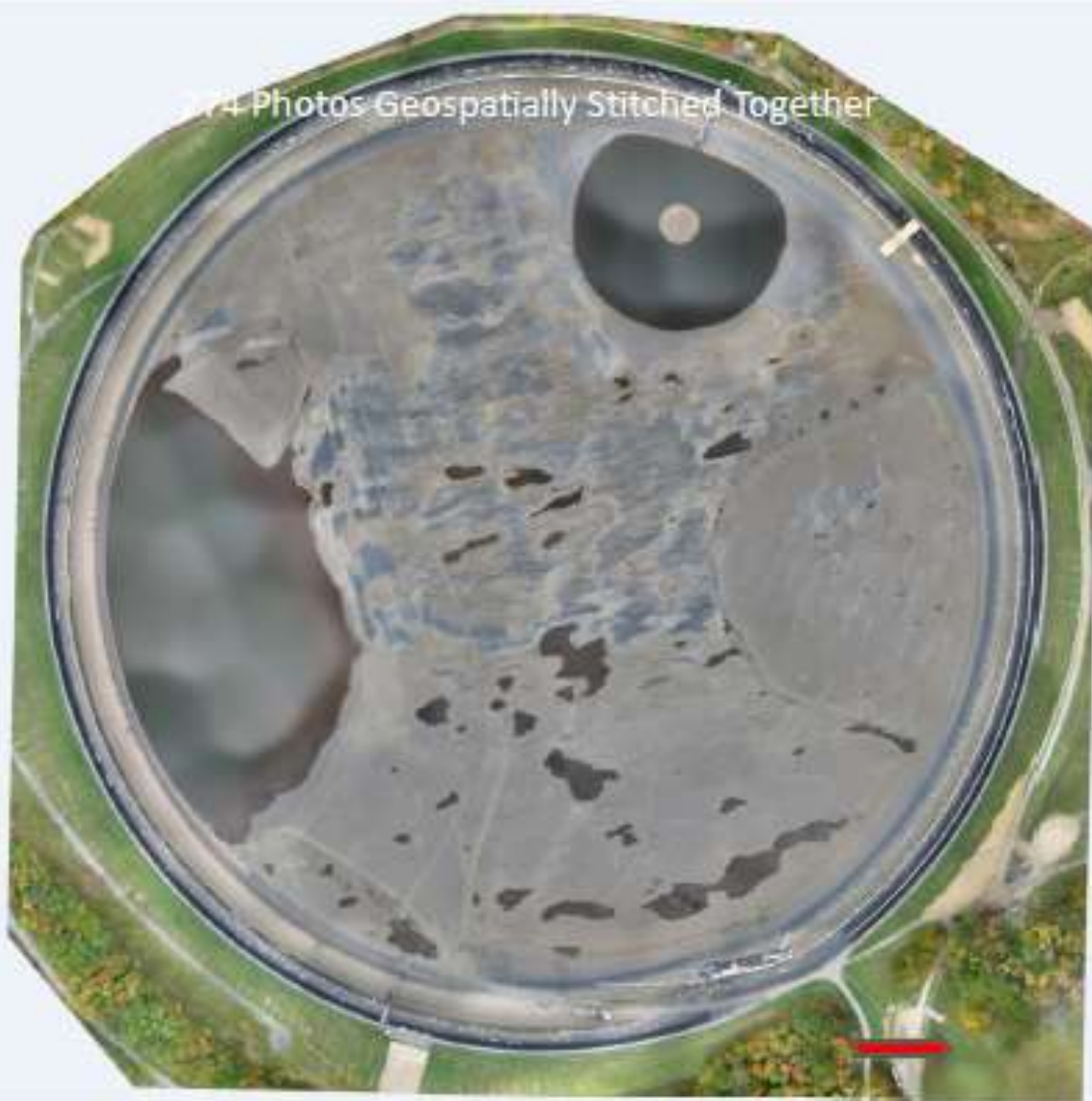




10 page Quality Report



74 Photos Geospatially Stitched Together









Seneca2100214.tif

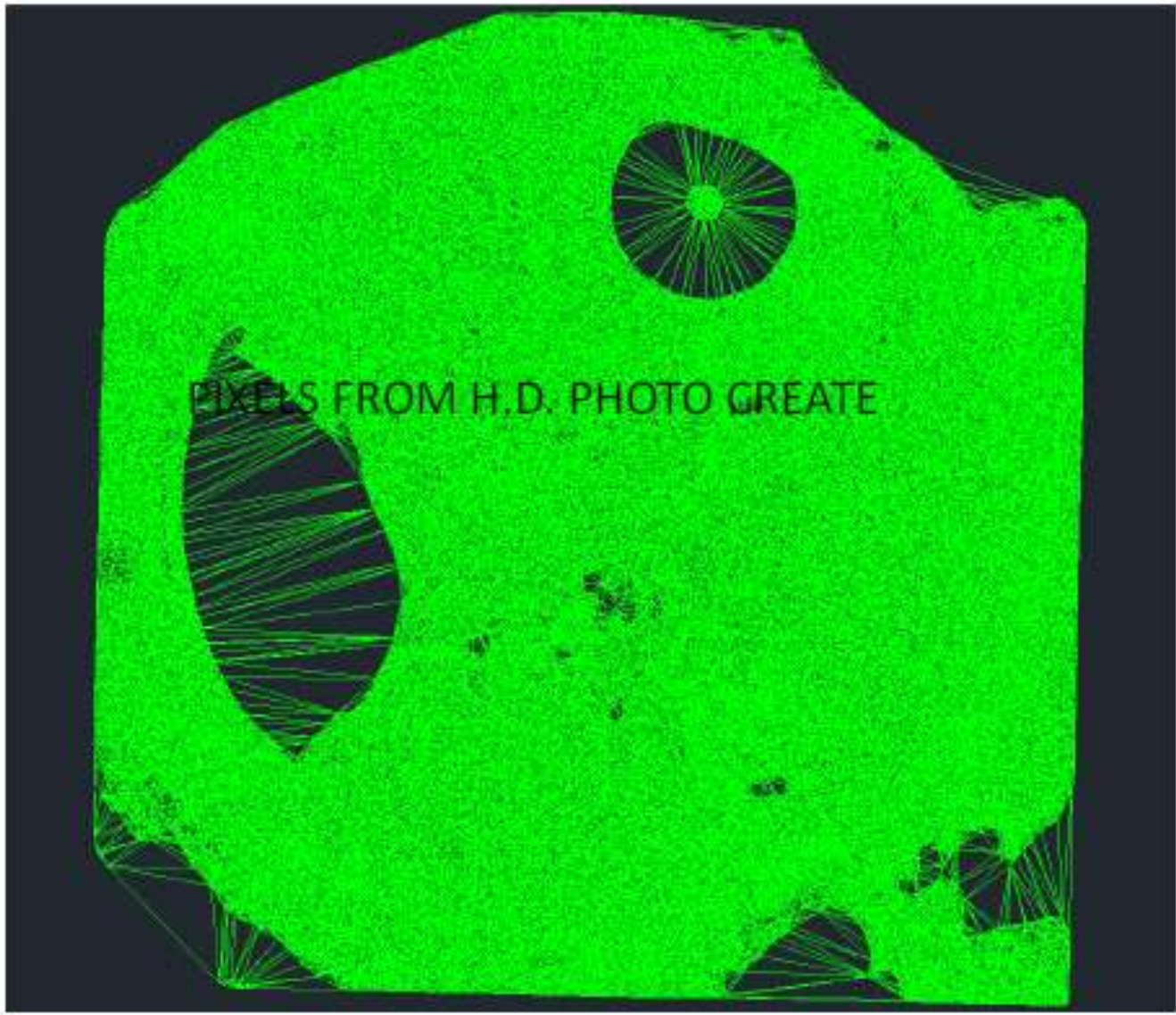
10/8/2014 2:17 PM

.TIFF image

695,456 KB



PIXELS FROM H.D. PHOTO CREATE





**WHEN RECEIVING sUAS DATA ALLOW PLEANTY OF
TIME TO EDIT!**



DELIVERABLES





SOUTHWEST INTERCEPTOR ROSBY LANDFILL AREA

NORTHEAST OHIO REGIONAL SEWER DISTRICT

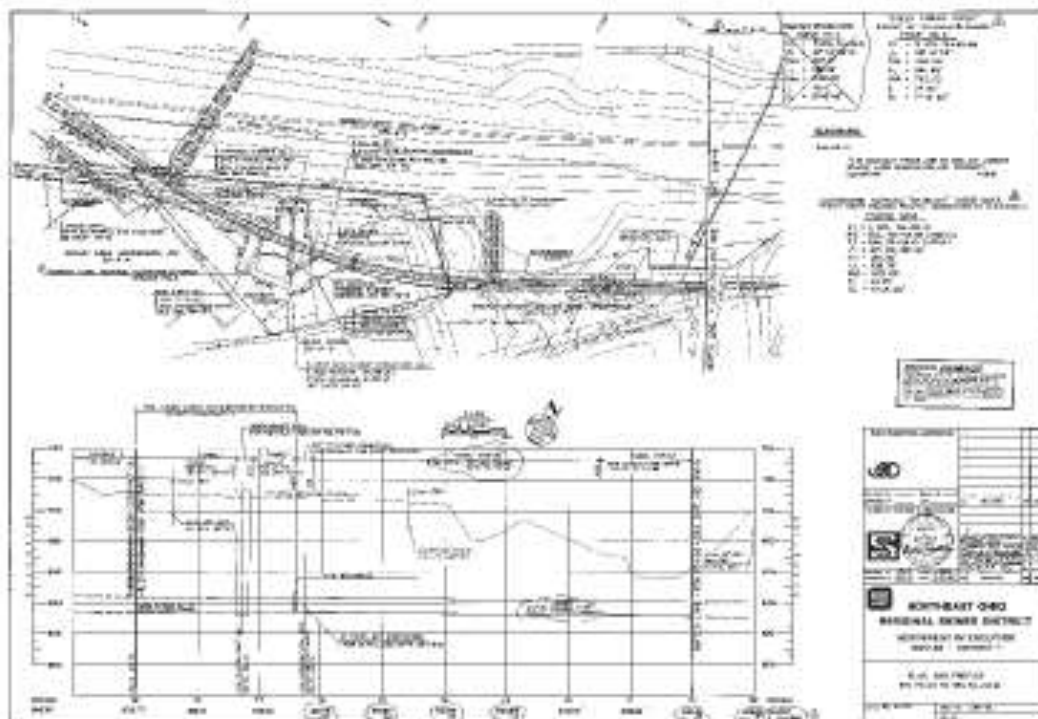
CLEVELAND, OHIO

SOUTHWEST INTERCEPTOR

DESIGNED AND DRAWN BY
DATE OF DESIGN

WATER AND SEWERAGE
DIVISION 2 BUREAU OF
ENGINEERING AND DESIGN
CITY OF CLEVELAND
LEONARD J. BERNARD
WILLIAM J. BERRY

DATE OF DESIGN: 11/10/00



ACTIVE LANDFILL





2014 ORTHO IMAGE TAKEN FROM EBEE AT 400'



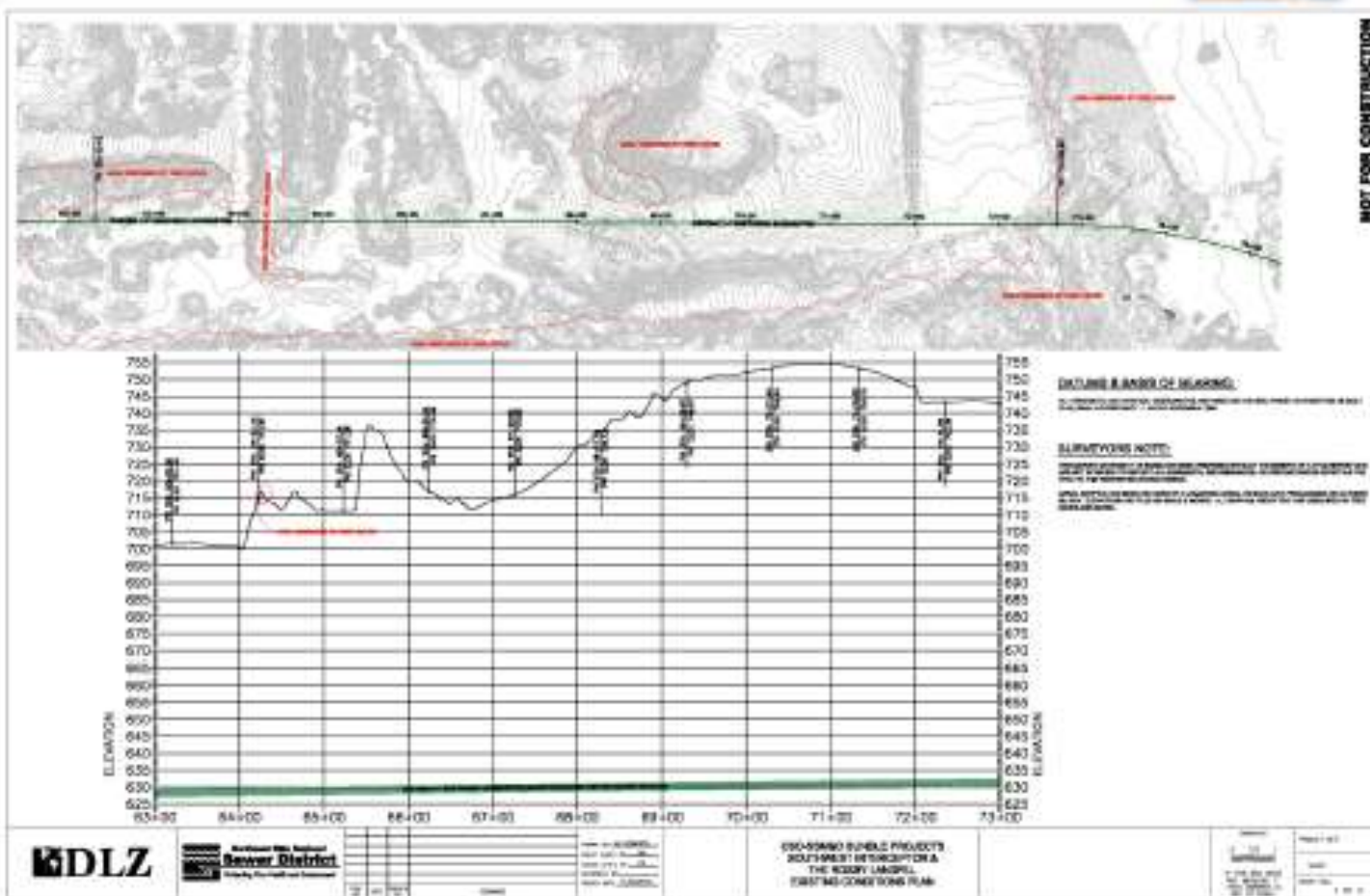
transparent_land@mesaic_group1.tif

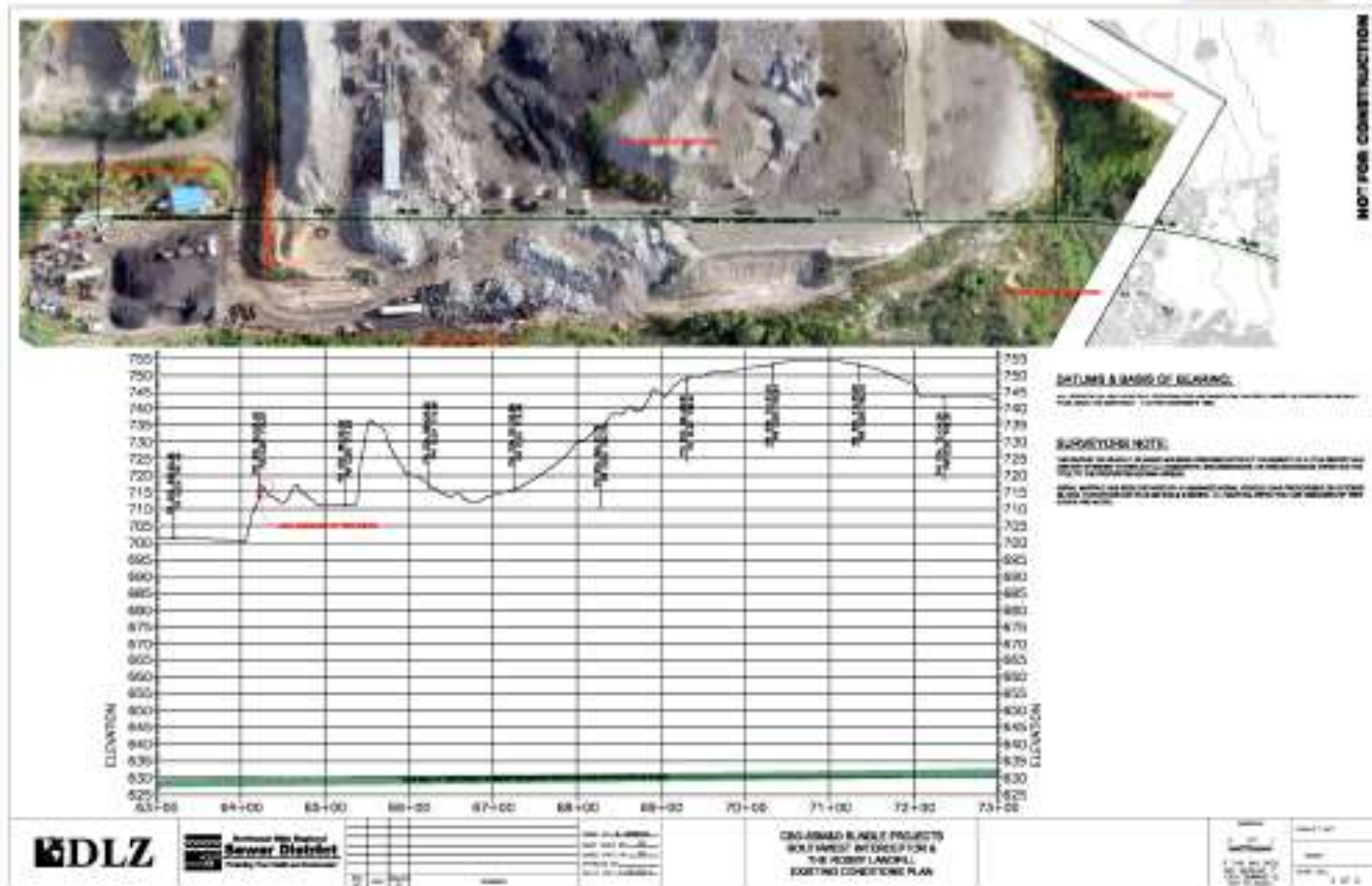
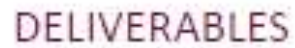
11/3/2014 12:27 AM TIF image

1,028,104 KB



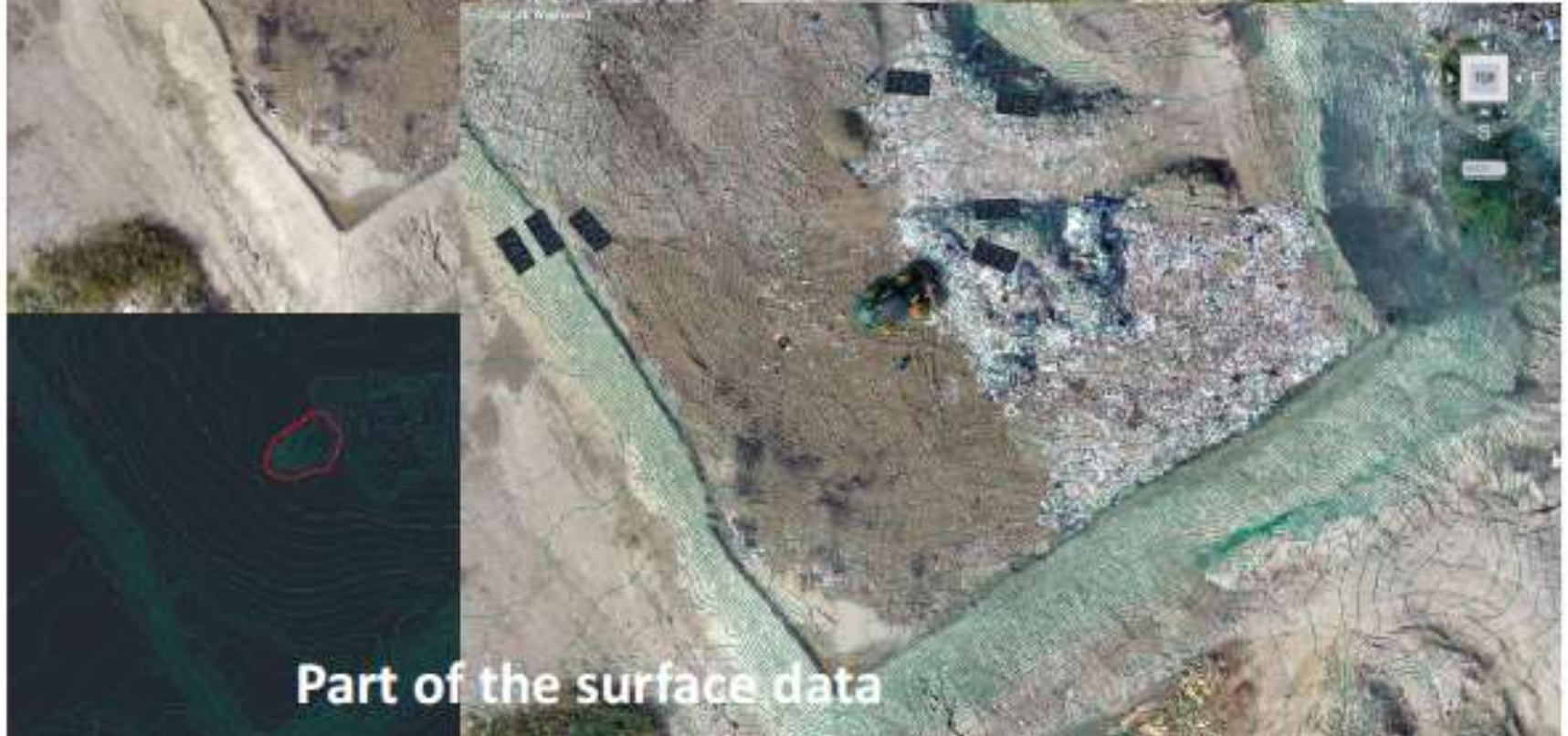
County
Commissioners
Association of Ohio





4-WHEEL SHEEPSFOOT ROLLER

Part of the surface data







FLIGHT NUMBER ONE



Flight-Ortho Q31F

30/08/2006 11:31 TFF image

3.08.011 NR

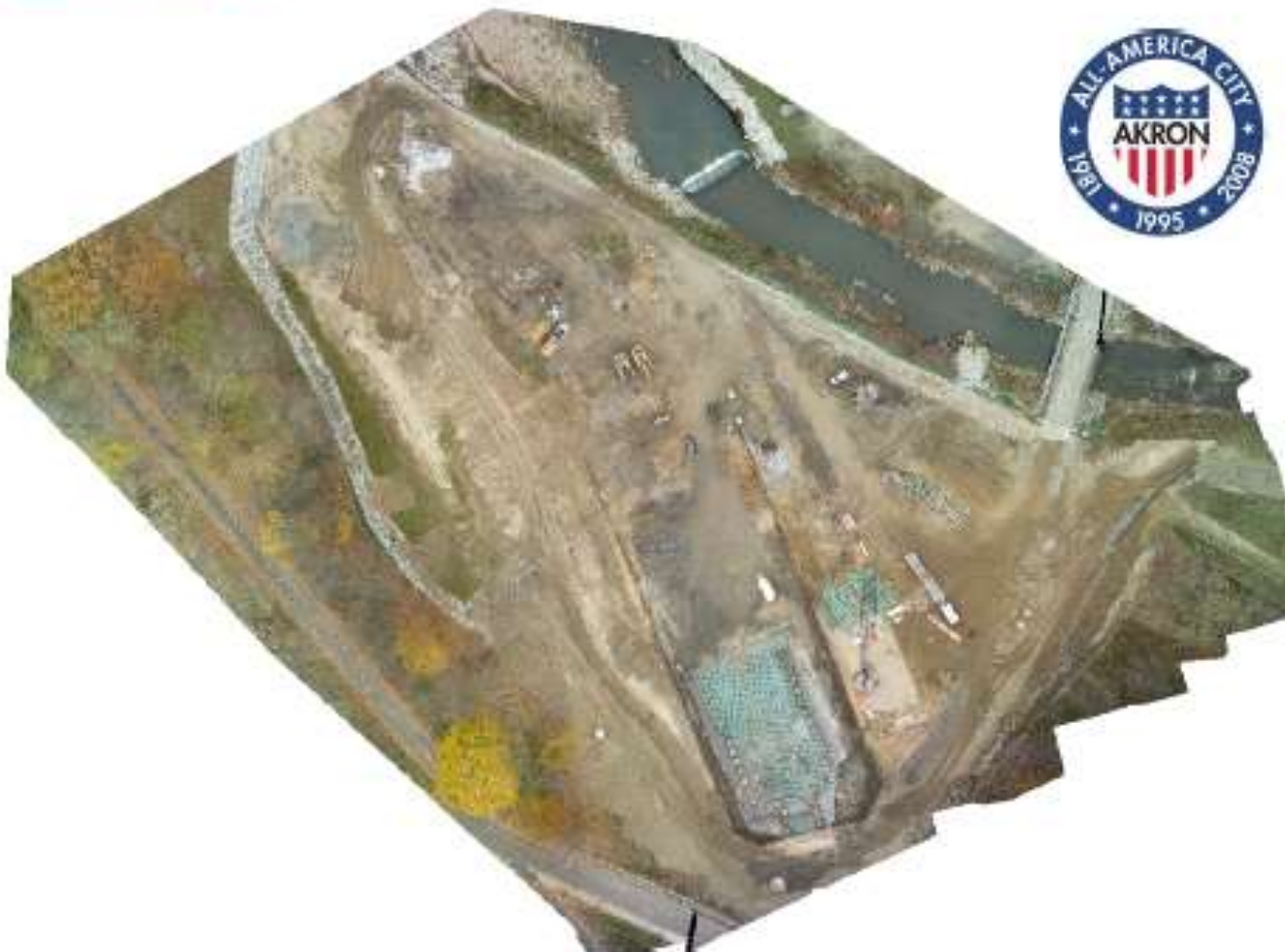


FLIGHT NUMBER TWO



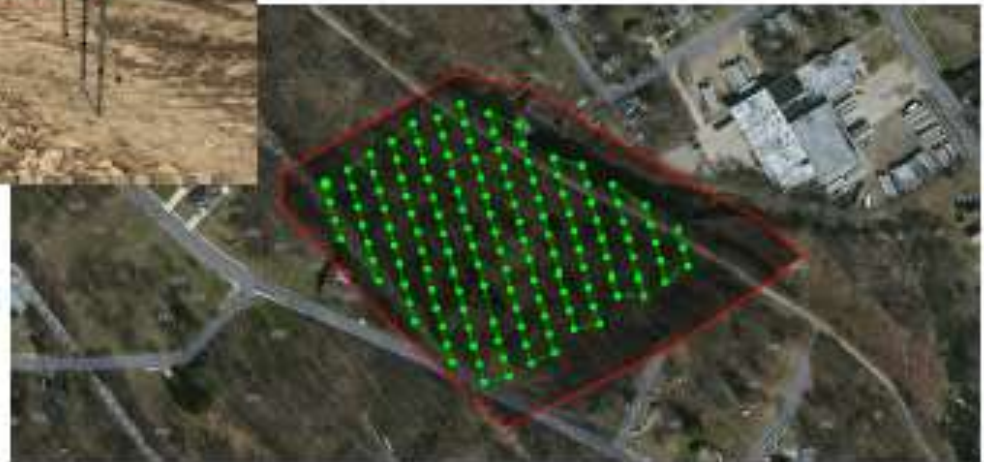


AKRON TUNNEL PROJECT



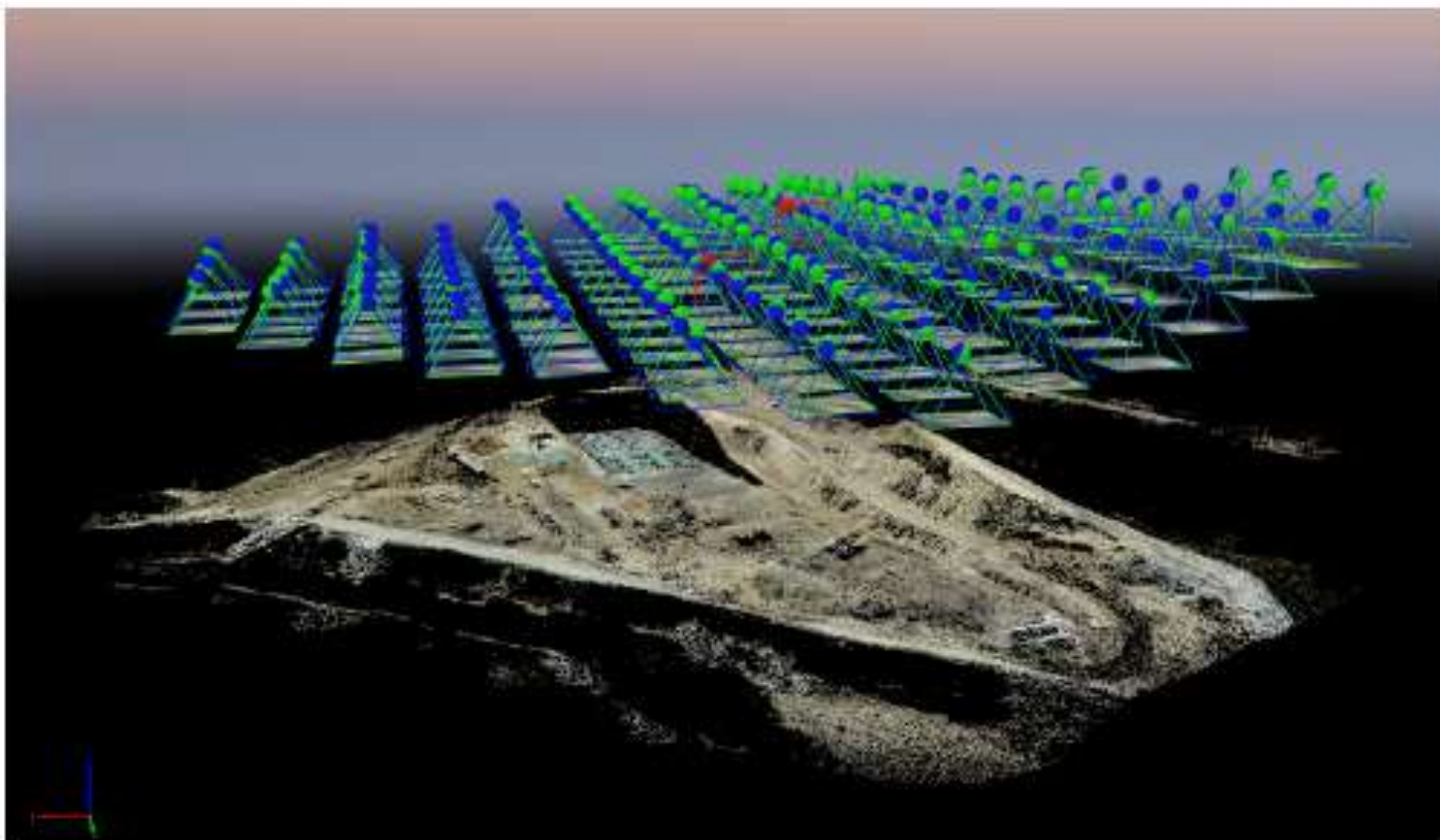


SITE AND FLIGHT SET UP



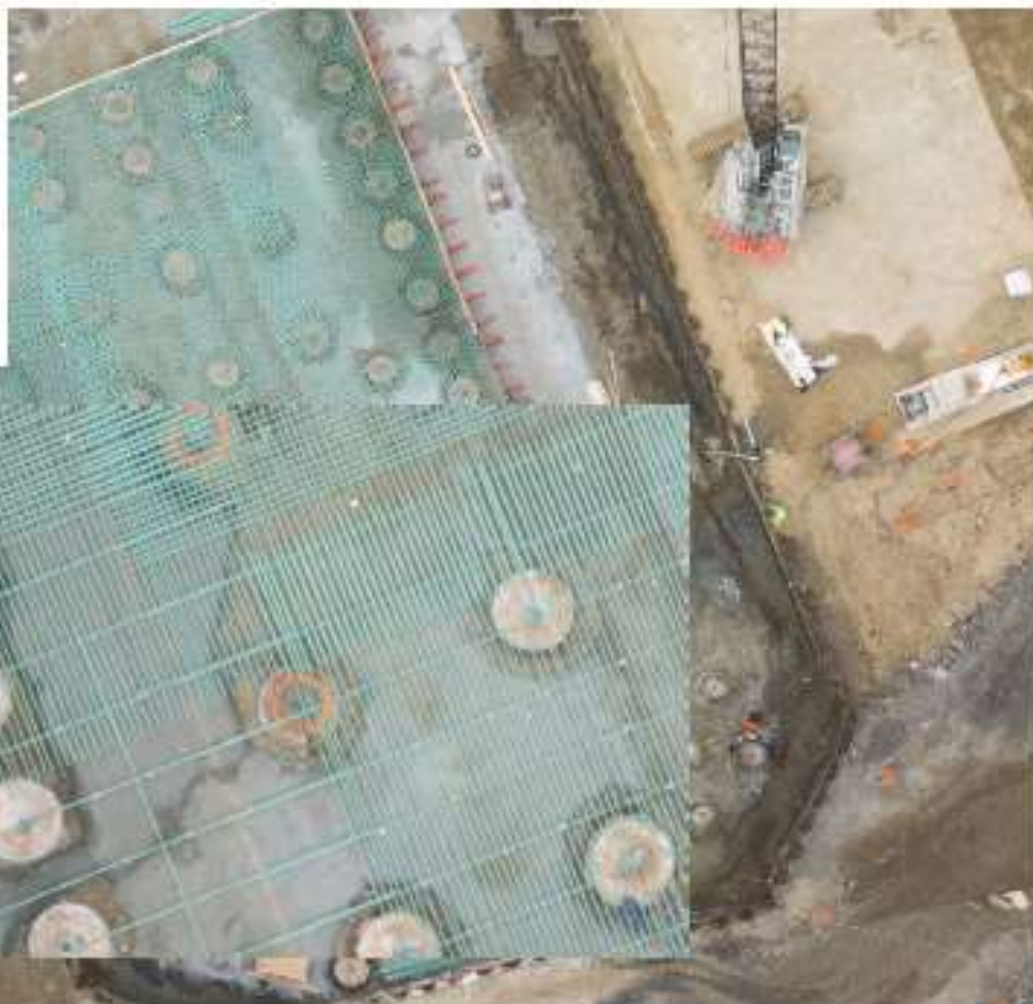


POINT CLOUD FROM STITCHED PHOTOS





PORTAL SITE





POINT CLOUD VIEW'S





QUESTIONS?

