NASAO
2019 CONVENTION + TRADESHOW
Partnerships at Work.

UAS Operation with GIS application for Airports

James Stephens | Chris Gardner | Gary Siegfried| Jared Wingo

Partnerships at Work.

NASAO
2019 CONVENTION + TRADESHOW

South Carolina Aeronautics Commission Unmanned Aircraft System (UAS) Program

Gary W. Siegfried, PE
Program Manager

South Carolina Aeronautics Commission

NASAO
St. Paul, MN

Defining The Need

- **Airports losing approaches due to obstructions**

- **Obstruction identification and removal process has limitations**
  - Ground survey
  - Costly for GA Airports to perform full scale traditional aerial mapping
  - Procuring full scale aerial mapping takes time
  - Out dated information in FAA database

Fixing the problem
The Unmanned Aircraft System

- **Other benefits**
  - 5010 inspections
  - Support as needed for FAA/NTSB in accident response
  - Assist with state's land use and compatibility program
  - Support other South Carolina state agencies with aerial imagery

UAS Program Goal

- Our goal is to provide high quality data sets for South Carolina airports that enable them to better manage the obstruction coordination and removal process. The integration of an Unmanned Aircraft System (UAS) along with GIS and our core safety initiatives are the foundation for our GIS program.

FAA Certificate of Authorization (COA) Process for UAS Operations

- **COA Steps:**
  - Letter from Attorney General from the State
  - Access to FAA COA online application
  - FAA performs the review process in phases
    - Admin Review Check
    - ATC Feasibility Check
    - Safety Review
    - ATC Facility Coordination
    - Signature
  - Created a UAS Operation manual
    - UAS Airworthiness Statement
    - Flight Ops Manual
    - Pilot Ops Manual
    - Training Manual
    - Pilot Qualifications and Records (Private Pilot required)
    - Visual Observer Qualifications and Records
    - Maintenance Procedures
    - Maintenance Records
    - UAS Operational Area Maps

Advantages of using a UAS

- Cost savings (average single airplane $250/hr versus pennies for charged batteries)
- Provide very accurate datasets
- Time savings
- On-demand mapping and aerial photography
- Data validation for SCAC Compatible Land Use Tool process
- Data validation for AIP construction projects
- Assistance with state emergency response needs

Disadvantages of using a UAS

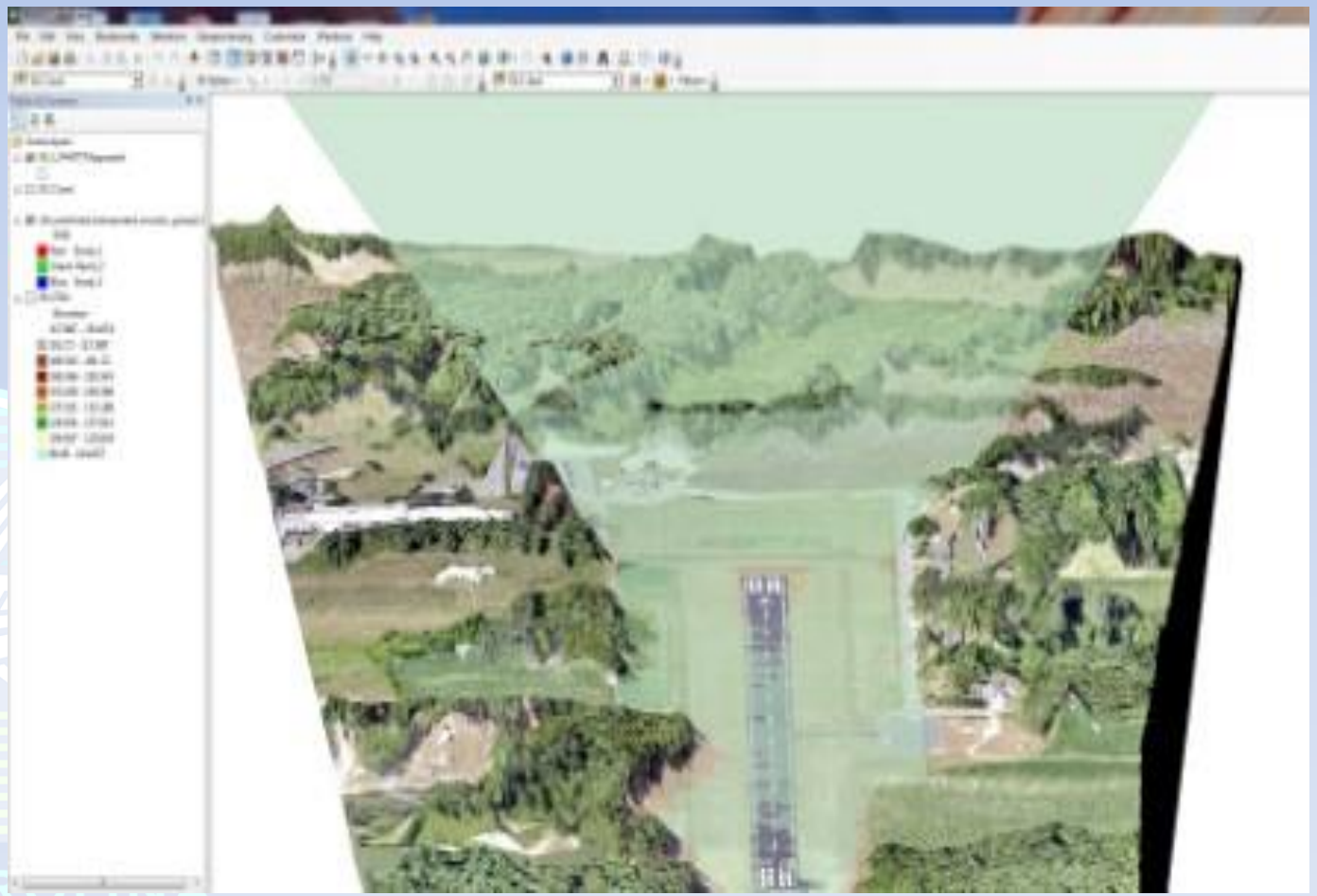
- Can not operate outside of Visual Line of Sight
- Battery life limitation
- Can only fly in VFR conditions
- Can not cover large areas in a single flight like conventional aerial data collection
- Limitation in heavily forested areas

SCAC UAS RESULTS

Point cloud imagery Dillon County Airport

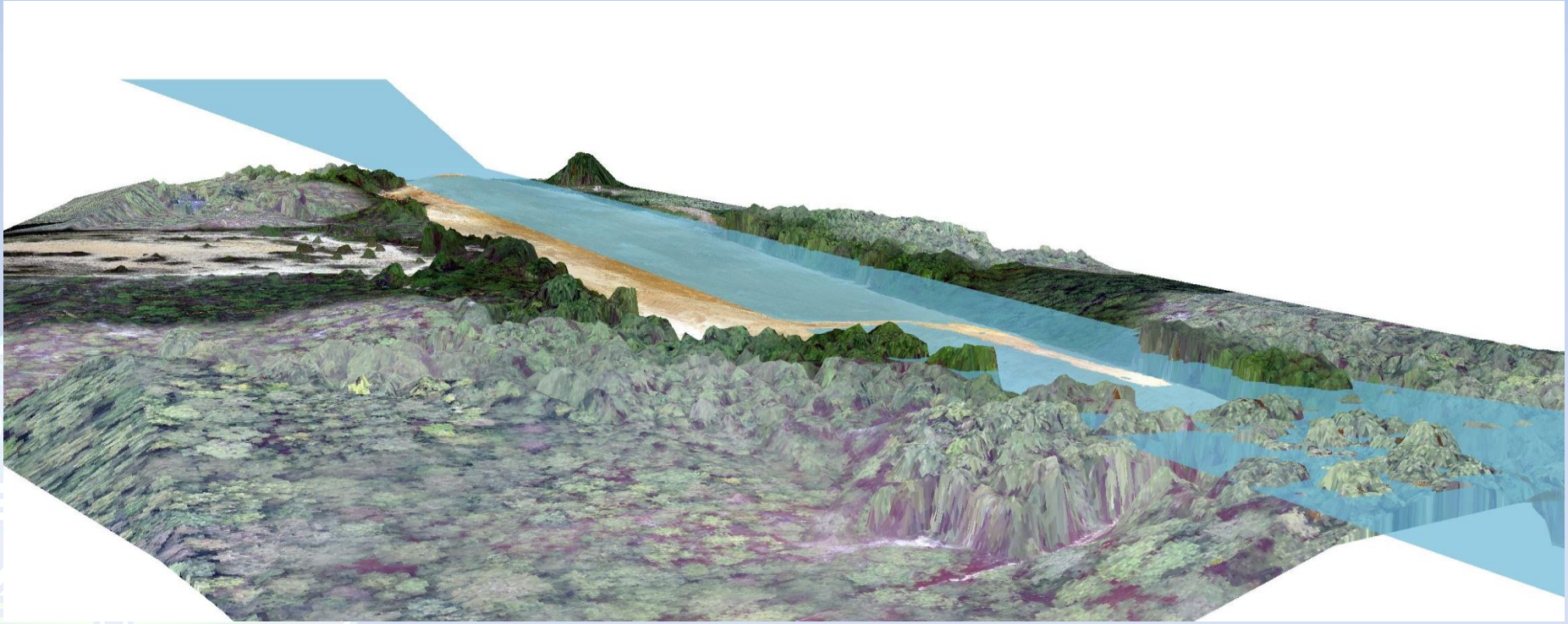
SCAC UAS RESULTS

Aerial image draped over point cloud



SCAC UAS RESULTS

Aerial image draped over point cloud



SCAC UAS RESULTS

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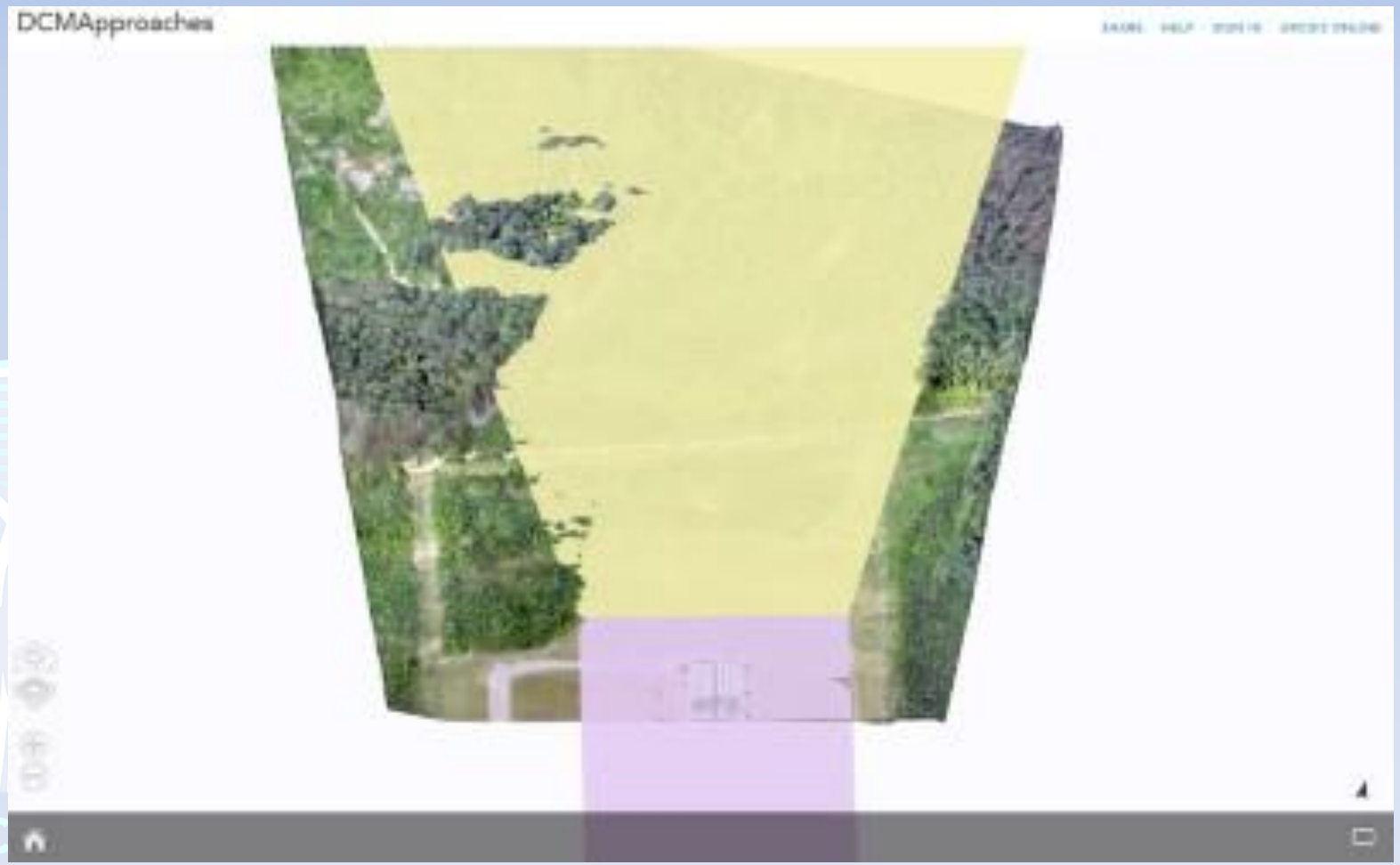


SCAC UAS RESULTS

Aerial image overlaid with property owner information

SCAC UAS RESULTS

A High Resolultion aerial image

Analysis results format

- Interactive web application
- Hard copy map
- Map package to be given to others with access to ESRI ArcMap
- Can be exported into AutoCad or any other mapping or engineering software that recognizes .tin models

UAS Program Future Proposed Capabilities

- Addition of a Quad Copter
- Provide assistance to other state agencies. (SCDNR, forestry, law enforcement)
- Expanded UAS sensor capabilities (thermal, LIDAR, infrared)
- Real-time live video feed from UAS
- Addition of on board ADS-B


State Aviation Journal
2016 NASAO Special Edition
NASAO Recognizes South Carolina for Innovative UAS Program
Changing of the Guard
Louisiana's Brad Brandt - NASAO's New Chair
San Antonio Hosts 85th NASAO Convention and Trade Show

Thank You - Questions?

Send feedback or suggestions to

Gary Siegfried

gsiegfried@aeronautics.sc.gov

803-896-6898

Matthew Baker

mbaker@aeronautics.sc.gov

803-896-6270

UAS & GIS integration at State Planning Level

Jared Wingo C.M., Sr. Aviation Planner

BOLTON & MENK

Real People. Real Solutions.

Presentation Overview

Existing Conditions

Integrating UAS & GIS Applications at State Level

Existing Conditions

Overview

Primary Purposes

- System Planning Data
- Inspection Database

Online Search

- 18 States have public GIS application

Existing Conditions

System Planning Data

GIS provides SASP Data

- Inventory
- Forecasting
- State Specific Measures

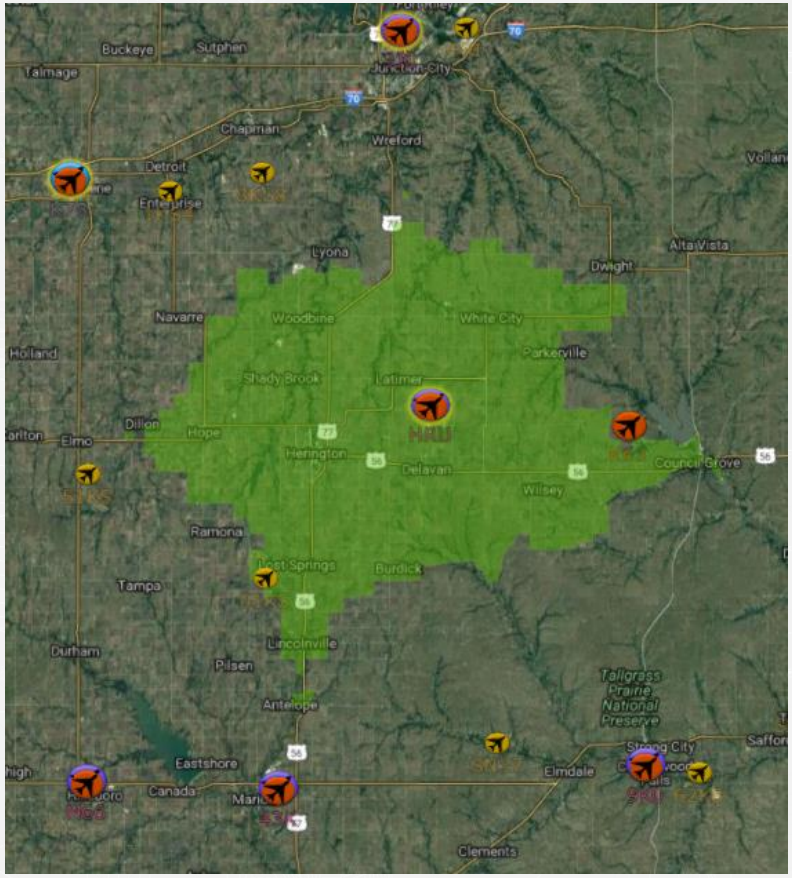
GIS provides Economic Impact Data

- Employment, Payroll, Output

GIS provides PCI Data

- Specific Airports PCI Data
- System PCI Data

Courtesy: KSDOT



Existing Conditions

Airport Inspections

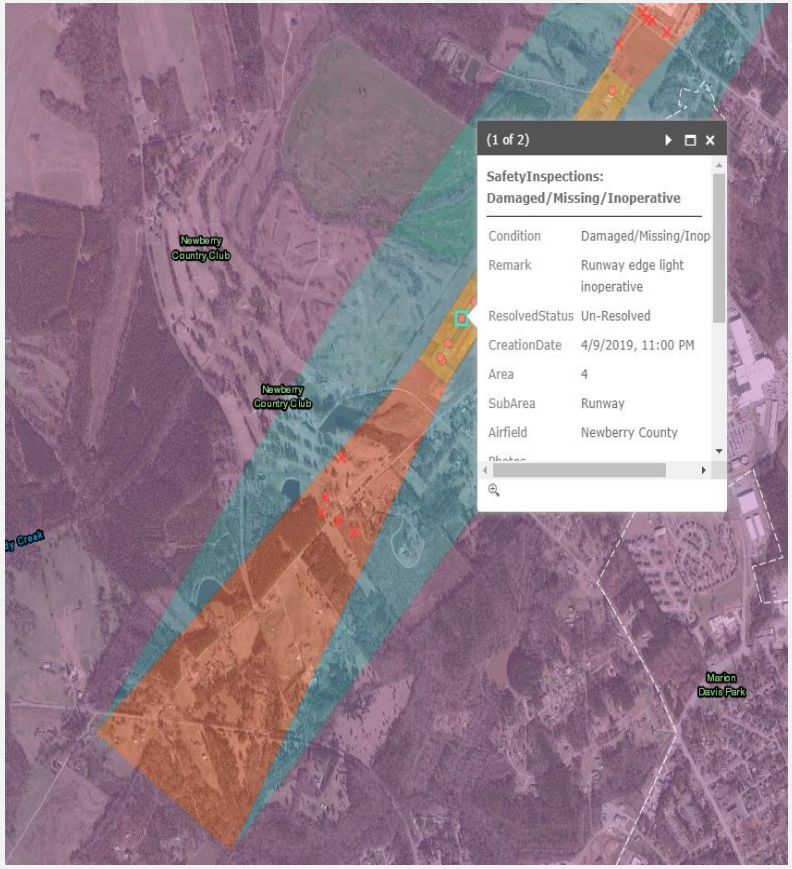
5010 Data Collection

- Safety Critical Items
- Inventory / Photos
- Resolution Status

Record Keeping

- Survey Data
- UAS Imagery
- Aerial Imagery

Courtesy: SCAC



Integrating UAS & GIS Applications at State Level

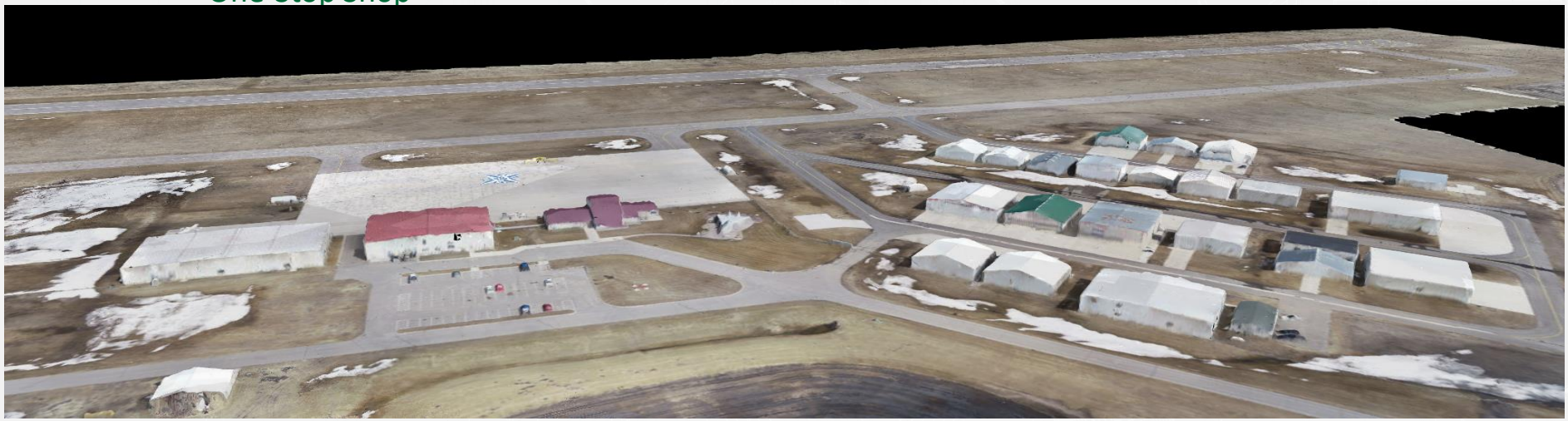
Overview

UAS

- Data Collection
- Airport/Project Imagery

GIS Applications

- “One-Stop Shop”



Integrating UAS & GIS Applications at State Level

UAS

Data Collection

- 5010 Use

Airport & Project Imagery

- Routine Collection Interval
- Before & After Photos

Integrating UAS & GIS Applications at State Level

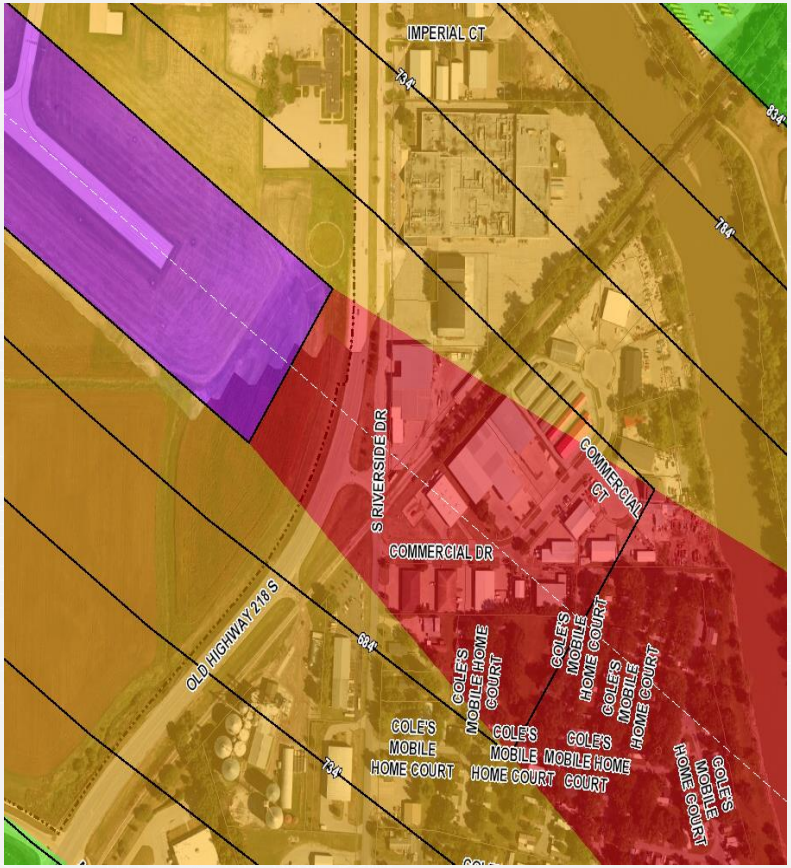
GIS Applications

"One-Stop Shop"

- State Aviation Portal

Interactive Connection

- Funding
- Inspection
- Operations



Thank you!
Questions?

Jared Wingo C.M., Sr. Aviation Planner
952-890-0509 ext. 3458
Jared.Wingo@Bolton-Menk.com

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UAS & GIS integration in Airport Planning

Christopher Gardner, GIS Specialist

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Presentation Overview

- Commercial UAV Operations Review
- Applying UAS Technology at Airports
- GIS Integration
- Project Examples

Commercial UAV Operations

Overview

14 CFR Part 107 (FAA 107 Rules)

- Document Released June 21, 2016
- August 29, 2016 107 Rules take effect

Part 107 Rules Overview

- Must yield right of way to other aircraft
- Aircraft must weigh less than 55 lbs.
- Must maintain visual line-of-sight (VLOS)
- Maximum altitude of 400 feet AGL
- Maximum ground speed 100 mph
- 3 statute miles visibility, 500 feet below and 2,000 feet horizontally from clouds
- Operations in Class B, C, D and E airspace require ATC permission

Individual states may have additional requirements

- Insurance
- Commercial license
- Registration

Applying UAS Technology at Airports

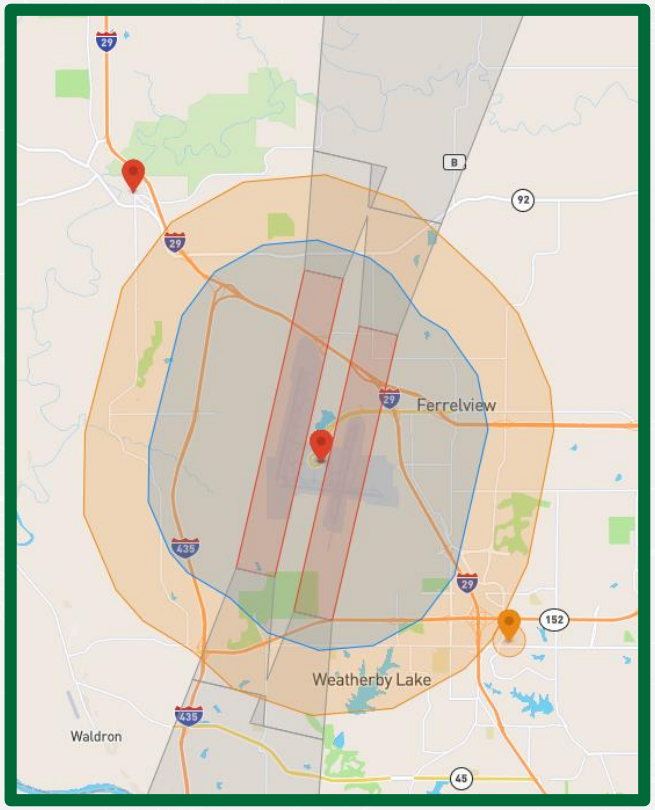
UAS & Airport Challenges

Airports are traditionally the area to avoid with UAS

- Most UAS Users try to avoid airports because of increased numbers of manned aircraft operating at lower elevations
- Must yield right of way to other aircraft

No Fly Zones

- Geofencing prohibits UAS use on or in vicinity of airports
- Special authorization to unlock prohibited zones

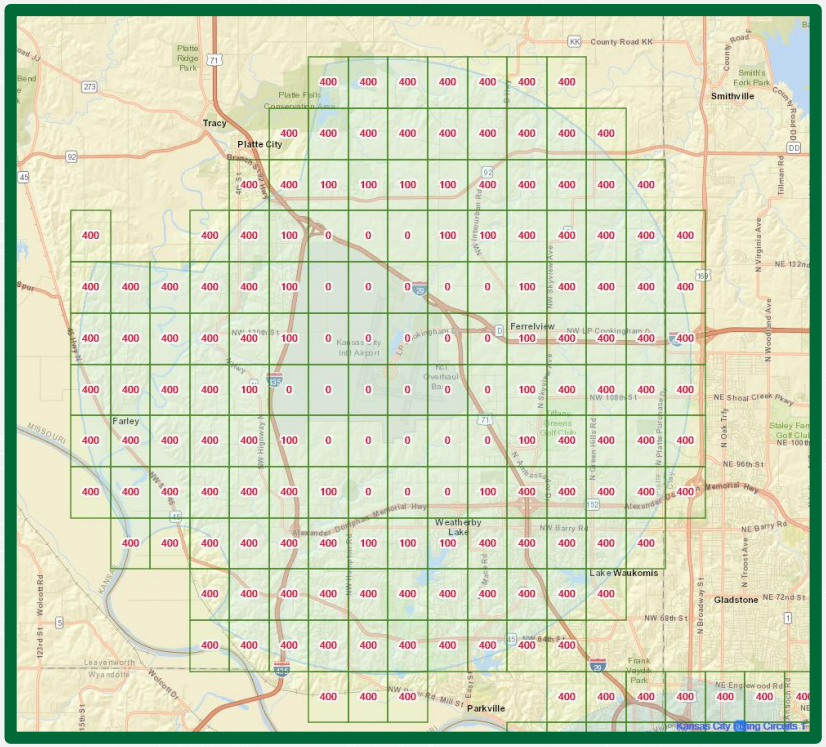


Applying UAS Technology at Airports

UAS & Airport Challenges

Airspace

- Operations in Class B, C, D and E airspace require ATC permission
- FAA LAANC (Low Altitude Authorization and Notification Capability) has now provided automated authorization process for certain areas
- LAANC reduced the time required to obtain authorization for flights in restricted airspace
- Airfield likely zero airspace elevation grid



Applying UAS Technology at Airports

UAS & Airport Challenges

Use Visual Observer

- Allows one person to focus on flying
- Additional person can scan for aircraft
- Listen for approaching or departing aircraft

Monitor Radio

- Listen for incoming & outgoing traffic

Issue NOTAM

Applying UAS Technology at Airports

UAS & Airport Challenges

Use Aero Points

- Provides increased accuracy with corrections
- Keeps survey equipment and personnel off of airfield

Applying UAS Technology at Airports

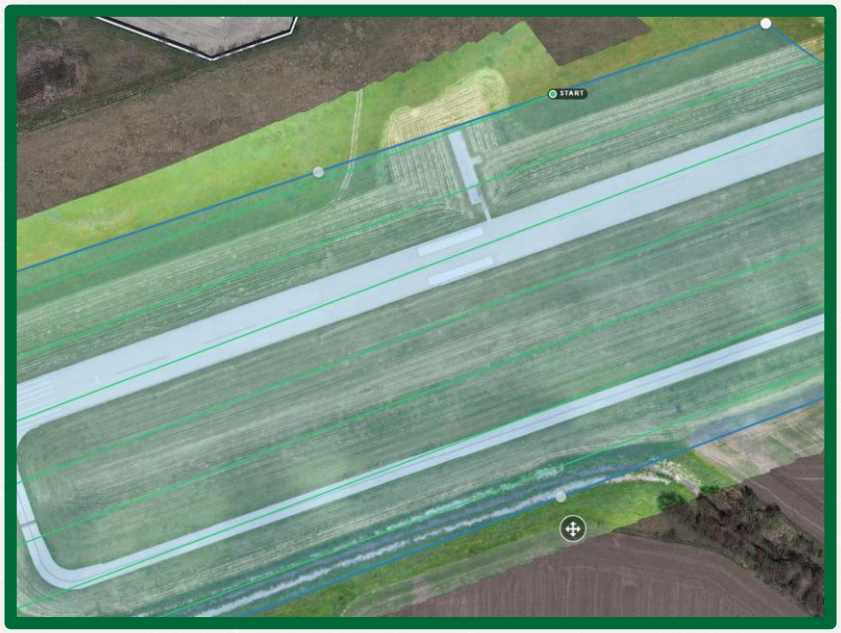
UAS & Airport Challenges

Different aircraft for different jobs

Applying UAS Technology at Airports

UAS & Airport Challenges

- Fly Grid Pattern
  - Automated Flight
  - Automated Image capture for desired interval
  - Set Elevation
  - Set Sidelap
  - Set Frontlap
  - Determine image resolution



Applying UAS Technology at Airports

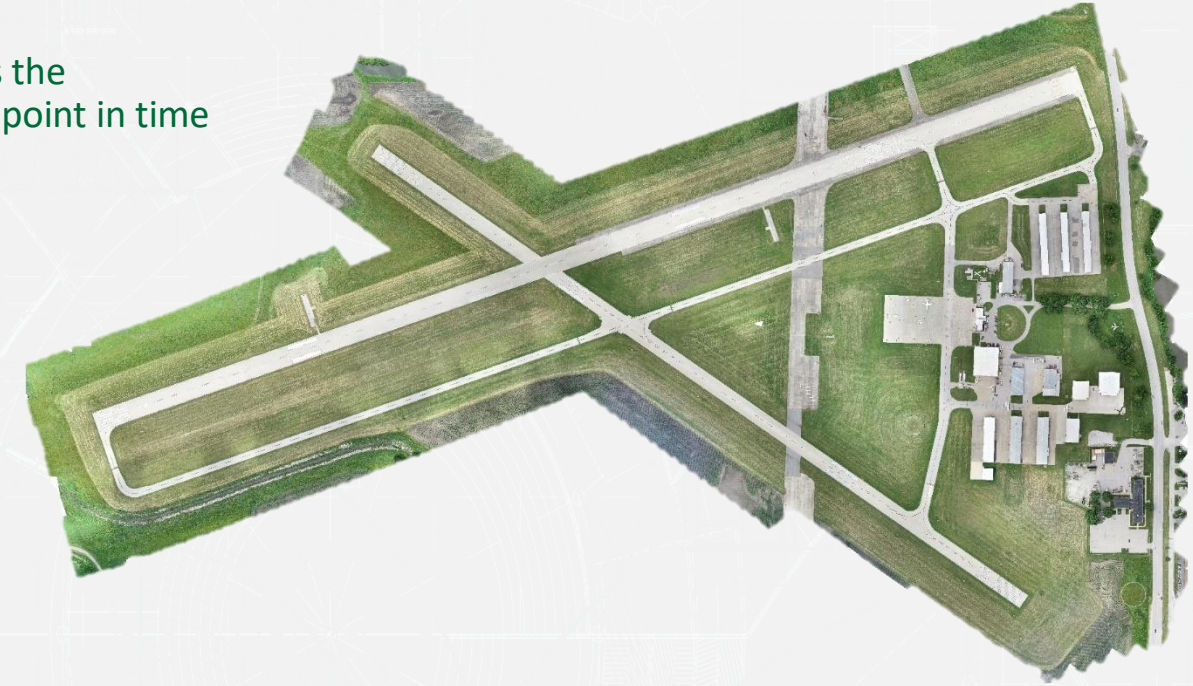
UAS & Airport Challenges

- Elevation/Time/Resolution
  - Greater pixel resolution
  - Increases flight time
  - Find an acceptable balance for desired product
  - Typical flight example
    - 250 ft. AGL
    - ~0.9 in. pixel resolution
    - Overlap at 75% 75%
    - ~20 mph
    - Cover 100 Acres in ~25 minutes

Applying UAS Technology at Airports

UAS & Airport Challenges

- Photo Inventory/Basemap
  - Have Aerial Image captures the infrastructure/condition at point in time
- Track changes over time
  - Pavement Deterioration
  - Water Runoff
  - Buildings
  - Wind, Fire, Tornado
- Marketing Photos/Videos
- Pavement Rehab Projects



Project Examples

Photo Inventory and Basemap

High Resolution Imagery updated at desired interval

Project Examples

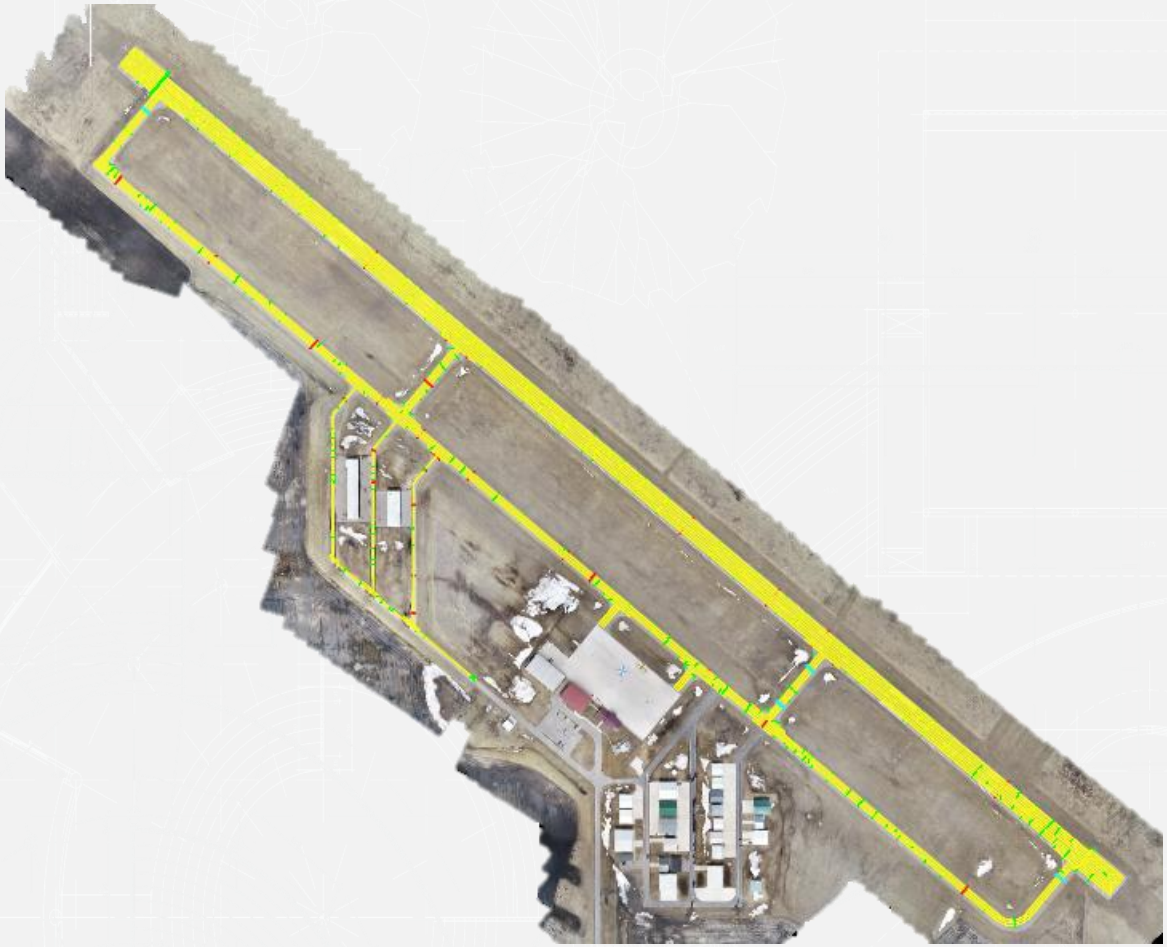
Record Changes

Project Examples

Marketing Photos & Video

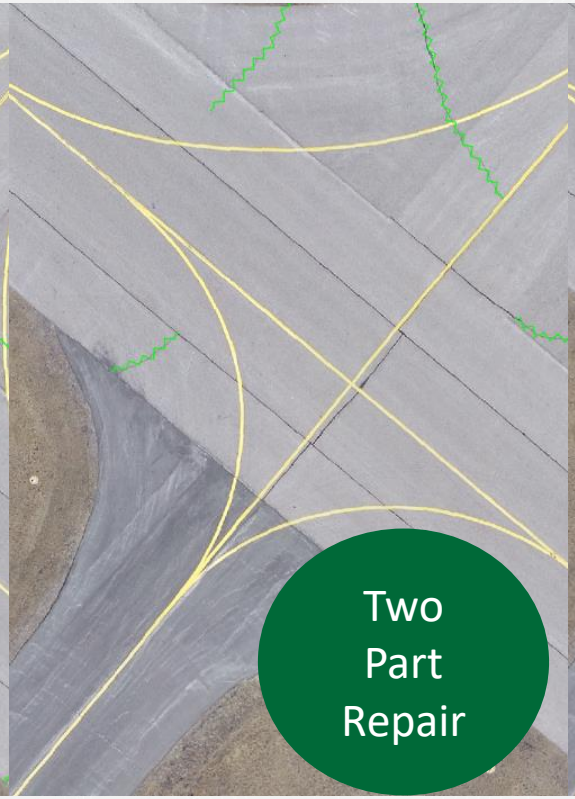
Project Examples

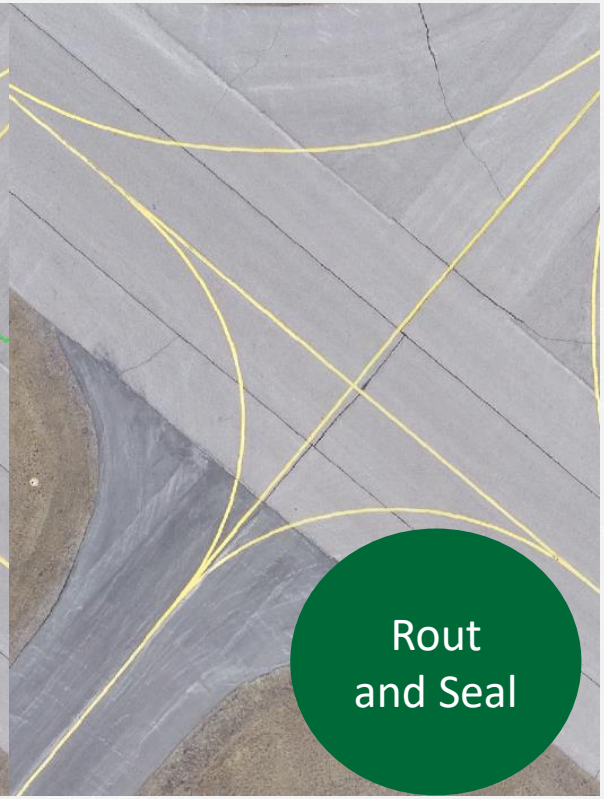
Pavement Rehab Projects



Project Examples

Pavement Rehab Projects



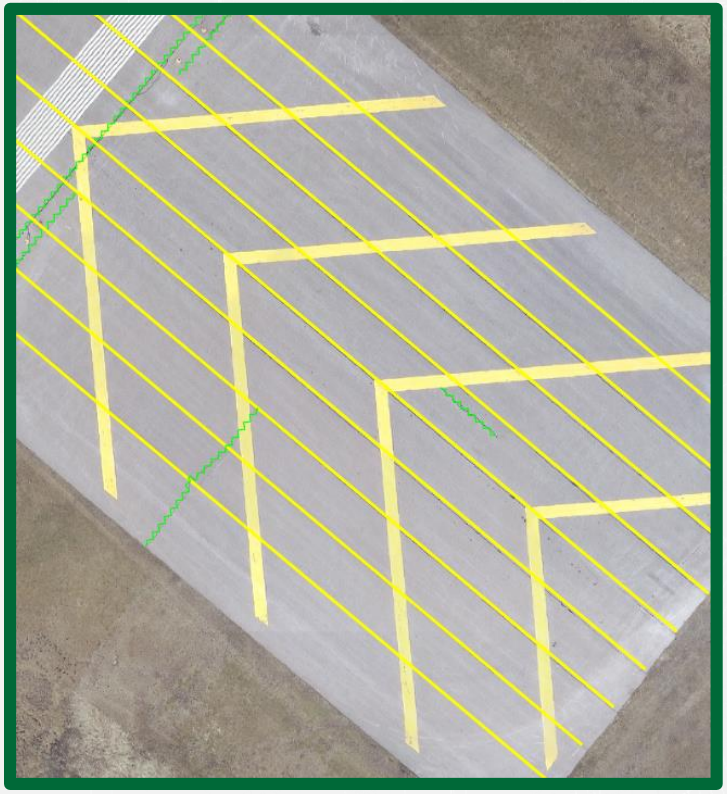


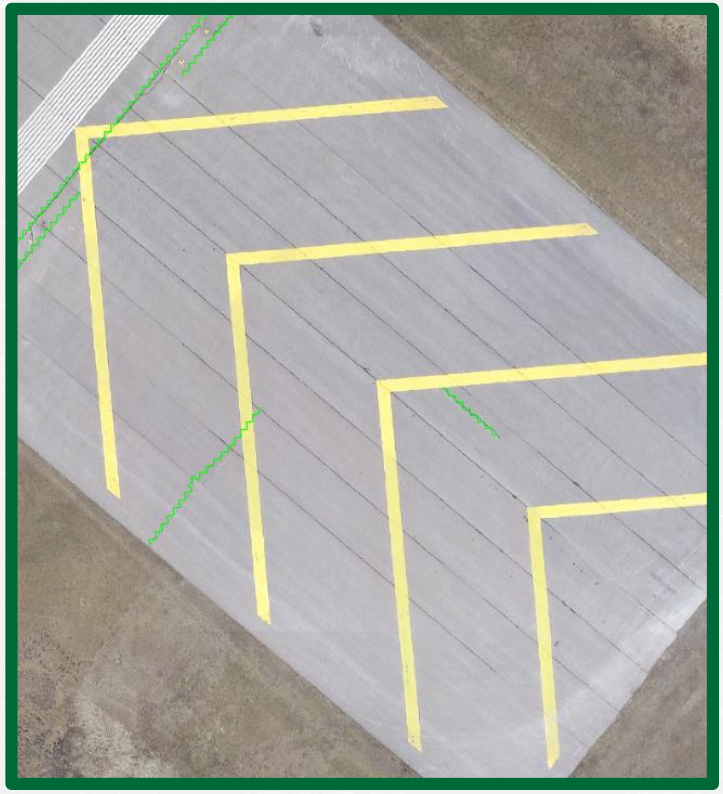
Project Examples

Pavement Rehab Projects

Project Examples

Pavement Rehab Projects





GIS Integration

Application Capabilities

- Aerial UAS Imagery from all projects flown
  - Toggle on and off Aerial Imagery from all available sources
- Pavement Conditions
  - Type of Repair
  - Contractor
  - Material
  - Depth
  - Date
  - Initial Repair Date
- Pavement information from repairs populated in GIS data generated from UAS imagery

GIS Integration

Application Capabilities

- Examined trends on airport using pavement repair data and GIS
  - Determine Problem locations by looking at the progression of pavement repairs in specific locations on airport
- Examine trends from a geographic region/state
  - Climate
  - Material
  - Process
  - Depth
  - Date repaired
  - Initial Repair Date

GIS Integration

UAS Imagery

GIS Integration

Pavement Conditions

Thank you!
Questions?

Christopher Gardner, GIS Specialist
507-625-4171 ext. 2986
Christopher.Gardner@Bolton-Menk.com

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