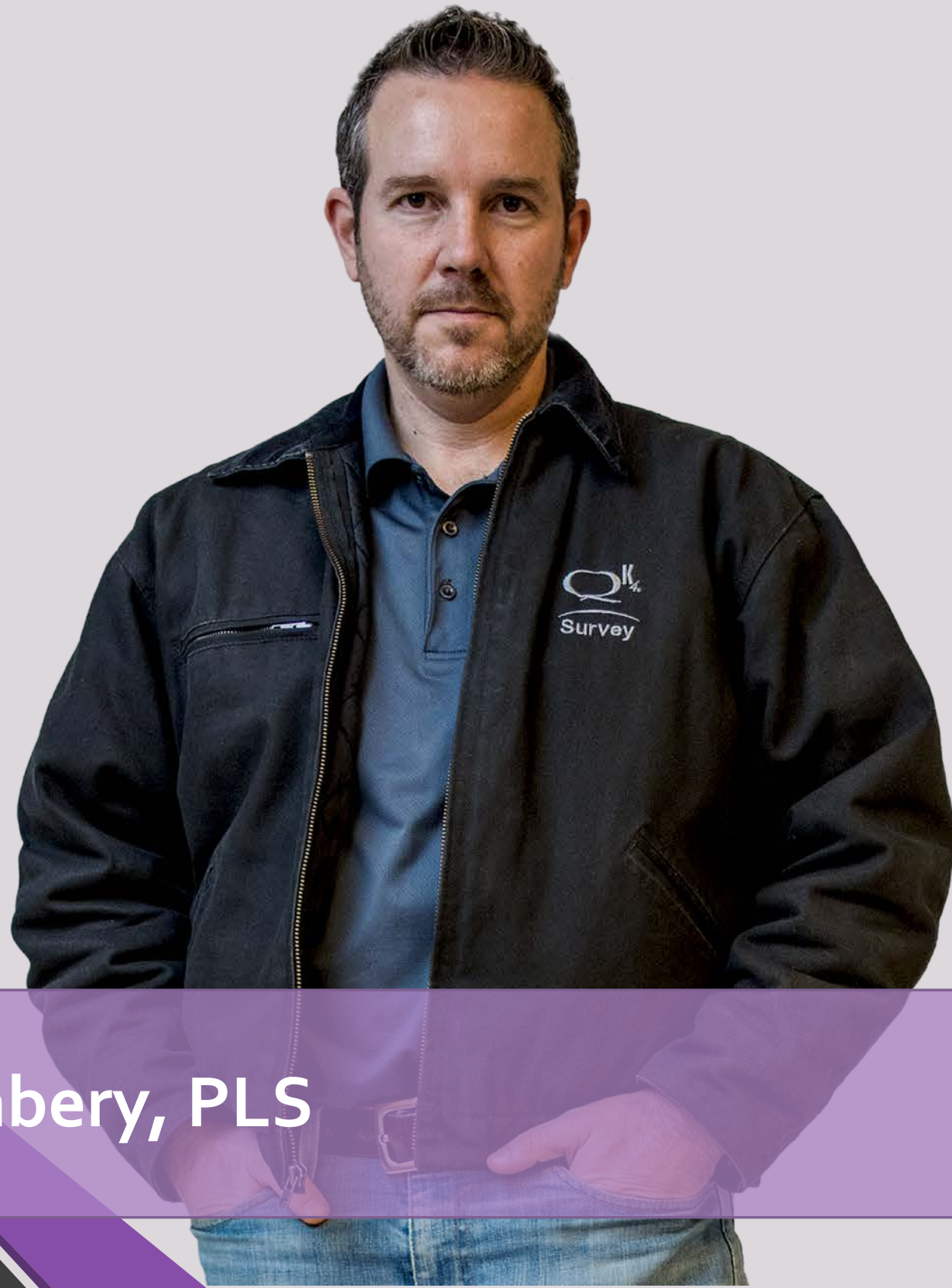


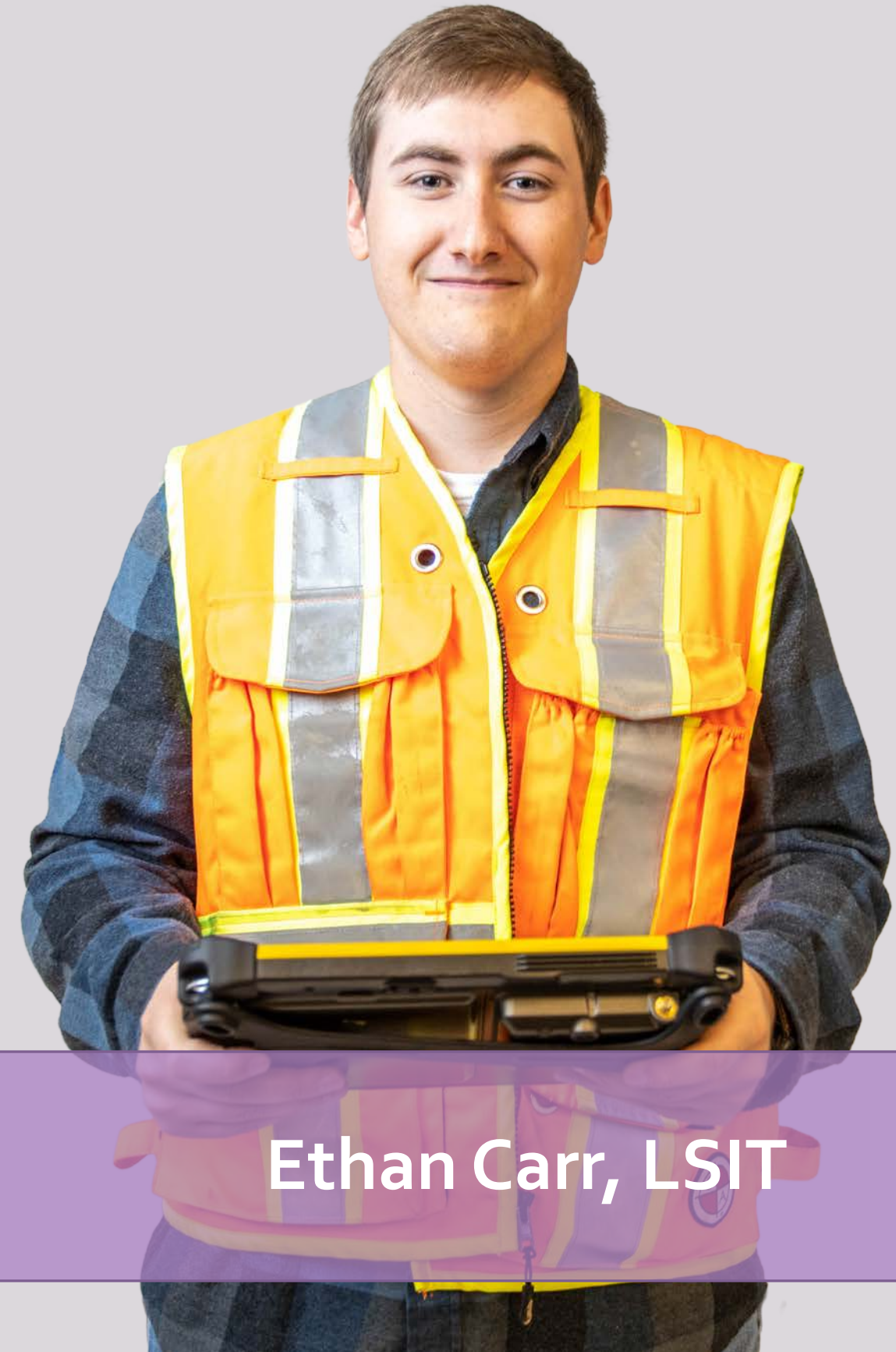
# **A New Surveyor's Perspective to Learning Field Survey**

Ethan Carr, LSIT & Ben Shinabery, PLS  
KAPS Conference 2023

# Speaker Intros...



Ben Shinabery, PLS



Ethan Carr, LSIT

# Surveyor from Birth...

- Born to a Land Surveyor
- Graduated from Glenville State College in May 2021
- Passed LSIT in December 2021
- Started at QK<sub>4</sub> as full-time crew chief in June 2021
- Kentucky Young Surveyors Network Associate Coordinator



*Groundbreaking by Design.*





# Learning from my Dad

- What a Surveyor does everyday
- Which end of the scope to look in
- Finding pins
- Finding snakes
- Finding chiggers
- Expectations in the field
- A job well done
- A precise traverse



# The 4 Year Surveying Degree...

With Kentucky requiring a four-year degree as qualification for professional licensure, what should every surveyor know about the classes a modern student takes in a land survey degree program?

What did you learn in school?

<https://www.glenville.edu/departments/land-resources/programs/nrm/land-surveying>



## ☰ Rover options

Survey type

RTK ▼

Broadcast format

VRS (CMR) ▼

### Antenna

Type

R10-2 Internal ▼

Measured to

Bottom of quick release ▼

Antenna height

6.562sft ▶

Part number

90912-xx

Serial number

?

Store points as

Vectors ▼

Elevation mask

10° ▶

PDOP mask

2.5 ▶

**Field work starts in  
your hand...**

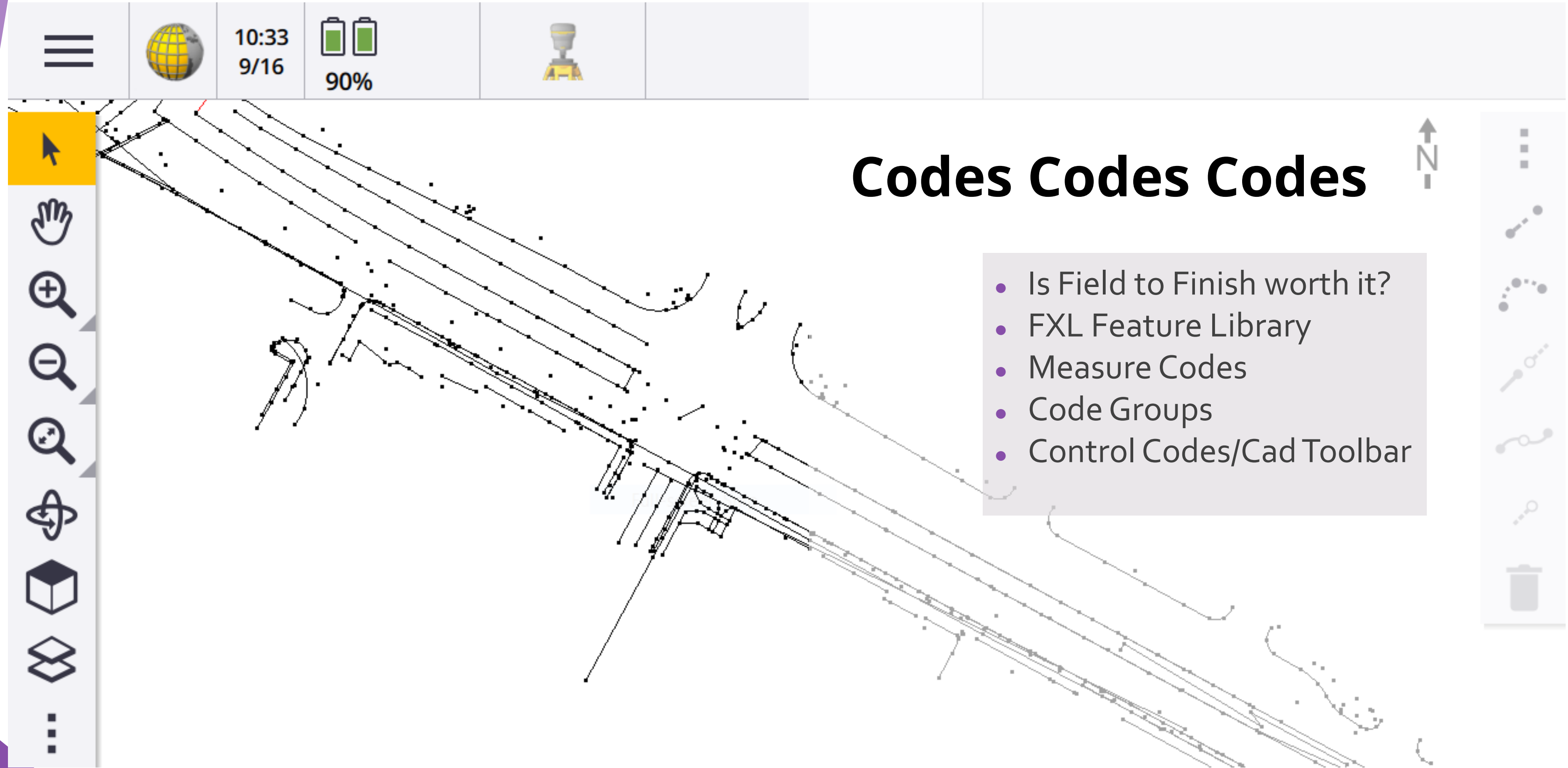
**All About the Setup...**

- The Question of Field Notes?
- Electronic Data Files
- Connecting the equipment
- Survey styles
- Internal radio Settings

Esc

Accept







# Reference Files

- Reference Control File
- reference other .job files
- Reference DXF Linework
  - Stakeout to linked files
  - Background imagery





# Data Export

- Everything needed is documented
- Retrieving field files is just like a CAD desktop
- Differences in usability between different brands
- Office integration from the field

## Export



File format

Comma Delimited (\*.CSV, \*.TXT) ▼

Point name

Field1 ▼

Northing

Field2 ▼

Elevation

Field4 ▼

File name

21586\_BOATWRIGHT\_WMA.csv



Point code

Field5 ▼

Easting

Field3 ▼

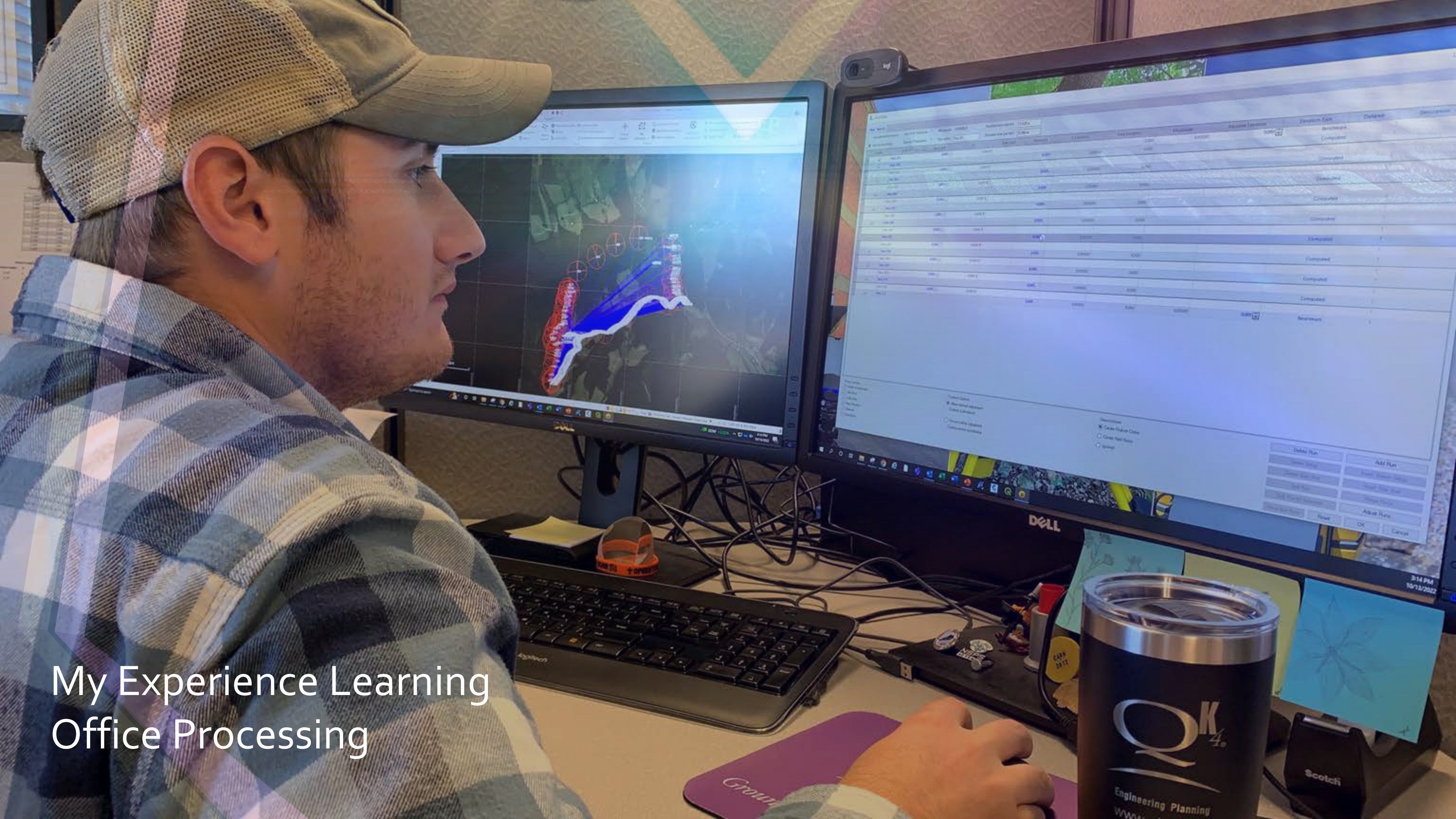
View created file

☐

Esc

Accept



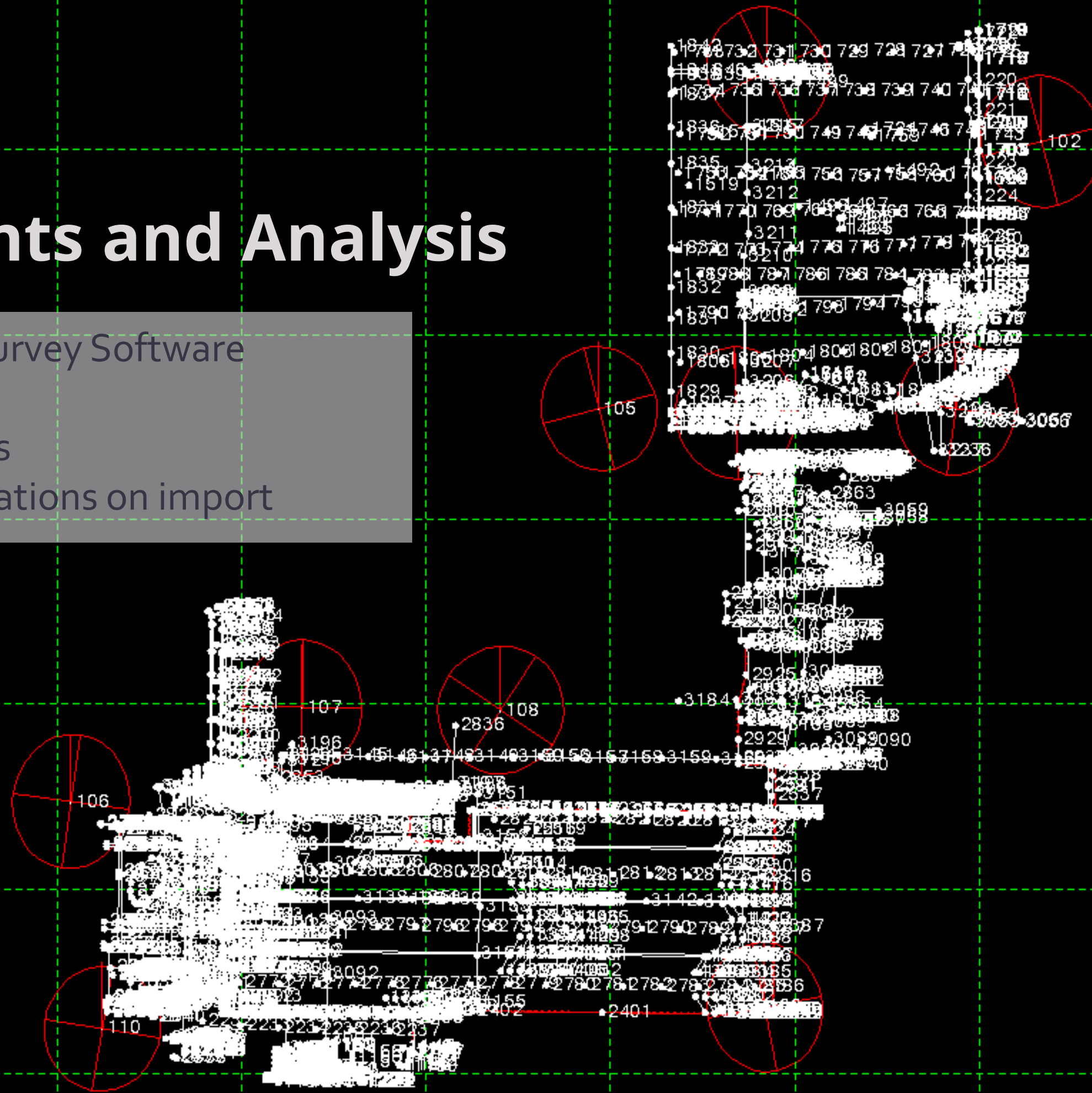


My Experience Learning  
Office Processing



- Drag and drop job file into Survey Software
- Easily post process data
- Easily adjust rod height busts
- Flags on problematic observations on import

- Drag and drop job file into Survey Software
- Easily post process data
- Easily adjust rod height busts
- Flags on problematic observations on import





# Least Squares Adjustment

- User friendly Least Squares Adjustment
- Survey Control
- Topographic shots
- Property monument confidence

## Level Data

- Easily process level data from Digital level
- Process level notes from manual level
- Combine level data with Least Squares Adjustment

<input type="checkbox"/>	10	0.005	?	
<input type="checkbox"/>	103	0.006	?	
<input type="checkbox"/>	104	0.005	?	
<input type="checkbox"/>	105	0.006	?	
<input type="checkbox"/>	106	0.006	?	
<input type="checkbox"/>	107	0.006	?	
<input type="checkbox"/>	108	0.005	?	
<input type="checkbox"/>	109	0.005	?	
<input type="checkbox"/>	11	0.008	?	
<input type="checkbox"/>	110	0.005	?	
<input type="checkbox"/>	111	0.005	?	
<input type="checkbox"/>	112	0.005	?	
<input type="checkbox"/>	113	0.005	?	
<input type="checkbox"/>	114	0.006	?	
<input type="checkbox"/>	115	0.005	?	
<input type="checkbox"/>	116	0.005	?	
<input type="checkbox"/>	117	0.006	?	
<input type="checkbox"/>	118	0.006	?	
<input type="checkbox"/>	119	0.007	?	
<input type="checkbox"/>	12	0.007	?	
<input type="checkbox"/>	120	0.005	?	
<input type="checkbox"/>	121	0.005	?	
<input type="checkbox"/>	122	0.004	?	
<input type="checkbox"/>	123	0.005	?	
<input type="checkbox"/>	124	0.005	?	
<input type="checkbox"/>	125	0.004	?	
<input type="checkbox"/>	126	0.004	?	
<input type="checkbox"/>	13	0.006	?	
<input type="checkbox"/>	14	0.007	?	
<input checked="" type="checkbox"/>	2	0.006	0.000	0 / 0
<input type="checkbox"/>	29	0.007	?	
<input type="checkbox"/>	3	0.007	?	
<input type="checkbox"/>	48	0.010	?	

Point pairs (0) with a relative positional precision greater than the allowable tolerance are reported in red.

Allowable Relative Tolerance (DRMS)  
Constant + scalar:



# Overcoming Frustrations with Technology in the Field



# Software Frustrations

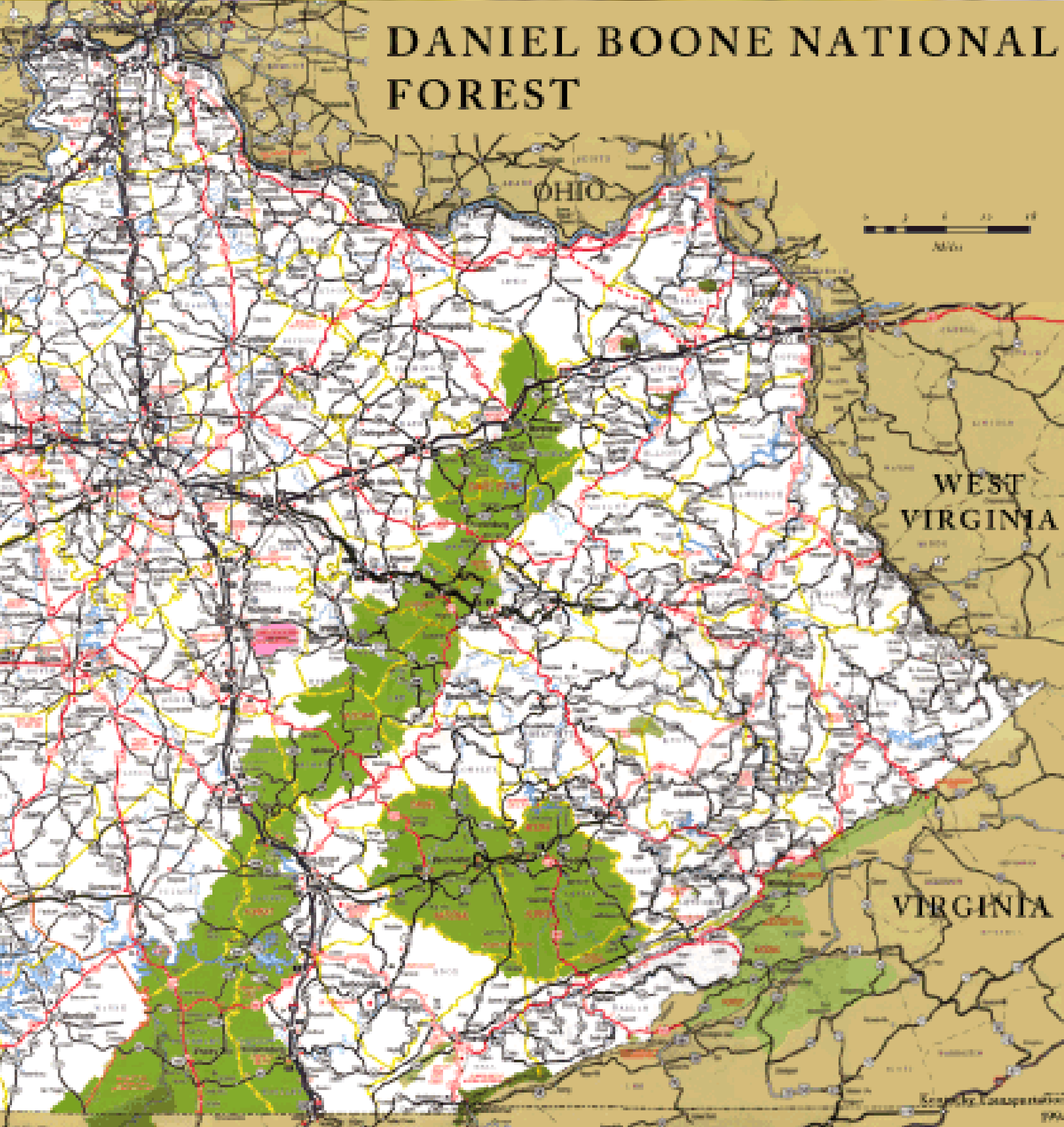
- Updates in the field
- Update cell firmware
- Connectivity issues
- Radio link issues



Working on updates  
20% complete  
Don't turn off your computer



# DANIEL BOONE NATIONAL FOREST



Successes with GPS in the woods





# Emergency Flooding Eastern Kentucky Bridge Surveys

- Focus on Safety in rough rugged environments
- Accurate flexible collection for quick topographic shots
- Robust GNSS signal and channels to maintain lock in tough terrain
- Integrated workflow with all other conventional survey tools



# GPS for Boundary Surveying & Least Squares Adjustment

- Complications with tilted positions and Least Squares adjustments
- Learning to communicate with Software (TBC / Carlson Survey)
- Speaking Least Squares Language





# Successes with Laser Scanning







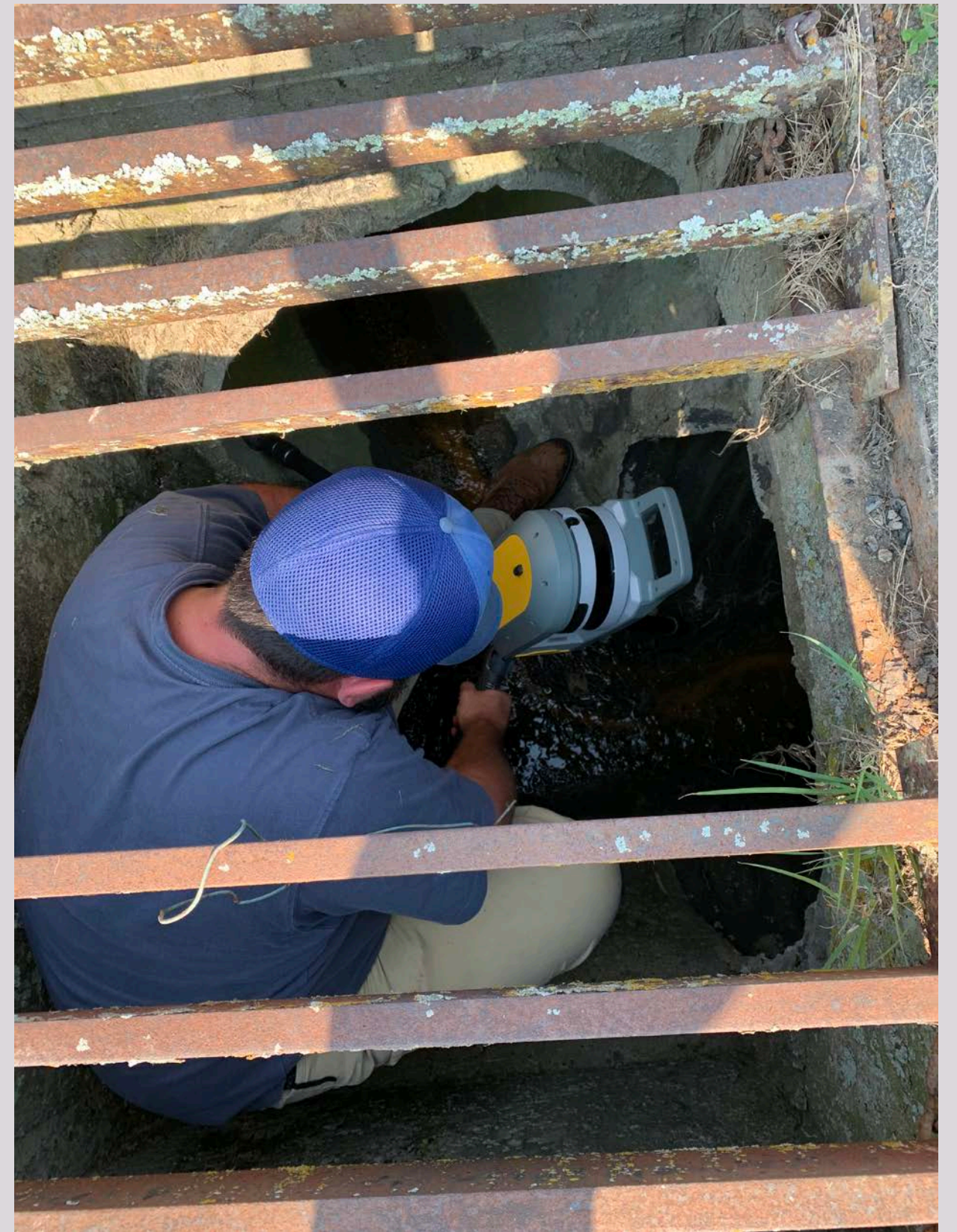
# Project Case Studies

- Is a scanner a survey tool for all situations?
- Total Station vs. Laser Scanning
- Workflow Solutions
- Is the data too big for its own good?



# Shawshank Scan of pipe at Morgan County Prison

- Learning confidence in unique situations
- The best way to measure a conditions of a pipe
- Tying Scans into survey control
- What to do with a pointcloud...



SUCCESSSES WITH SX10 & X7 SCANNERS





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