Allen Nobles & Associates, Inc.

Airborne LiDAR
and
3D Scanners (HDS)

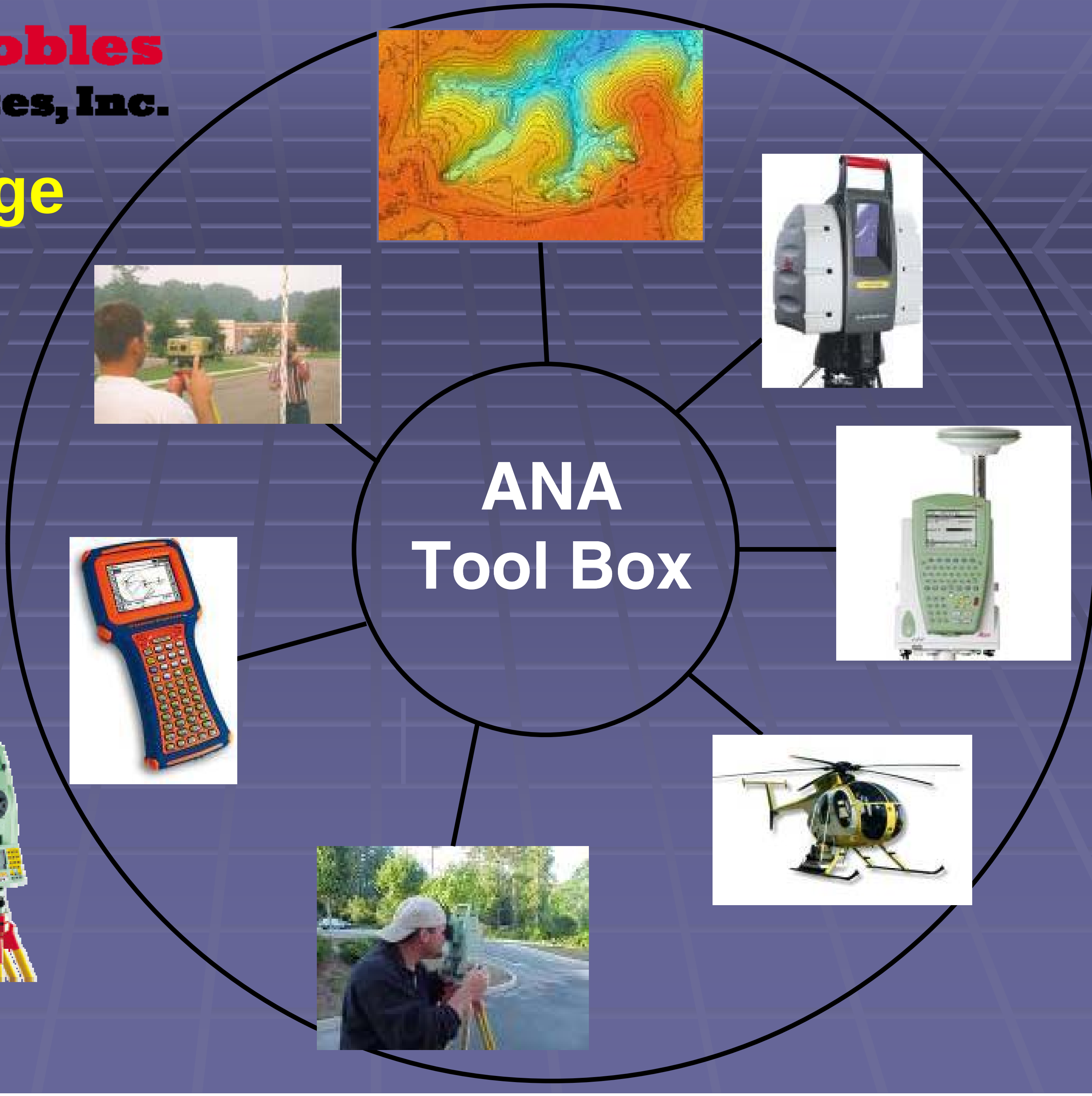
Allen Nobles & Associates, Inc.

About Us

- Surveying & Engineering Firm located in Florida
- Company-wide Staff – Average 70+ Employees
- 10 Professional Surveyors

Allen Nobles & Associates, Inc.

Wide Range of Tools



What is LiDAR or Laser Scanning?

LiDAR: (airborne scanning)

Light Detection And Ranging

Ground Based Scanners

3D Scanning

Laser Scanning

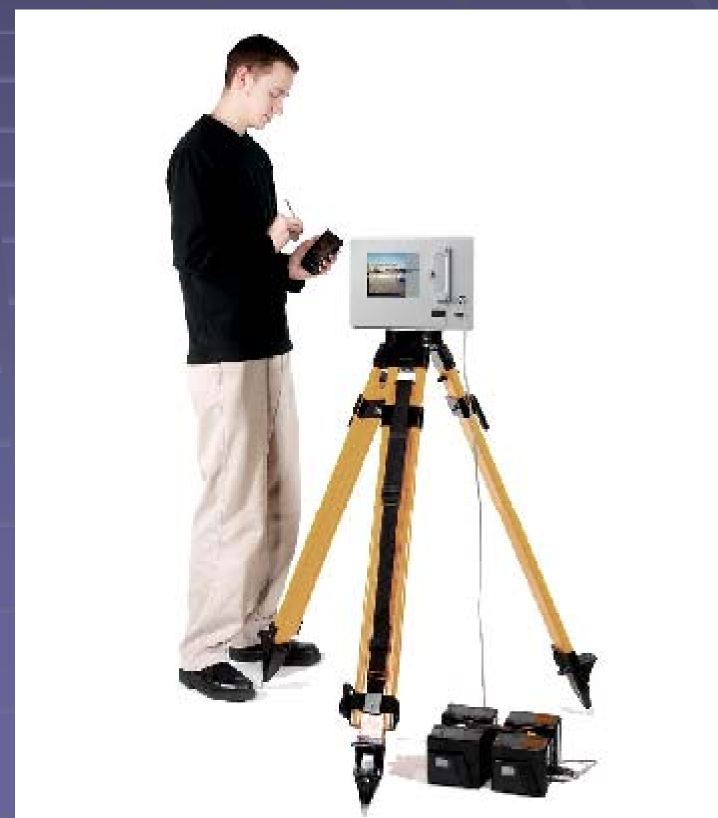
HDS – High Definition Surveying

Two Basic Sensors

Topographic

(Airborne)

Ground Based



Convention Center

What is Scanning?

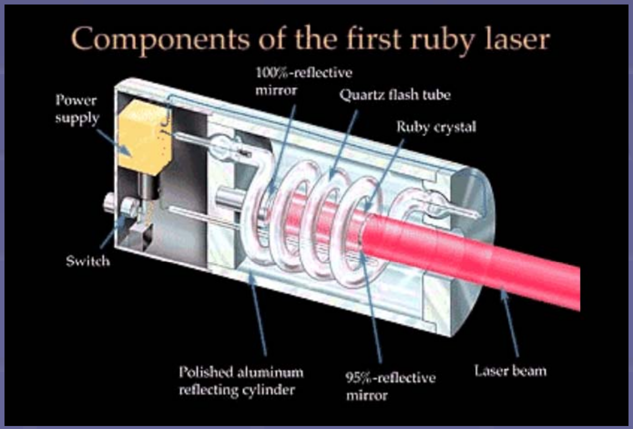
- It is an active sensing system:

  It is the science of using a laser to measure distances to specific points. It uses its own energy source, not reflected natural or naturally emitted radiation

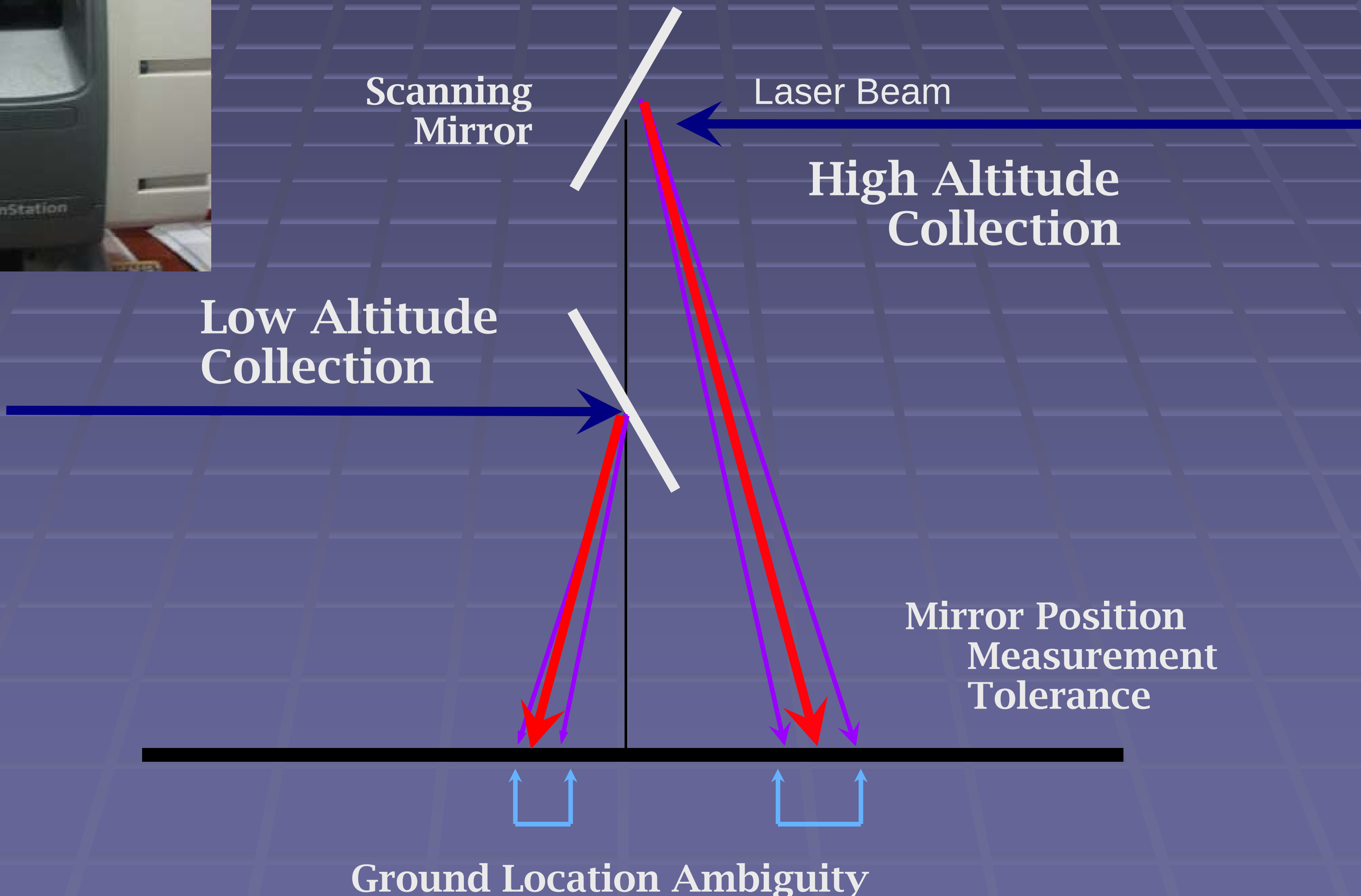
- It can be operated both day or night
- Direct acquisition of terrain information
- Photogrammetry is inferential

Operational Theory

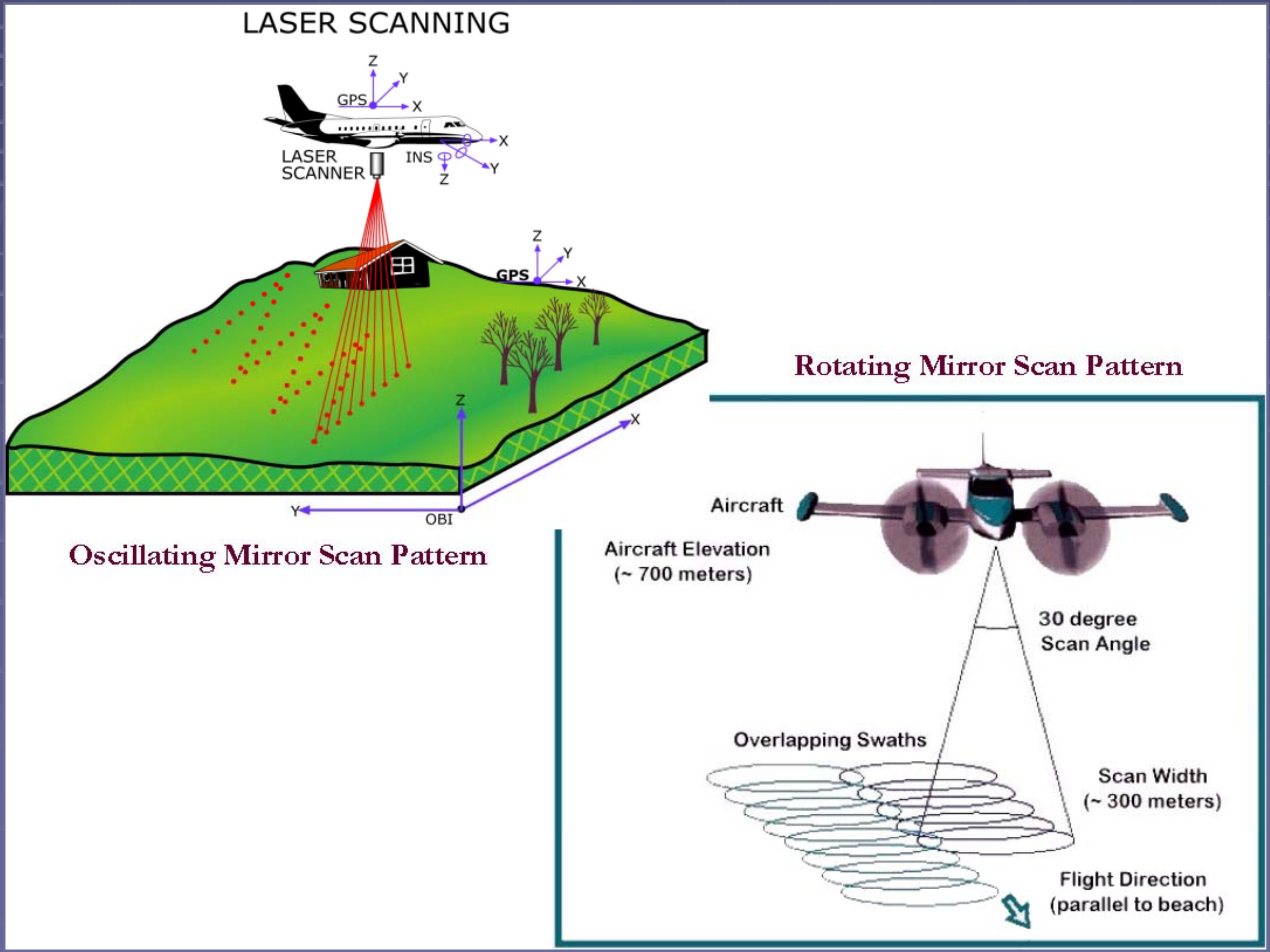
- A pulse of light is emitted and the precise time is recorded.
- The reflection of that pulse is detected and the precise time is recorded.
- Using the constant speed of light, the delay can be converted into a “slant range” distance.
- Knowing the position and orientation of the sensor, the XYZ coordinate of the reflective surface can be calculated.



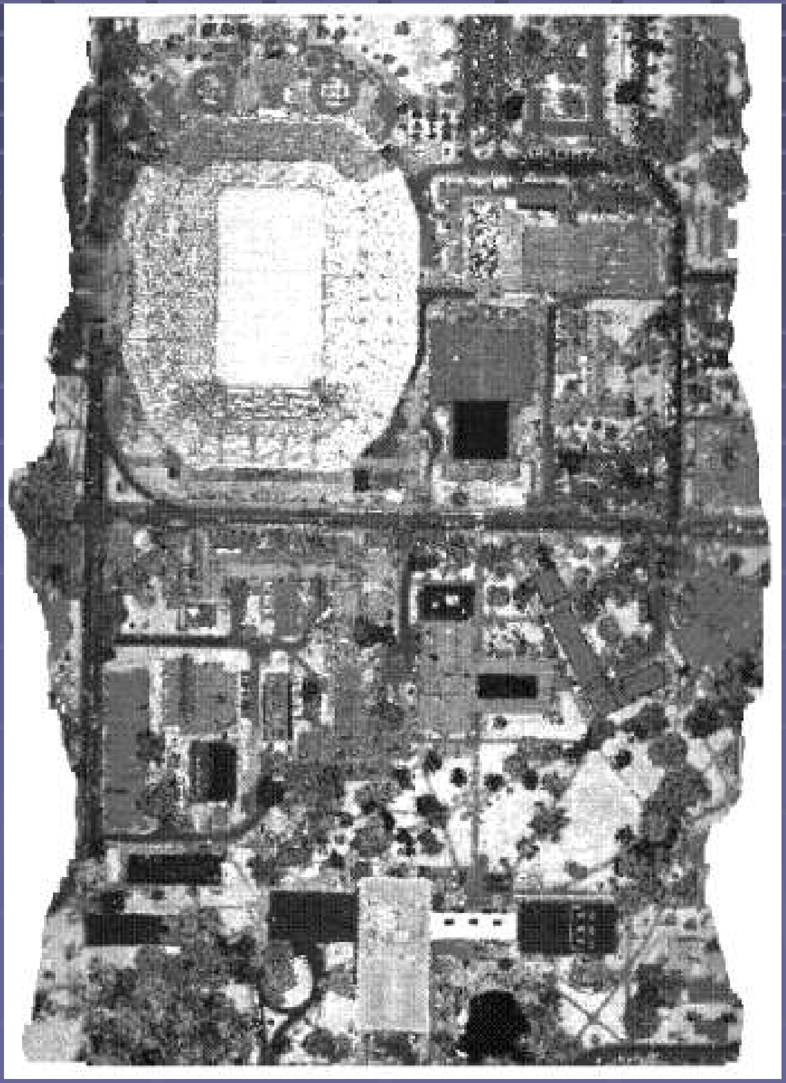
Scanner Mirrors



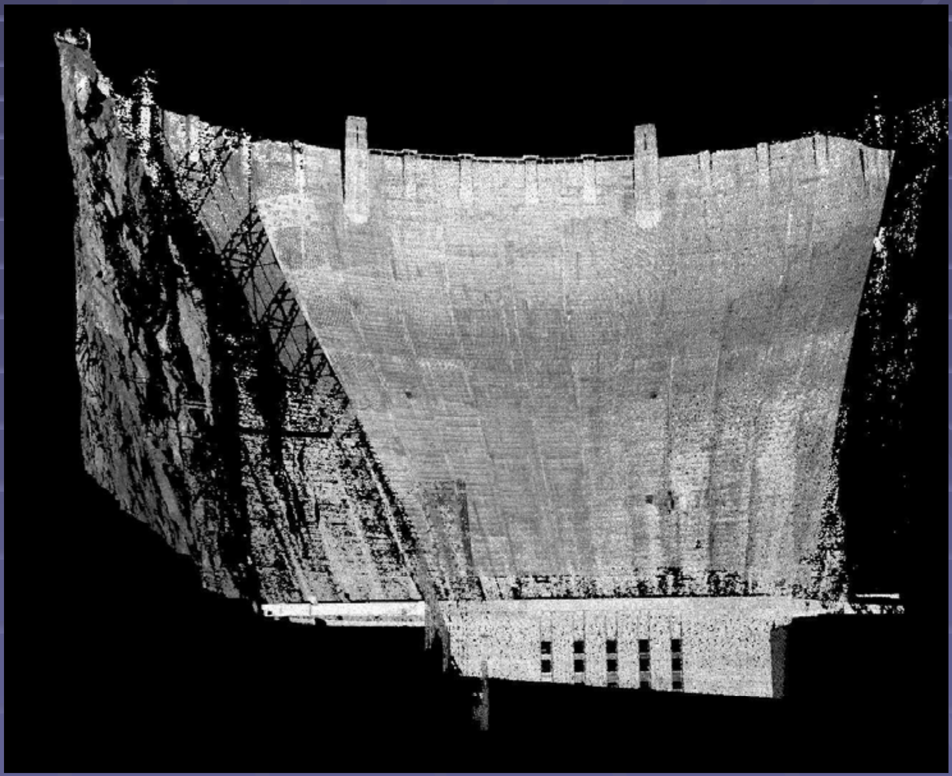
Scan Mirror


LASER SCANNING
GPS
LASER SCANNER
INS
GPS
OBI
Oscillating Mirror Scan Pattern
Rotating Mirror Scan Pattern
Aircraft
Aircraft Elevation
(~ 700 meters)
30 degree
Scan Angle
Overlapping Swaths
Scan Width
(~ 300 meters)
Flight Direction
(parallel to beach)

Intensity Image



Intensity Image



Ground Based

Scanner

Return Intensity Capture

- Can provide useful image information
- Often not a consistent imaging technology
- Images can be difficult to interpret
- Pixel Resolution a Function of the post-spacing
- Laser wavelength is a factor
- Holes in the data may be identified quickly
- Some General Interpretations are Possible

What Scanning Is Not:

NOT Light/Laser Assisted RADAR

RADAR uses electro-magnetic (EM) energy in the radio frequency range; LIDAR does not. It uses light in the near infrared spectrum.

NOT all-weather

The target MUST be visible. Some haze is manageable, but fog is not.

NOT able to 'see through' trees

LiDAR sees around trees, not through them. Fully closed canopies (rain forests) cannot be penetrated.

NOT a substitute for photography

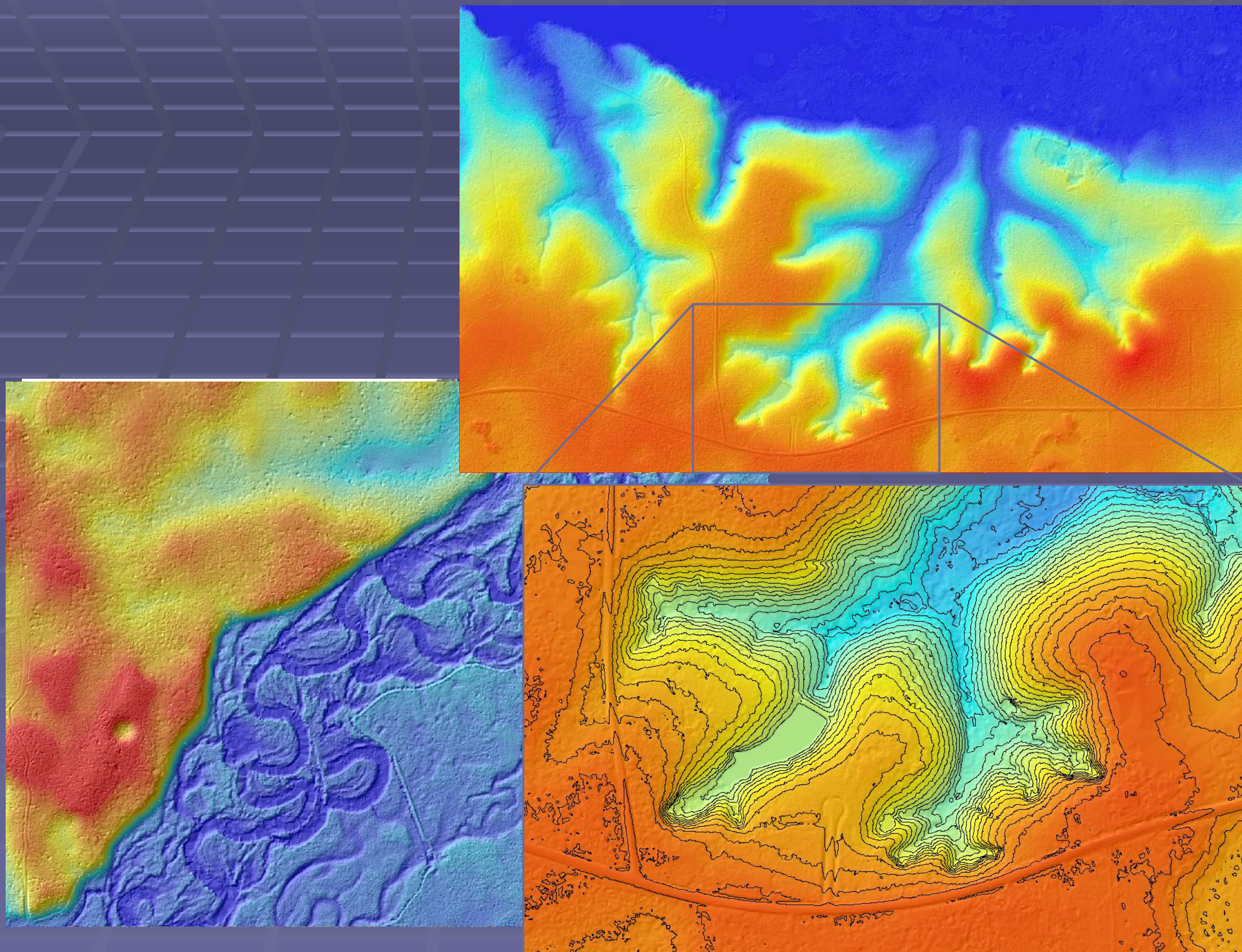
For MOST users, LiDAR intensity images are NOT viable replacements for conventional or digital imagery.

Lidar

LiDAR Characteristics

- Capable of collecting millions of elevation points per hour – much faster than traditional methods
- Produces datasets with much greater density than traditional mapping
- Some systems capable of capturing multiple returns per pulse and/or intensity images
- Supported by rigorous QA/QC

Topographic Mapping with LIDAR



Why Now?

- Several recent, enabling technological advances have made LIDAR possible:
- Airborne GPS
- Inertial Measurement Units (IMU)
- Availability of affordable lasers and other specialized materials and sensors
- Advances in computer technology (speed, performance, size, and of course, price)

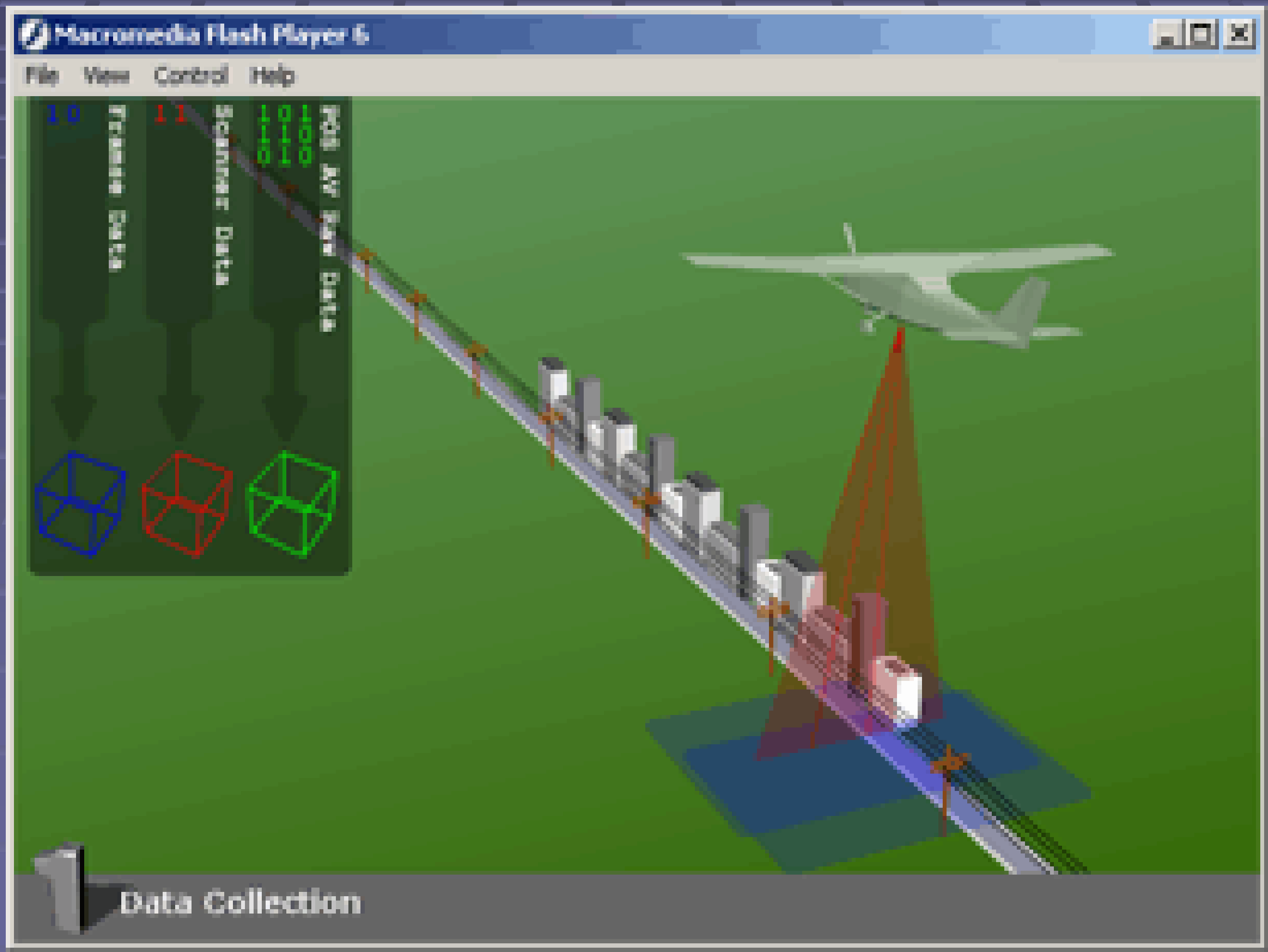
The Airborne Platform

Laser Scanner

Inertial Measuring Unit

Global Positioning Receiver

The Scanner



Macromedia Flash Player 6
File View Control Help
Frame Data
Scanner Data
POS AV Raw Data
Data Collection

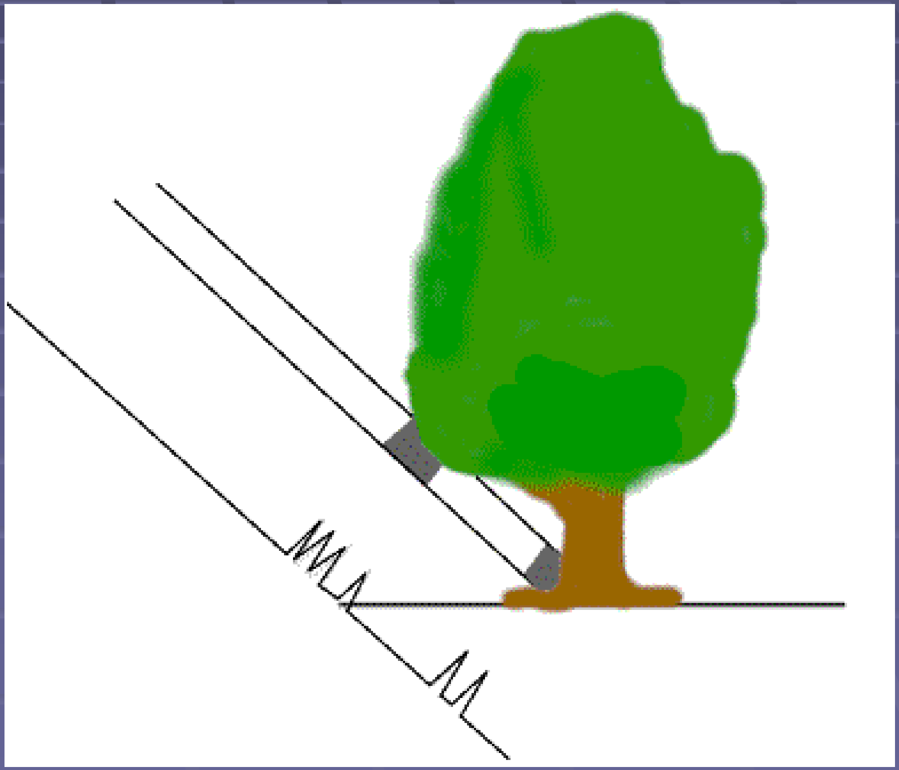
Scanner Pulse Returns

Return Per Pulse Detection

- Single First Surface
  - Limited vegetation penetration
  - Good for some Urban Applications
- First & Last
  - Good vegetation penetration & ground detection
  - Some Applications fit this scenario well
- Discrete Multiple
  - Allows advanced analysis of vegetation structure
  - Widest range of applications for about same cost

FIRST PULSE Return

- First-pulse
  - Measures the range to the first object encountered - in this illustration, the tree foliage.

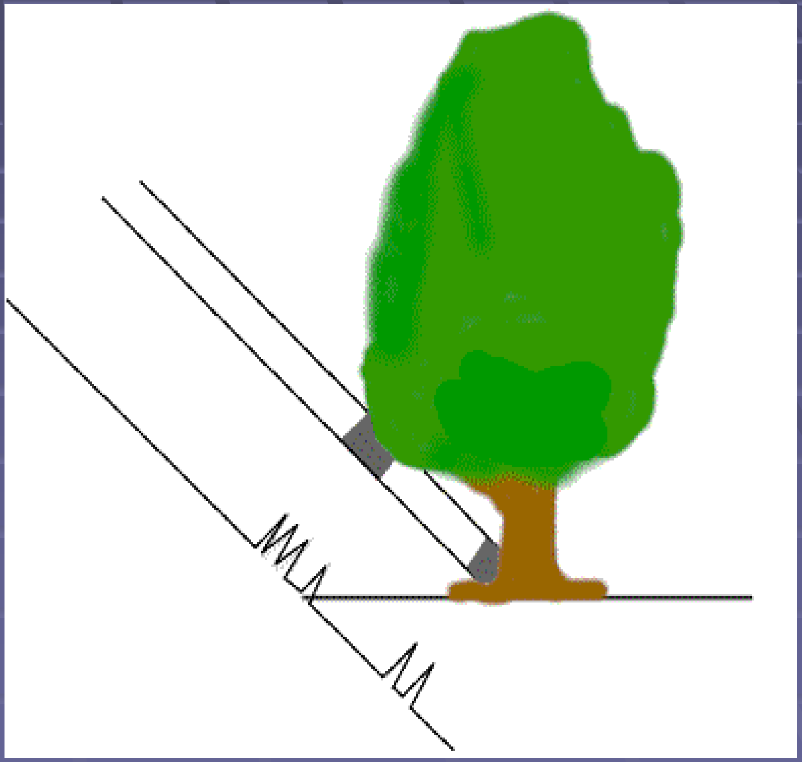


LAST / PULSE Return

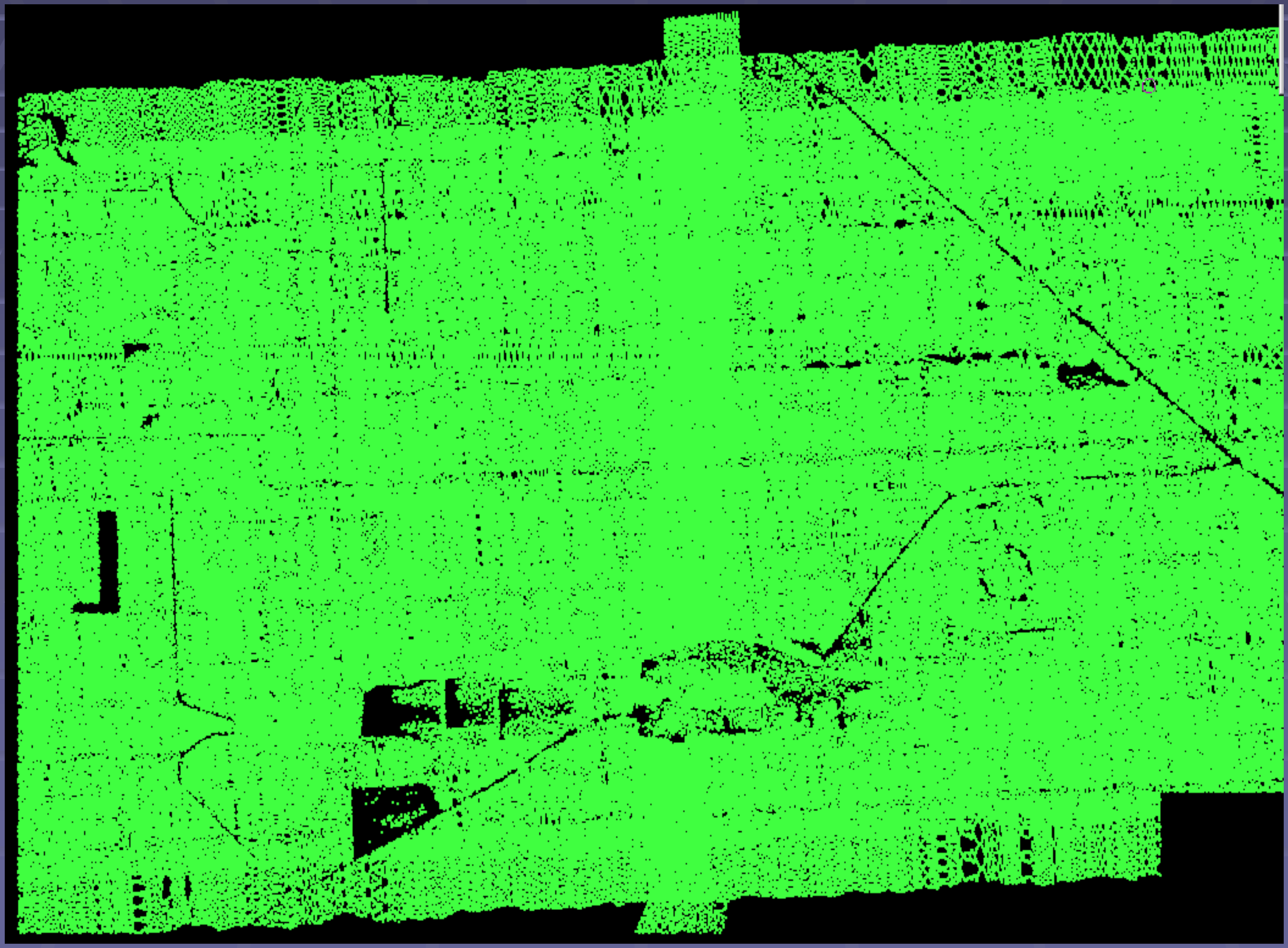
Last-pulse

- Measures the range to the last object - in this case, the ground.

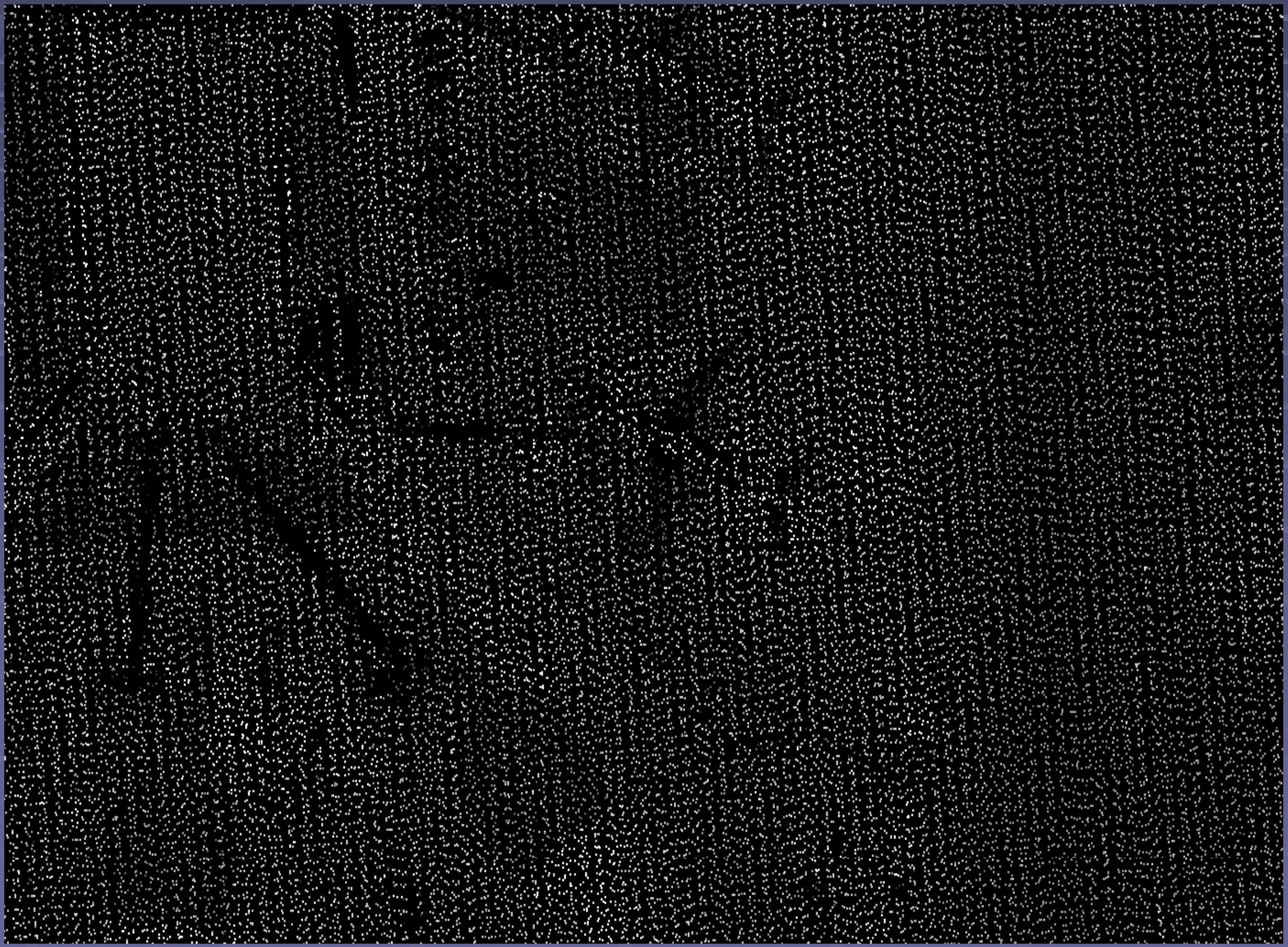
- By acquiring first- and last-pulse data simultaneously, it is possible to measure both tree-heights and the topography of the ground beneath in a single pass.



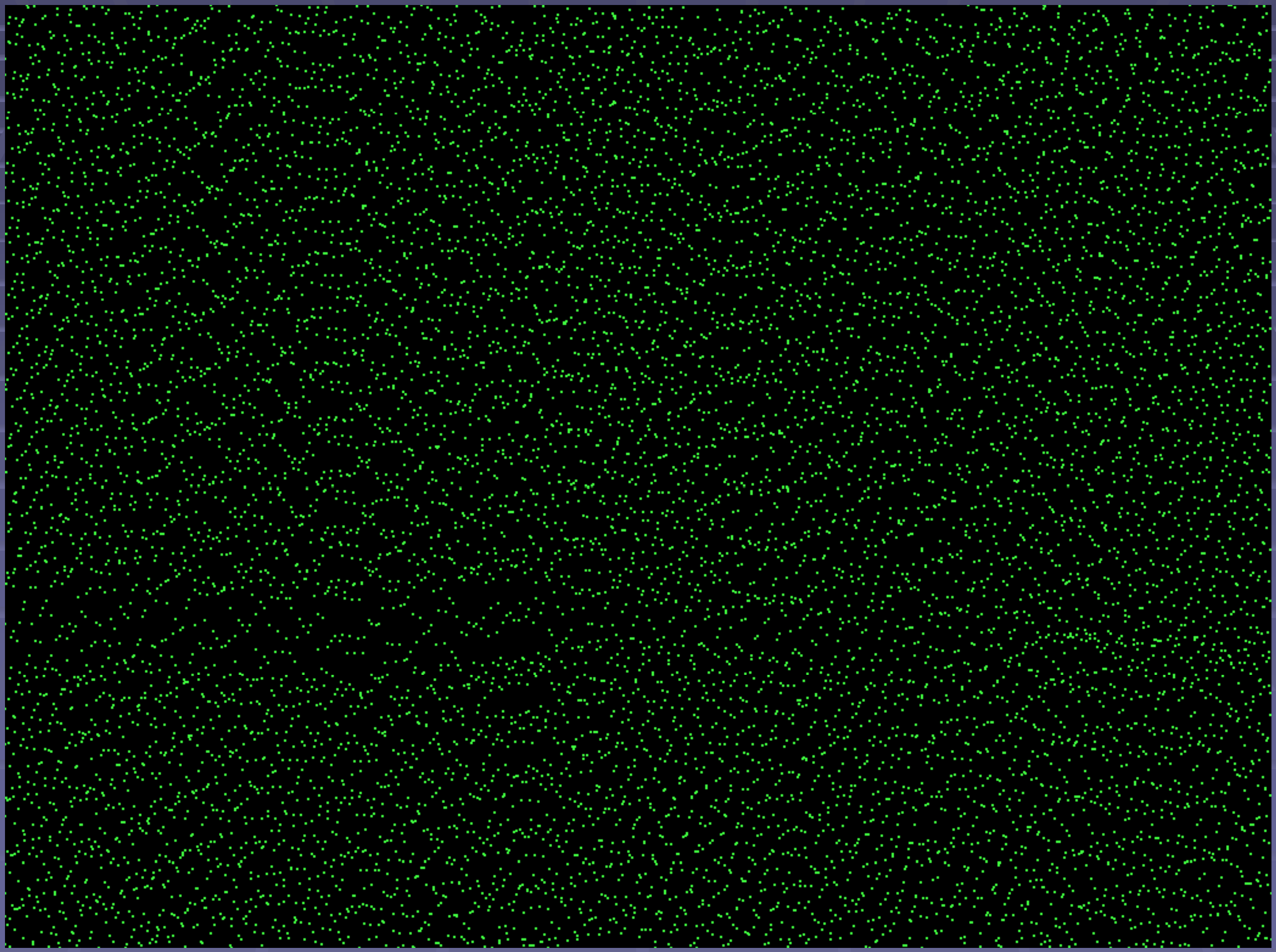
Mass Point Cloud



Mass Point Cloud



Enlarged Cloud



Intensity Return

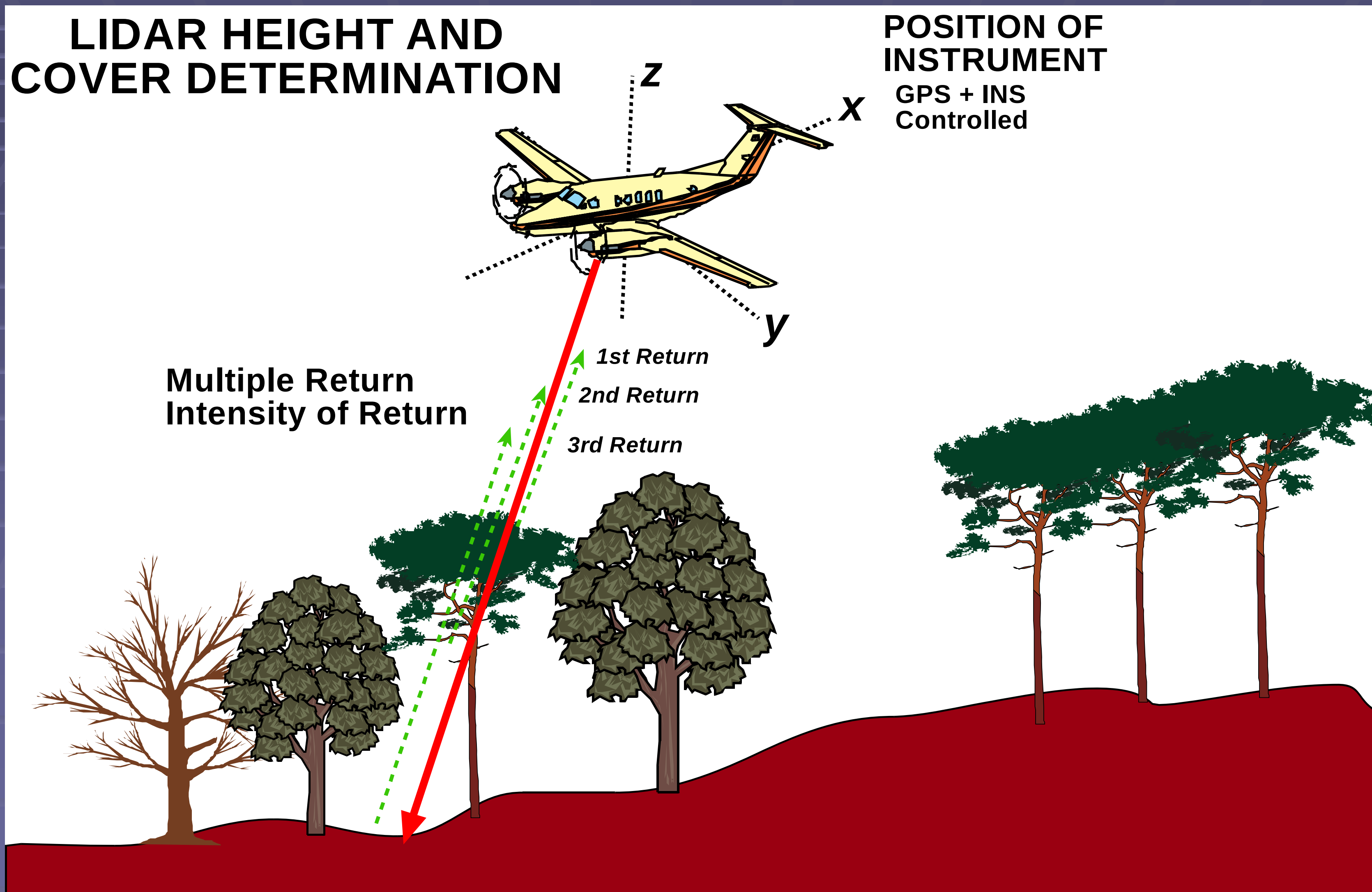
Bare Earth Points

Data Processing

- Solve for aircraft position (GPS)
- Solve for aircraft attitude (IMU)
- Solve for the Laser Positions (Ground)

POSITION

Orientation



GPS

Master Base Station

Master Remote

Differential Solution

Camera Events


NovAtel

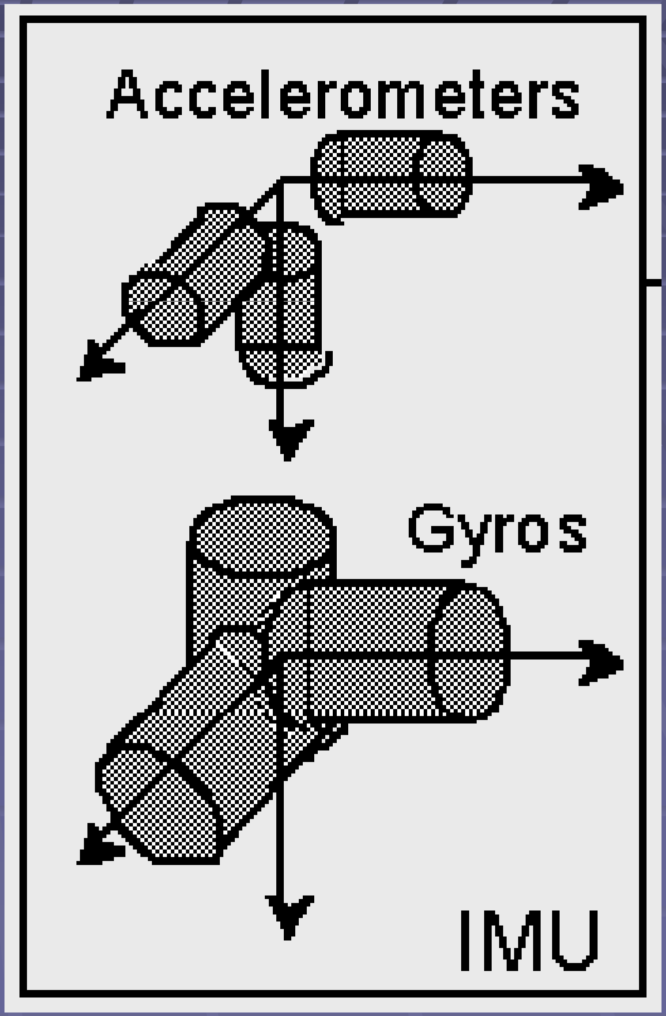
ORIENTATION

Orientation Information

- Accurate placement of reflective point requires information on aircraft attitude
- Need the rotation around 3 axes of the aircraft - roll, pitch and yaw
- Two techniques in practice:
  - multiple GPS receivers (less accurate)
  - inertial measurement units (very accurate)

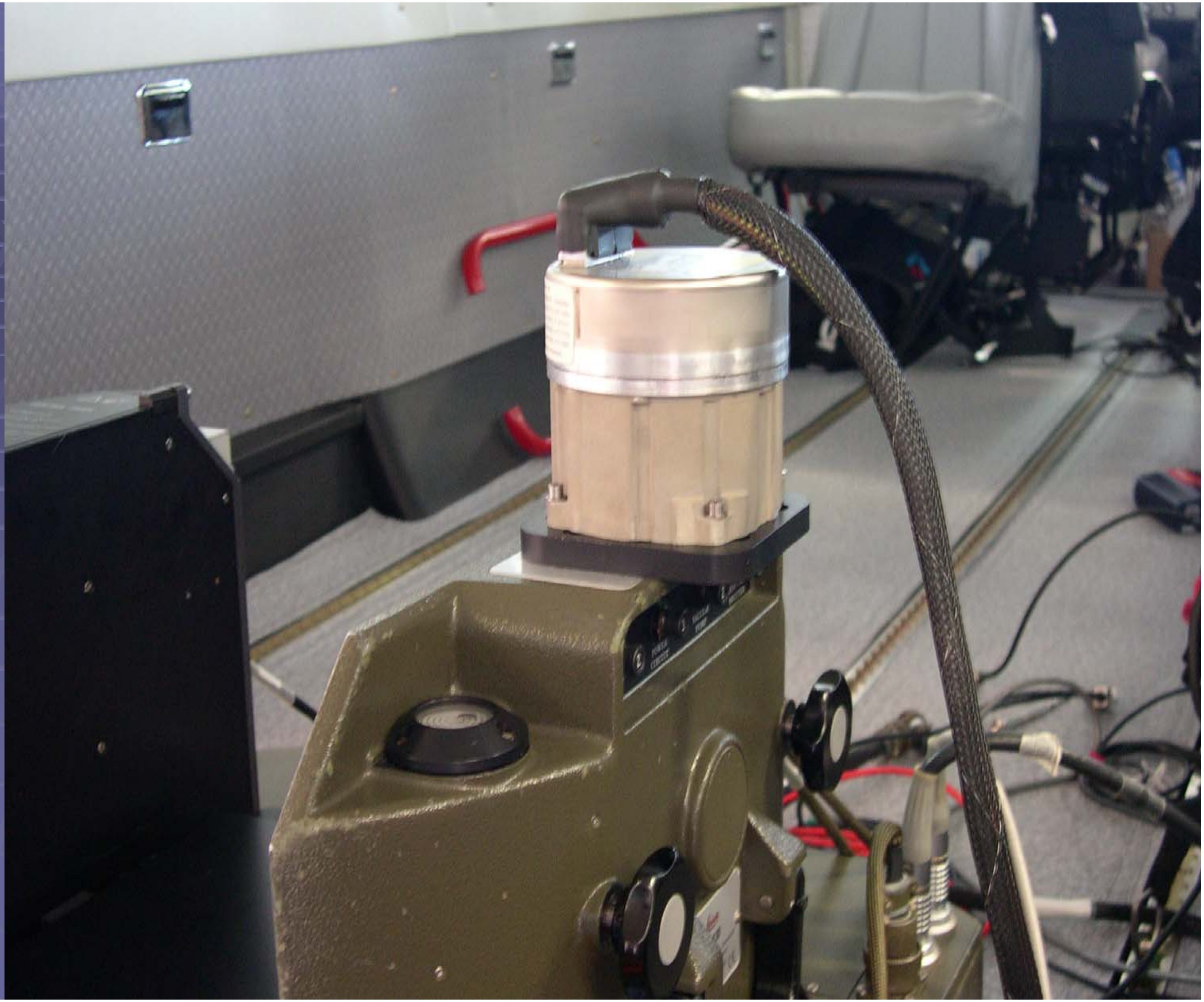
Inertial Measurement Unit

- Combination of gyros and accelerometers
- Typically integrated with GPS system
- Accuracies of 18 - 25 arc-seconds (0.005-deg for pitch and roll, 0.01-deg for yaw)



IMU Animation


APPLANIX
POSITION & ORIENTATION SYSTEM



Integration of

GPS and IMU Data

Computer Processing System

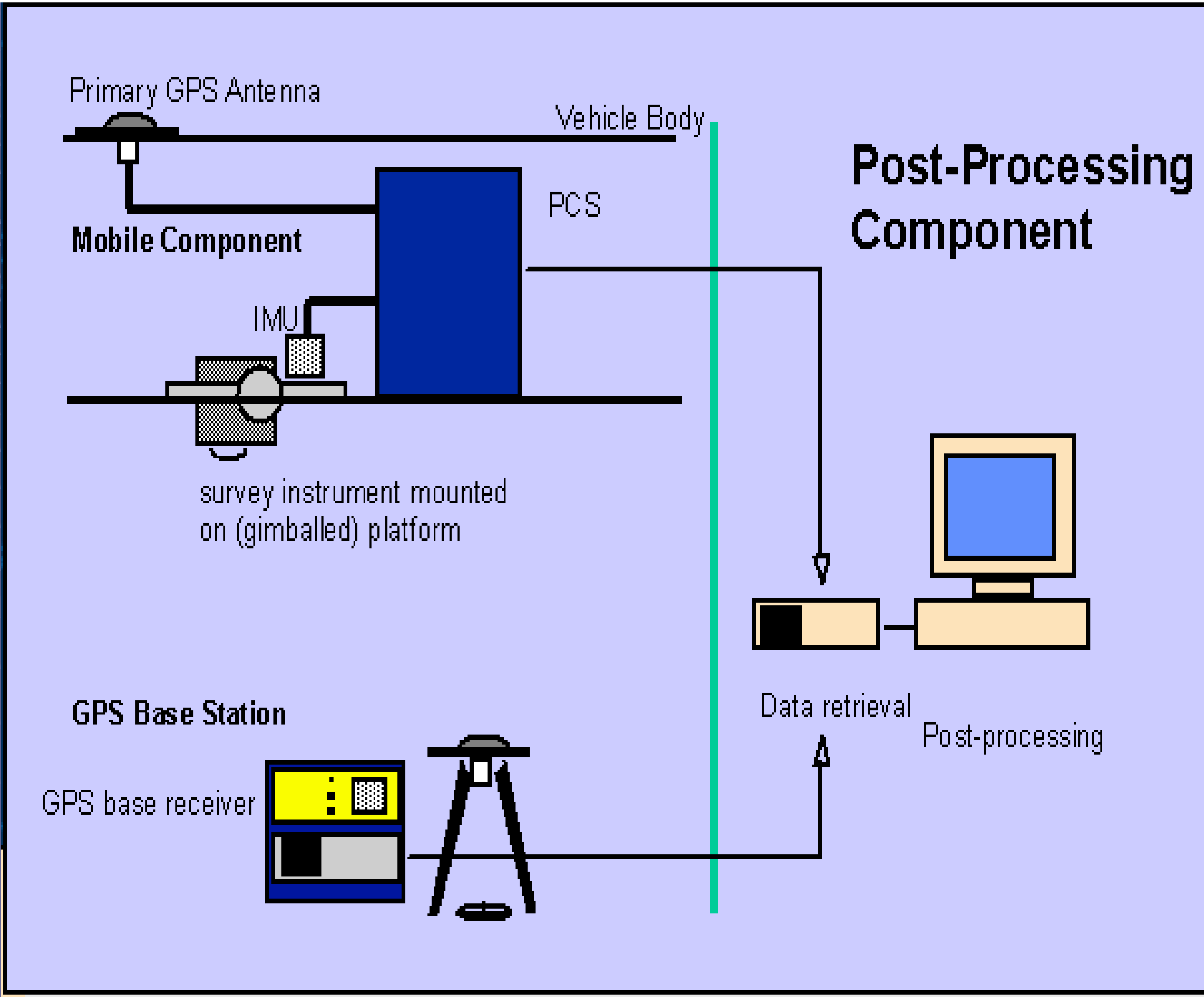
Real-time Processing,

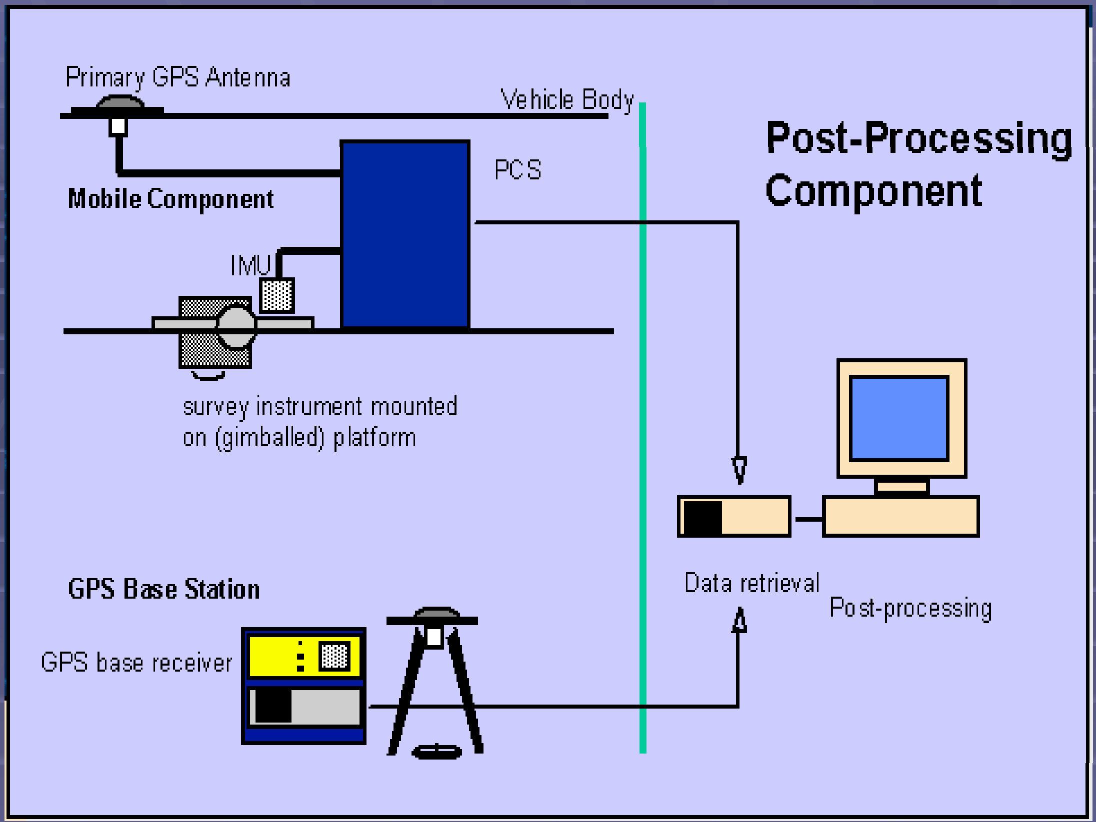
Time Alignment and

Data Acquisition,

and Data Storage

from IMU


Primary GPS Antenna
Vehicle Body
Post-Processing Component
PCS
Mobile Component
IMU
survey instrument mounted on (gimballed) platform
GPS Base Station
GPS base receiver
Data retrieval
Post-processing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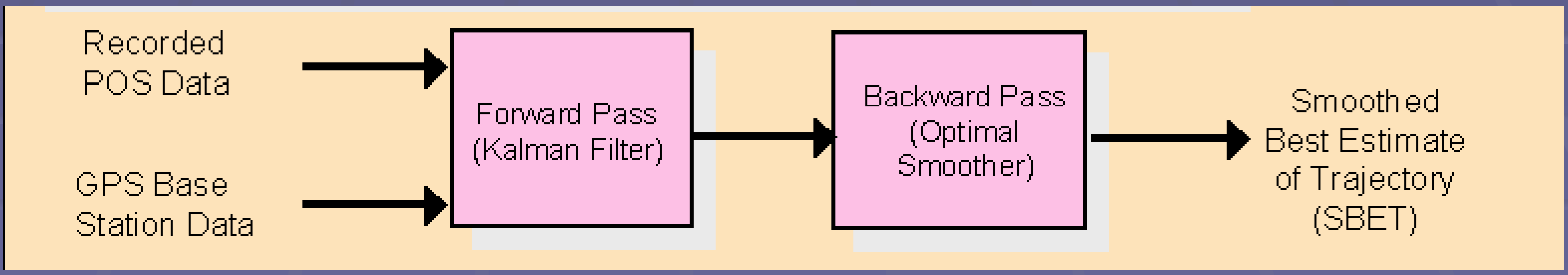
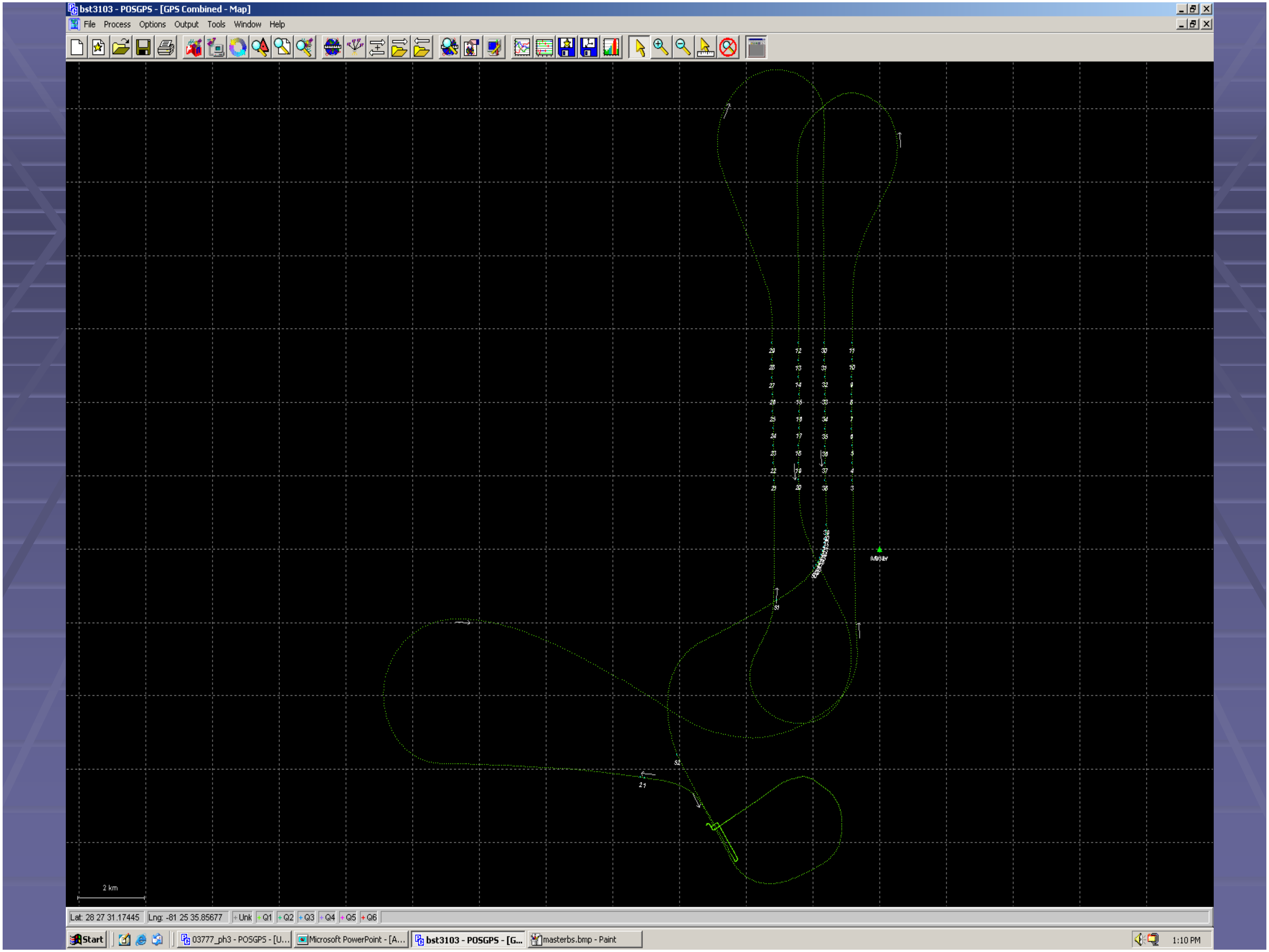
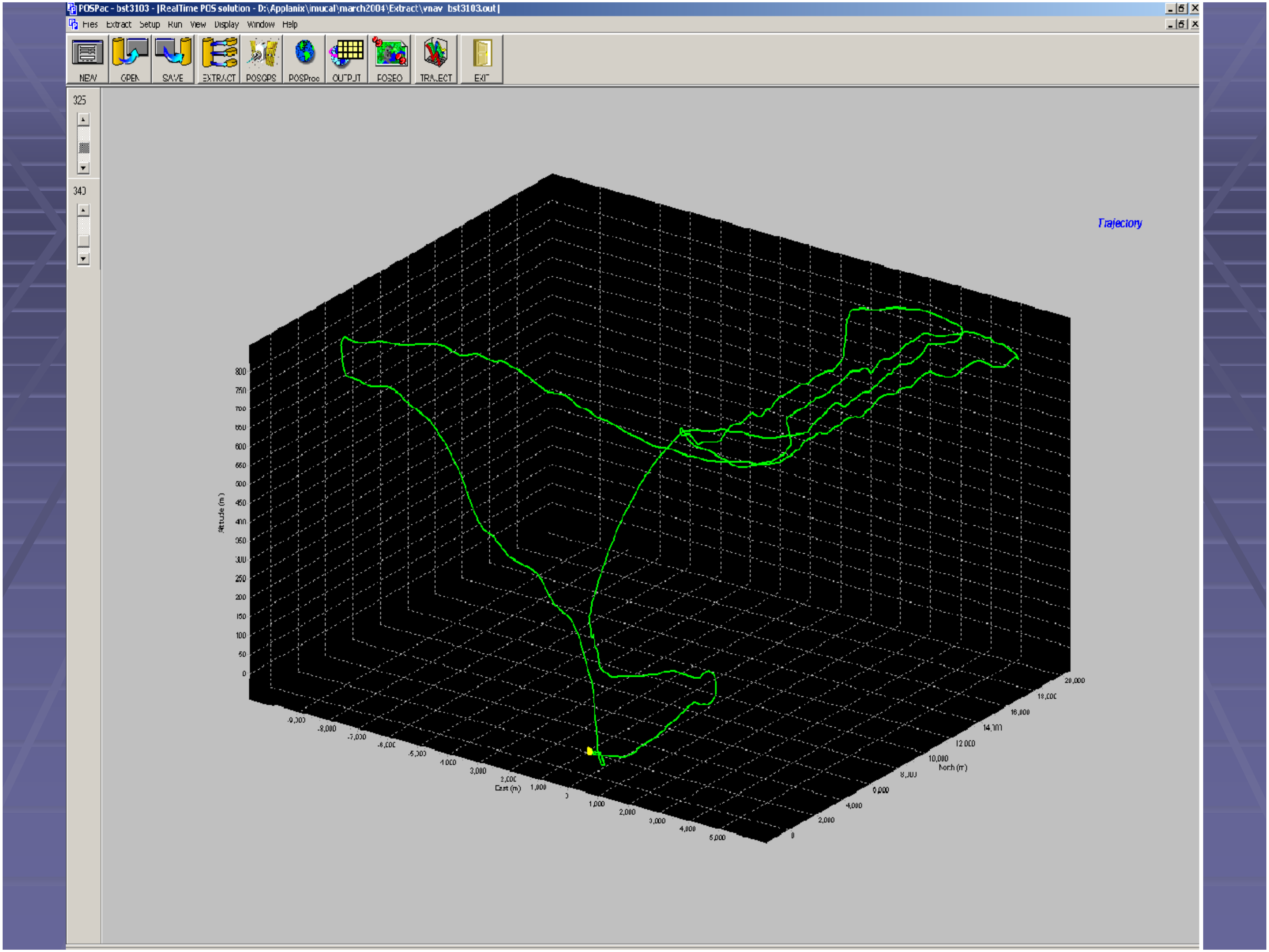

Recorded POS Data
GPS Base Station Data
Forward Pass (Kalman Filter)
Backward Pass (Optimal Smoother)
Smoothed Best Estimate of Trajectory (SBET)


bst3103 - POSGPS - [GPS Combined - Map]
File Process Options Output Tools Window Help
Master
2 km
Lat: 28 27 31.17445
Lng: -81 25 35.85677
Unk Q1 Q2 Q3 Q4 Q5 Q6
Start
03777_ph3 - POSGPS - [U...
Microsoft PowerPoint - [A...
bst3103 - POSGPS - [G...
masterbs.bmp - Paint
1:10 PM


POSPac - bst3103 - [RealTime POS solution - D:\Applanix\imucal\march2004\Extract\vnav bst3103.out]
Files Extract Setup Run View Display Window Help
NEW
OPEN
SAVE
EXTRACT
POSGPS
POSProc
OUTPUT
POSEO
TRAJECT
EXIT
Trajectory
Altitude (m)
East (m)
North (m)

Data Classification

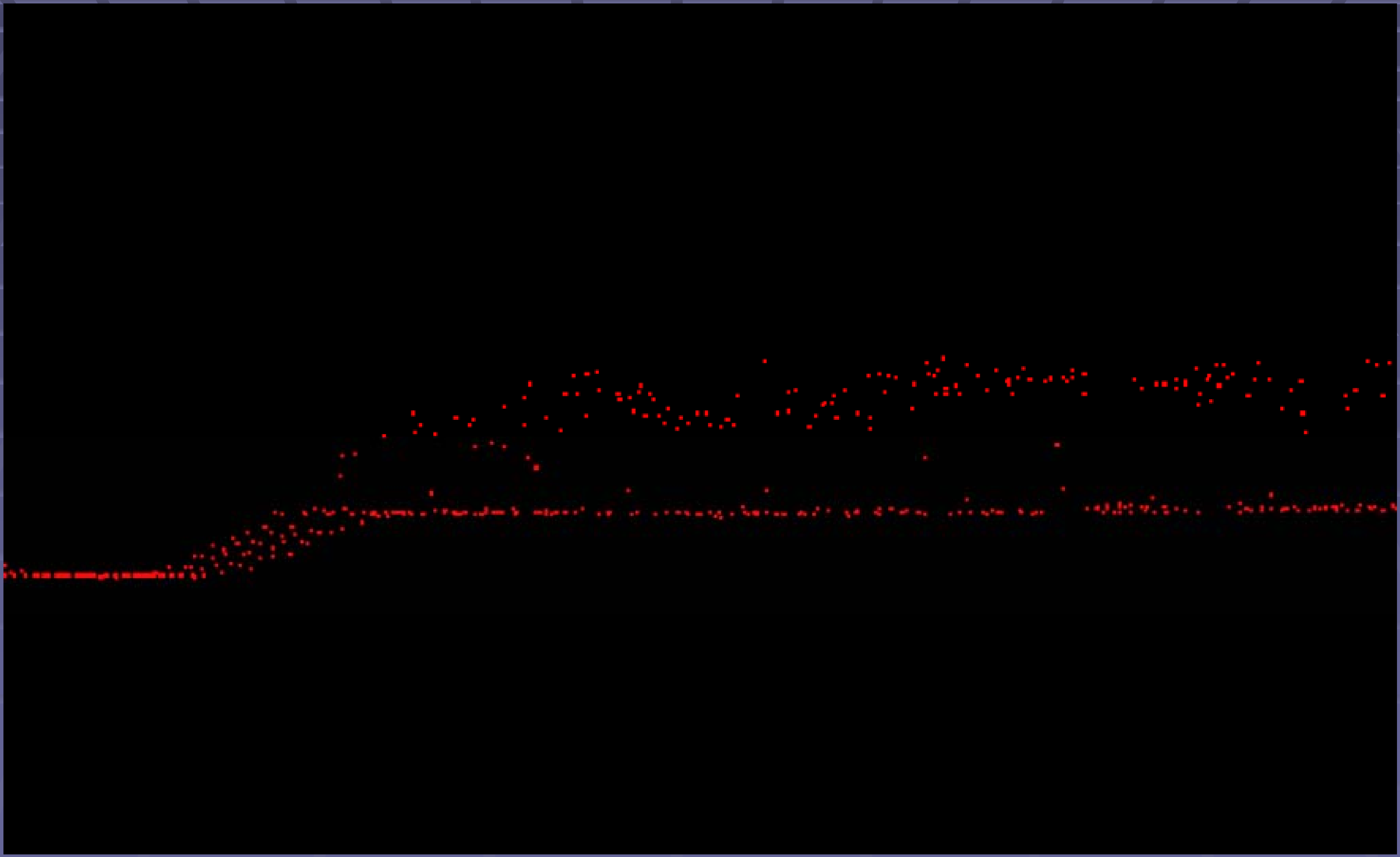
Filtration Process to extract above ground features

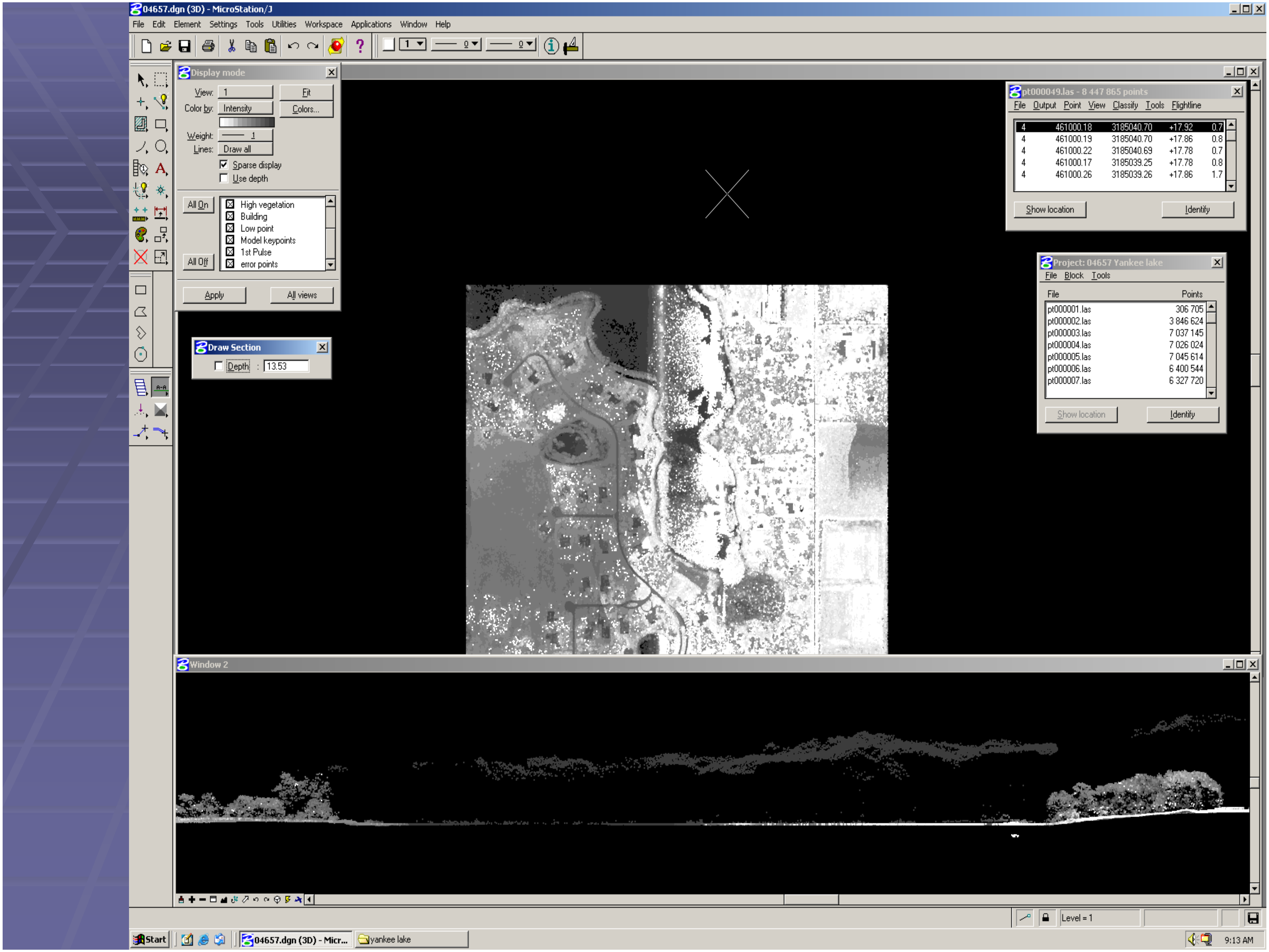
Classification is necessary to determine an accurate bare earth DEM

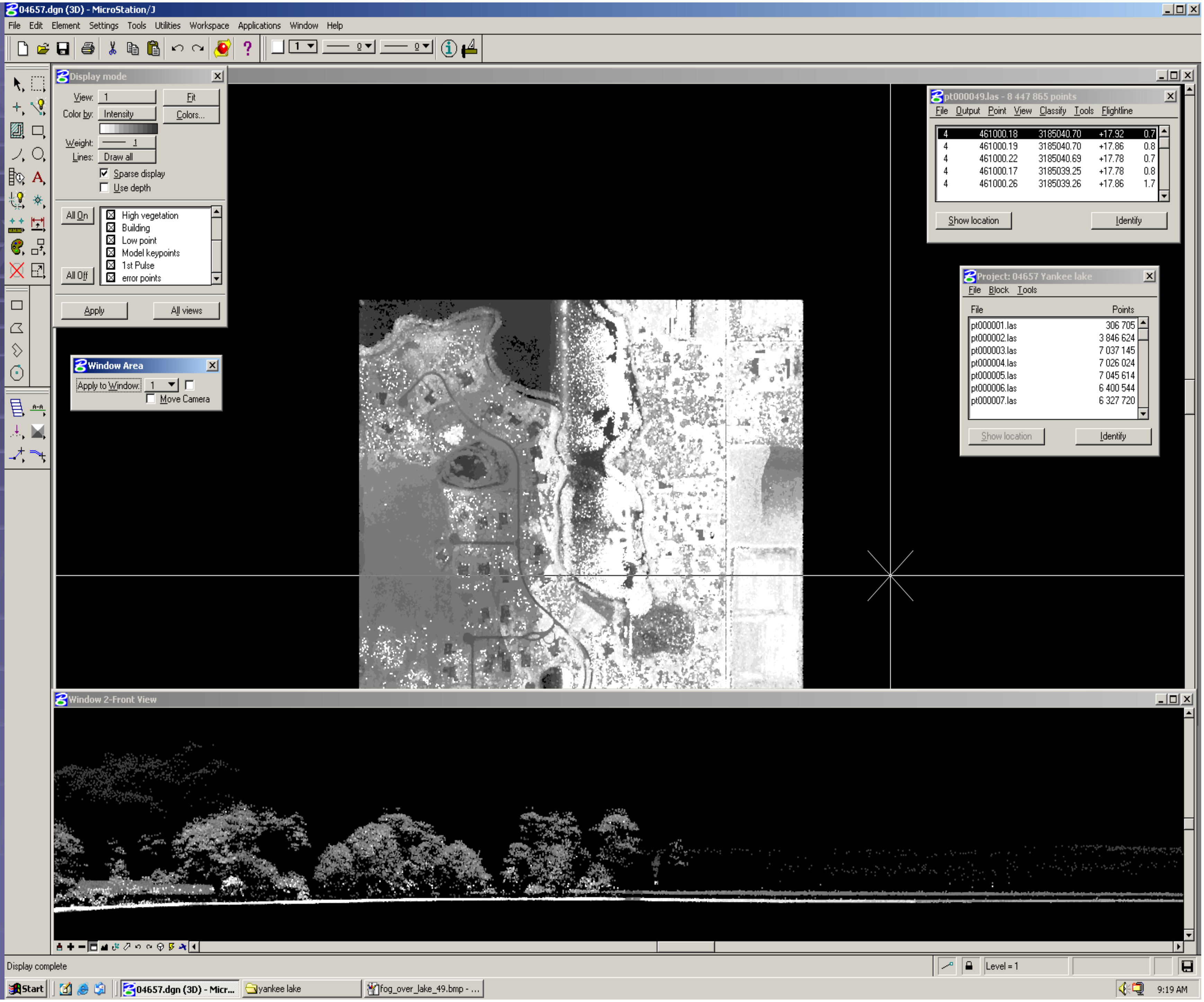
Done correctly it is a powerful Quality Control tool

Commercially Off The Shelf Software

Mass Point Profile

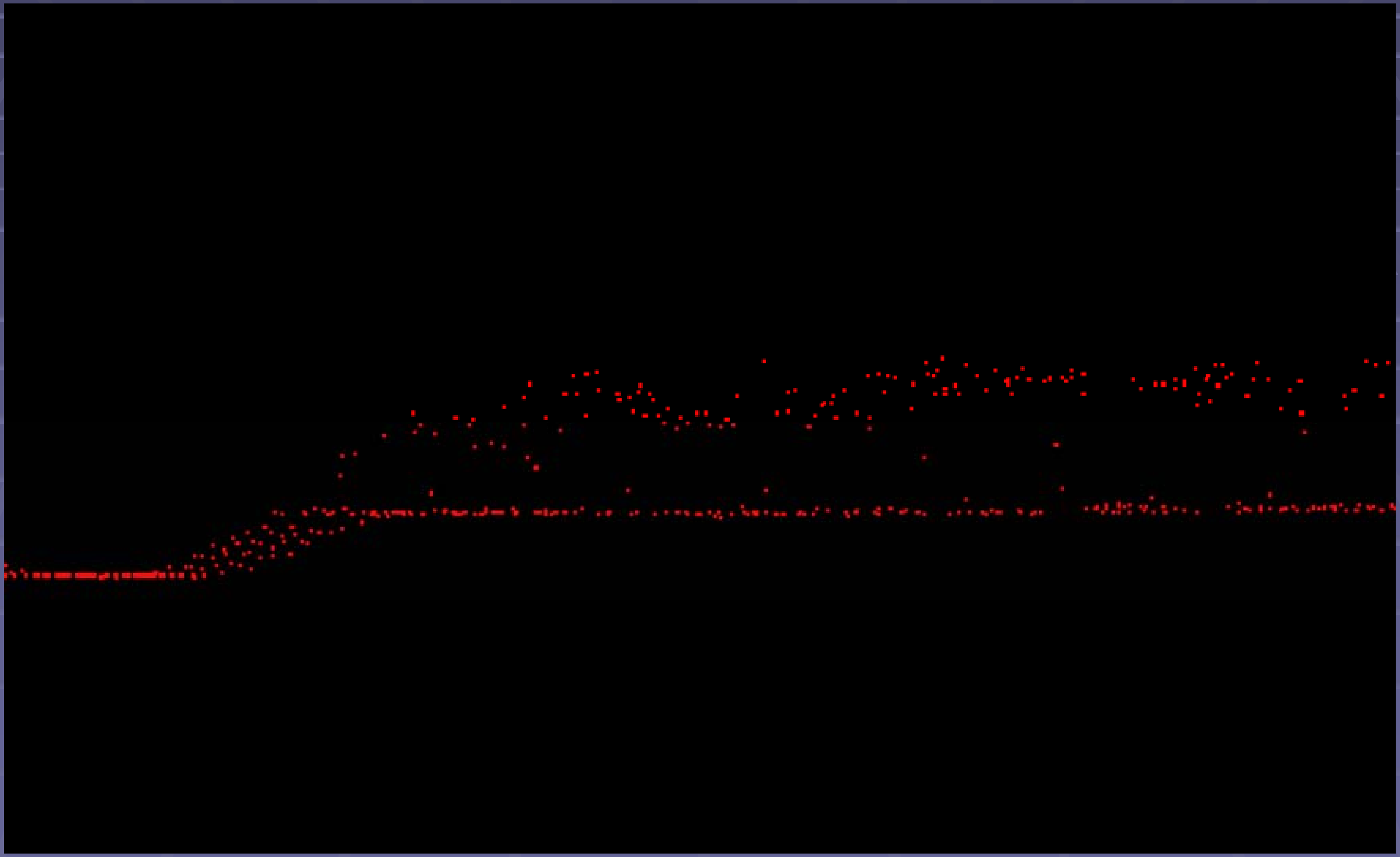



04657.dgn (3D) - MicroStation/J
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Display mode
View: 1
Fit
Color by: Intensity
Colors...
Weight: 1
Lines: Draw all
Sparse display
Use depth
All On
All Off
High vegetation
Building
Low point
Model keypoints
1st Pulse
error points
Apply
All views
Draw Section
Depth : 13.53
pt000049.las - 8 447 865 points
File Output Point View Classify Tools Flightline
4 461000.18 3185040.70 +17.92 0.7
4 461000.19 3185040.70 +17.86 0.8
4 461000.22 3185040.69 +17.78 0.7
4 461000.17 3185039.25 +17.78 0.8
4 461000.26 3185039.26 +17.86 1.7
Show location
Identify
Project: 04657 Yankee lake
File Block Tools
File Points
pt000001.las 306 705
pt000002.las 3 846 624
pt000003.las 7 037 145
pt000004.las 7 026 024
pt000005.las 7 045 614
pt000006.las 6 400 544
pt000007.las 6 327 720
Show location
Identify
Window 2
Level = 1
Start
04657.dgn (3D) - Micr...
yankee lake
9:13 AM

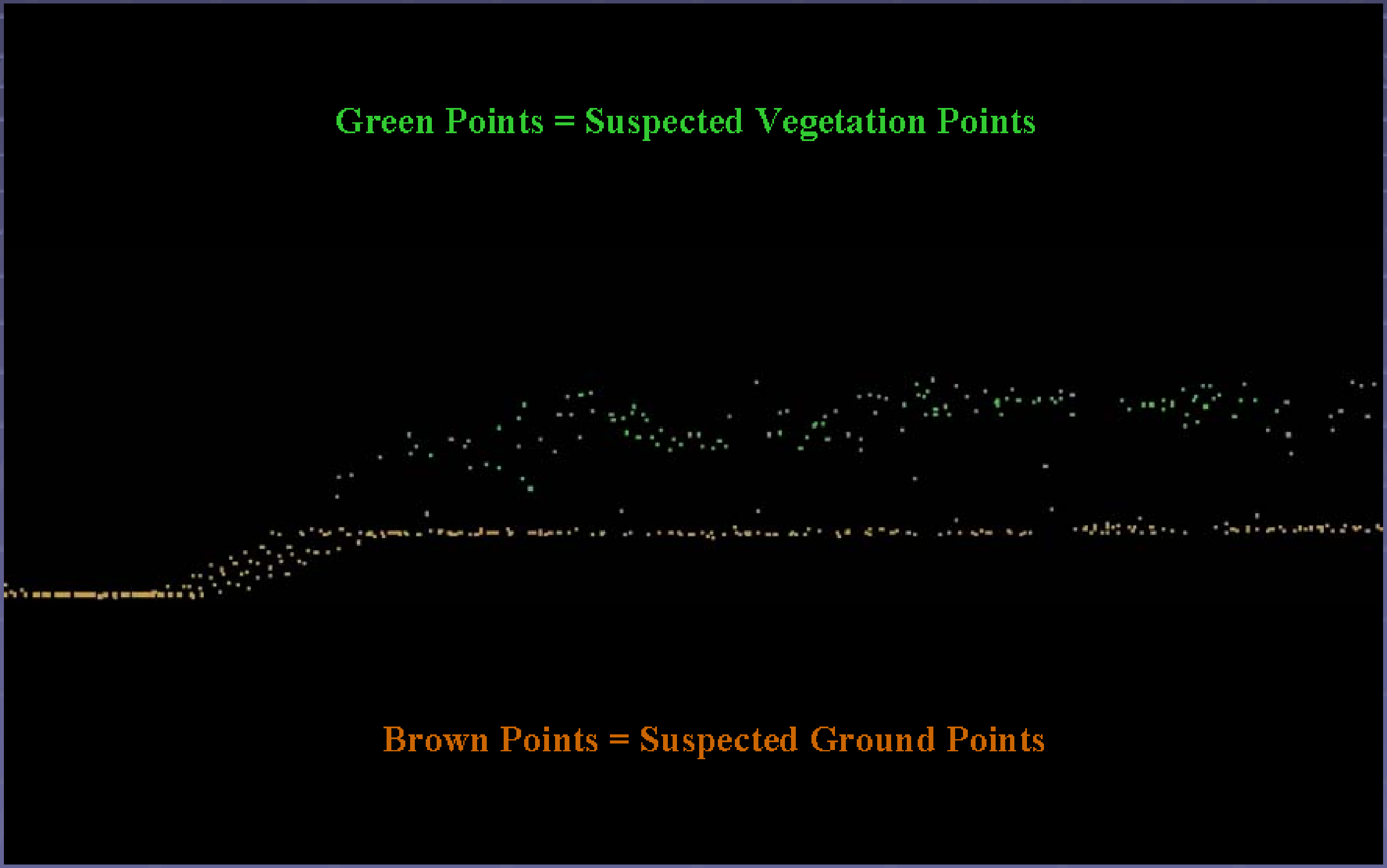


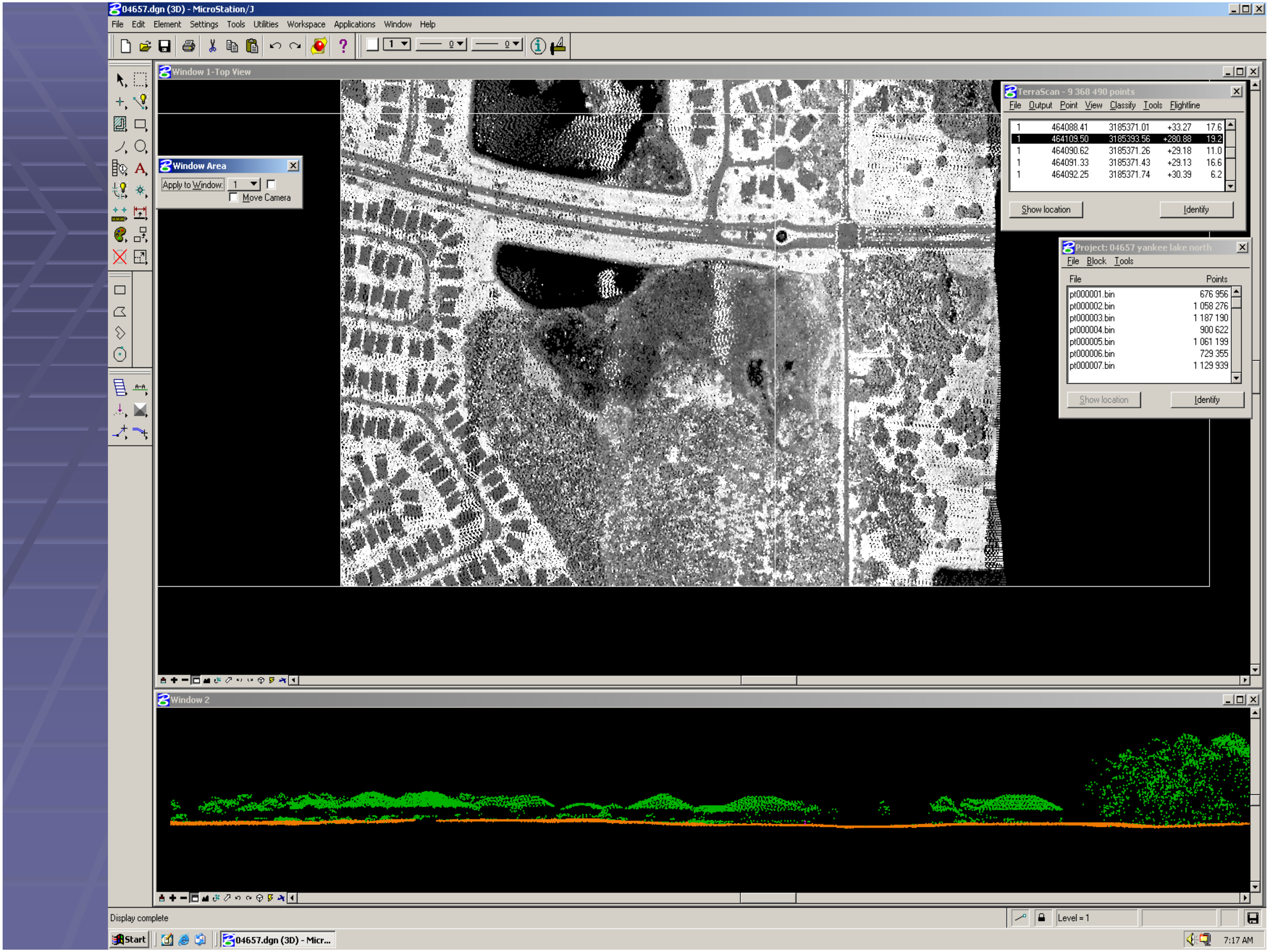
04657.dgn (3D) - MicroStation/J
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Display mode
View: 1
Fit
Color by: Intensity
Colors...
Weight: 1
Lines: Draw all
Sparse display
Use depth
All On
All Off
High vegetation
Building
Low point
Model keypoints
1st Pulse
error points
Apply
All views
Window Area
Apply to Window: 1
Move Camera
pt000049.las - 8 447 865 points
File Output Point View Classify Tools Flightline
4 461000.18 3185040.70 +17.92 0.7
4 461000.19 3185040.70 +17.86 0.8
4 461000.22 3185040.69 +17.78 0.7
4 461000.17 3185039.25 +17.78 0.8
4 461000.26 3185039.26 +17.86 1.7
Show location
Identify
Project: 04657 Yankee lake
File Block Tools
File
Points
pt000001.las 306 705
pt000002.las 3 846 624
pt000003.las 7 037 145
pt000004.las 7 026 024
pt000005.las 7 045 614
pt000006.las 6 400 544
pt000007.las 6 327 720
Show location
Identify
Window 2-Front View
Display complete
Level = 1
Start
04657.dgn (3D) - Micr...
yankee lake
fog_over_lake_49.bmp - ...
9:19 AM

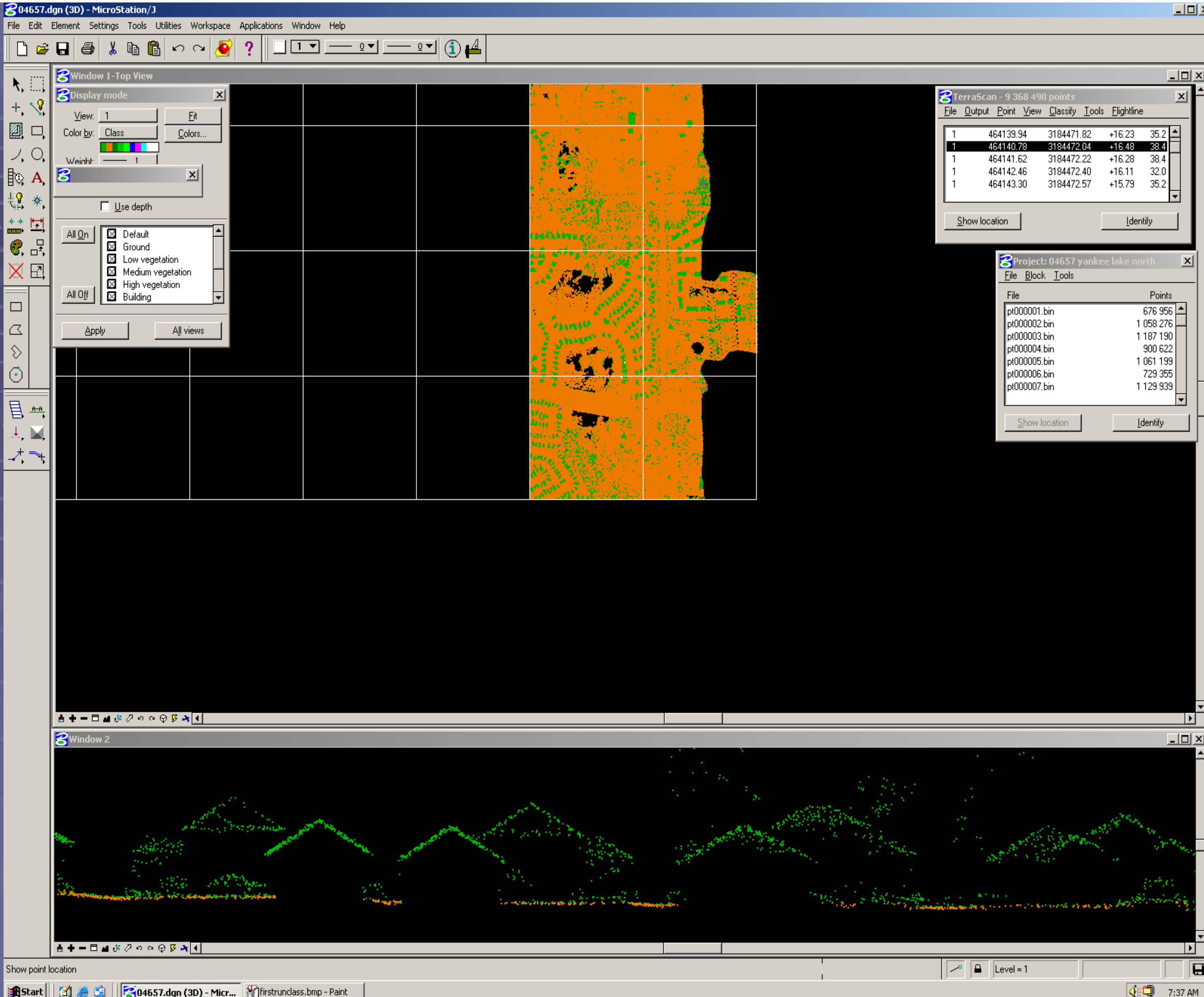
Mass Point Profile



Classified Features Profile




04657.dgn (3D) - MicroStation/J
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Window 1-Top View
Window Area
Apply to Window: 1
Move Camera
TerraScan - 9 368 490 points
File Output Point View Classify Tools Flightline
1 464088.41 3185371.01 +33.27 17.6
1 464109.50 3185393.56 +280.88 19.2
1 464090.62 3185371.26 +29.18 11.0
1 464091.33 3185371.43 +29.13 16.6
1 464092.25 3185371.74 +30.39 6.2
Show location
Identify
Project: 04657 yankee lake north
File Block Tools
File Points
pt000001.bin 676 956
pt000002.bin 1 058 276
pt000003.bin 1 187 190
pt000004.bin 900 622
pt000005.bin 1 061 199
pt000006.bin 729 355
pt000007.bin 1 129 939
Show location
Identify
Window 2
Display complete
Level = 1
Start
04657.dgn (3D) - Micr...
7:17 AM



04657.dgn (3D) - MicroStation/J
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Window 1-Top View
Display mode
View: 1
Fit
Color by: Class
Colors...
Use depth
All On
All Off
Default
Ground
Low vegetation
Medium vegetation
High vegetation
Building
Apply
All views
TerraScan - 9 368 490 points
File Output Point View Classify Tools Flightline
1 464139.94 3184471.82 +16.23 35.2
1 464140.78 3184472.04 +16.48 38.4
1 464141.62 3184472.22 +16.28 38.4
1 464142.46 3184472.40 +16.11 32.0
1 464143.30 3184472.57 +15.79 35.2
Show location
Identify
Project: 04657 yankee lake north
File Block Tools
File Points
pt000001.bin 676 956
pt000002.bin 1 058 276
pt000003.bin 1 187 190
pt000004.bin 900 622
pt000005.bin 1 061 199
pt000006.bin 729 355
pt000007.bin 1 129 939
Show location
Identify
Window 2
Show point location
Level = 1
Start
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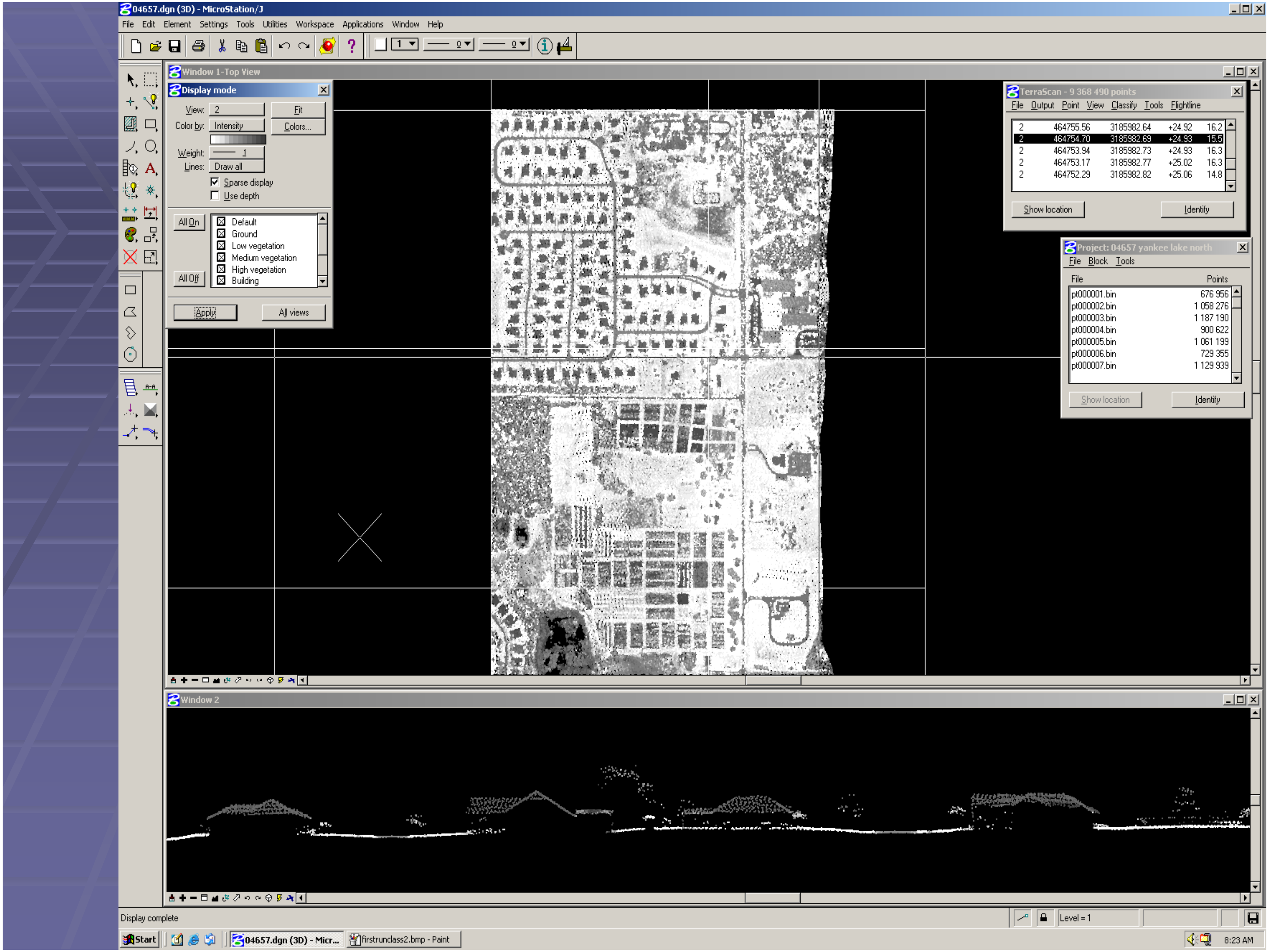
firstrunclass.bmp - Paint
7:37 AM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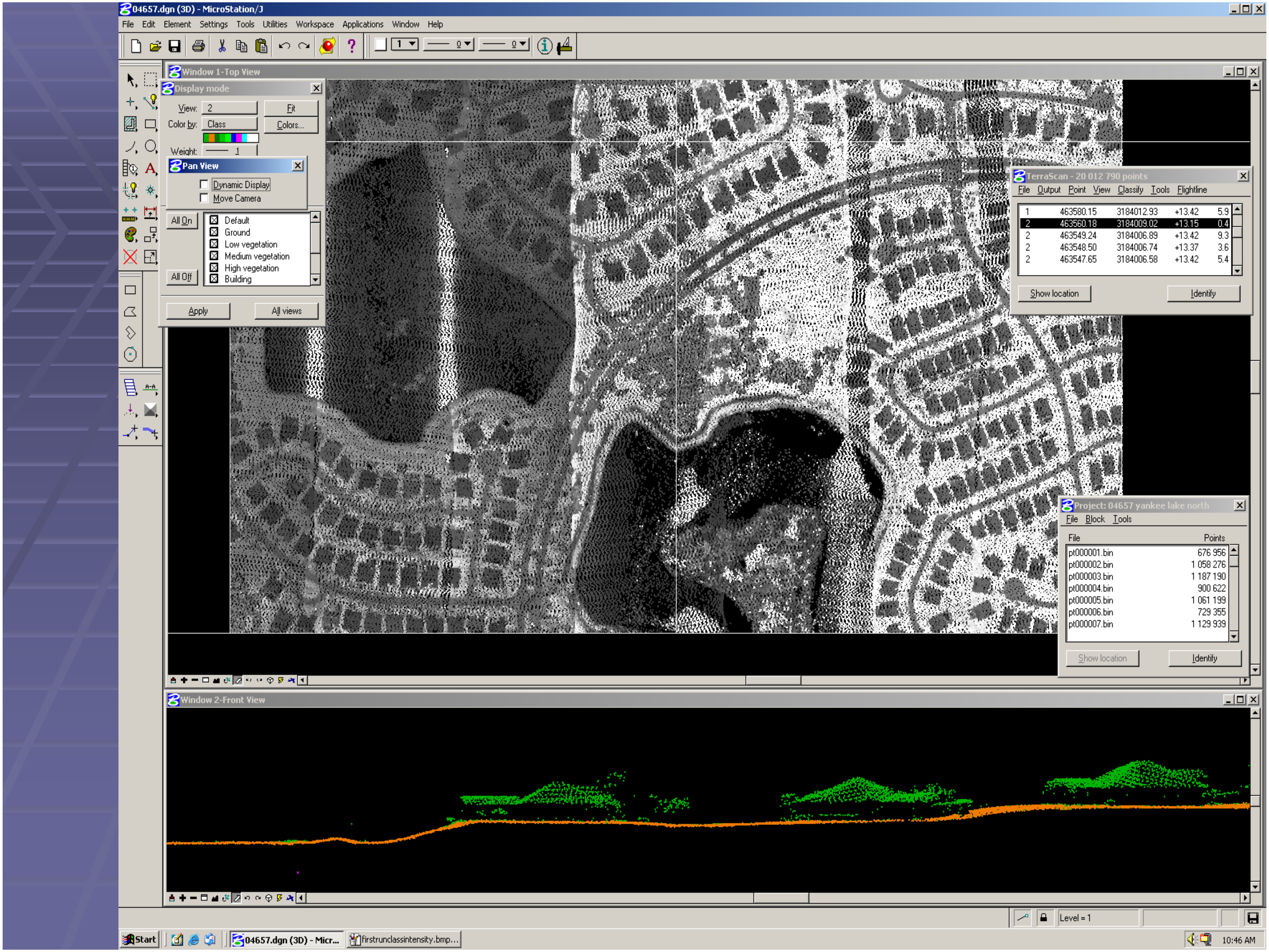
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Window 1-Top View
Display mode
View: 2
Fit
Color by: Intensity
Colors...
Weight: 1
Lines: Draw all
Sparse display
Use depth
All On
All Off
Default
Ground
Low vegetation
Medium vegetation
High vegetation
Building
Apply
All views
TerraScan - 9 368 490 points
File Output Point View Classify Tools Flightline
2 464755.56 3185982.64 +24.92 16.2
2 464754.70 3185982.69 +24.93 15.5
2 464753.94 3185982.73 +24.93 16.3
2 464753.17 3185982.77 +25.02 16.3
2 464752.29 3185982.82 +25.06 14.8
Show location
Identify
Project: 04657 yankee lake north
File Block Tools
File
Points
pt000001.bin 676 956
pt000002.bin 1 058 276
pt000003.bin 1 187 190
pt000004.bin 900 622
pt000005.bin 1 061 199
pt000006.bin 729 355
pt000007.bin 1 129 939
Show location
Identify
Window 2
Display complete
Level = 1
Start
04657.dgn (3D) - Micr...
firstrunclass2.bmp - Paint
8:23 AM


04657.dgn (3D) - MicroStation/J
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Window 1-Top View
Display mode
View: 2
Fit
Color by: Class
Colors...
Weight:
Pan View
Dynamic Display
Move Camera
All On
All Off
Default
Ground
Low vegetation
Medium vegetation
High vegetation
Building
Apply
All views
TerraScan - 20 012 790 points
File Output Point View Classify Tools Flightline
1 463580.15 3184012.93 +13.42 5.9
2 463560.18 3184009.02 +13.15 0.4
2 463549.24 3184006.89 +13.42 9.3
2 463548.50 3184006.74 +13.37 3.6
2 463547.65 3184006.58 +13.42 5.4
Show location
Identify
Project: 04657 yankee lake north
File Block Tools
File
Points
pt000001.bin 676 956
pt000002.bin 1 058 276
pt000003.bin 1 187 190
pt000004.bin 900 622
pt000005.bin 1 061 199
pt000006.bin 729 355
pt000007.bin 1 129 939
Show location
Identify
Window 2-Front View
Level = 1
Start
04657.dgn (3D) - Micr...
firstrunclassintensity.bmp...
10:46 AM

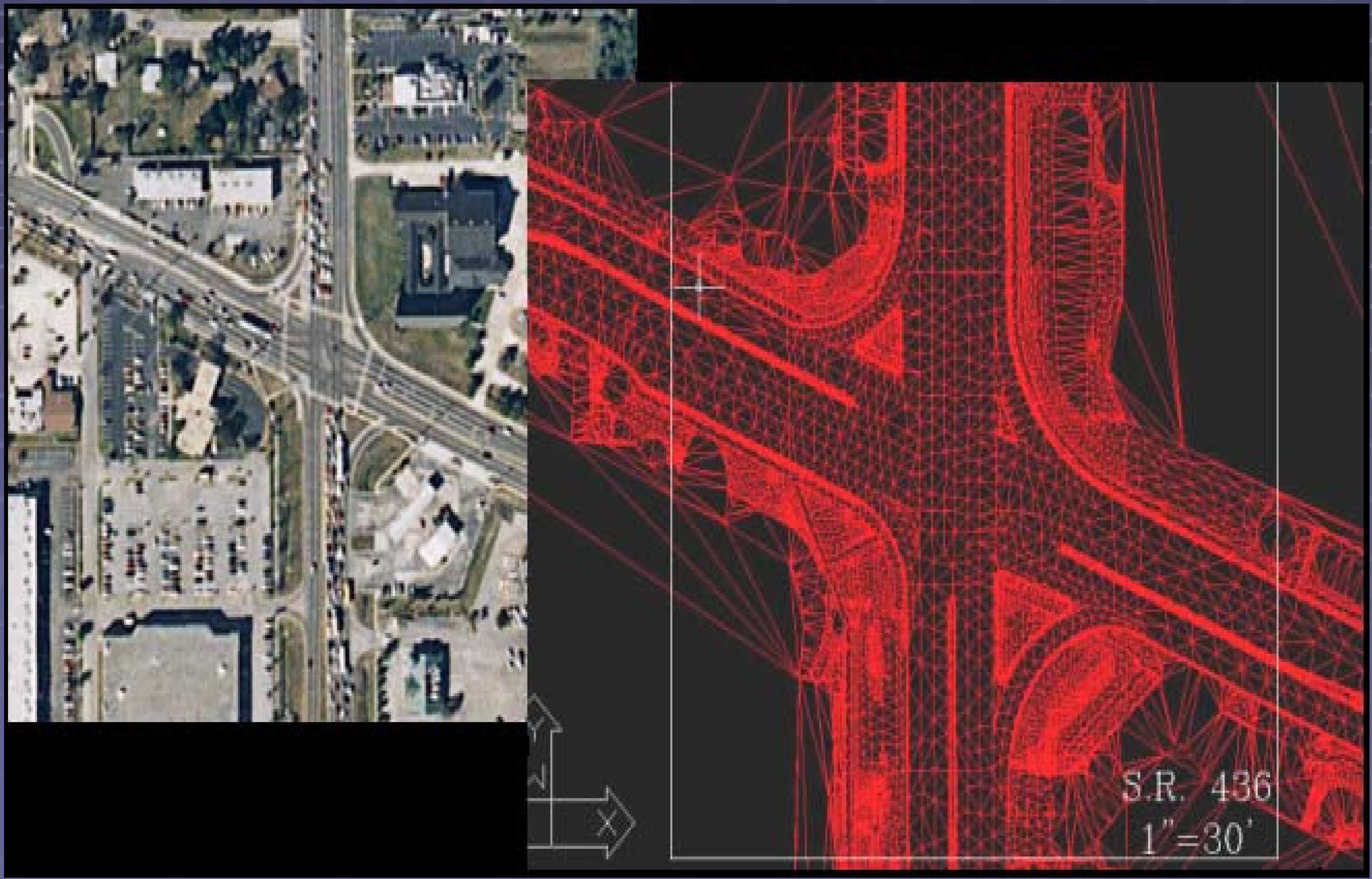
Comparing Technology

LiDAR vs. Stereo Compilation

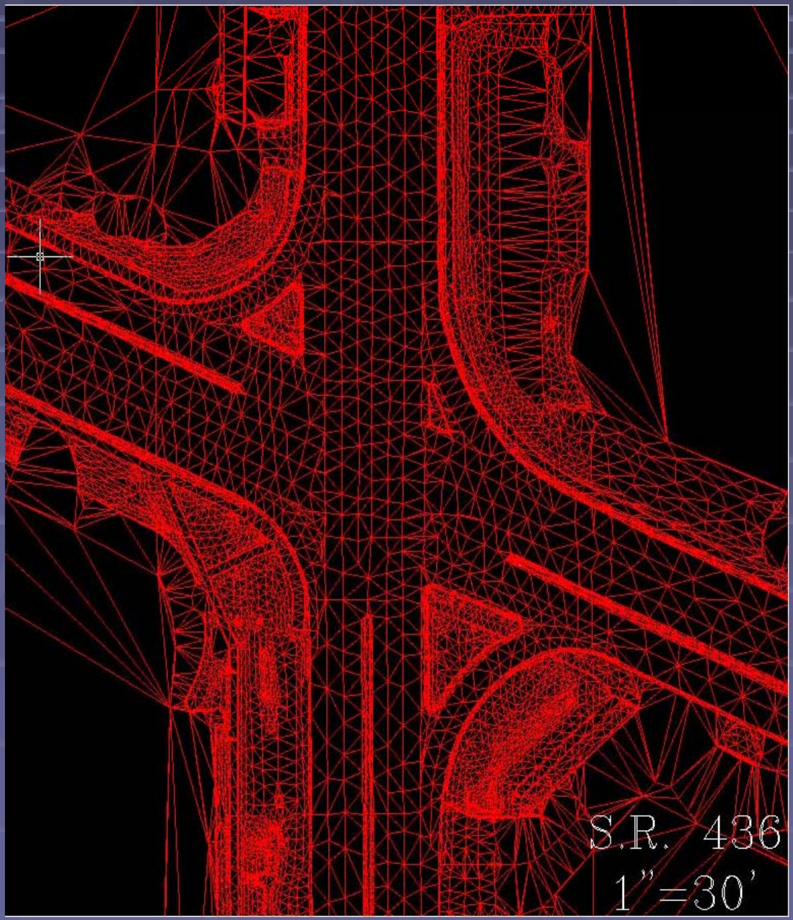
1”=100’ Scale Mapping

- Compiled Mass Points more widely spaced: 60’ vs. 7’
- Compiled DTMs use breaklines; LiDAR *usually** does not
- Compiler can place points; LiDAR is semi-random
- Compiler must see the ground; LiDAR is self-illuminating
  - **Technology is beginning to close this gap*

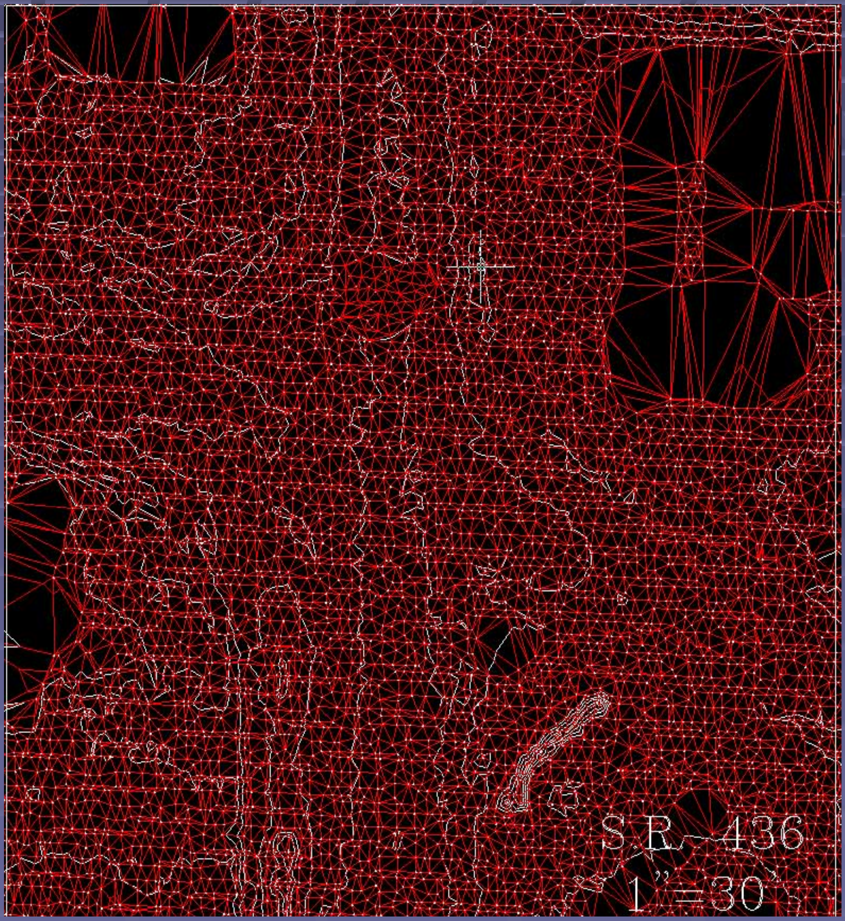
SR436 & Curry Ford Rd



TIN Comparison



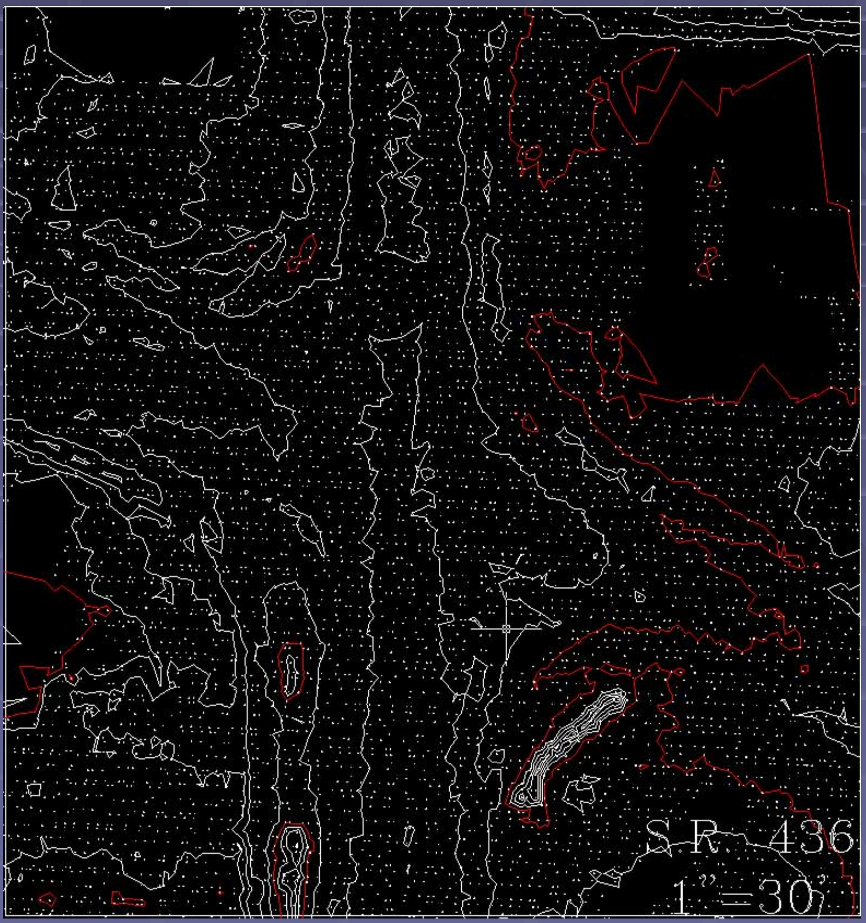
Photogrammetry



LiDAR

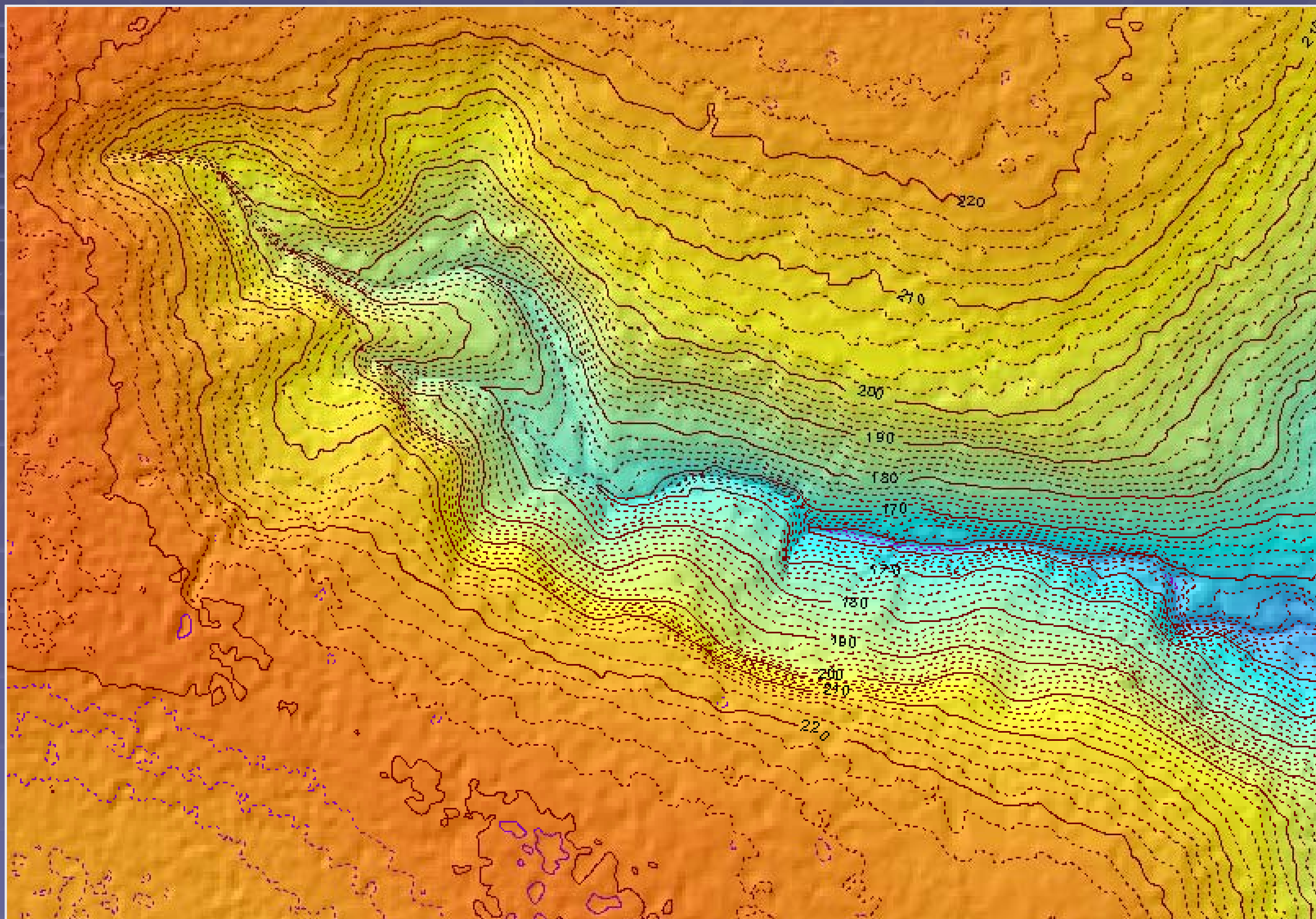
Contour Comparison

Photogrammetry



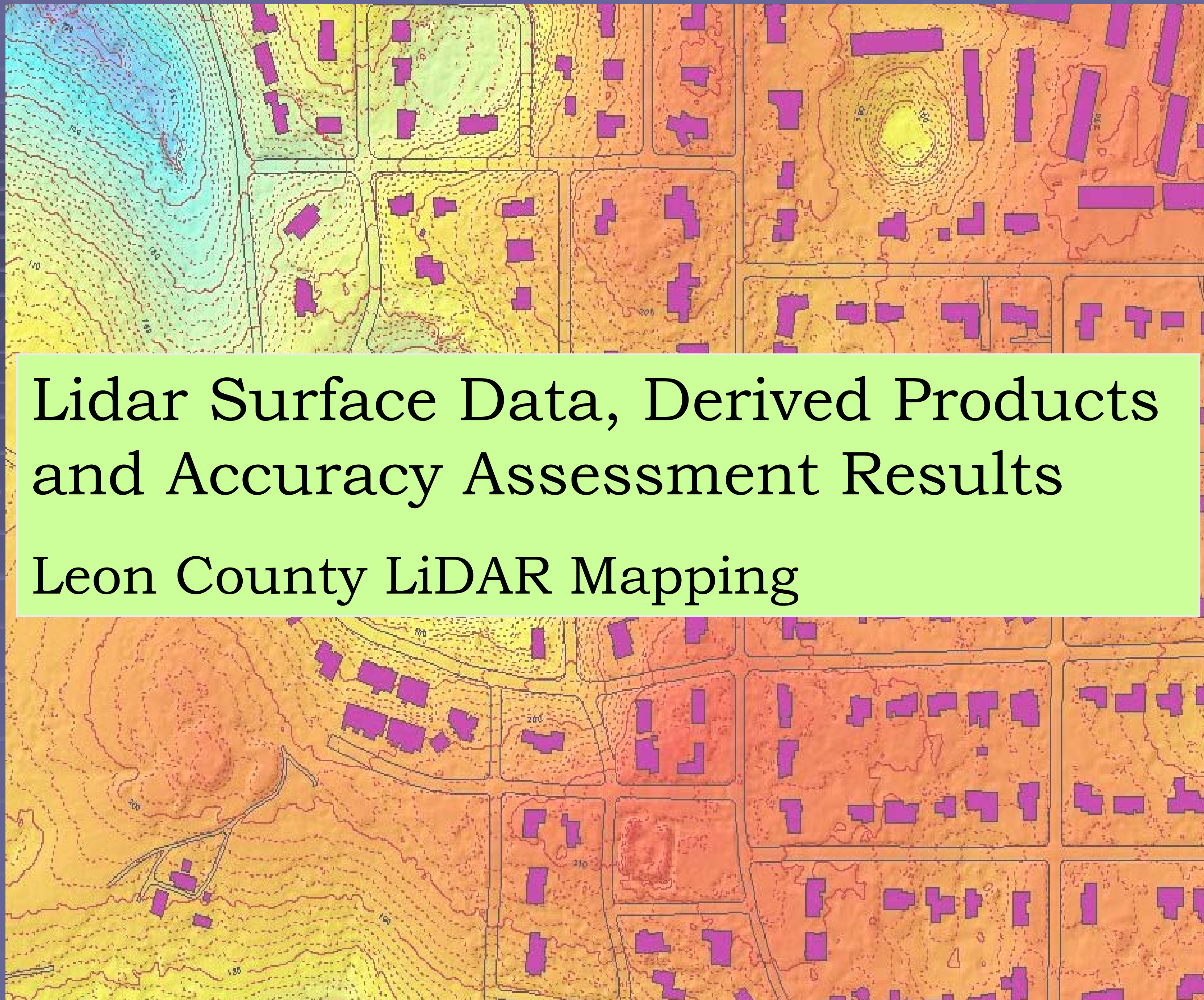
LiDAR

Contour Comparison



Lidar Surface Data, Derived Products and Accuracy Assessment Results

Leon County LiDAR Mapping



Tallahassee-Leon County LIDAR Mapping Project

- Acquisition Date: January, 2002
- Project Area: 702 Square Miles
- Elevation Accuracy Specification: 2 Ft Contour
- Breaklines captured from 1 : 7920 photography
- Pulse Rate: 40 KiloHertz
- 1239 Checkpoints for QA/QC
- -0.40 feet adjustment to correct systematic error

LIDAR Checkpoints

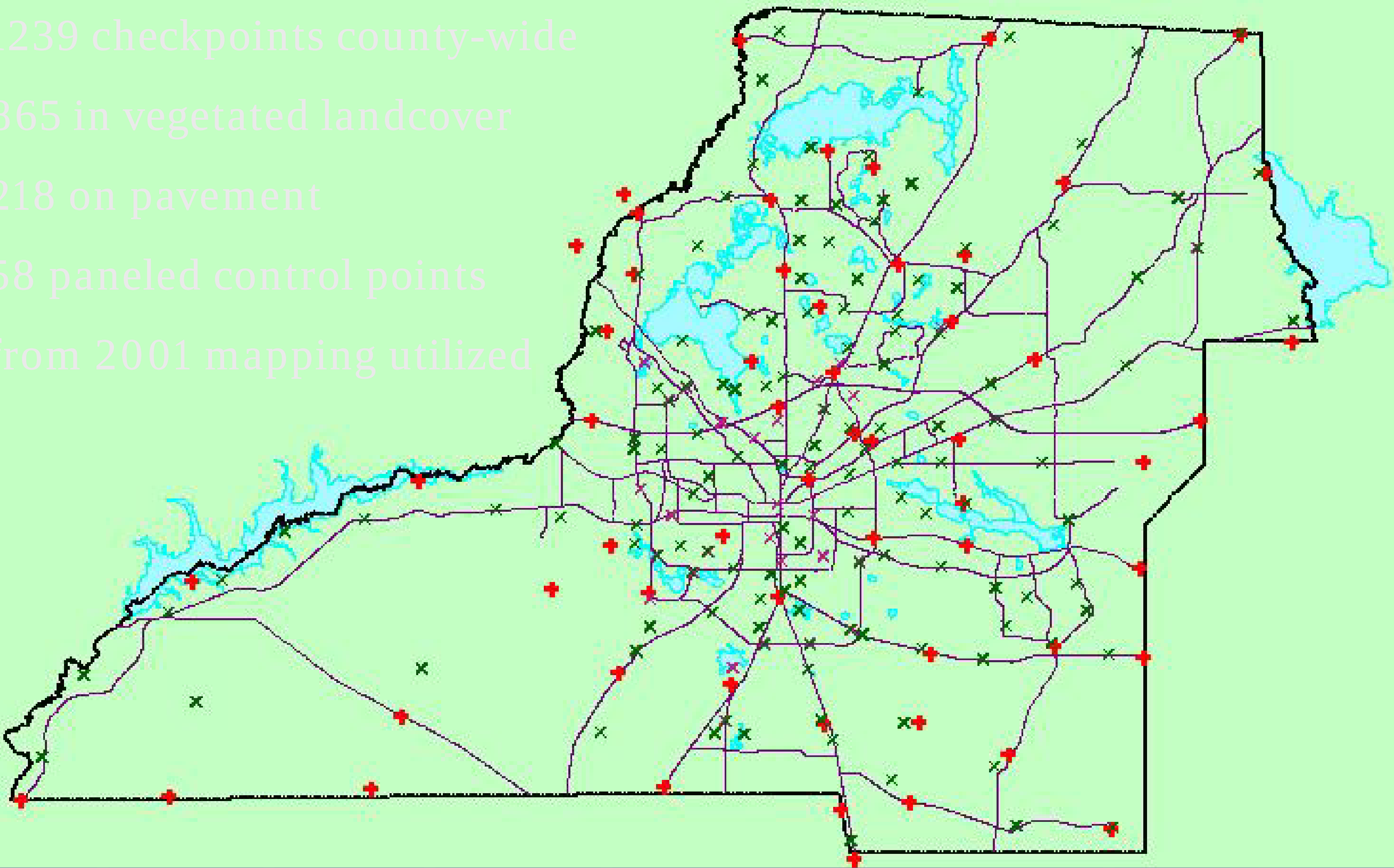
1239 checkpoints county-wide

865 in vegetated landcover

218 on pavement

58 paneled control points

from 2001 mapping utilized



TALLAHASSEE - LEON COUNTY GIS

Accuracy Assessment Results

Table1: All Checkpoints

Data Source	# Pts	Std Dev	Mean	Min	Max	SSE	RMSE
Base01	58	0.35	-0.02	-1.30	0.94	7.098	0.349
Asphalt	218	0.52	-0.05	-2.39	2.09	59.081	0.520
Ground	865	1.24	-0.08	-5.68	12.08	1329.98	1.240

Table2: Points greater than 3 Std Deviations from the mean removed

Data Source	# Pts	Std Dev	Mean	Min	Max	SSE	RMSE
Base01	57	0.33	0.01	-0.63	0.94	5.408	0.308
Asphalt	211	0.42	-0.02	-1.35	1.22	39.928	0.383
Ground	842	0.76	0.05	-3.57	3.46	405.377	0.694

Positional Accuracy Exceeding Standards

(2001 panel control)

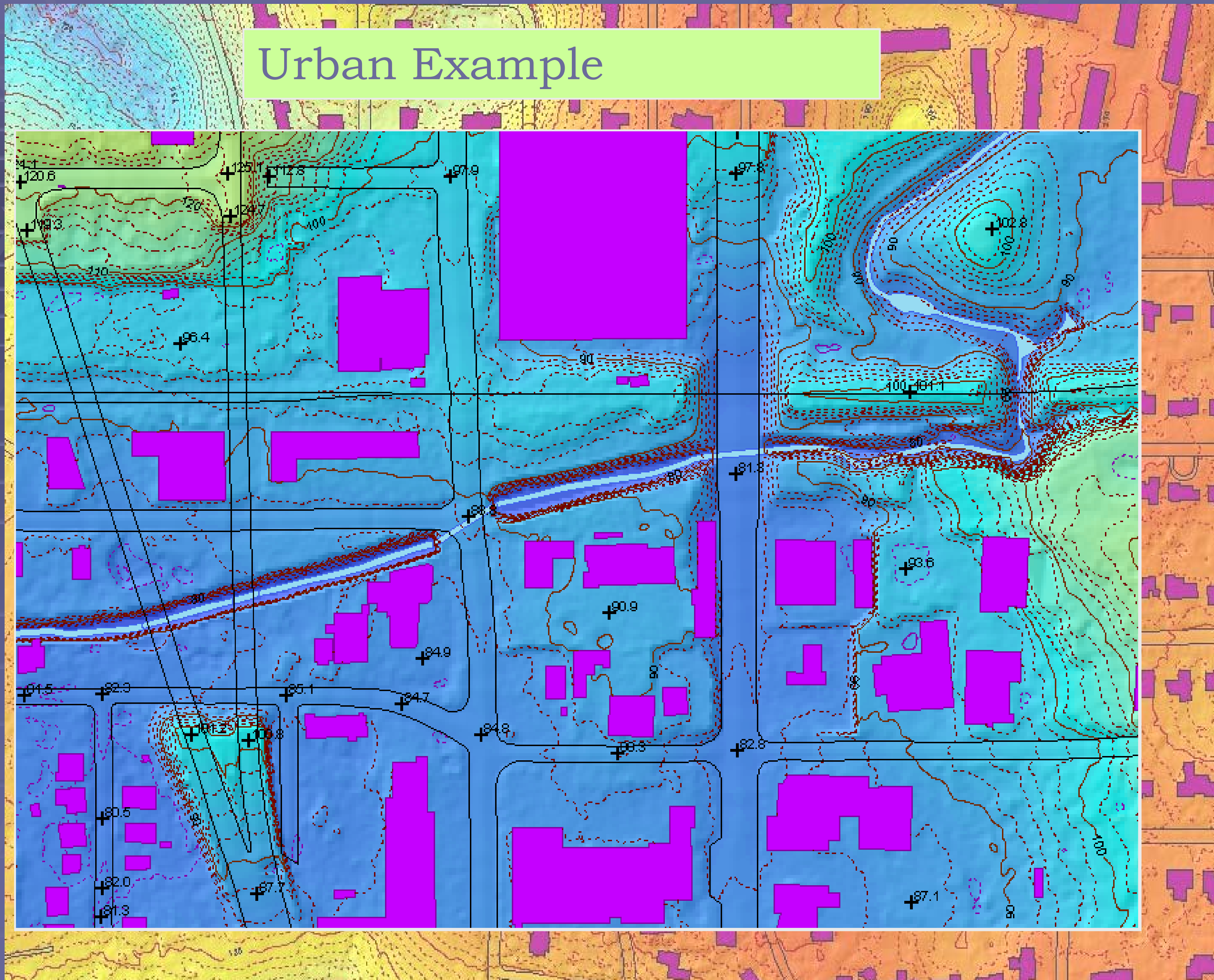
Vertical Accuracy Objective	1
Control Points in Report	81
Elevation Calculation Method	Interpolated
Control Points with LiDAR Coverage	58
Control Locations in Spec (+/- 1.0)	57
Percent of Control Locations in Spec (+/- 1.0)	98.28
Average Control Error Reported	-0.02
Maximum (highest) Control Error Reported	0.94
Median Control Error Reported	0.01
Minimum (lowest) Control Error Reported	-1.3
Standard deviation (sigma) of Z for sample	0.35
RMSE of Z for sample	0.35
FGDC/NSSDA Vertical Accuracy	0.68
FEMA Vertical Accuracy	0.83

Positional Accuracy Exceeding Standards

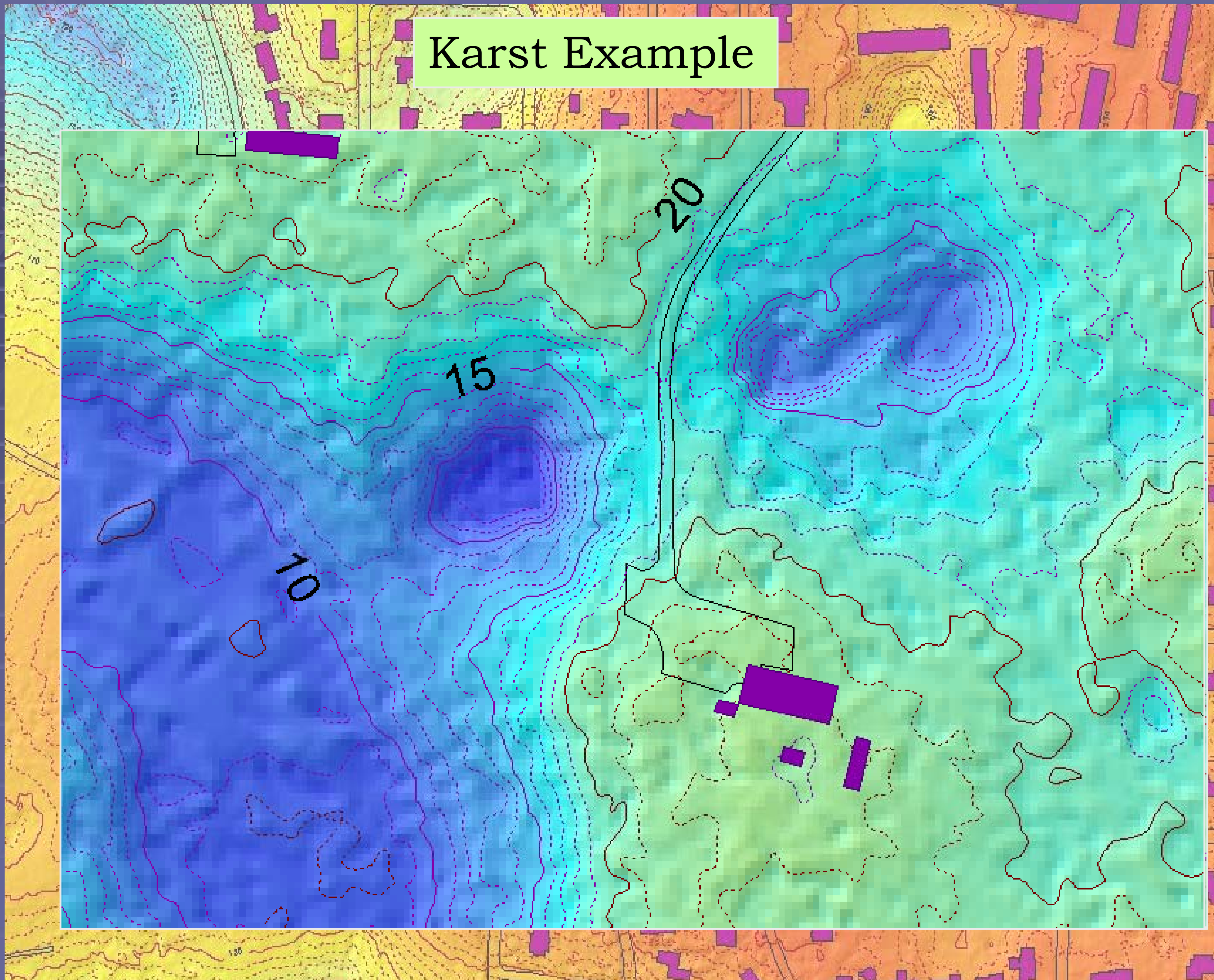
(2001 / 2002 control)

Vertical Accuracy Objective	1
Control Points in Report	134
Elevation Calculation Method	Interpolated
Control Points with LiDAR Coverage	102
Control Locations in Spec (+/- 1.0)	97
Percent of Control Locations in Spec (+/- 1.0)	95.1
Average Control Error Reported	-0.1
Maximum (highest) Control Error Reported	0.94
Median Control Error Reported	-0.05
Minimum (lowest) Control Error Reported	-2.82
Standard deviation (sigma) of Z for sample	0.49
RMSE of Z for sample	0.5
FGDC/NSSDA Vertical Accuracy	0.98
FEMA Vertical Accuracy	1.12

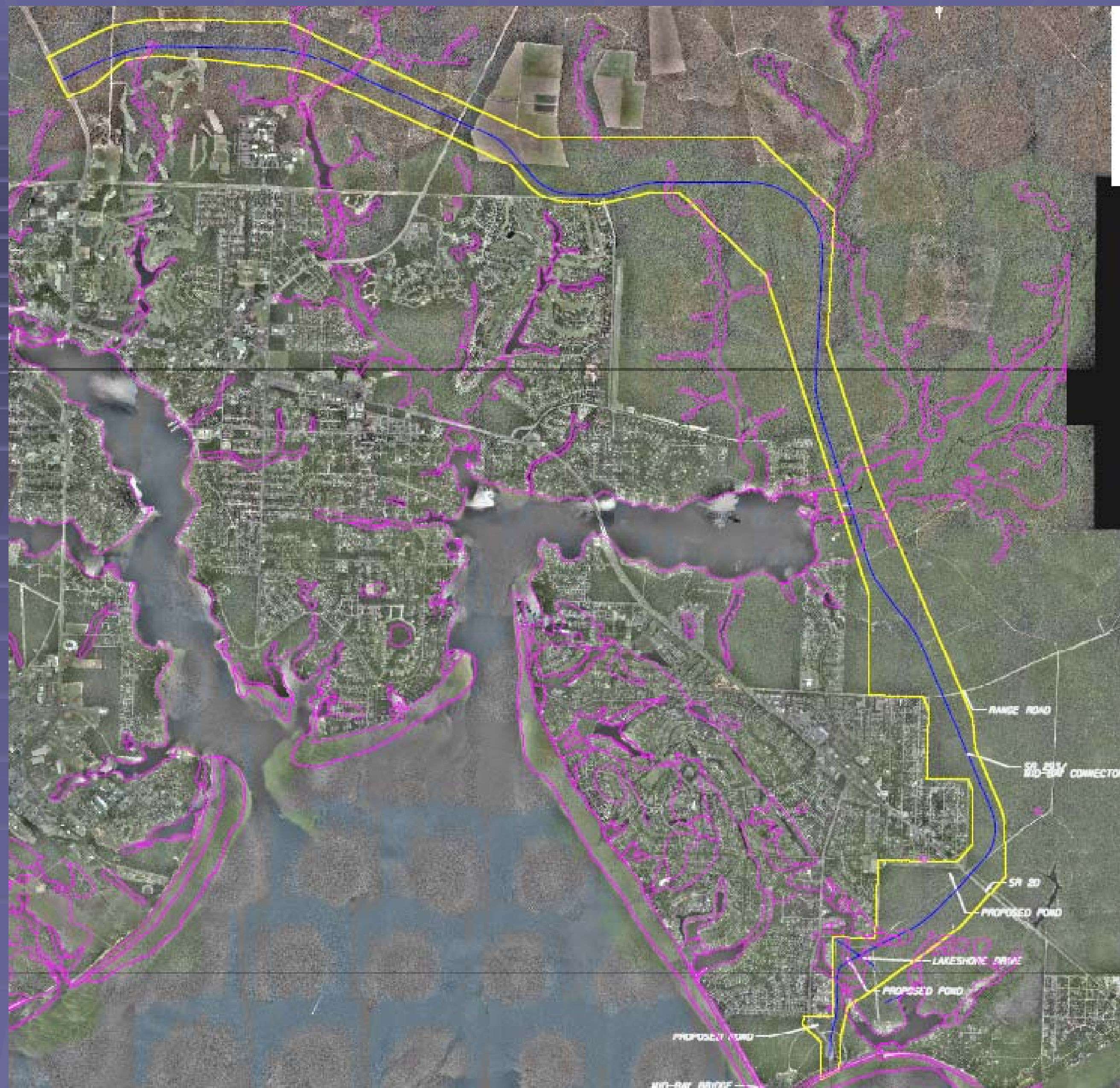
Urban Example



Karst Example



Mid-Bay Bridge LiDAR Project 2007



Mid-Bay Bridge LiDAR Project

Contour lines and DTM surface of areas lying between conventionally collected intersections were obtained utilizing airborne (Helicopter) LiDAR data collection techniques.

Results yielded a Standard Deviation of 0.49 feet in the data collected with 90% of checked locations lying within 0.81 feet of a 1 foot contour.

Mid-Bay Bridge LiDAR Project

The subsequently readjusted DTM surface (collected with LiDAR techniques) lying between the conventionally collected intersections was compared with an additional set of conventionally collected cross sections yielded the following results:

For contour lines to be mapped from LiDAR collected data, sufficient data was collected in order to insure that 90% of ground point elevations taken from 1-foot contours are within 0.66 feet of said contour interval. The Standard Deviation of the LiDAR collected elevation data versus the conventionally collected (ground truth) data = 0.42 feet.

HDS Scanning

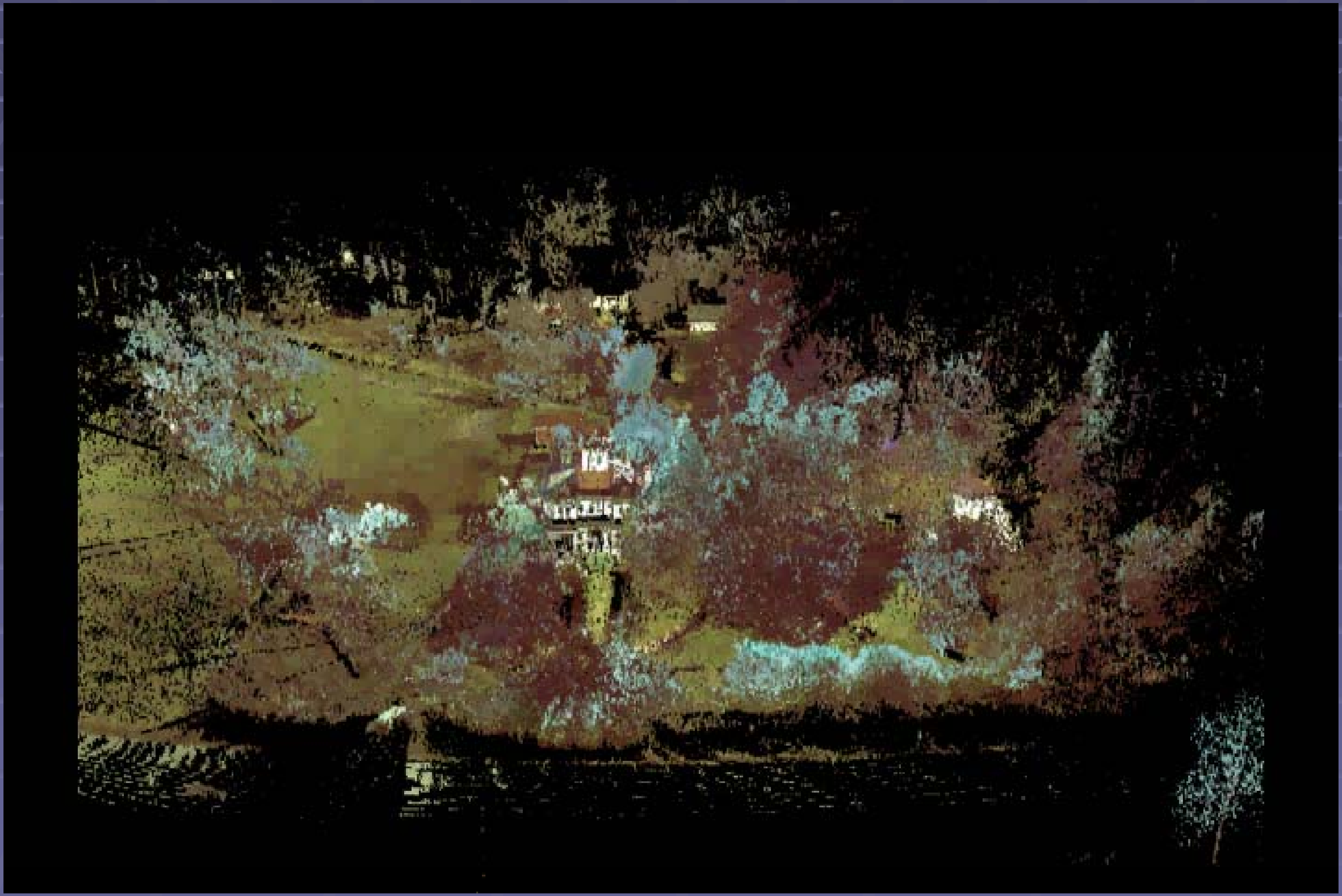
What is a High-Definition Scanner?

- Collects millions of points per hour – much faster than traditional methods

- Produces datasets with much greater density than traditional mapping

- A total station on steroids

What is a High-Definition Scanner?

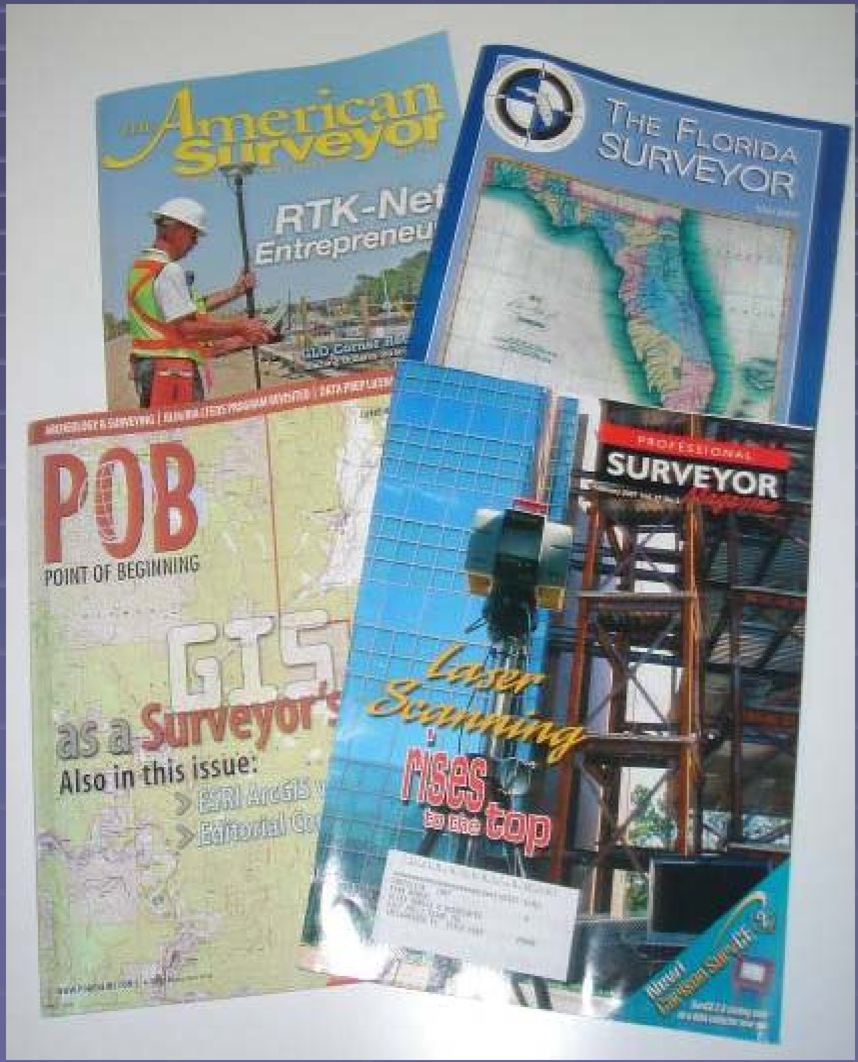


Hardman Farm

Scanners are Here to Stay

If you want to see what is happening in any trade, read the ads and the articles.

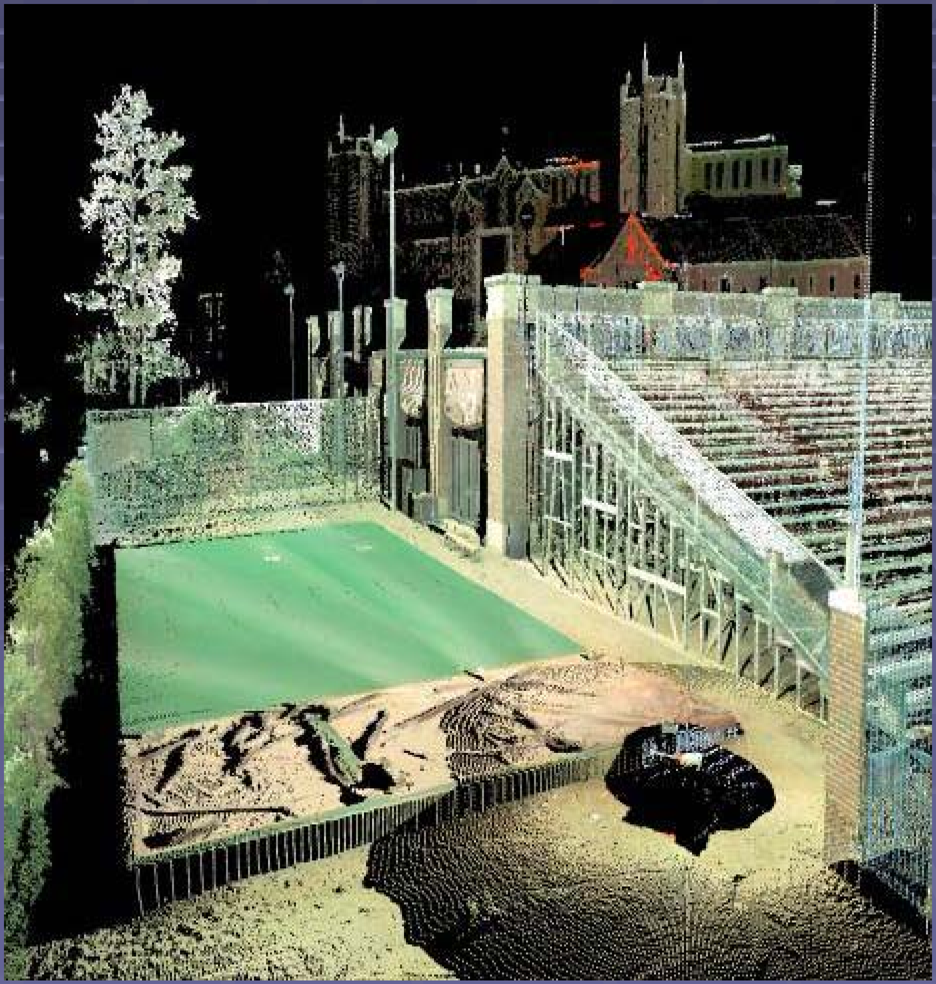
Surveying magazines always have three things; ads (for scanners), a GPS article and a scanner article.



Looking at Scanners

In five years most civil survey firms will own a scanner.

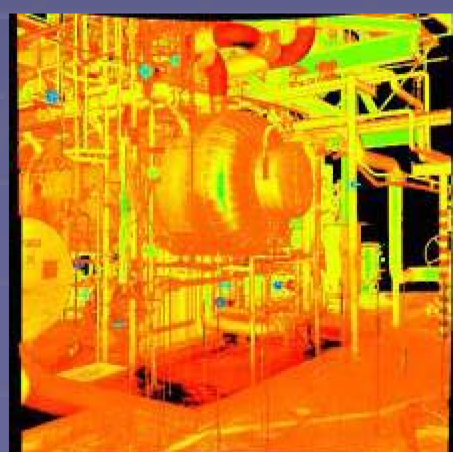
It is the same as GPS was in the 90’s but on a much faster track.

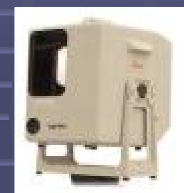


Product Perspective

1998

2001



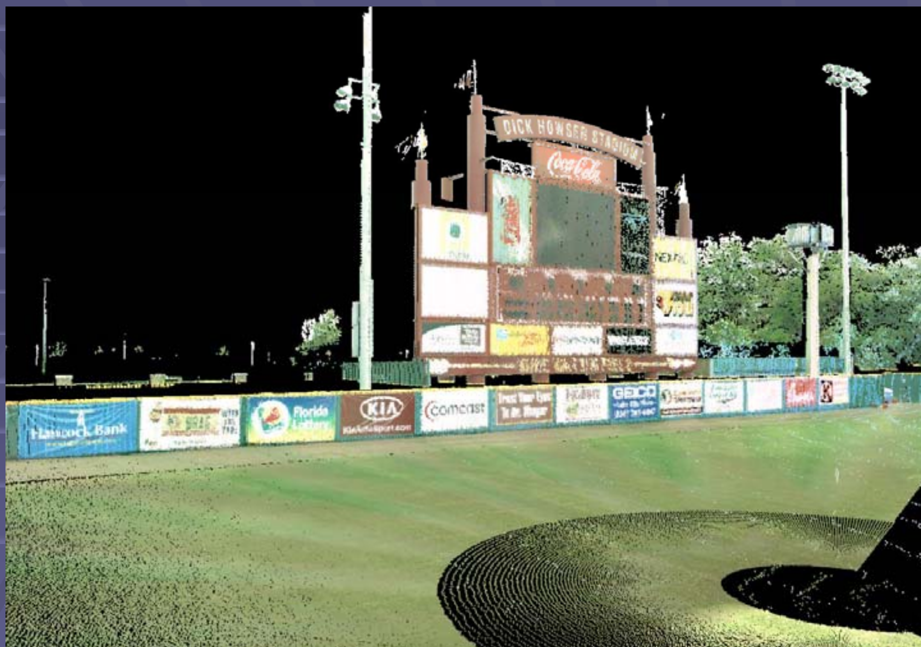


2003

2006

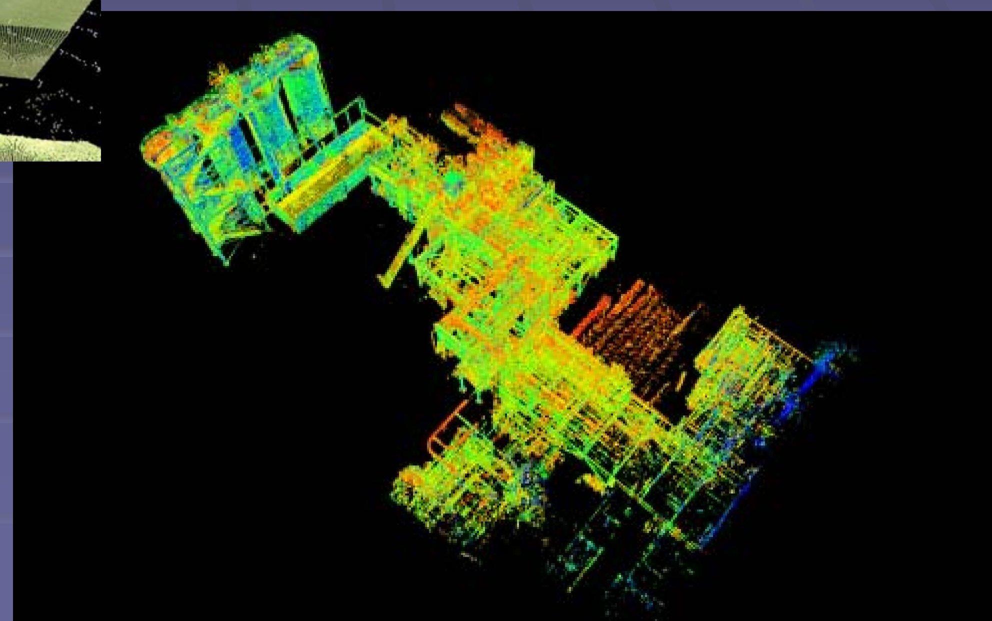
Other Units

Two Basic Sensors



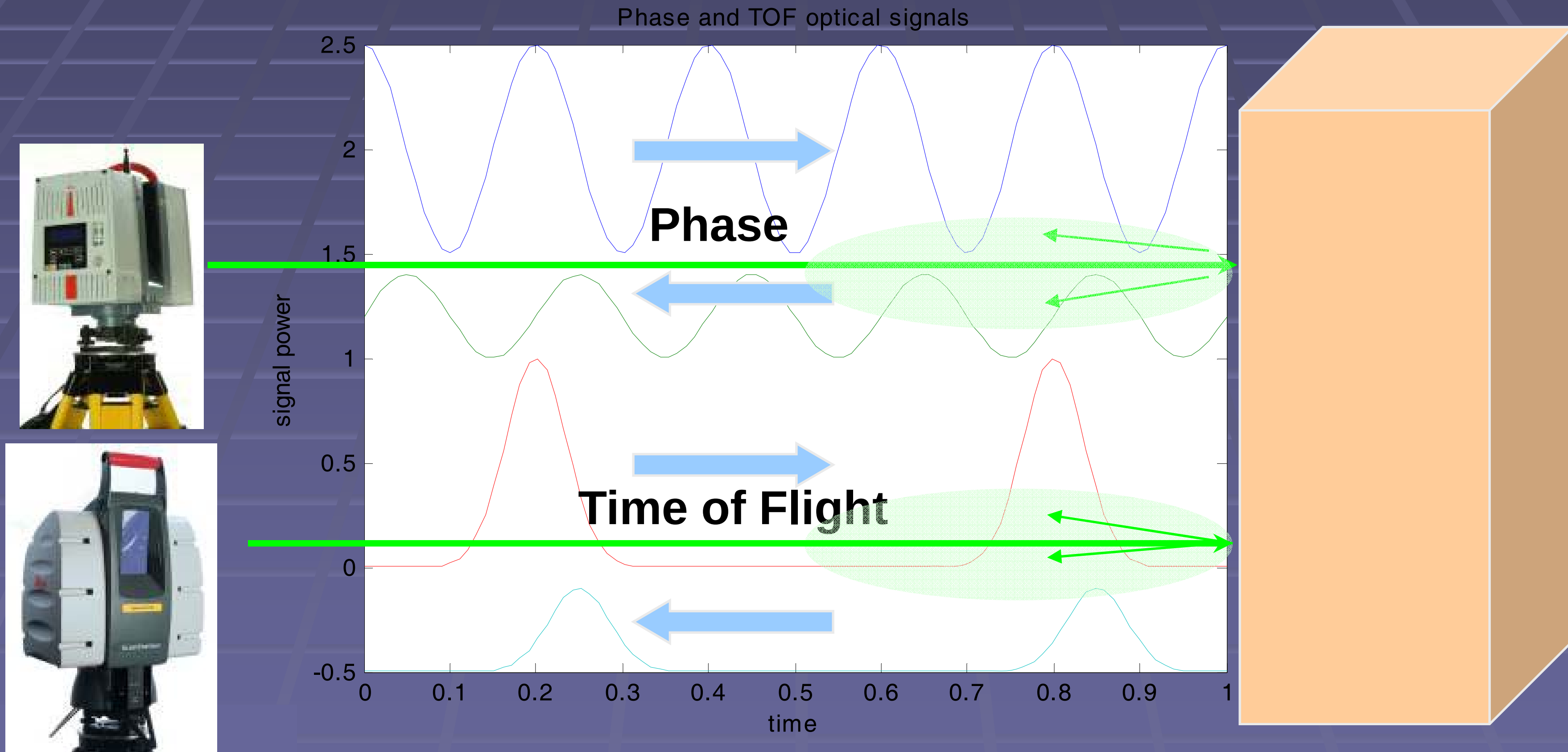
Time of Flight

Phase Based



Phase Based or Time of Flight Scanners

Send out lumps of photons, receive lumps of photons:



Phase Based or Time of Flight Scanners

Phase Based

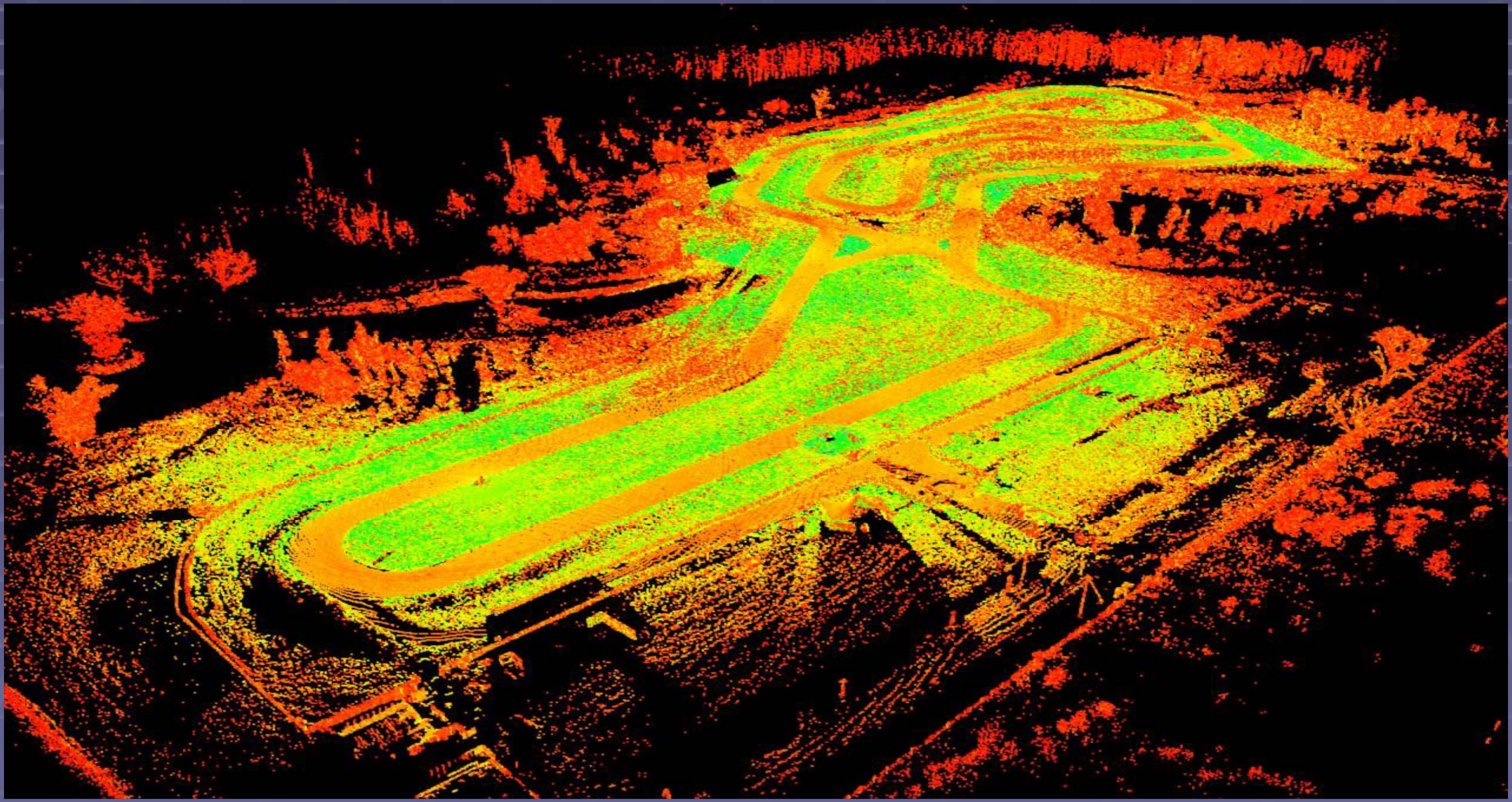
Better Accuracy
Very Fast
Short Range
No Photos
No Traversing

Time of Flight

Long Range
Visible Light
Takes Photos
Tilt Compensation

Slower than Phased Based
(1 hour vs. 15 minutes)

Sample Project Work Flow

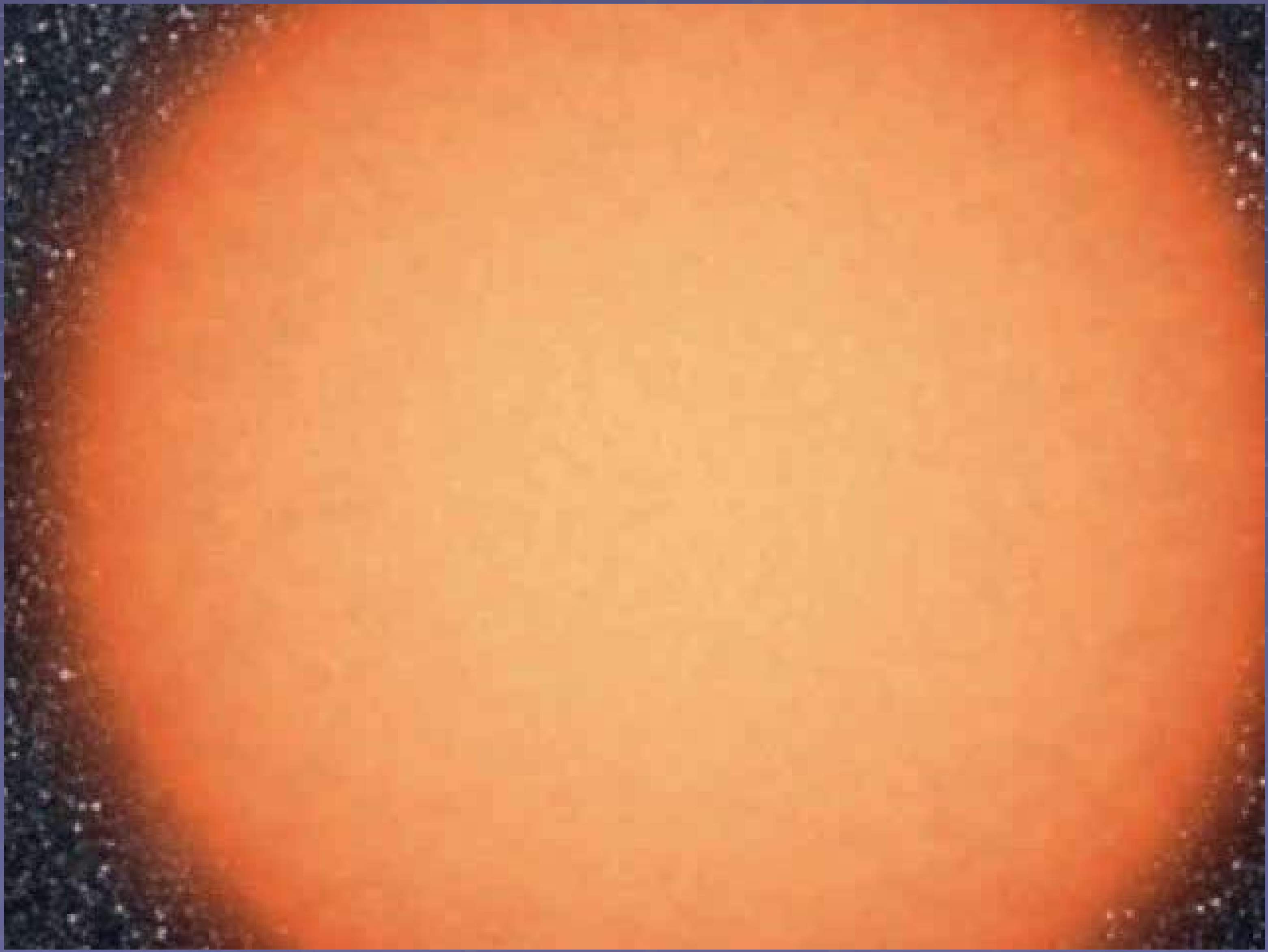


Kart Track Scan

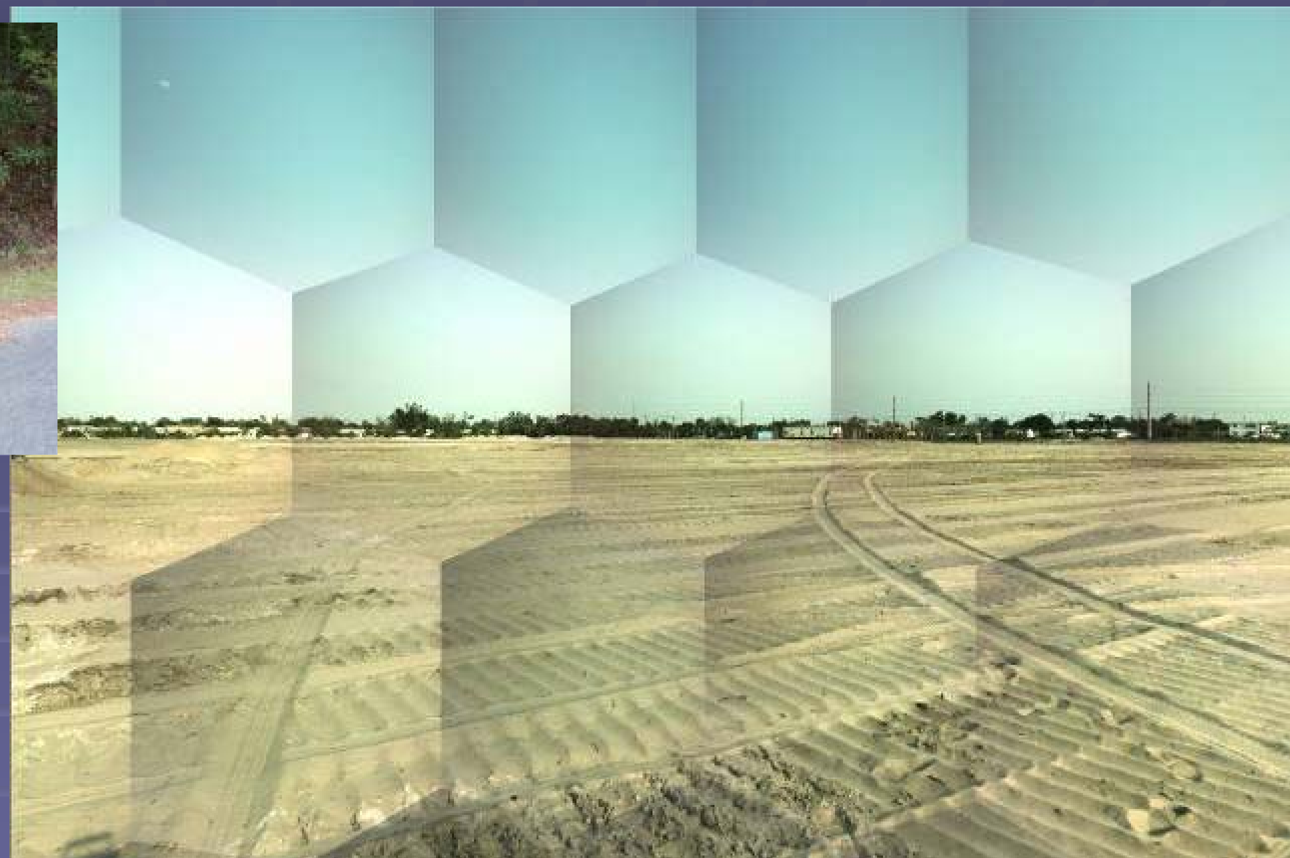
Scanner Data Results

- Raw Scans
- 2D Drawing from Scans
- 3D Data Files
- 3D Solid Models
- Video Files or Movies
- Interactive Files (Tru-View)

The Works

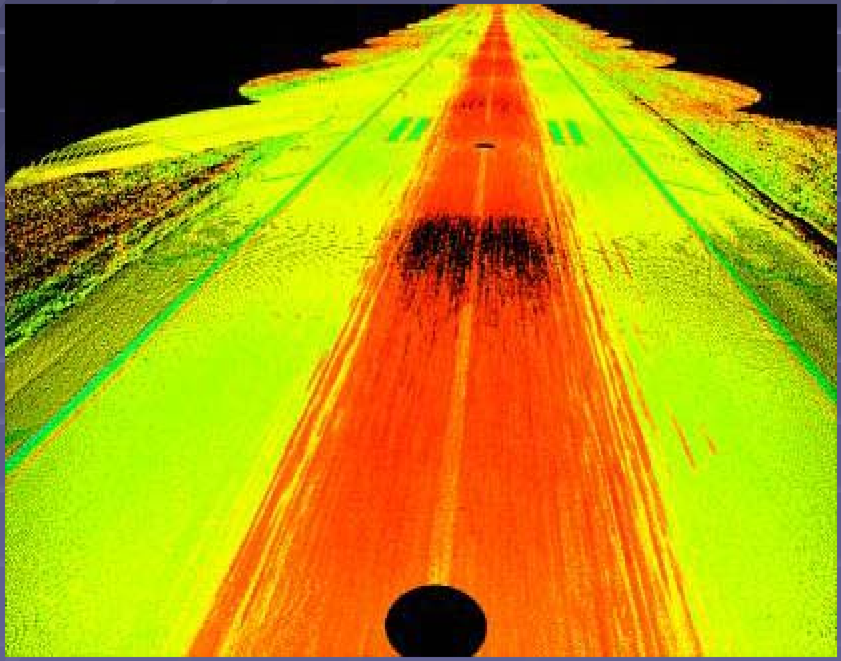


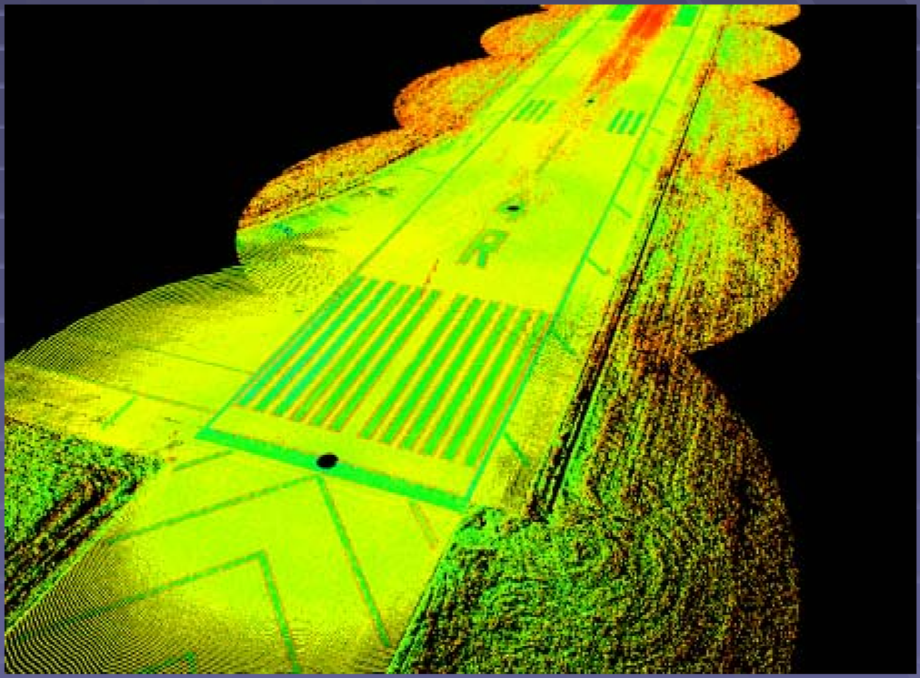
Field Data Collection



Picture of Project
from Scanner

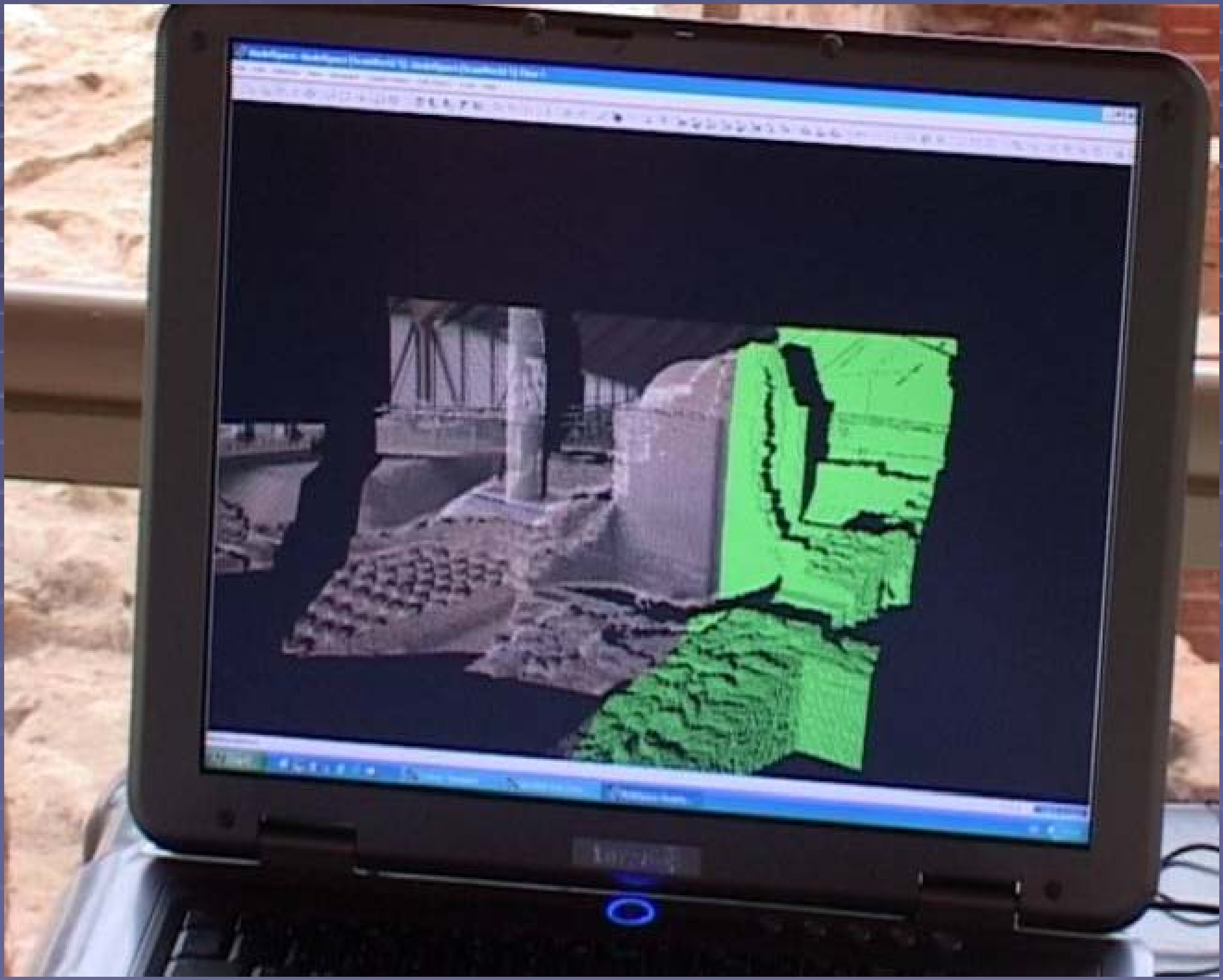
Field Data Collection





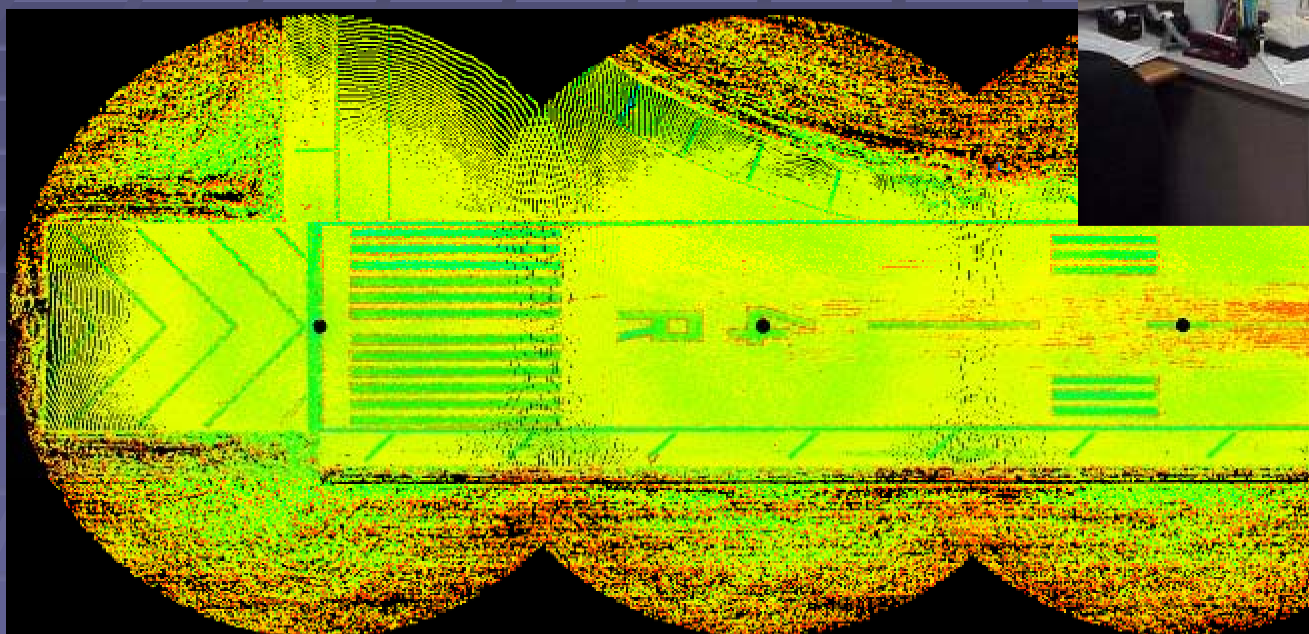
Scanner Targets

Pointcloud



Office Work Flow

Registered Point Cloud



Office Work Flow

Raw Scan

Scan with Photo

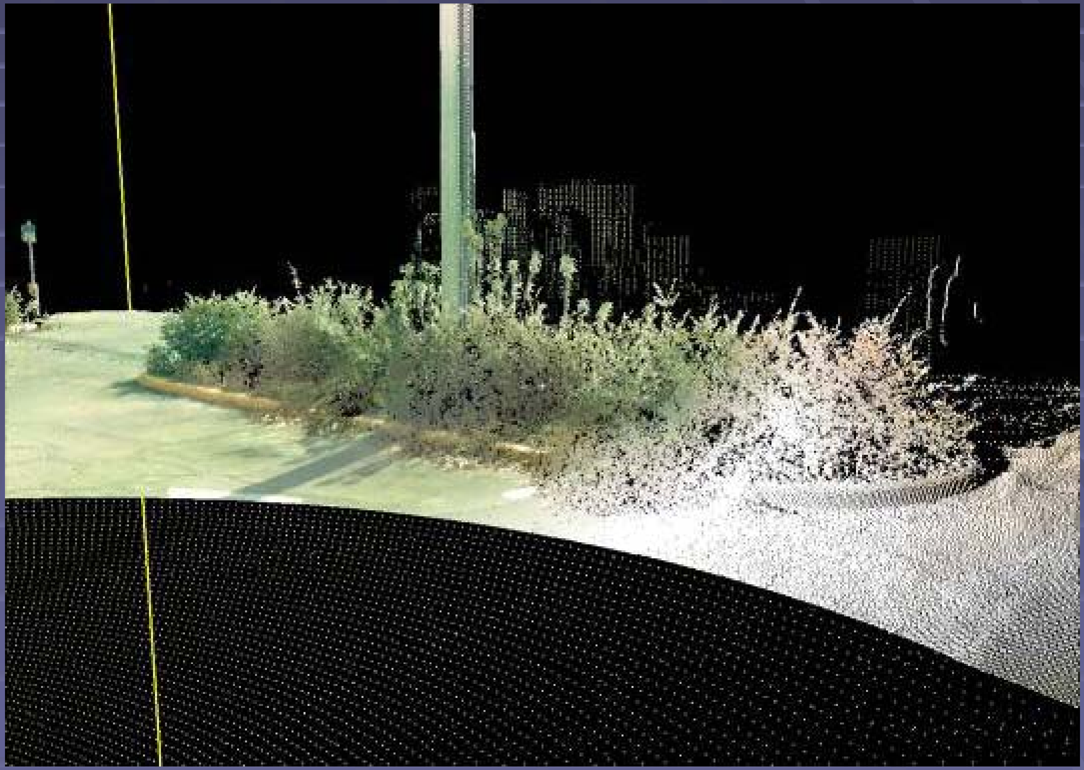
Working the Scanner

Common Problems:

- Steam, rain, dust and fog effect the data.
- Grass and vegetation.
- Shadows (objects blocking the scanner).
- Surface types and colors.
- Edges.
- Unit Elevations.
- Fences show mirror images.
- Lack of scripting. Scripting is a must.
- Direct sunlight stops scan (low sun angle).
- Glare from asphalt in photos.

Working the Scanner

- Photo exposures.
- Grass and vegetation.

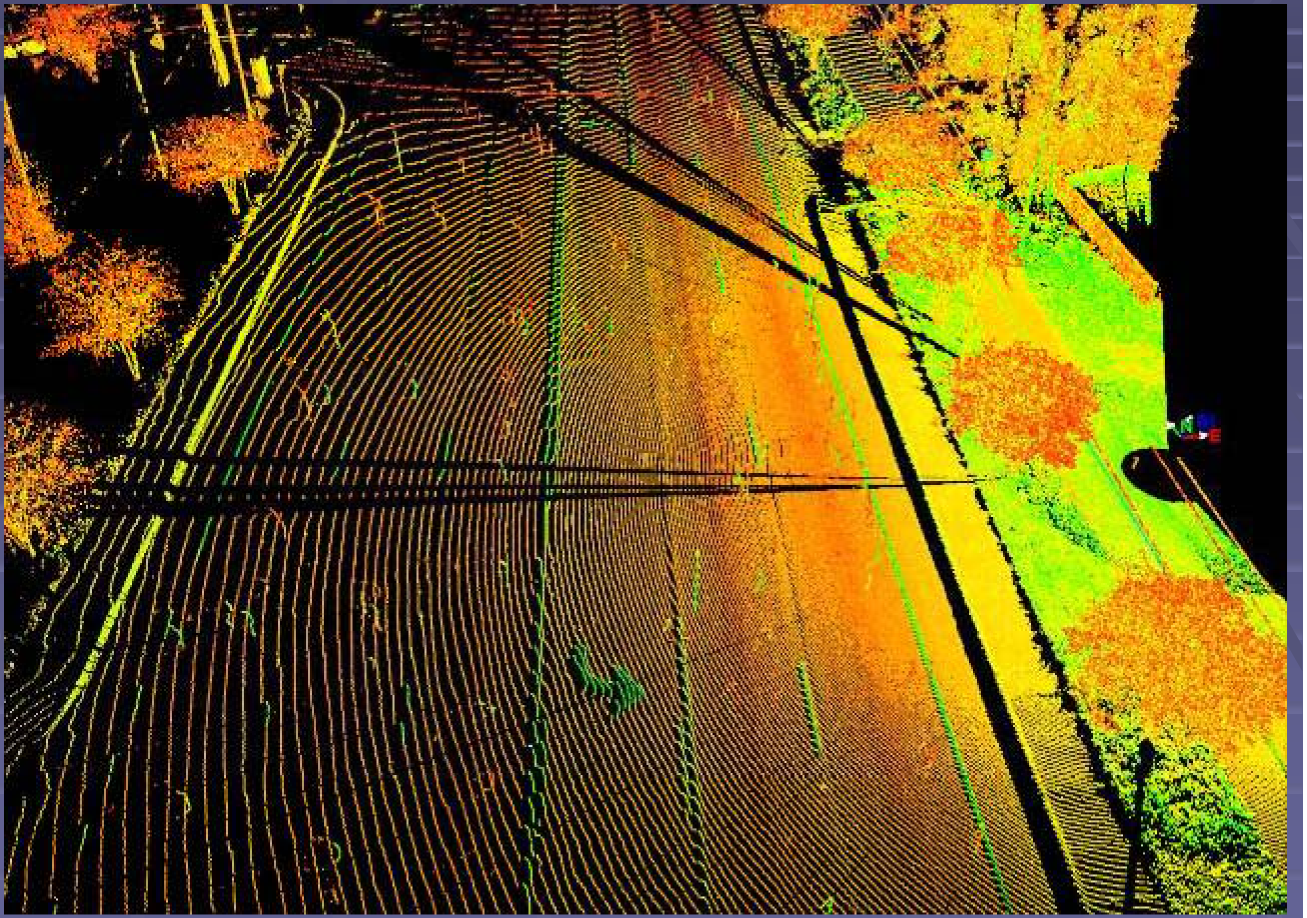


Working the Scanner

Dealing with parked cars.

Working the Scanner

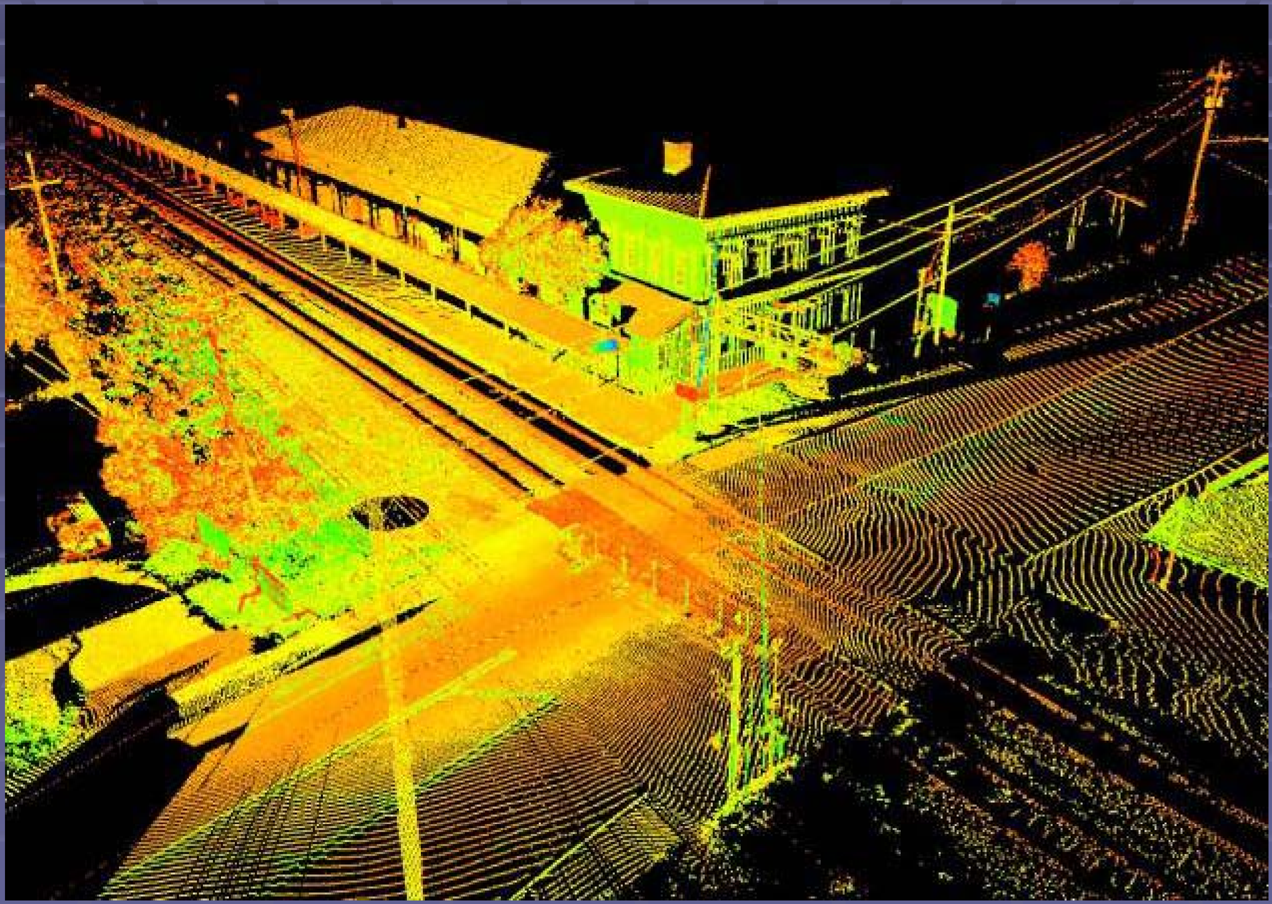
- Scanner too far from curbing so edge of pavement not defined.



Working the Scanner

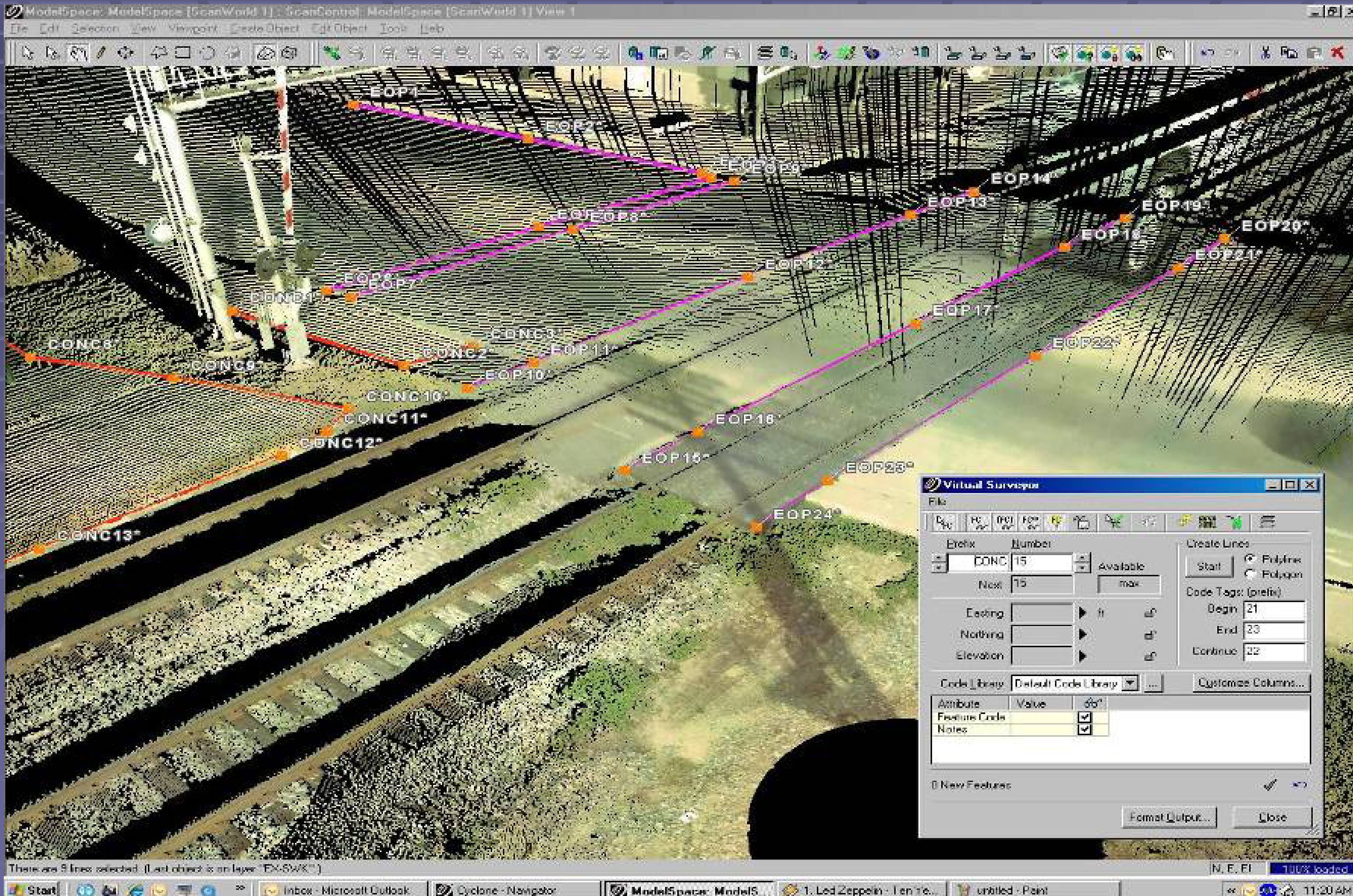
- Fences show mirror images.

Office Work Flow



Tallahassee Train Station

Office Work Flow



Office Work Flow

4193501 PP.txt - WordPad

File Edit View Insert Format Help

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PP2	508772.7609	2037470.9142	66.0773	GYP
PP3	508739.0778	2037572.7996	67.0181	PP
PP4	508620.2698	2037521.4589	68.2529	PPL
PP5	508595.0565	2037393.6548	67.1955	PPL
PP6	508565.0103	2037356.8484	67.3674	GYP
PP7	508491.1664	2037479.4794	65.3495	GYP
PP8	508484.1399	2037462.7517	67.1455	PPL
PP9	508369.5585	2037539.9961	65.4316	GYP
PP10	508451.6335	2037332.1111	67.7093	PPT
PP11	508334.0766	2037402.0707	67.7241	PPL
PP12	508306.6126	2037268.3377	68.5181	PPL
PP13	508188.5445	2037216.8787	70.5928	PPL
PP14	508240.6848	2037357.0808	68.1992	GYP
PP15	508149.9134	2037325.9434	69.5146	GYP
PP16	508085.1846	2037285.5655	70.7654	PPL
PP17	508051.4824	2037157.2782	72.4383	PPL
PP18	508052.5571	2037134.3413	77.1347	PP
PP19	508037.6419	2037268.5076	70.3185	GYP
PP20	508410.0343	2037312.1659	67.5119	SSP
PP21	508445.8378	2037462.4916	66.1929	SSP
PP22	508343.0628	2037403.3874	67.4468	SSP
PP23	508323.2545	2037266.0628	68.0779	SSP
GYA1	508188.8616	2037195.9696	70.7146	GYA
GYA2	508058.7160	2037160.6170	75.4854	GYA
GYA3	508243.6492	2037365.2676	68.0488	GYA
GYA4	508333.1219	2037419.4883	67.9129	GYA
GYA5	508333.2749	2037422.1994	69.8378	GYA
GYA6	508486.4813	2037486.8818	65.7419	GYA
GYA7	508566.6300	2037353.7124	67.4546	GYA
GYA8	508733.8945	2037584.4086	66.8156	GYA
GYA9	508734.0361	2037586.9943	66.4434	GYA
GYA10	508733.8365	2037587.3177	66.3574	GYA
SGCP1	508415.2498	2037439.1954	66.8126	SIGP

For Help, press F1 NUM

4193501 SIGNS.txt - WordPad

File Edit View Insert Format Help

Point Number	N	E	Z	Feature Code	Notes
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MS2	508782.1313	2037438.8994	66.0957	MS	WOOD POST
MS3	508715.7852	2037420.7227	66.9401	MS	WOOD POST
MS4	508721.0285	2037414.2407	67.1187	MS	WOOD POST
MS5	508672.7323	2037405.3728	66.6009	MS	WOOD POST
MS6	508676.9263	2037397.9564	66.7329	MS	WOOD POST
MS7	508633.6693	2037381.7952	66.6795	MS	WOOD POST
MS8	508639.5511	2037384.0934	66.5642	MS	WOOD POST
MS9	508319.2655	2037399.4155	67.5340	MS	WOOD POST
MS10	508318.4262	2037395.5564	67.3285	MS	WOOD POST
SSS1	508435.3042	2037471.7189	67.2999	SSS	W11A-2
SSS2	508470.6040	2037454.3884	67.3608	SSS	YIELD
SSS3	508491.4645	2037461.2659	68.2821	SSS	W11-1
SSS4	508507.6882	2037468.3273	68.3163	SSS	R3-17
SSS5	508608.6294	2037511.5210	68.2796	SSS	BUS STOP
SSS6	508829.6656	2037492.4198	67.4411	SSS	
SSS7	508740.2090	2037453.0712	66.2449	SSS	R1-1
SSS8	508551.9251	2037354.9482	67.0800	SSS	W3-1A
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SSS10	508414.7651	2037295.4866	67.7817	SSS	R1-1
SSS11	508398.6175	2037255.3750	68.7682	SSS	R2-1
SSS12	508335.8609	2037244.2874	67.8156	SSS	
SSS13	508272.5012	2037256.8711	69.2564	SSS	R3-17
SSS14	508227.4558	2037349.1318	68.6007	SSS	R3-17
SSS15	508258.9287	2037360.2874	68.8614	SSS	1CENT TAX
SSS16	508344.6582	2037418.3672	67.3809	SSS	W11A-1

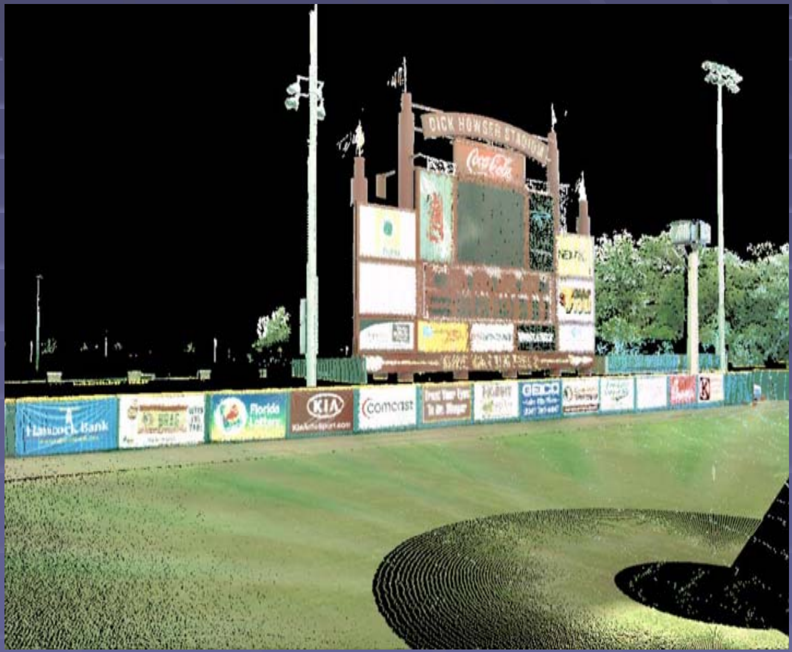
For Help, press F1 NUM

Office Work Flow

Collateral Data

(secondary or accompanying data):

Any data or information collected outside of the “scope of services” or not needed to produce the survey deliverables.

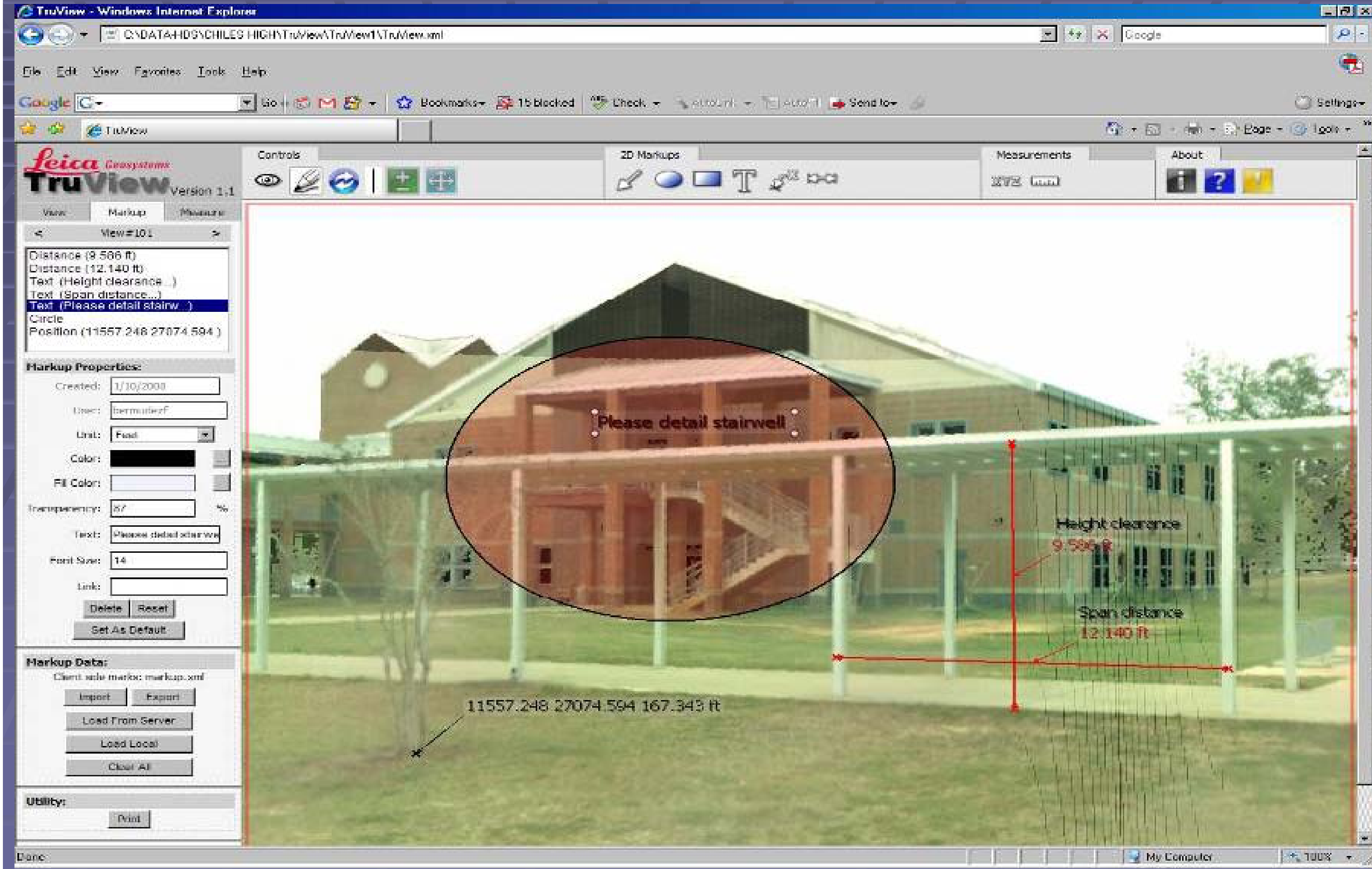


External Camera Kit

Image 1

Highway 98 Photo

Tru-View


TruView - Windows Internet Explorer
C:\DATA-HDS\CHILES HIGH\TruView\TruView1\TruView.xml
File Edit View Favorites Tools Help
Controls
2D Markups
Measurements
About
TruView Version 1.1
View Markup Measure
View#101
Distance (9.586 ft)
Distance (12.140 ft)
Text (Height clearance...)
Text (Span distance...)
Text (Please detail stairw...)
Circle
Position (11557.248 27074.594)
Markup Properties:
Created:
Unit:
Color:
Fill Color:
Transparency:
Text:
Font Size:
Link:
Delete Reset
Set As Default
Markup Data:
Import Export
Load From Server
Load Local
Clear All
Utility:
Print
Please detail stairwell
Height clearance
9.586 ft
Span distance
12.140 ft
11557.248 27074.594 167.343 ft
Done
My Computer

Tru-View Project

What Jobs are Best Suited for High Definition Scanning?

Working the Scanner

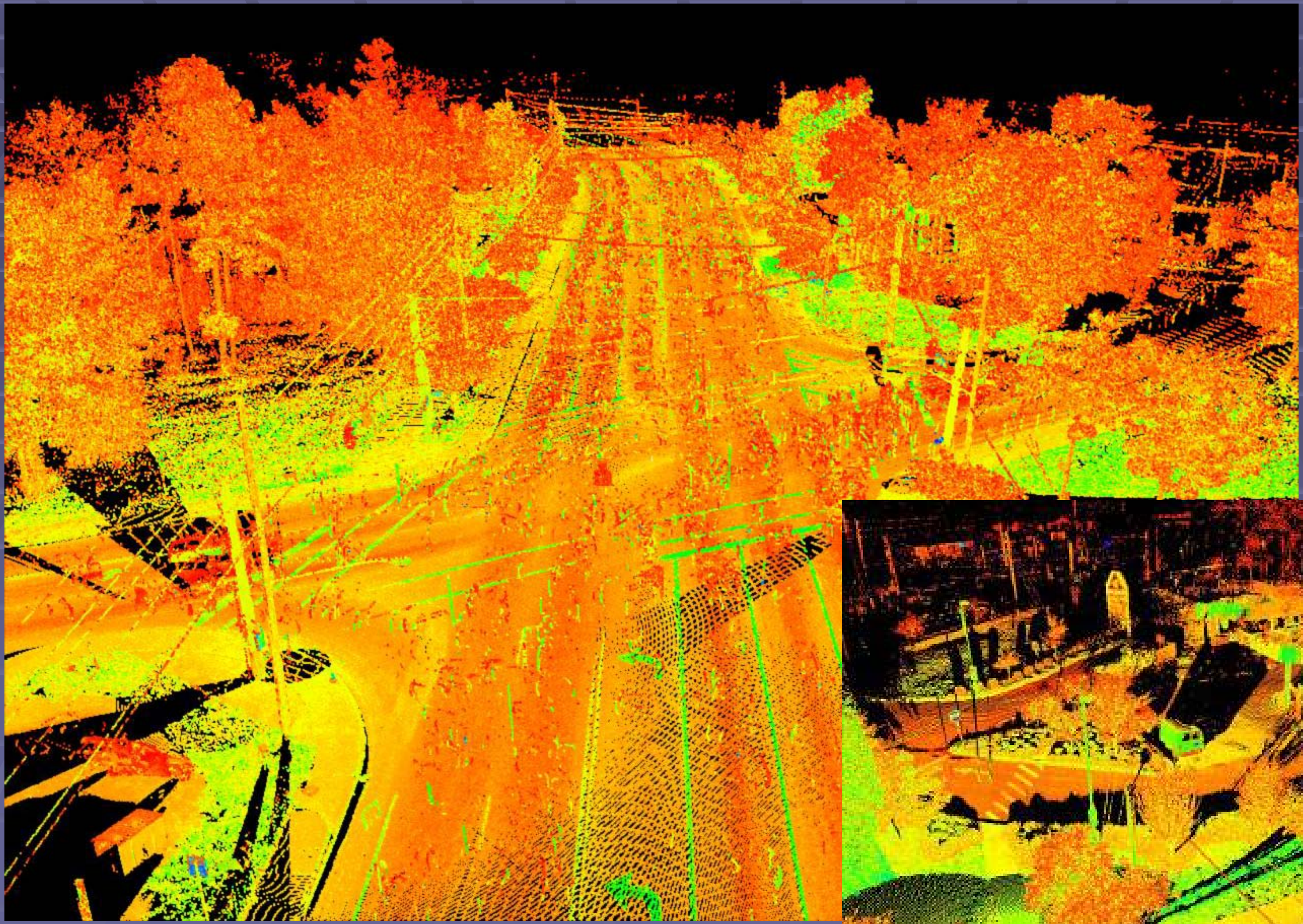
Office Survey

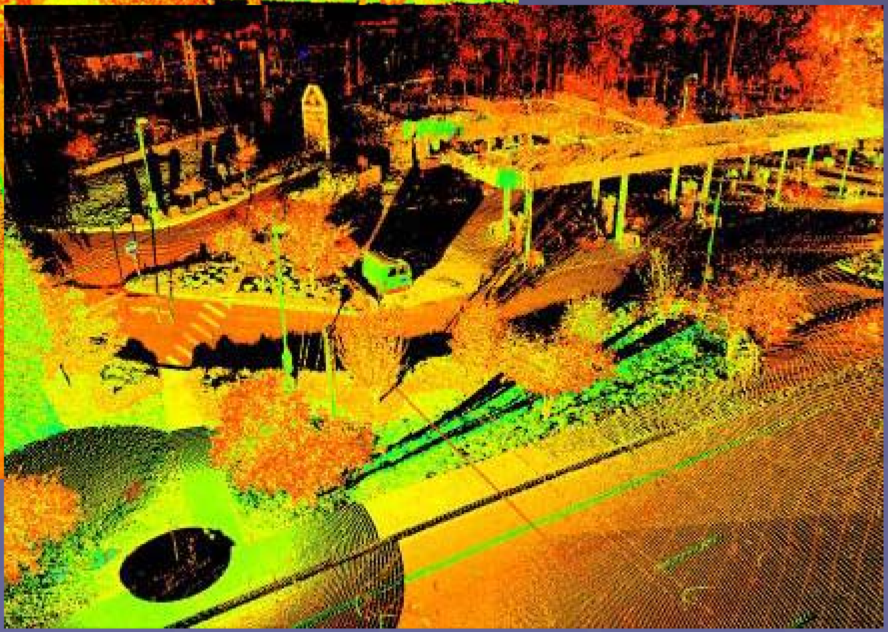
Holding Pond Survey

Started with existing as-built surveys.

Working the Scanner

Working the Scanner

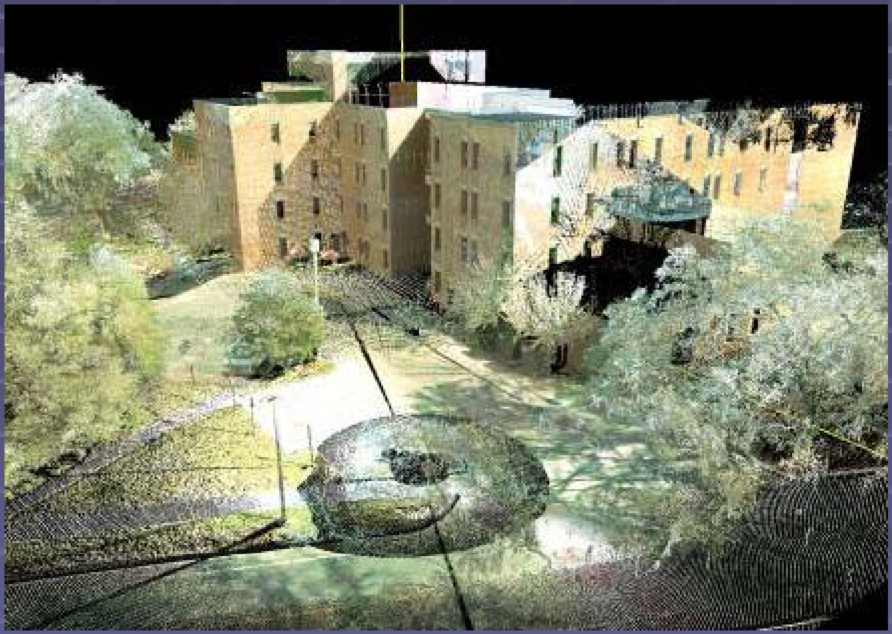




FDOT Roadway Project

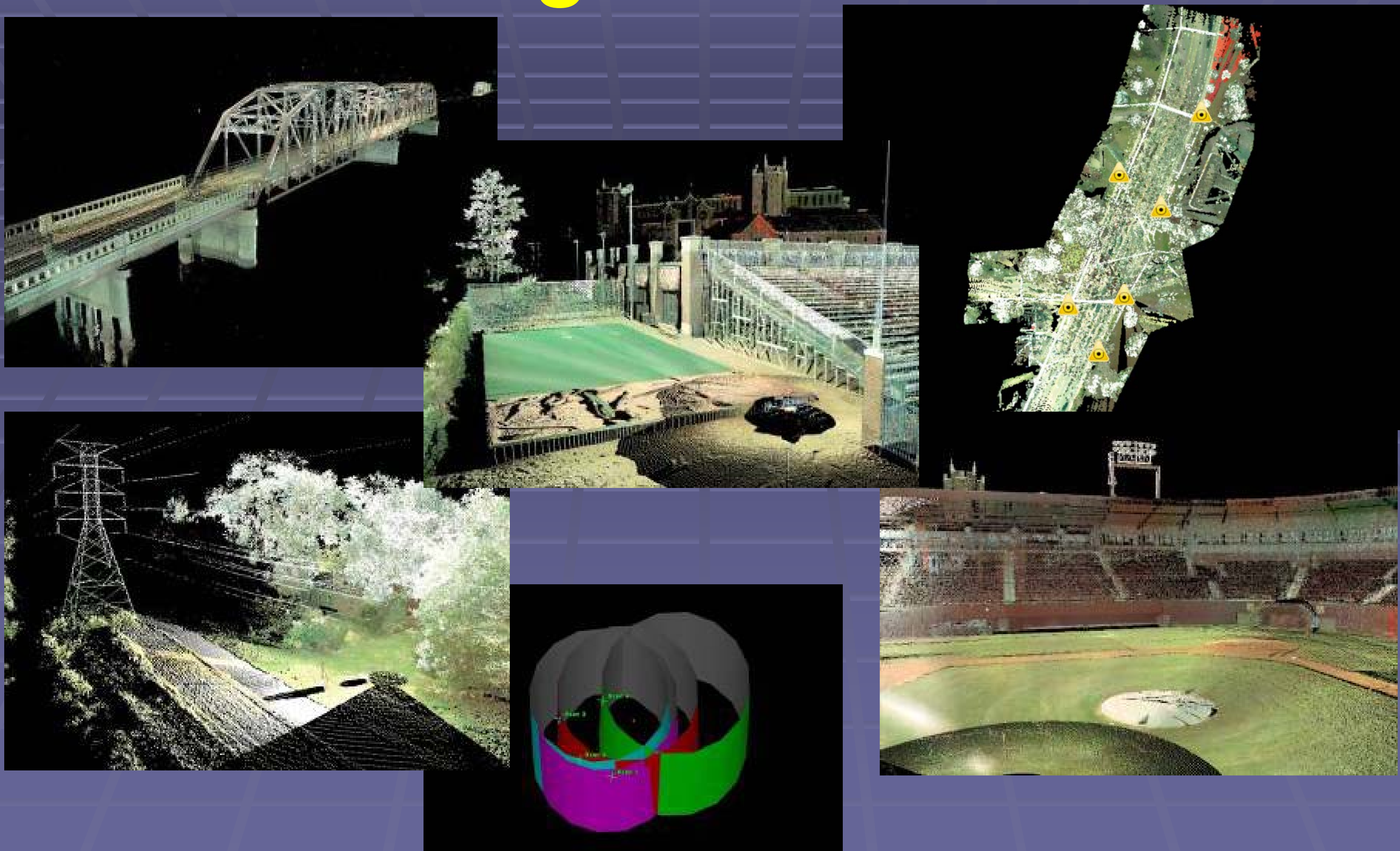
Working the Scanner

Ruediger School Drainage Survey

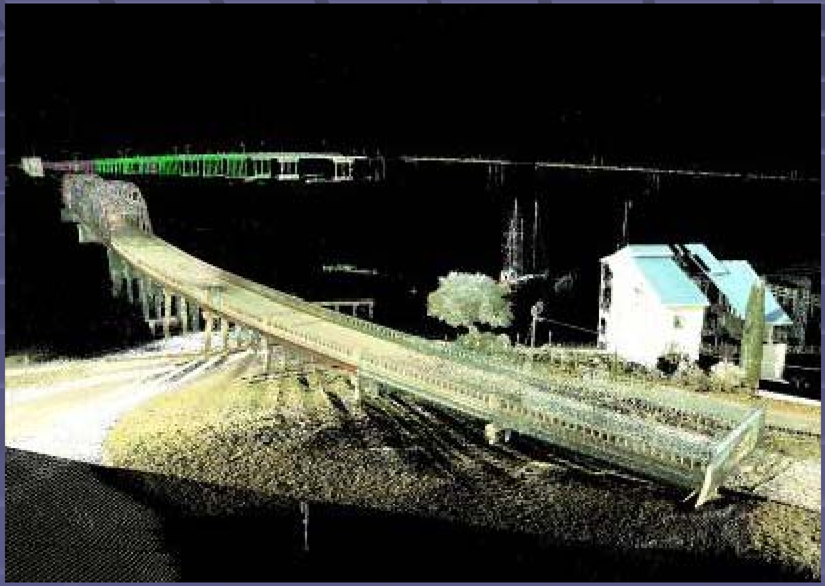


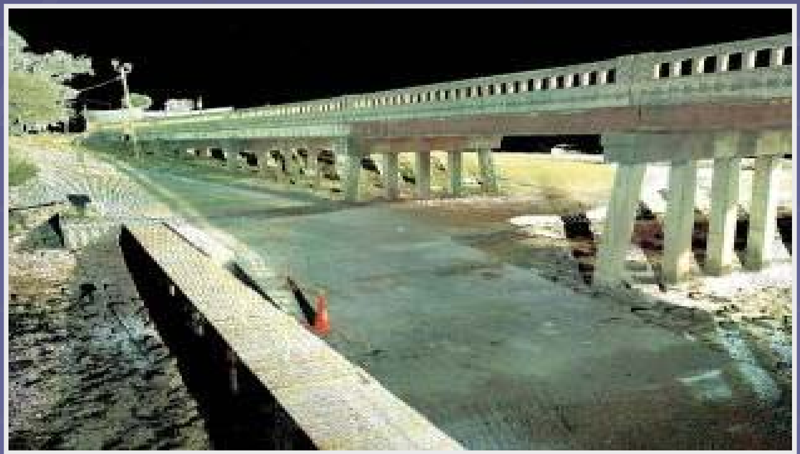
Stone Building @ FSU

Working the Scanner



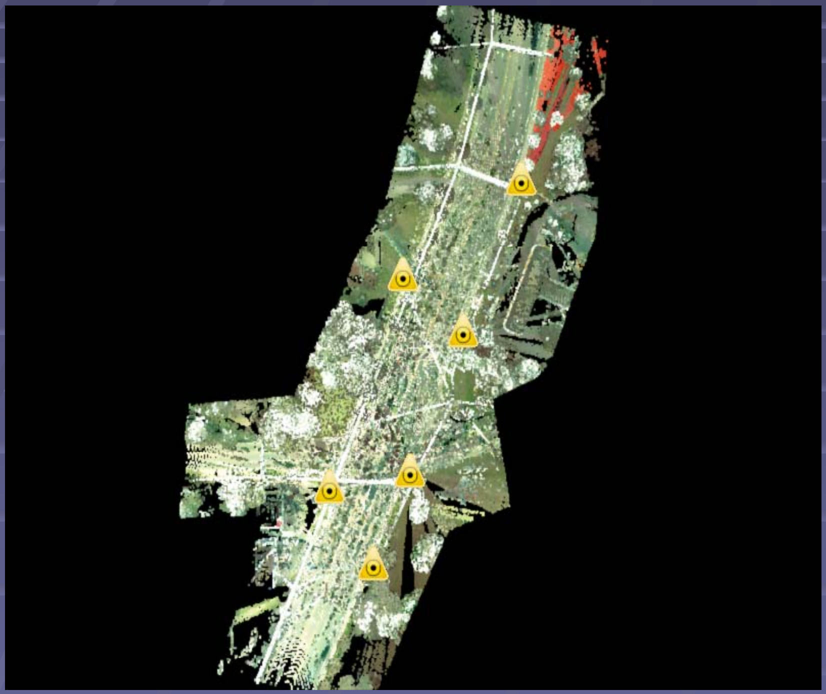
Projects

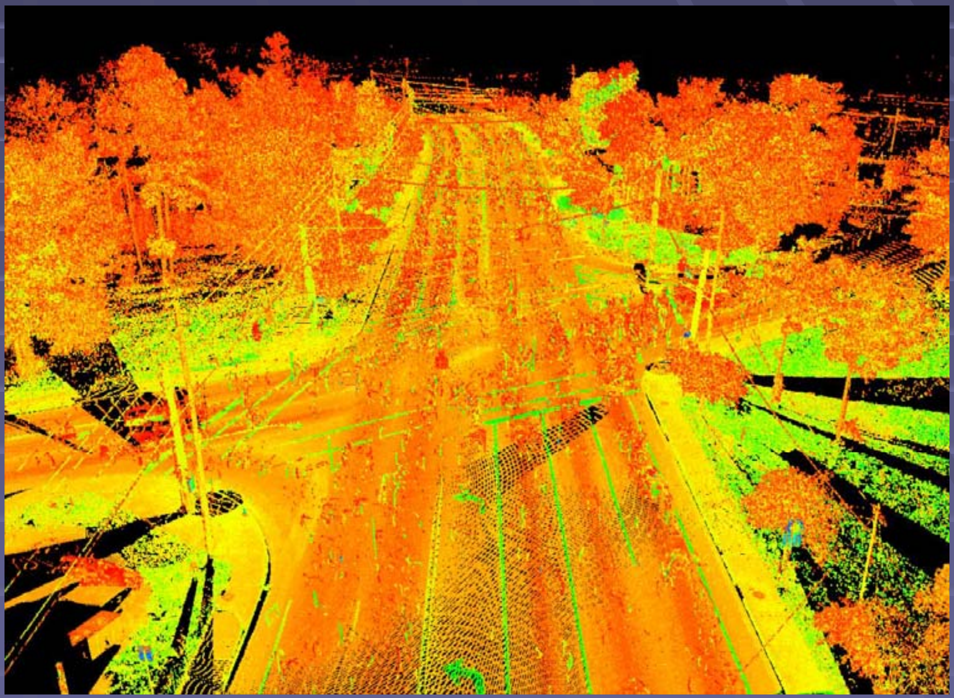




Dupont Bridge – 2 field days

Projects

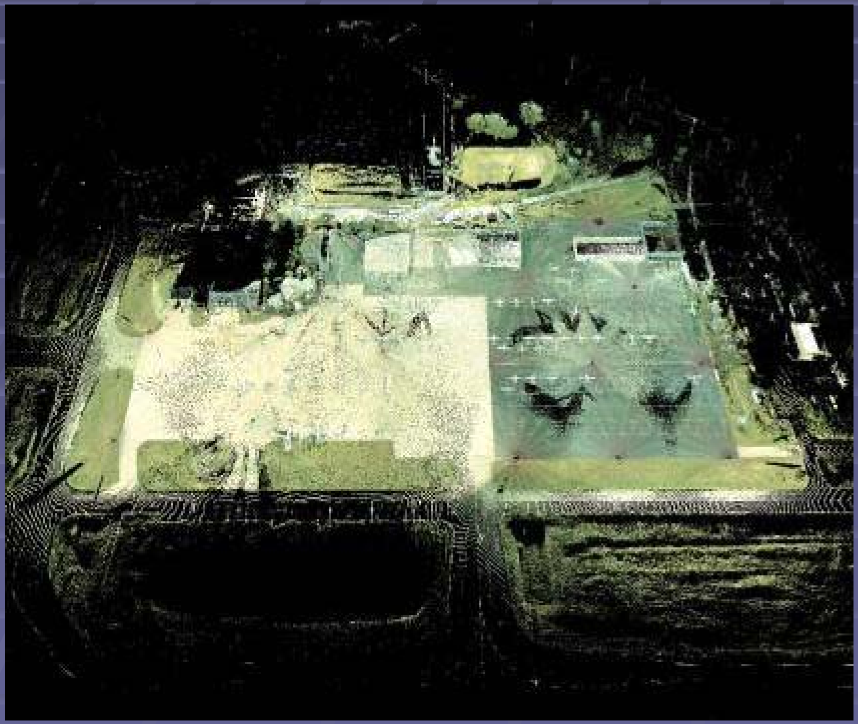




Gail Street Scan – One Day of Field Work

Projects

Tallahassee Airport



1 Field Day

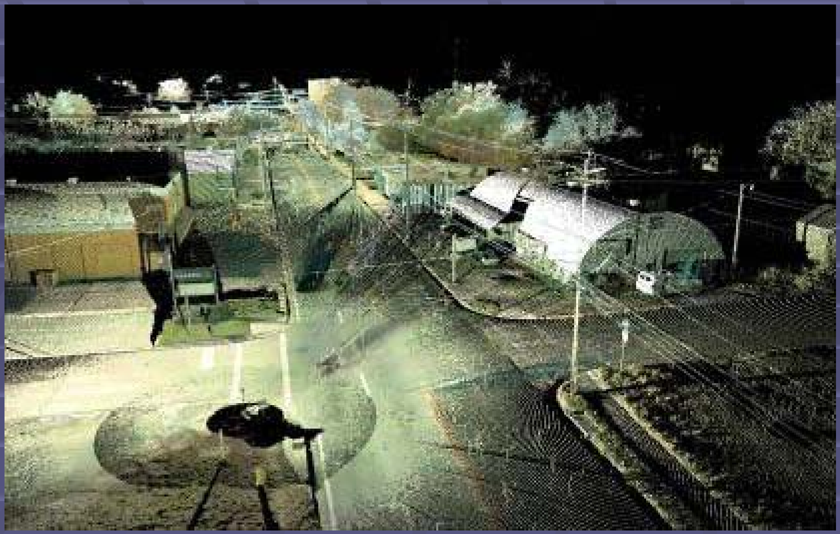
25 Acres – 4 Field Days

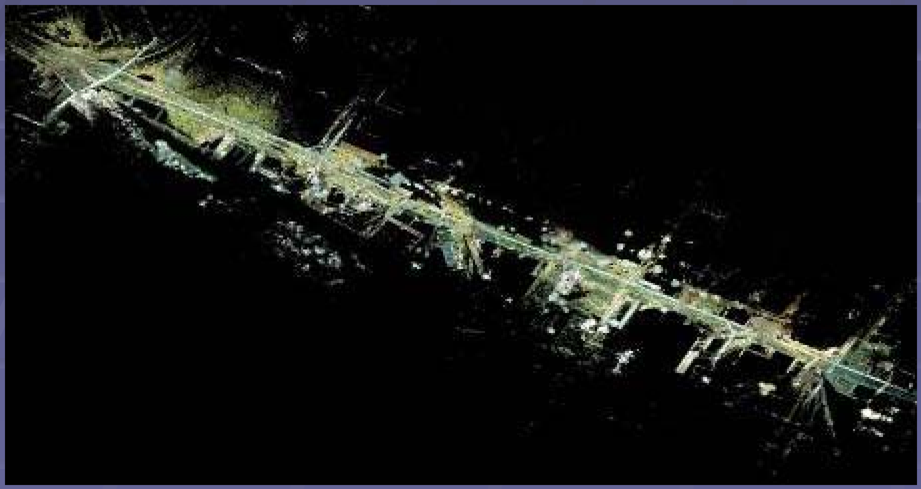
Projects

Tallahassee Airport – 3 Field Days

Airport Scan

Projects





Gaines Street - 3 Field Days

Gaines Street Scan

Thank You

Questions?