

Introduction to Lidar for Land Surveyors

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Agenda

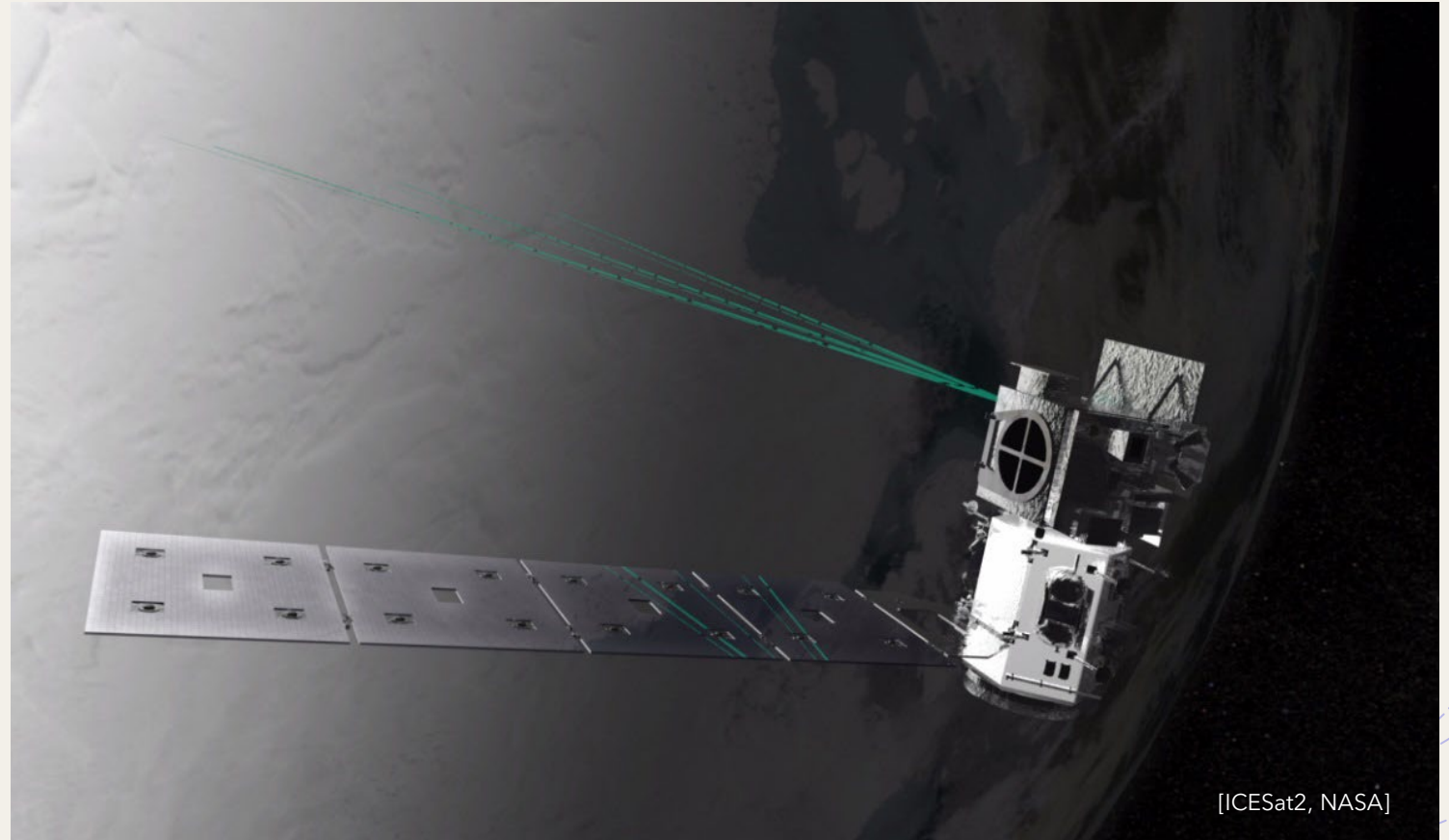
- Technology
- Processing
- Guidelines
- Data Source(s)

Lidar Technology

- + Definition: LiDAR (Light Detection and Ranging)
 - + Remote sensing technology that uses laser pulses to measure distances
 - + Distance = (speed of light * time to target and back) / 2

Lidar Technology

- + Types of Lidar
 - + Spaceborne



Lidar Technology

- + Types of Lidar
 - + Spaceborne
 - + Terrestrial
 - + Static



Lidar Technology

+ Types of Lidar

- + Spaceborne
- + Terrestrial
 - + Static
 - + Mobile



Lidar Technology

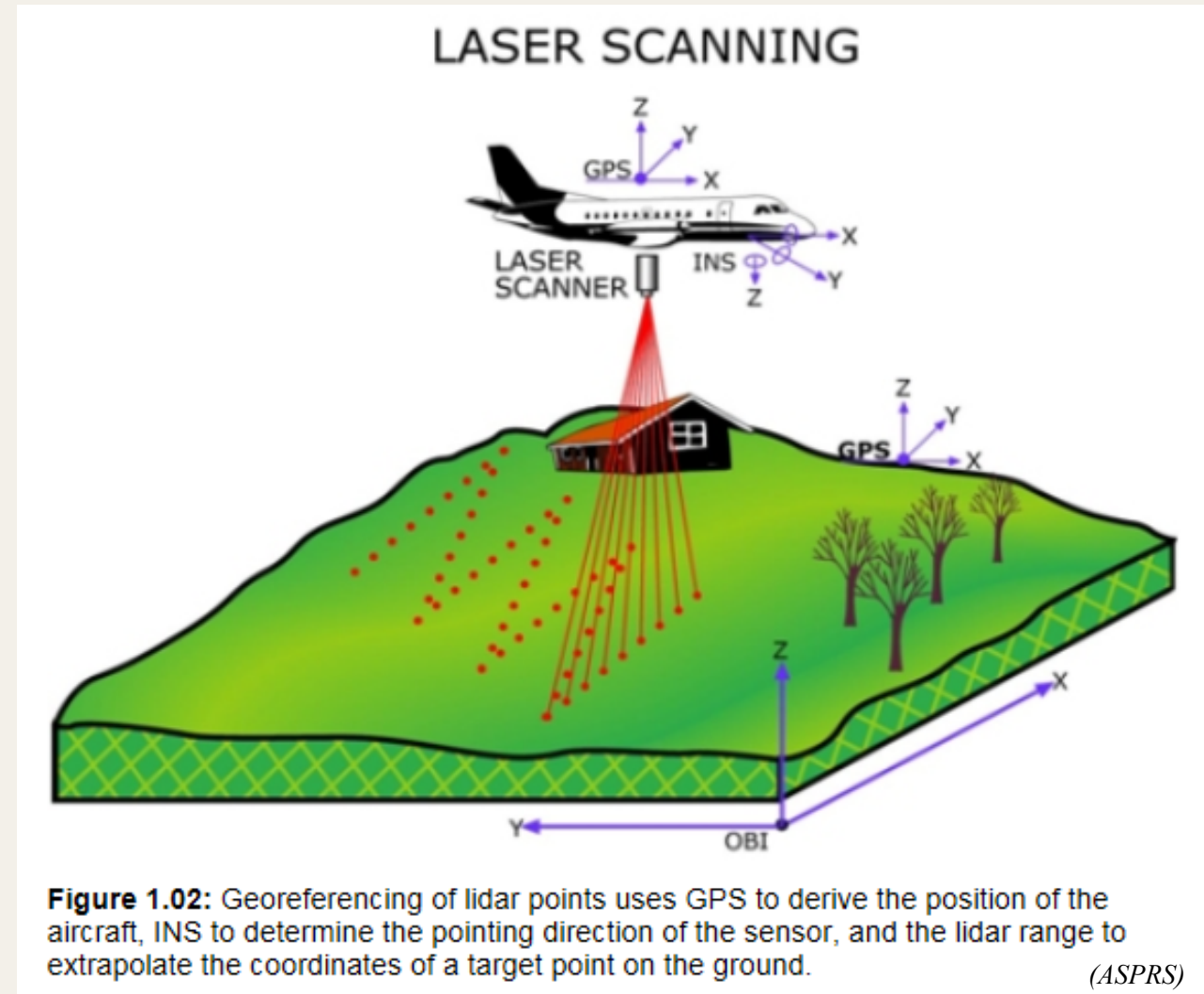
- + Types of Lidar
 - + Spaceborne
 - + Terrestrial
 - + Static
 - + Mobile
 - + Airborne



Lidar Technology

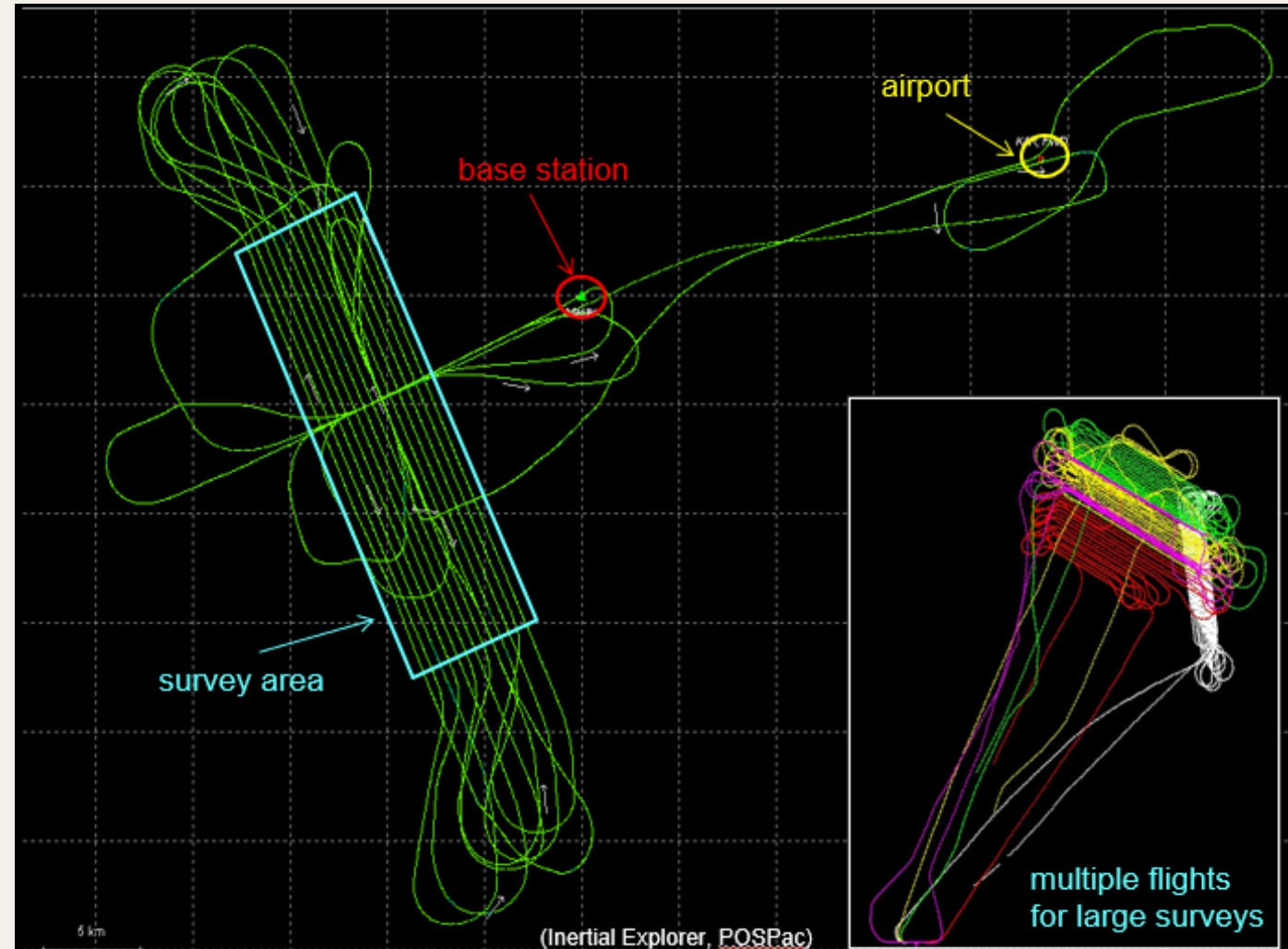
+ Core Components

- + Laser
- + GNSS
- + IMU



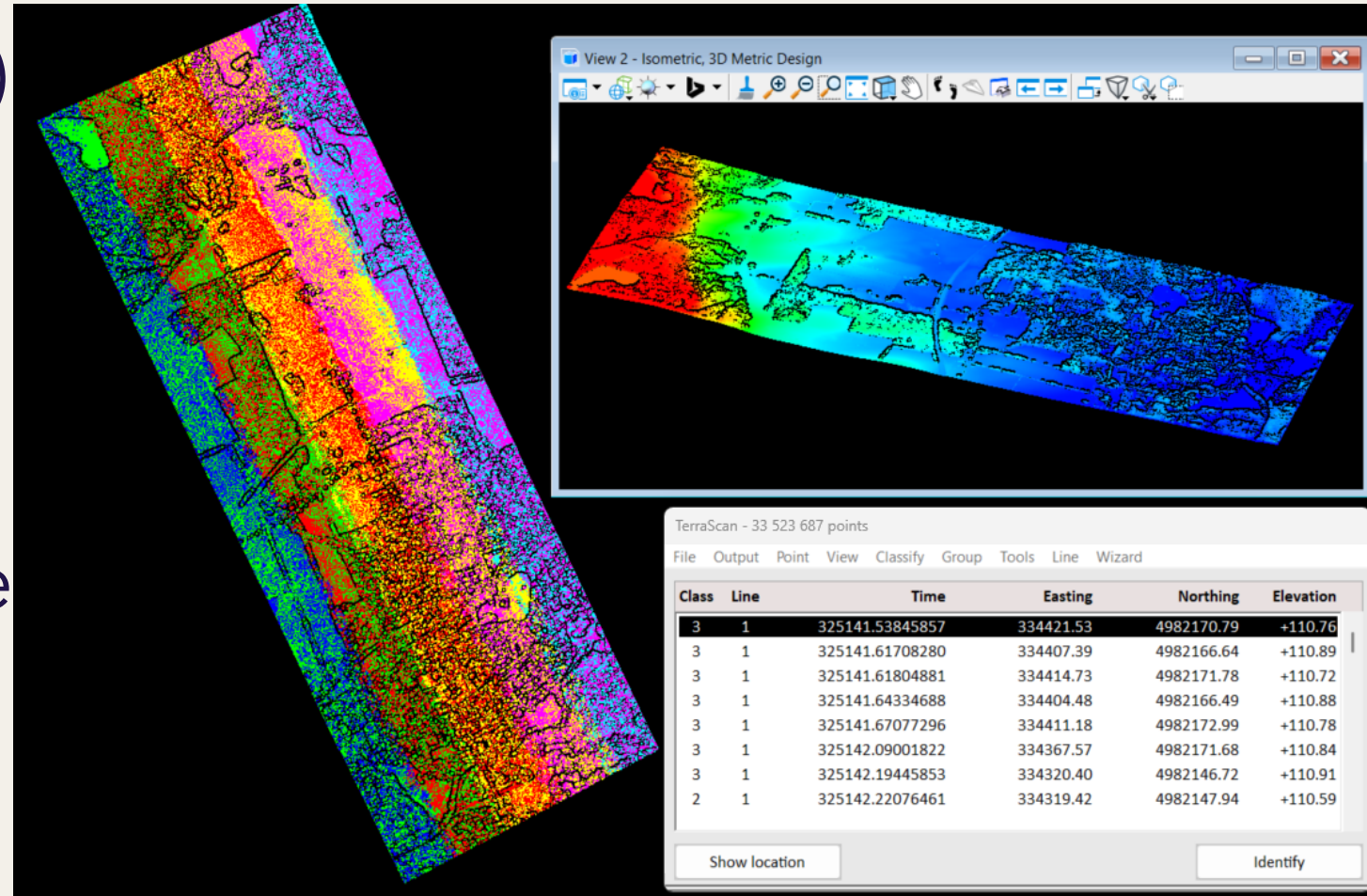
Lidar Processing

- + The information from the GNSS and INS are post-processed to create the Smoothed Best Estimate of Trajectory (SBET).



Lidar Processing

- + The SBET (trajectory) is applied to the raw laser file to output a point cloud in las or laz format.
- + Typically, this is done using proprietary (laser-specific) software.

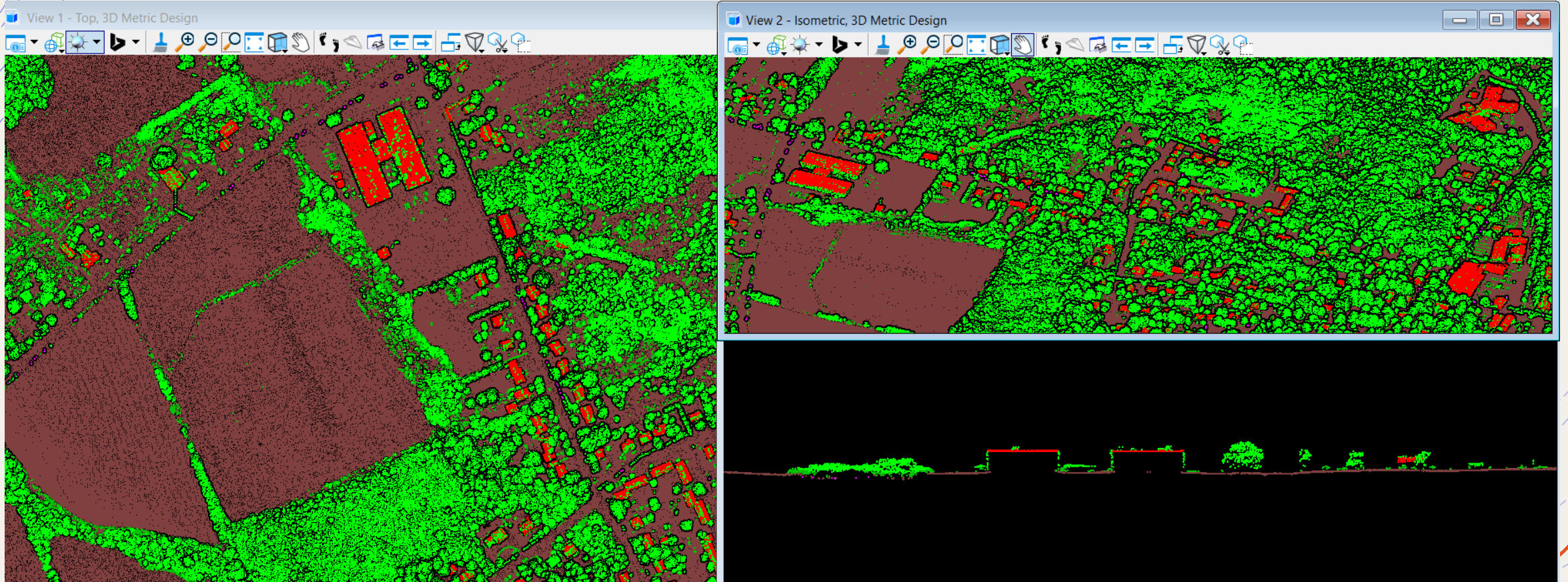


Lidar Processing

- + Classification
 - + Typical workflow:
 - + Identify/classify noise
 - + Classify ground
 - + Classify non-ground features
- + Classification can be considered semi-automatic with manual editing often required

Lidar Processing

+ Classified point cloud

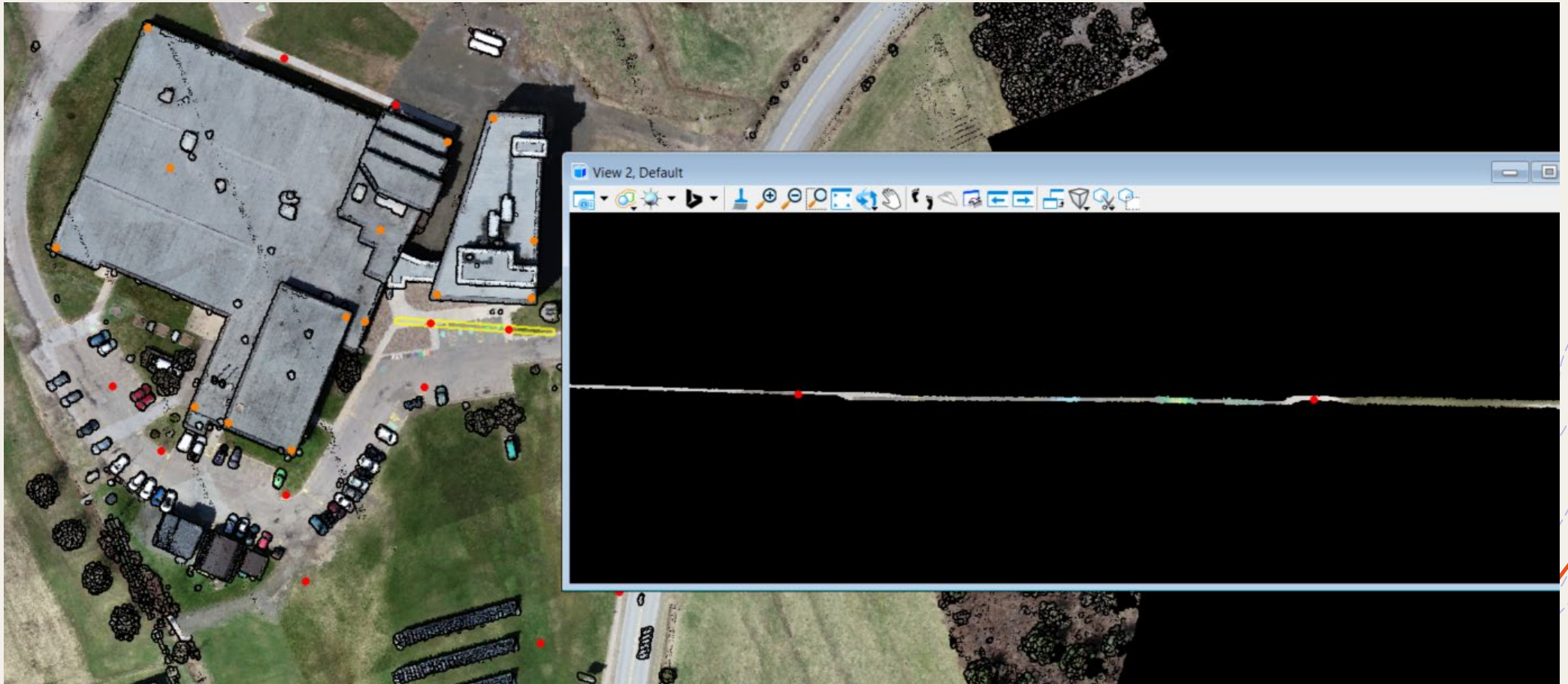


Lidar Processing

- + Accuracy Assessment
 - + Lidar points are compared to “known” points
 - + Known points should be more accurate than the lidar (typically RTK, PPK, sometimes static)
 - + Reporting on vertical error only is the norm
 - + Challenging to report on horizontal error
 - + Rule of thumb for airborne lidar is the horizontal error is twice the vertical error

Lidar Processing

+ Accuracy Assessment



Lidar Processing

+ Accuracy Assessment

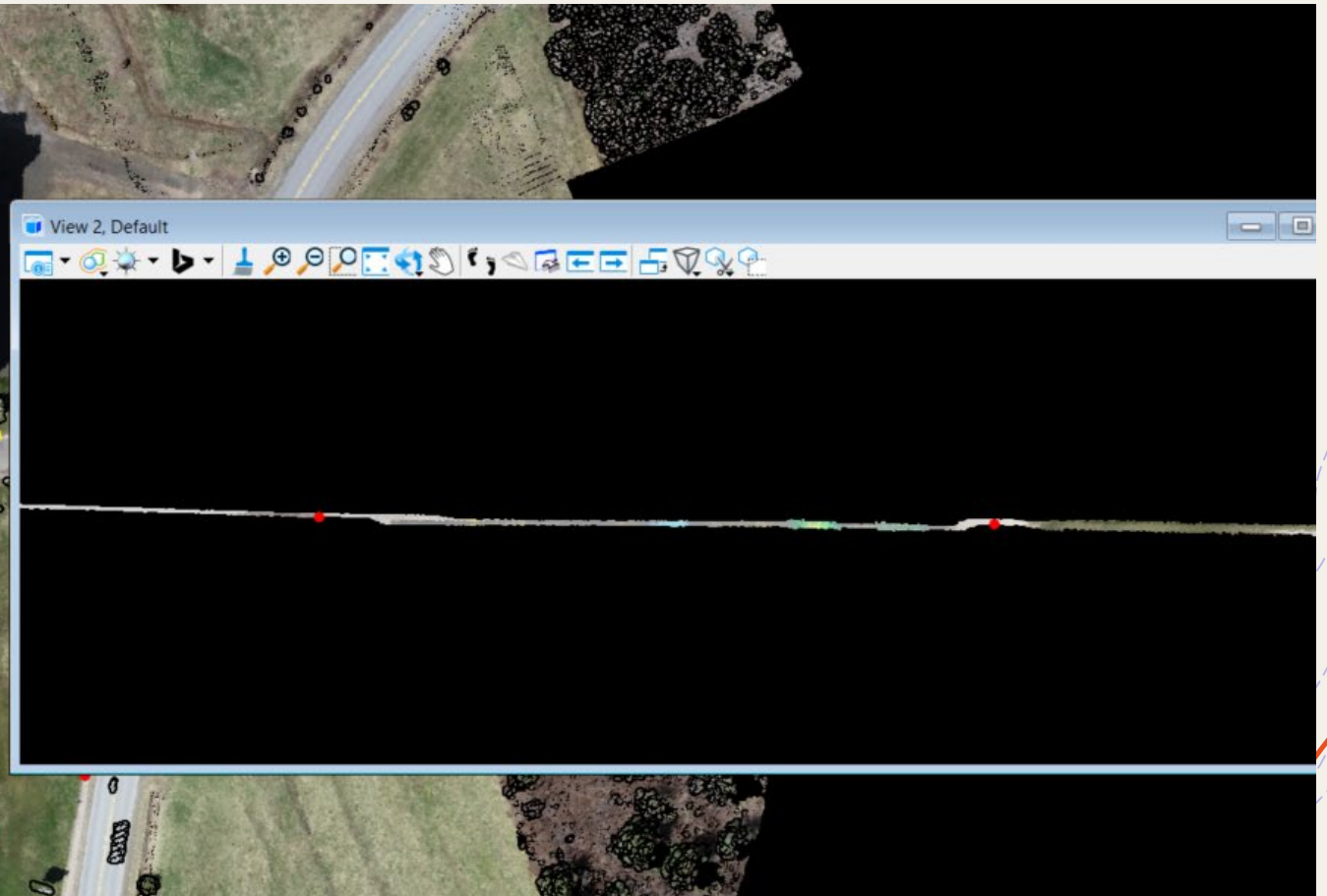
Control report - C:\Courses\REMS_6200\2025\RobCOGS_Processing\rtk_points_xyz.csv

File Sort Apply View

Use	Number	Easting	Northing	Known Z	Laser Z	Dz
☒	nva01	328803.61	4972227.01	4.173	4.190	+0.017
☒	nva02	328767.69	4972234.66	4.351	4.370	+0.019
☒	nva03	328738.06	4972326.57	4.971	4.980	+0.009
☒	nva04	328603.95	4972932.72	5.885	5.900	+0.015
☒	nva05	328642.63	4973055.55	5.236	5.260	+0.024
☒	nva06	328610.86	4972892.39	6.113	6.150	+0.037
☒	nva07	328635.79	4972824.38	7.021	7.040	+0.019
☒	nva08	328657.09	4972772.45	7.258	7.250	-0.008
☒	nva09	328681.75	4972710.30	7.258	7.280	+0.022
☒	nva10	328706.09	4972648.75	6.859	6.870	+0.011
☒	nva11	328728.84	4972586.35	6.332	6.350	+0.018
☒	nva12	328714.80	4972573.36	6.350	6.400	+0.050

Average magnitude	0.0452	Average dz	+0.0380
Std deviation	0.0421	Minimum dz	-0.0802
Root mean square	0.0564	Maximum dz	+0.1222

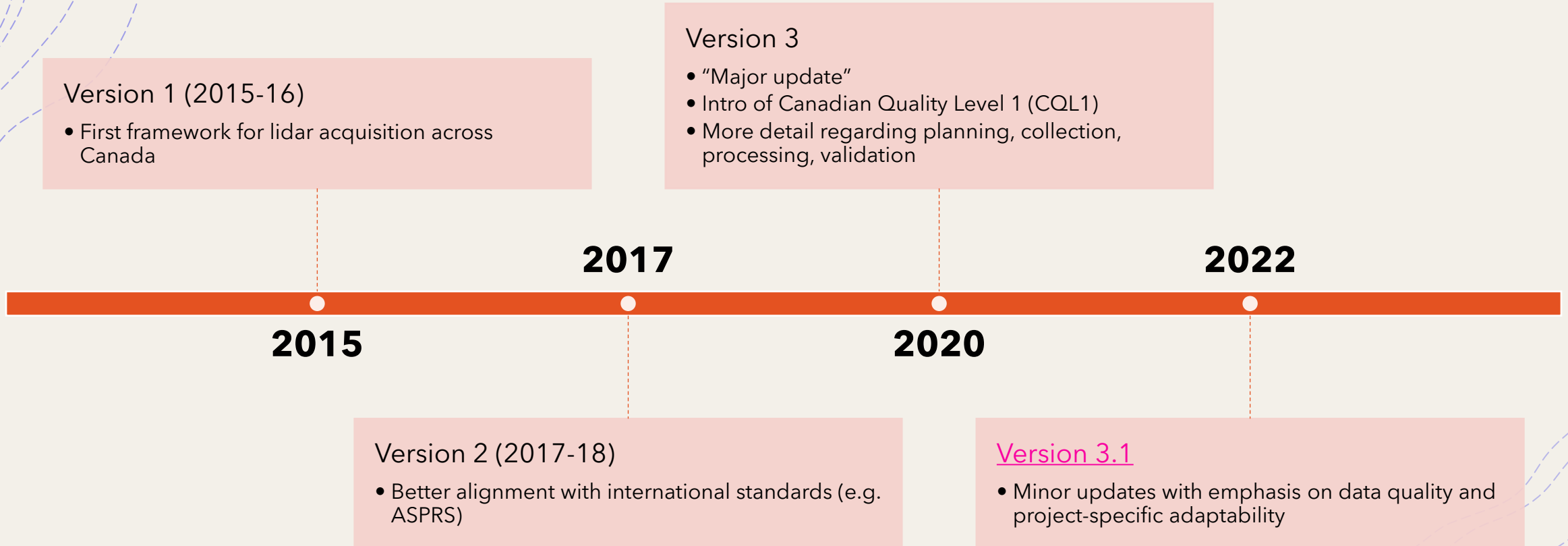
Show location Identify



Lidar Processing

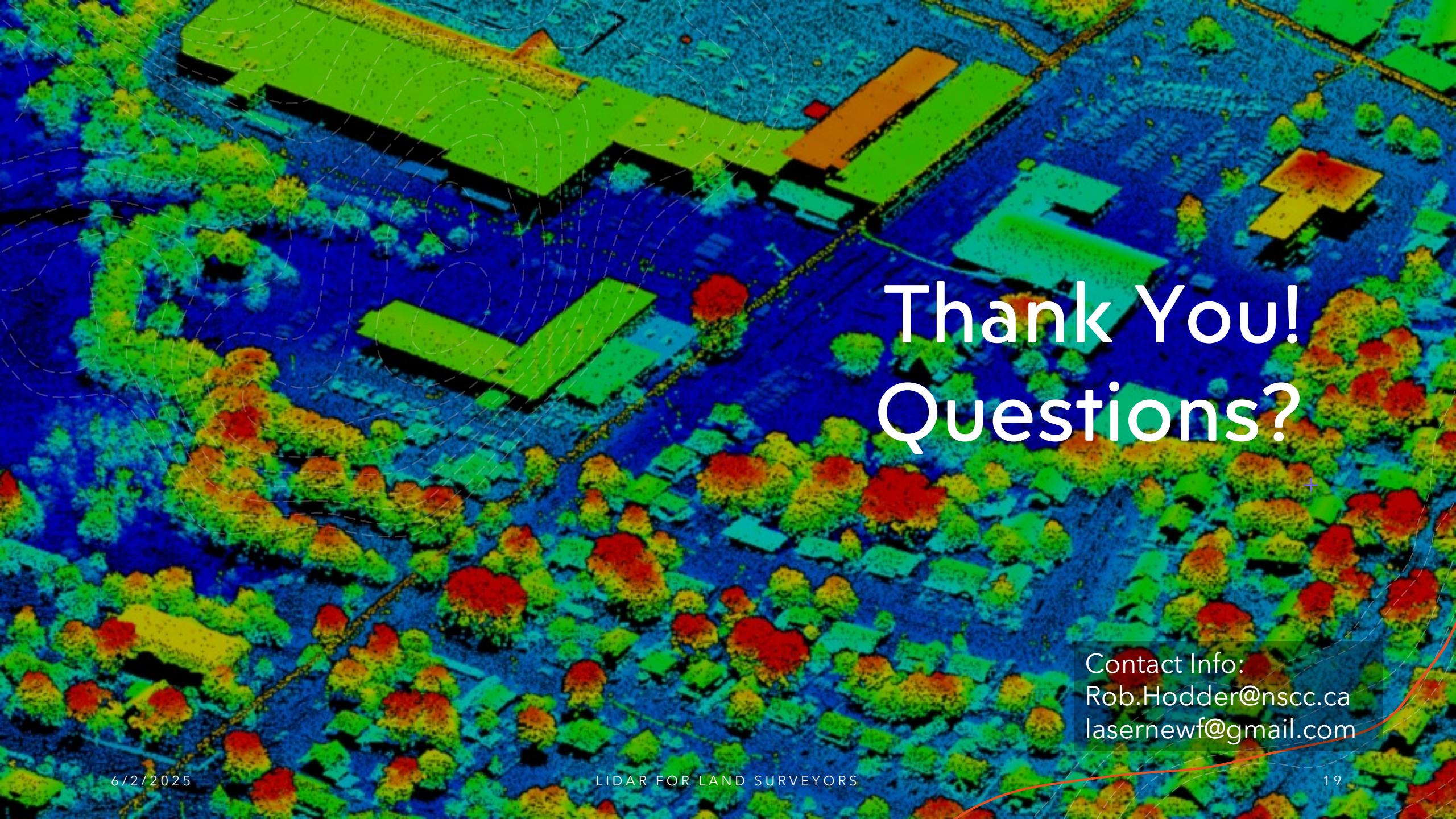
- + Derivative Products
 - + 3d rasters (typically 1m and geotiff format)
 - + BareEarth (DEM/DTM)
 - + FullEarth (DSM)
 - + Contours
 - + Slope/Aspect rasters
 - + Hillshades
 - + others

Federal Airborne LiDAR Data Acquisition Guideline



Nova Scotia Lidar Coverage

- + All of Nova Scotia has been lidar'd
 - + Not all provinces are fortunate enough to have free access to high quality airborne lidar data
 - + [Nova Scotia Elevation Explorer](#)
 - + All point cloud data is available in *laz* format
 - + If laz doesn't work in your software, can use [LASzip](#) to decompress to las



Thank You! Questions?

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