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USGS science for a changing world

Houston, TX Area 2024 Lidar Collection, Processing, and Deliverables

Project Briefing and Overview

April 3rd, 2024

Presenter: Jackie Monge,
Senior Project Manager,
NV5

Agenda

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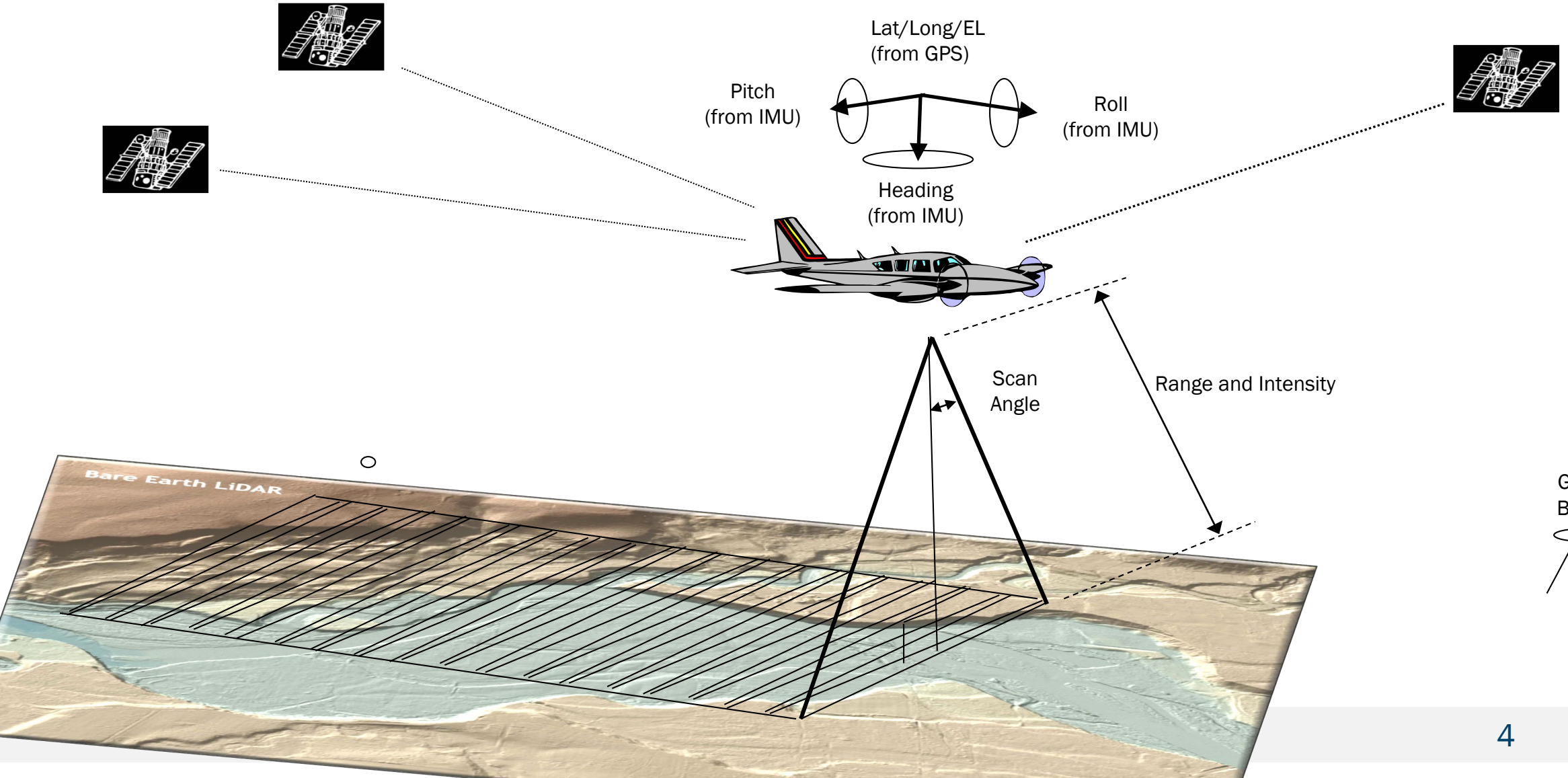
- Project Overview
- Control Survey Operations
- Control Planning and Executions
- Deliverables
- Project Schedule

WHAT IS LiDAR?

- Highest quality elevation data
- Collected remotely from an airborne system
- Verified with ground control

Light Detection and Ranging (LiDAR)

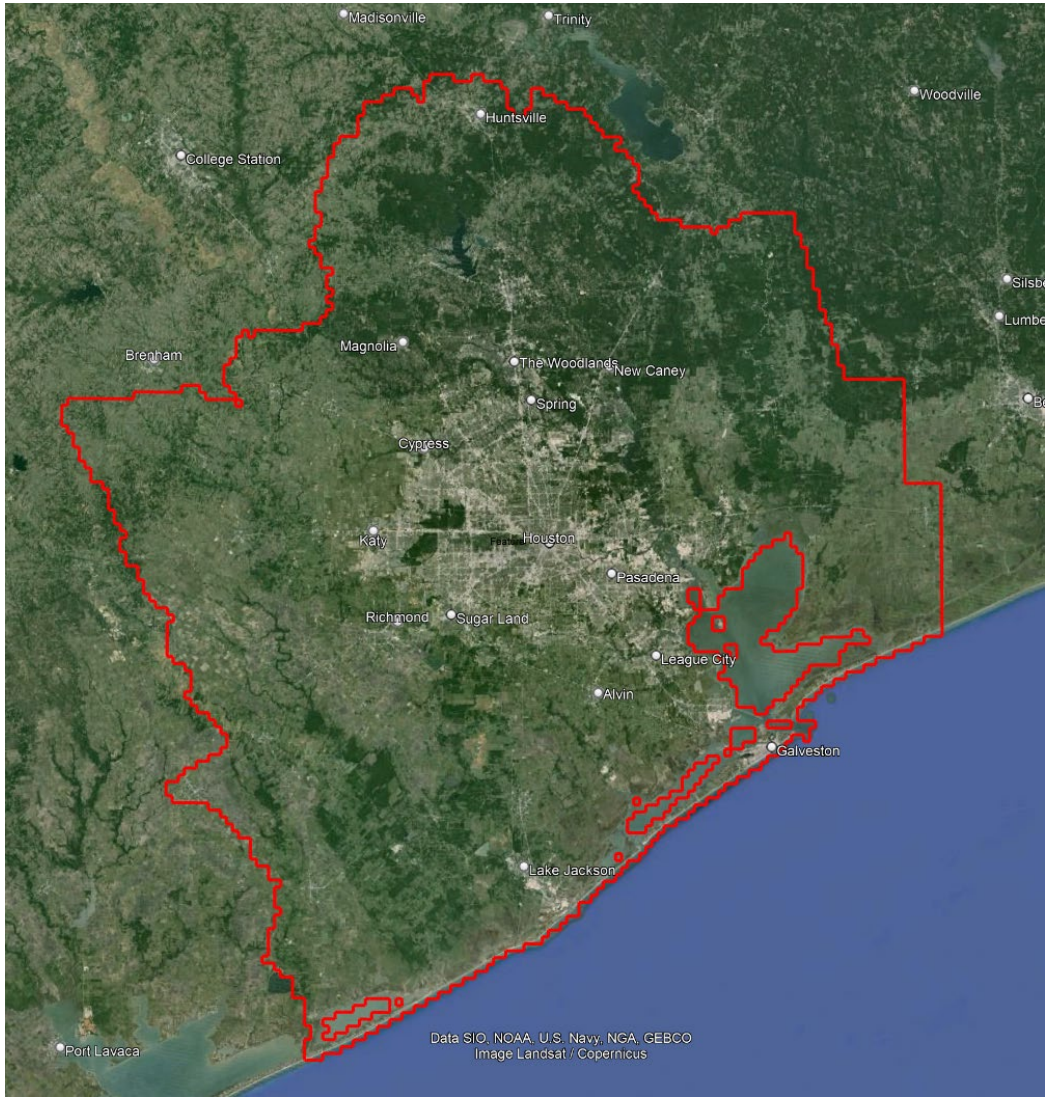
Airborne LiDAR systems employ technologies that include...



Overview of the Houston, Texas 2024 LiDAR Project

Houston, TX LiDAR 2024: USGS Task Order Overview

- The Houston, Texas LiDAR project area spans ~11,562 square miles
- QL1 LiDAR specifications (8 ppsm)
- Coordinate System: UTM Zone 14/15 North
- Units of meters
- Horizontal Datum: NAD 1983 (2011)
- Vertical Datum: NAVD 1988 (GEOID18)



Houston, TX 2024 LiDAR : Project Deliverables

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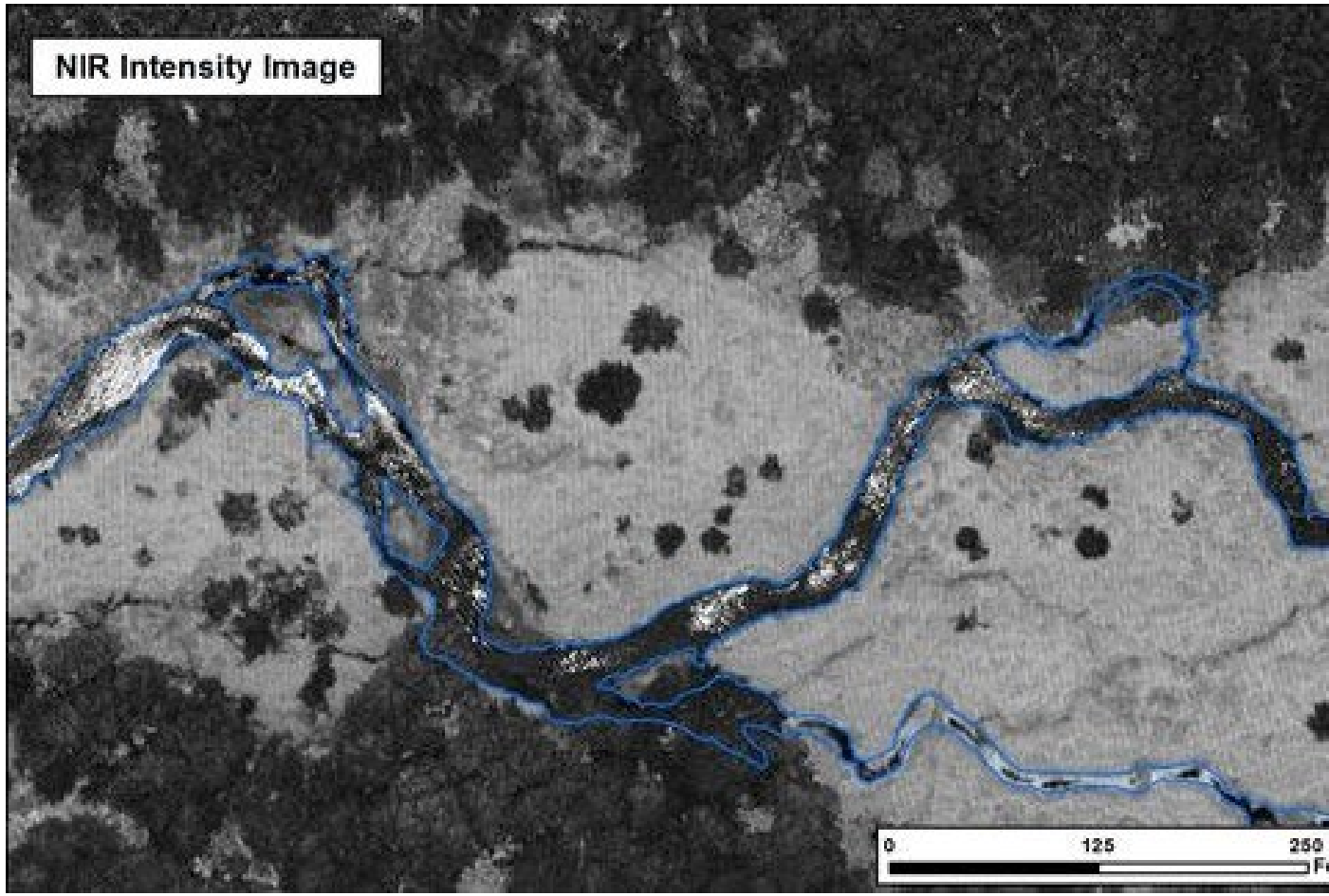
Deliverable Products Summary

- Classified LAS point cloud, 8 ppsm
- Bare Earth Digital Elevation Model, hydroflattened
- Intensity imagery
- Swath separation images
- Maximum surface height rasters
- Breaklines (Hydrology lines)
- Tiling index
- Metadata and Reports (Control, Technical)

To meet the National Geospatial Program Lidar Base Specification 2023, revision A



AERIAL ACQUISITION

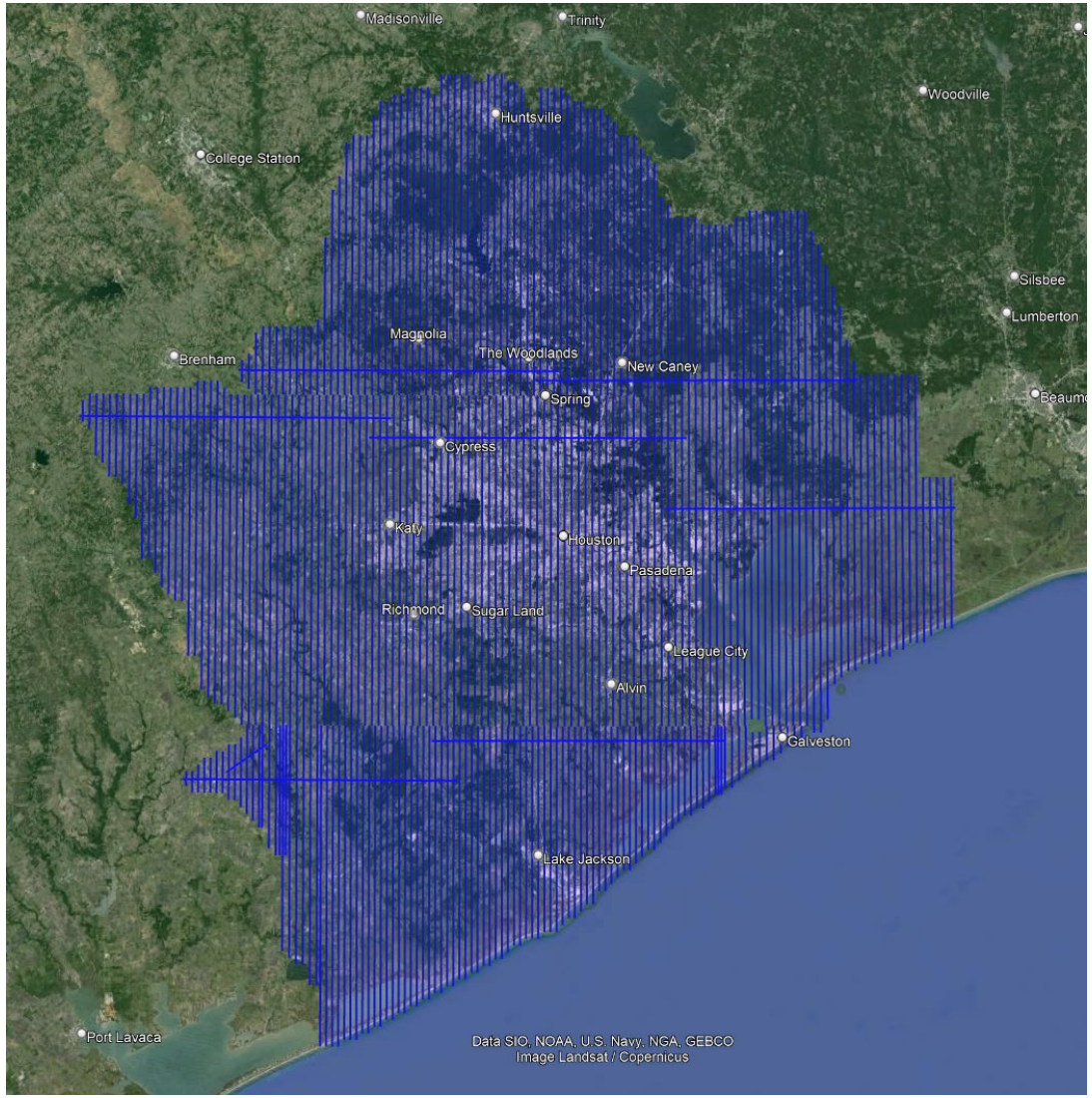
- Timeline: Winter/Spring 2024 leaf-off window.
- Riegl 1560ii-s sensor
- Sufficient overlap to ensure no data voids
- Roll compensated via Gyrostabilized Mount
- Quick QC to ensure full coverage, sufficient relative accuracy

Collection/Sensor Parameters	QL1
Collection altitude (m)	1950
Number of flight lines	316
Total Flight line Length (nmi)	10469
Overlap	20%
Scan rate (Hz)	2x148
Pulse rate (kHz)	2x1100
FOV (degrees)	58.5
Projected ANPD	8
Projected ANPS (m)	0.35

AERIAL ACQUISITION – FLIGHTPLAN AND STATUS

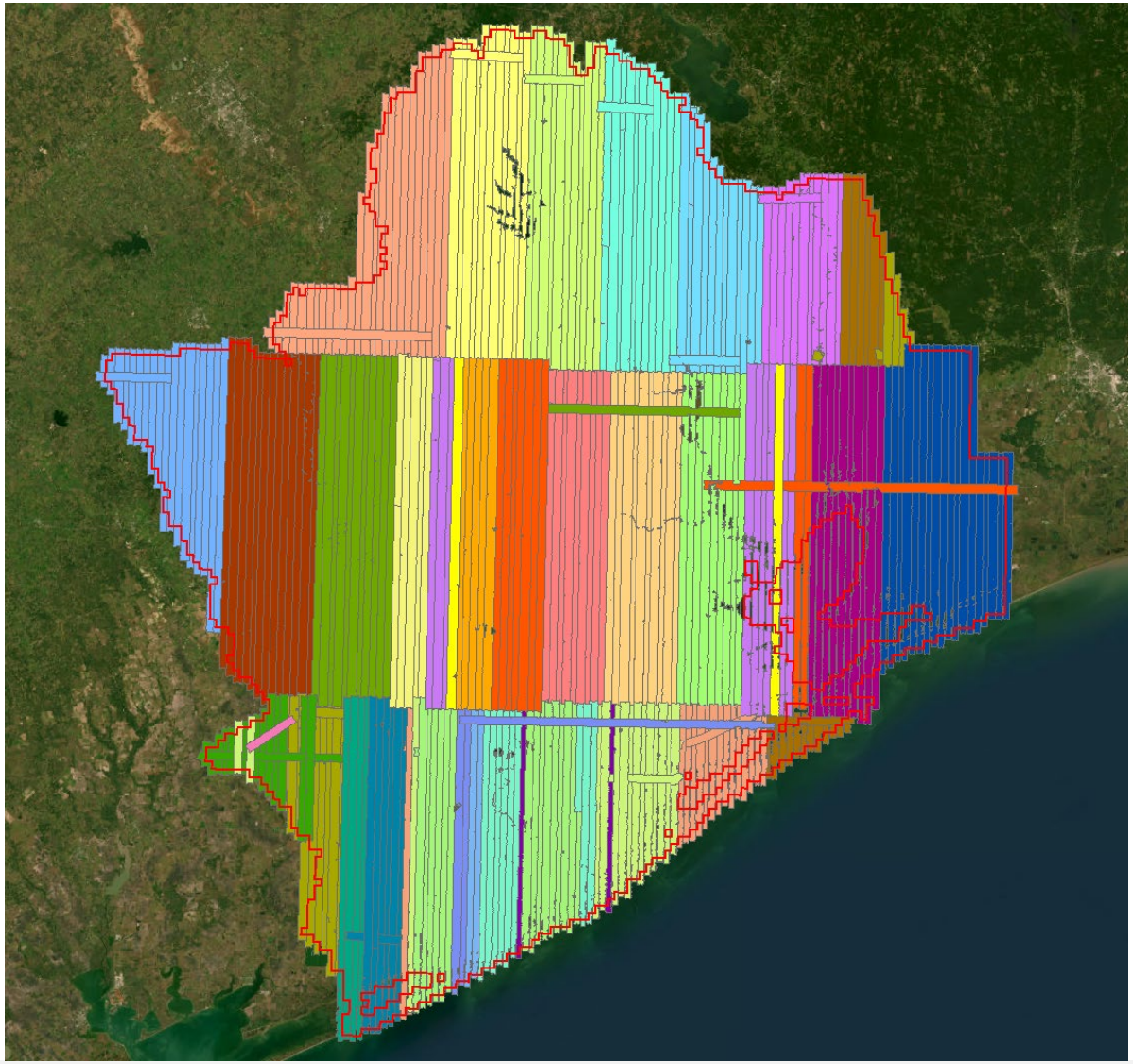
100% complete as of 4/2

Blue – acquired and accepted in QC



AERIAL ACQUISITION STATUS Cont'd

35+ missions of accepted data as of 4/2



What is QL1 LiDAR?

TECHNICAL REQUIREMENTS

Vertical Accuracy

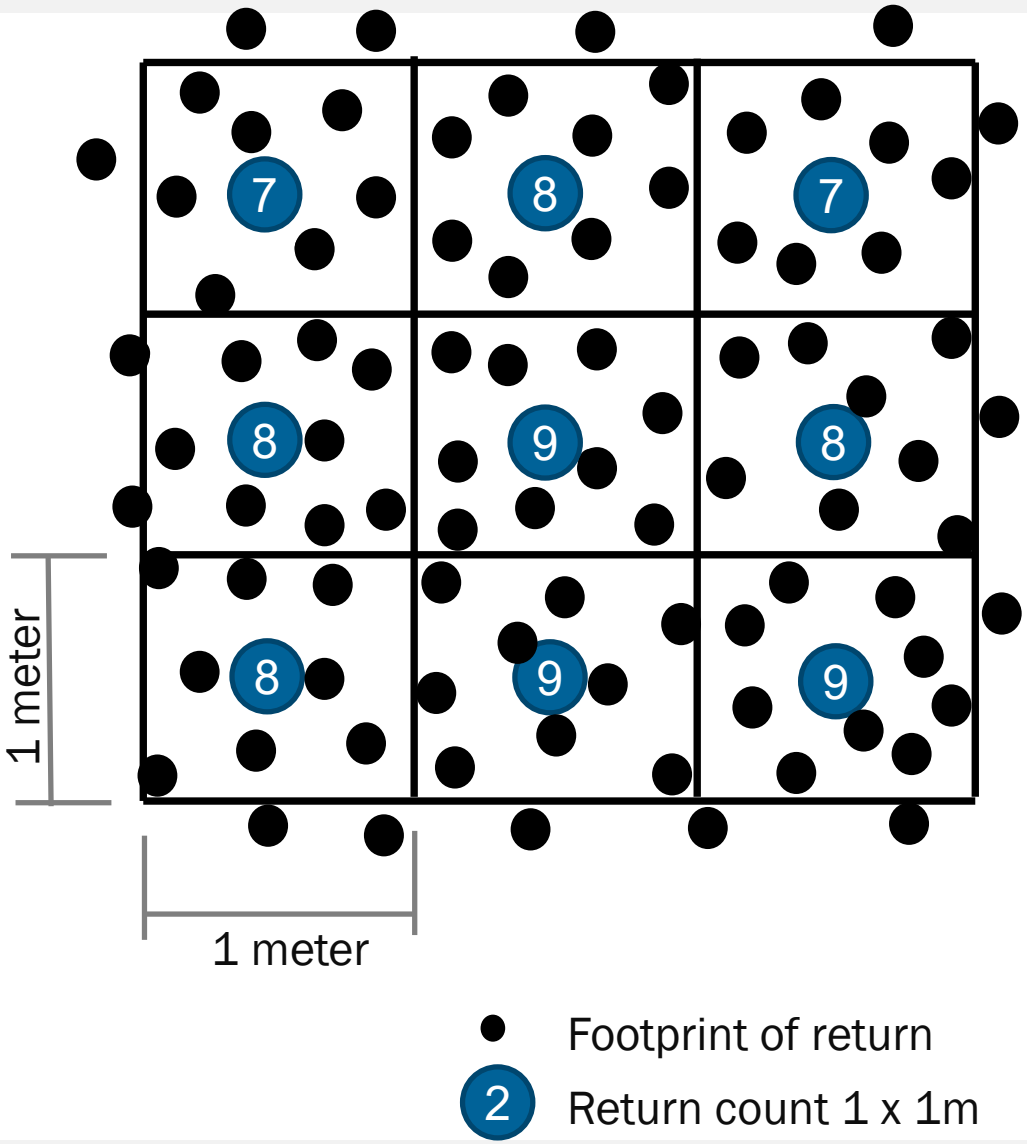
RMSEz of 10 cm (~4 in)

NVA of 19.6 cm (~8 in) at 95% C.I.

VVA of 30 cm (~12 in) at 95th percentile

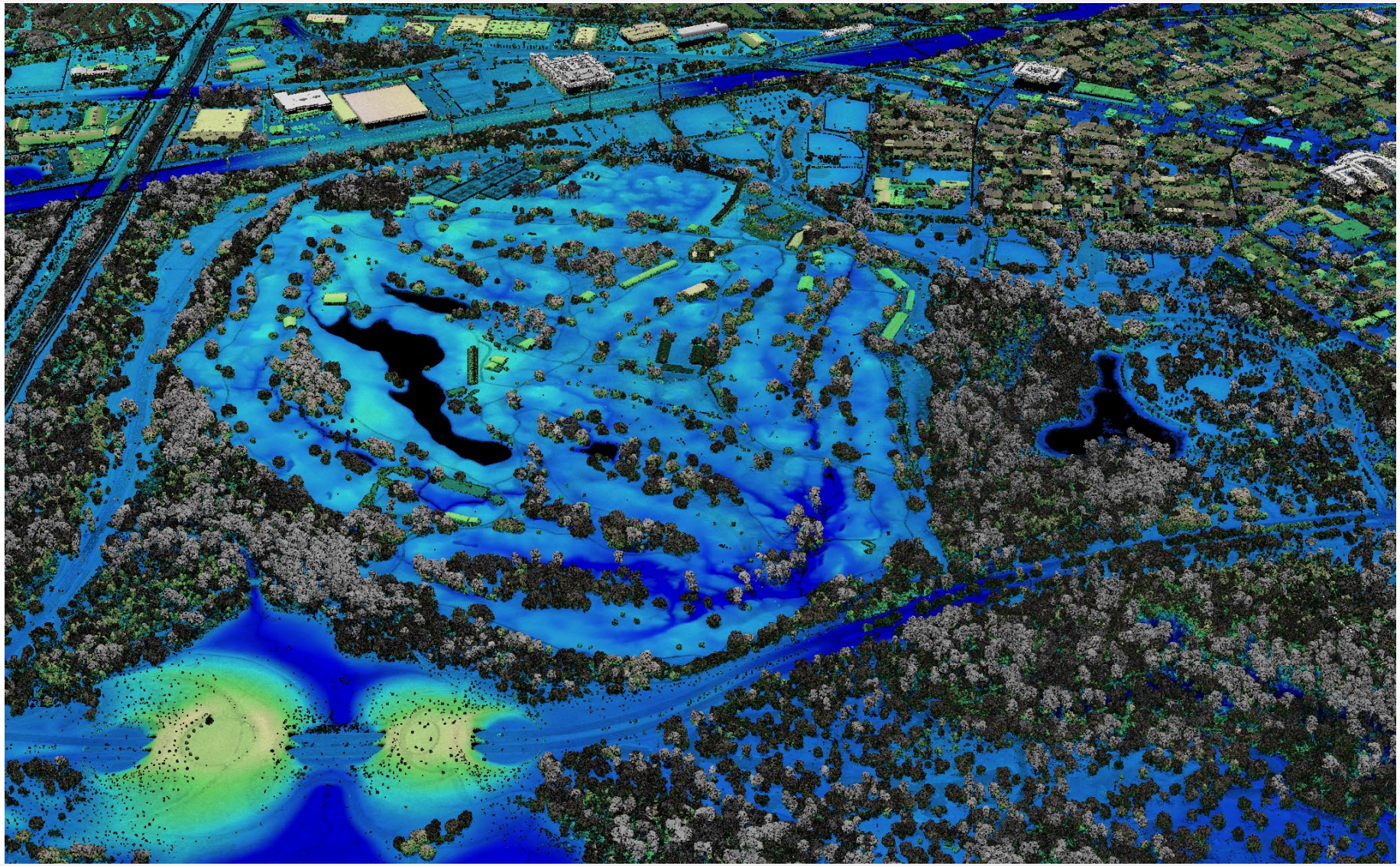
Point Density

Nominally 8 points per square meter (ppsm)



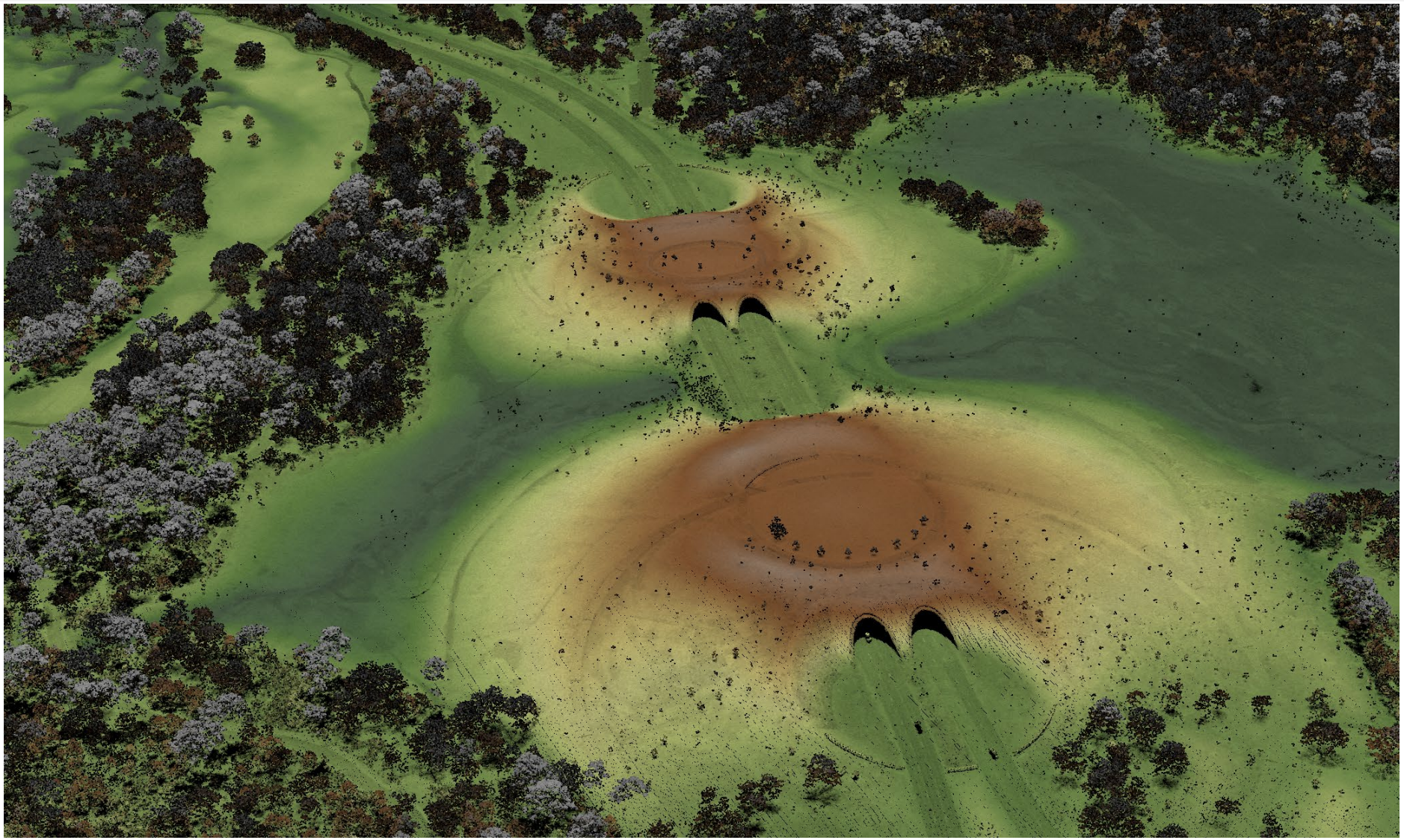
Memorial Park, Houston

*LiDAR Intensity



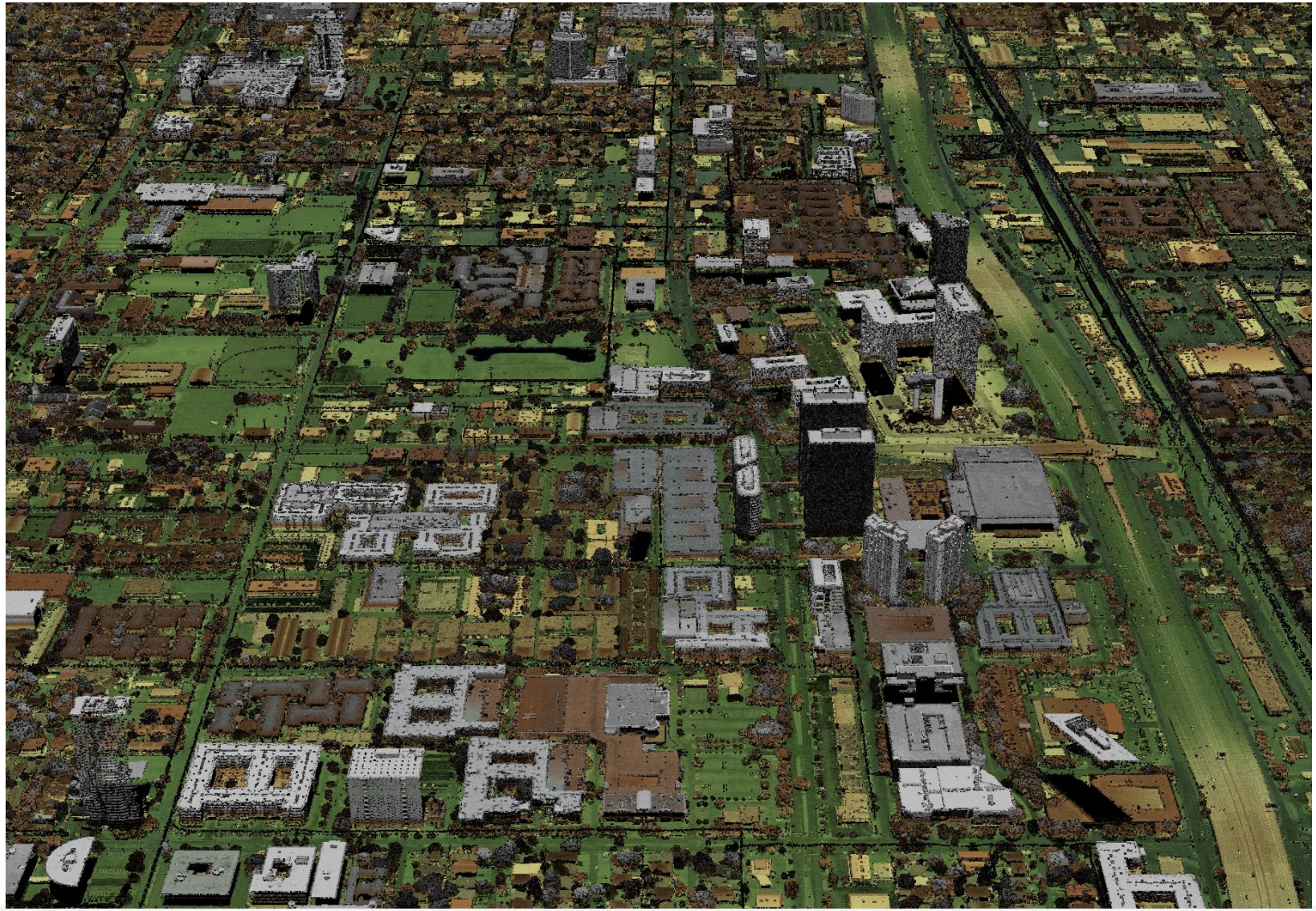
Memorial Park, Houston

*Colorized by elevation



*Colorized by elevation

Westheimer /
West Alabama /
Richmond Ave



Southwest Freeway

GROUND SURVEY STATUS

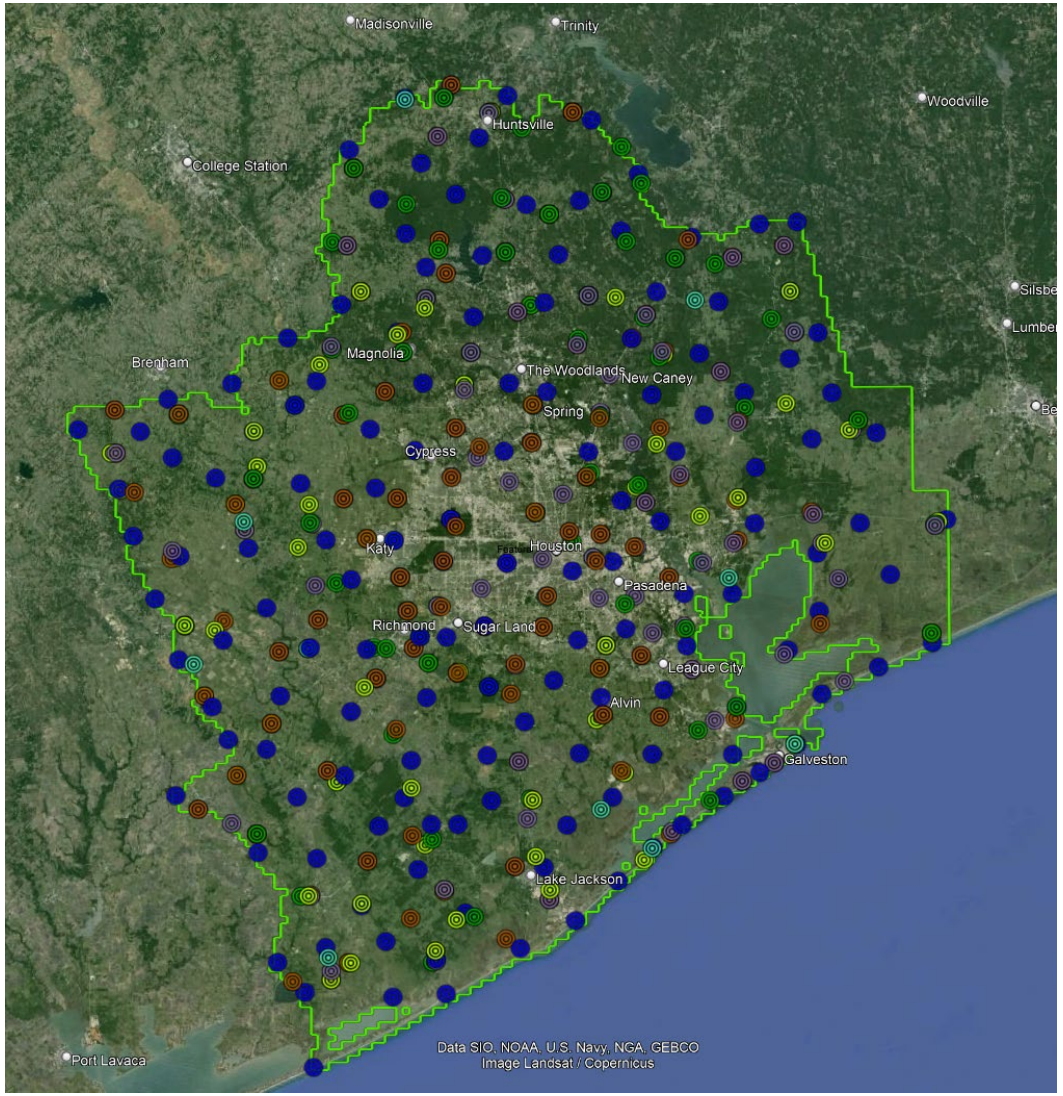
A minimum of 375 checkpoints were collected across the project area to support the vertical accuracy requirements of the project.

- 220 Non-vegetated vertical accuracy (NVA) checkpoints
- 155 Vegetated vertical accuracy (VVA) checkpoints

Survey checkpoint accuracy - 3x the targeted lidar data accuracy

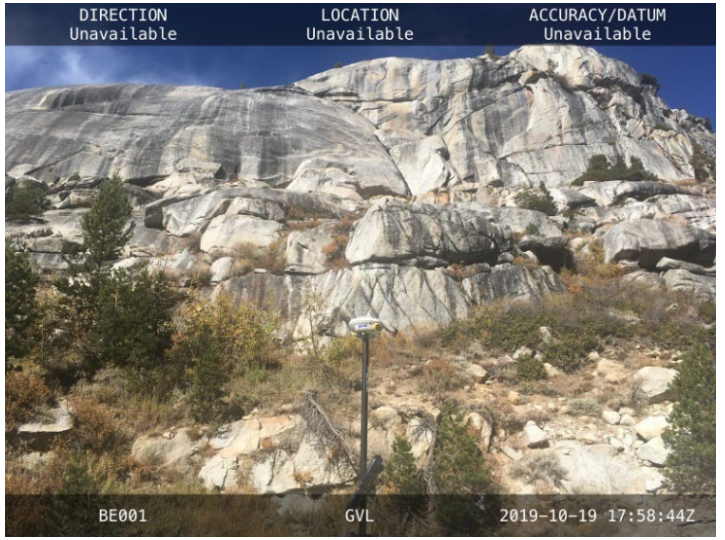
Calibration points were also collected to help remove vertical bias from the dataset.

Ground survey collection is 100% complete as of 3/29



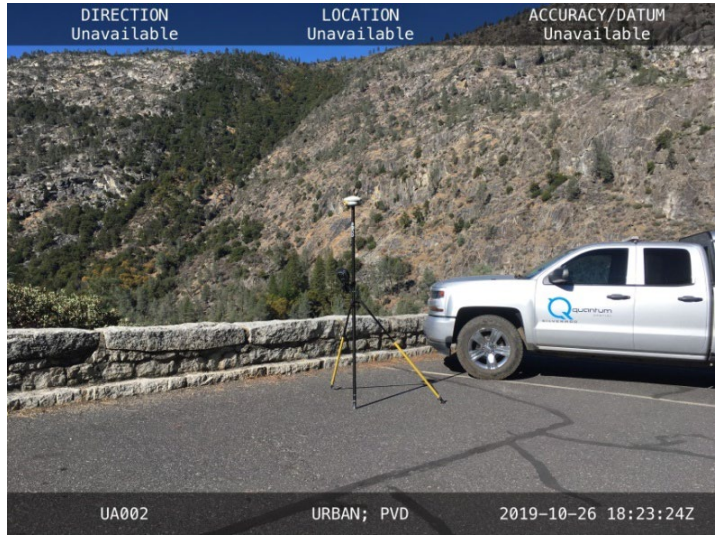
NVA: Non-vegetated Vertical Accuracy

Bare Earth



NVA: Non-vegetated Vertical Accuracy

Urban



VVA: Vegetated Vertical Accuracy

Tall grass / Tall weeds

VVA: Vegetated Vertical Accuracy

Forest


Note: FR036


Note: FR036


Note: BS036


Note: TS036

VVA: Vegetated Vertical Accuracy

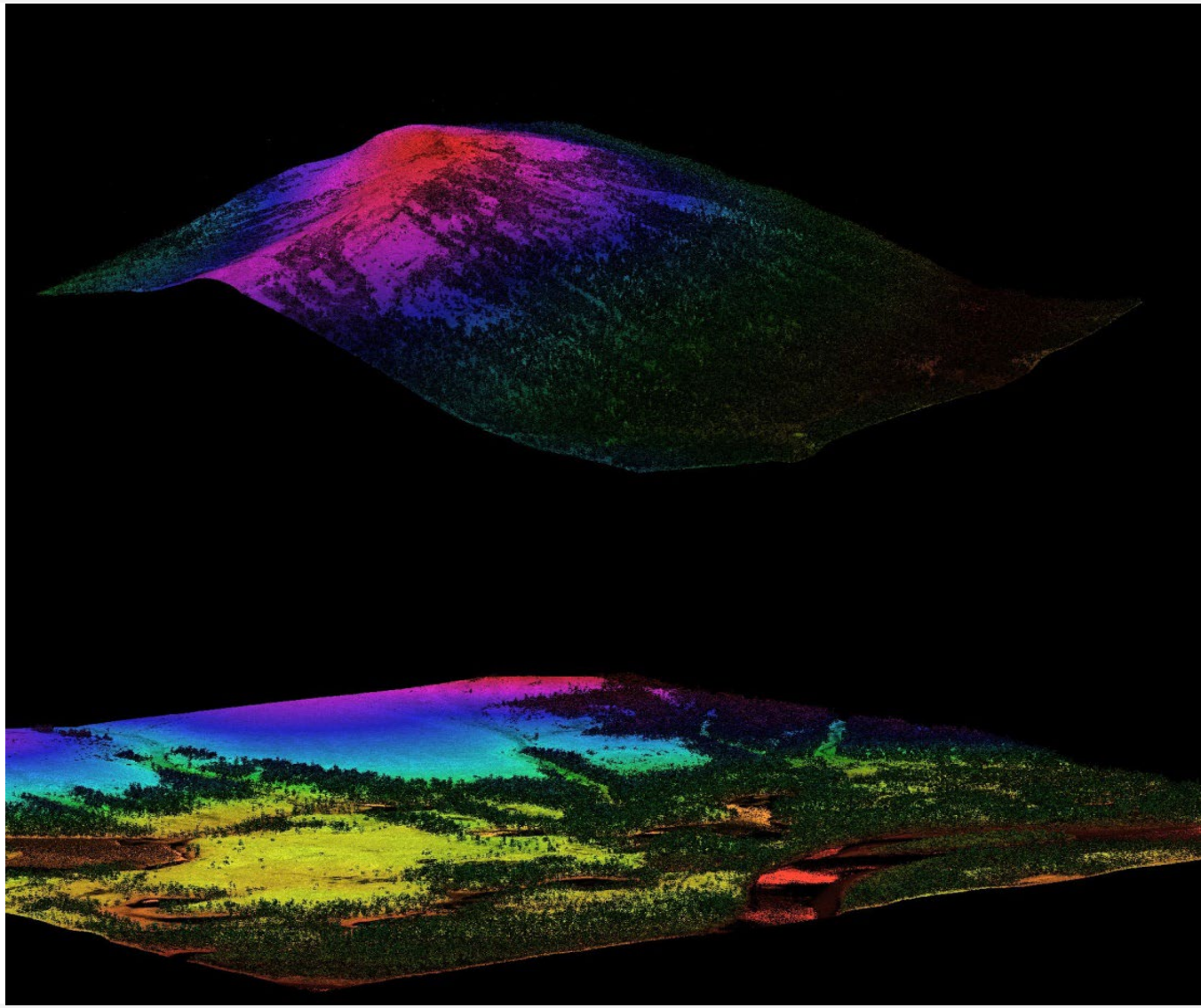
Shrub

LiDAR Calibration Points

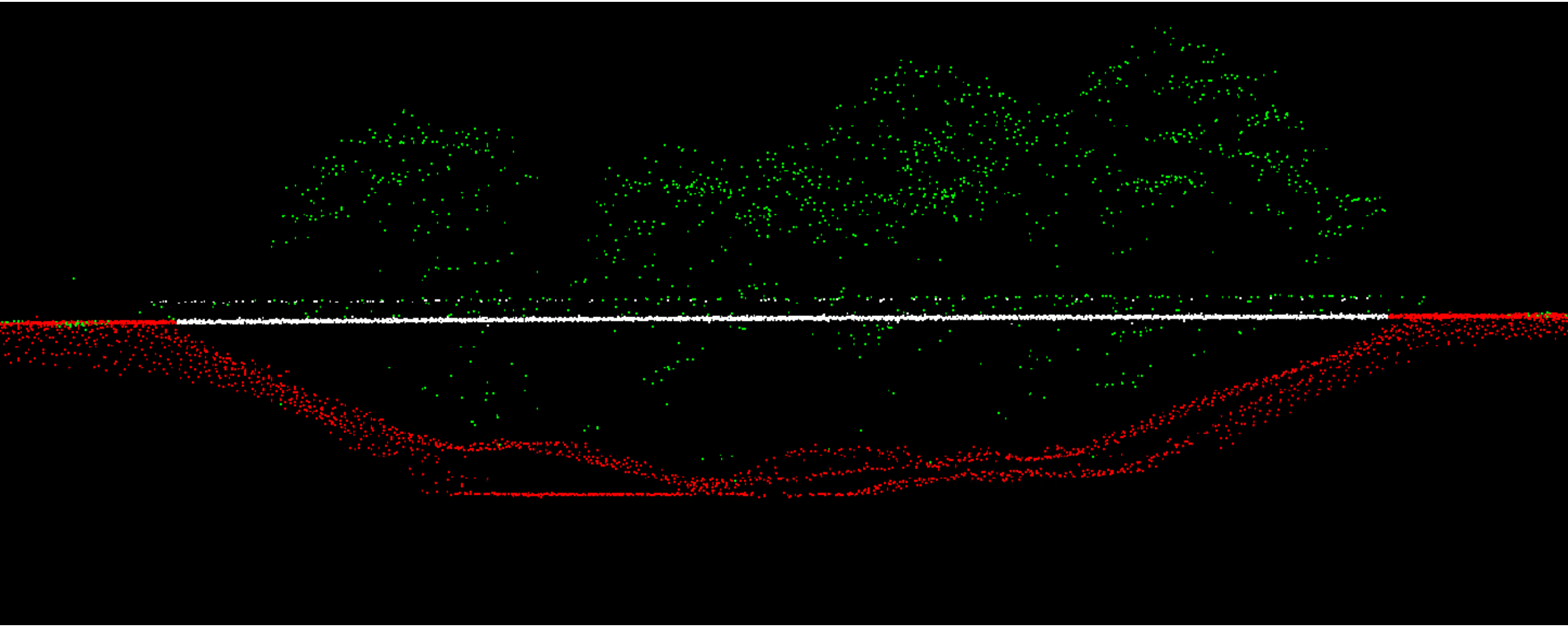
To support data calibration/processing

DELIVERABLES - LIDAR

LiDAR Point Cloud Classes (LAS Version 1.4)*	
1	Processed, but unclassified
2	Bare-earth ground
7	Low Noise (Low, manually identified)
9	Water
17	Bridge Decks
18	High Noise (high, manually identified, if necessary)
20	Ignored Ground (breakline proximity)
21	Snow (if present and identifiable)
22	Temporal exclusion (typically non-favored data in intertidal zones, use as necessary)



DELIVERABLES – LIDAR Cont'd

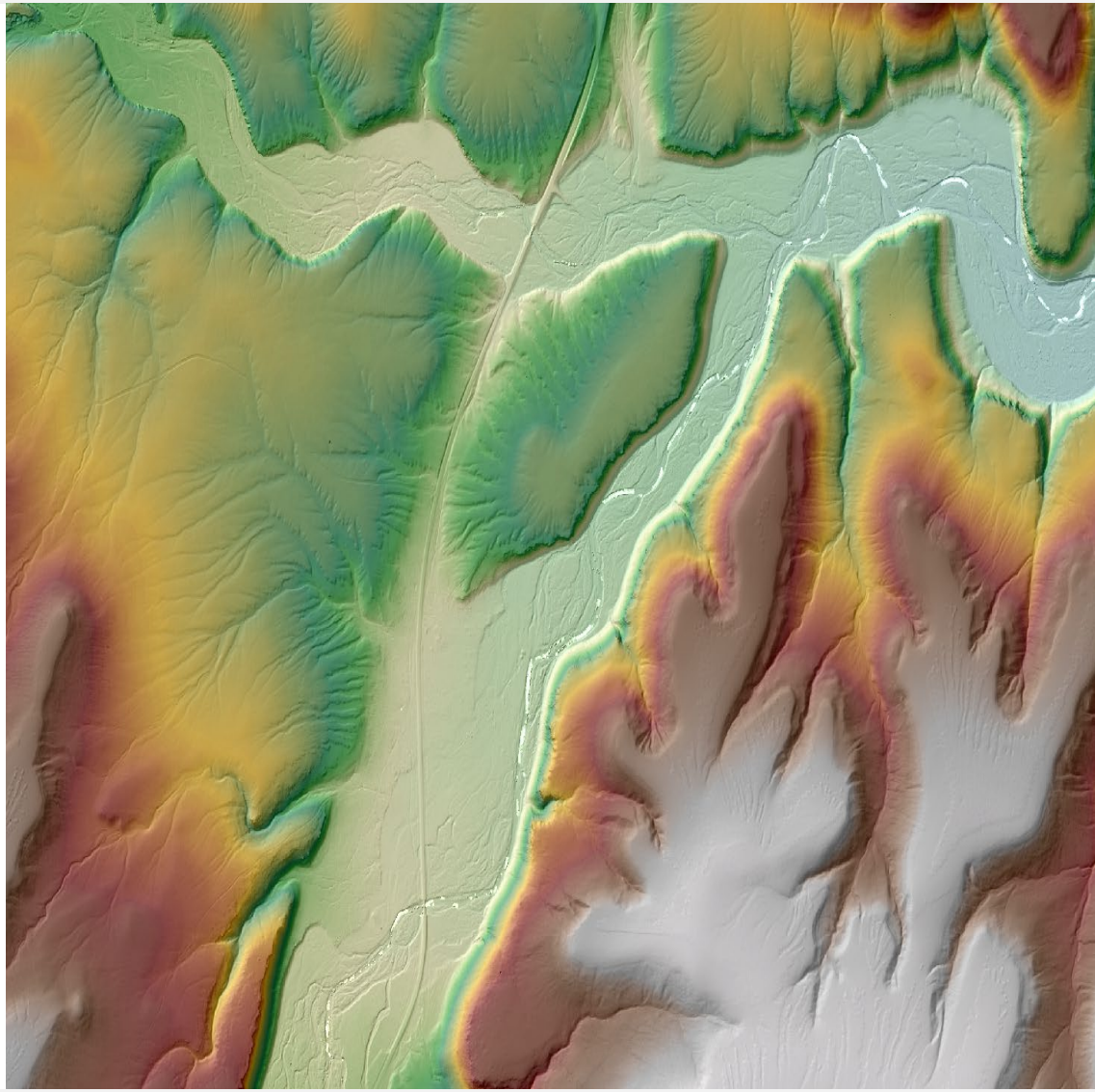


DELIVERABLES – LIDAR DERIVED – DIGITAL ELEVATION MODEL (DEM)

Hydroflattened (streams nominally wider than 30m, lakes and other water bodies >2 acres in size)

0.5 meter GSD resolution for QL1

GeoTIFF



DELIVERABLES – LIDAR Support – Intensity Images and MSHRs

Intensity Images

Intensity 8 bit, linear rescaling applied

256 color gray scale

0.5 meter GSD resolution QL1

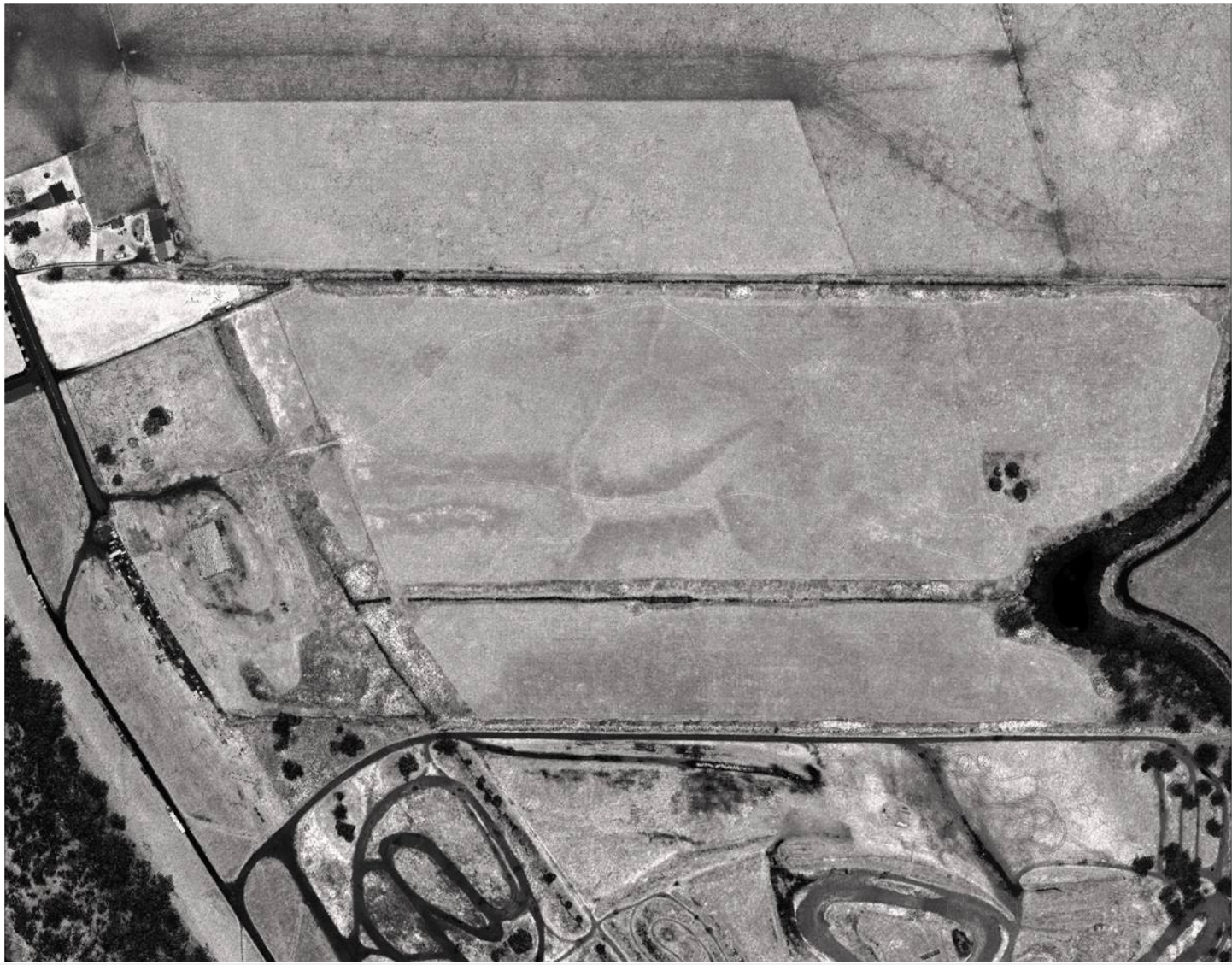
GeoTIFF

Mean Surface Height Rasters

Generated using all points except those flagged as withheld

1 meter GSD resolution QL1

GeoTIFF

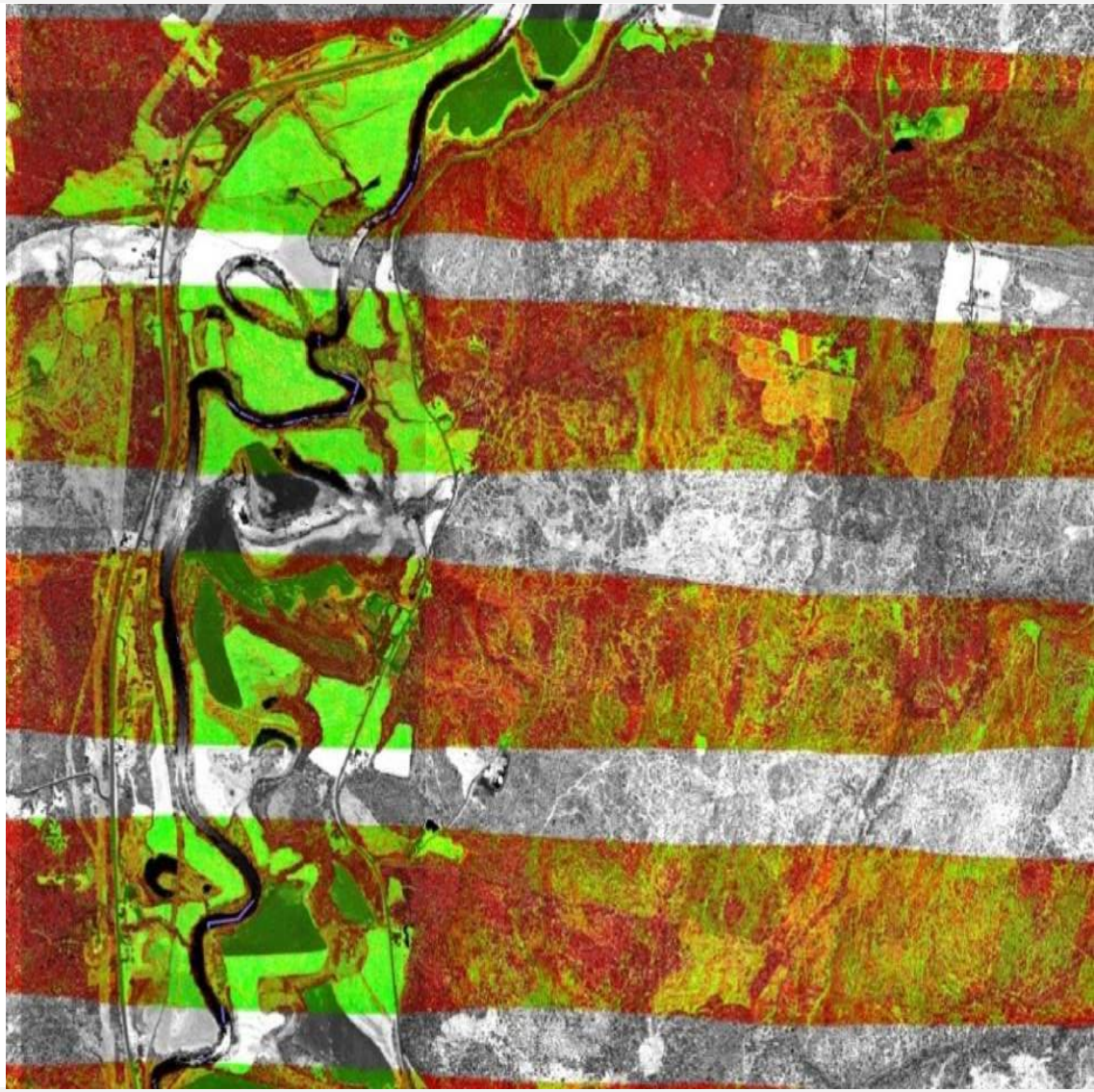


DELIVERABLES – LIDAR DERIVED – Swath Separation Images

A swath separation image shows inter-swath alignment (generated using last returns)

1 meter GSD resolution QL1

GeoTIFF



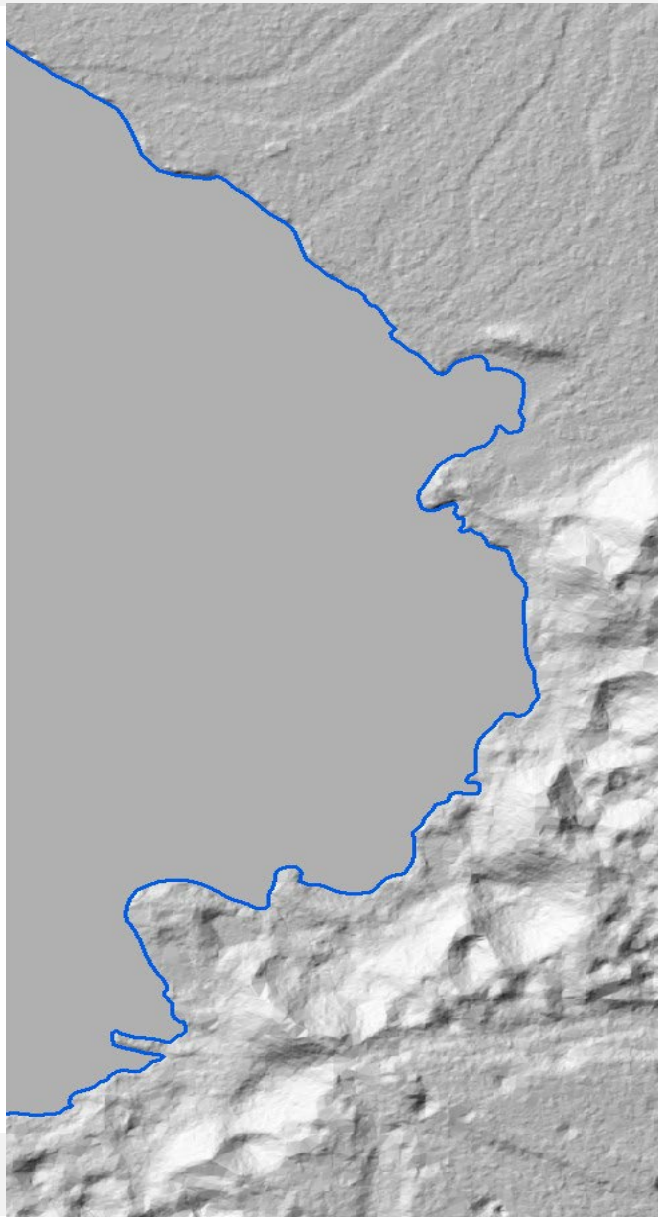
DELIVERABLES – LIDAR SUPPORT

Breaklines

- Breaklines will be provided in a single layer to the limit of the DPA in a shapefile (.shp), ESRI File Geodatabase (.gdb),or Geopackage format

Index

- Uniform for all tiled products, 1,000m x 1,000m, .shp



DELIVERABLES – REPORTING AND METADATA

XML Metadata for each deliverable type (FGDC compliant)

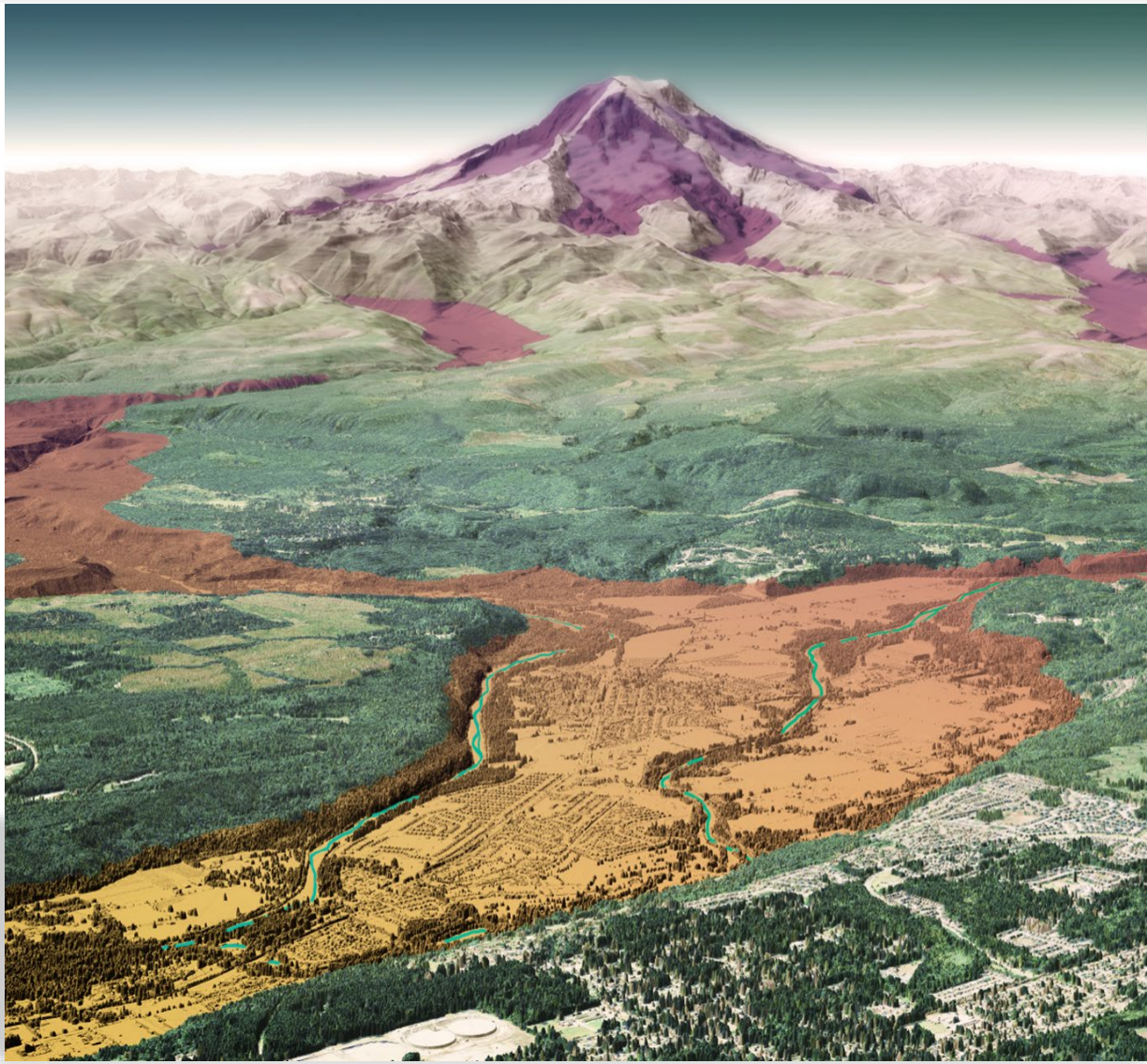
Reports:

- Ground Survey Report
- LiDAR Mapping Report
- Flight index
- Control locations

PROJECT SCHEDULE

- Complete all aerial and ground operations by May 31st, 2024
- Provide pilot data delivery to USGS by July 30th, 2024
- Preliminary data deliveries to project partners by November 27th, 2024.
- AOI Delivery to USGS for QA reviews by May 31st, 2025
- Final data copies shipped by December 31st, 2025
- USGS Final Acceptance January 30th, 2026

* Dates are dependent upon data collection completion timeline



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Thank you