

# Independent Verification and Validation

Steve Clifflen, IV&V Manager

**Intermap Technologies**

**Ottawa, Canada**

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# IV&V Overview

- ▀ Intermap established an IV&V team in 2004
- ▀ Part of Customer Care Department
- ▀ Work independently from Production
- ▀ Act as internal clients
  - Assess product accuracy, quality and usability
- ▀ Provide objective and unbiased feedback
  - Production, Sales, Management, External Clients
- ▀ Not QC, “look at the forest, not the tree”
  - Do not review all data
  - 10% sampling



# Verification

## Verify adherence to product specifications:

- Core Product Handbook
- NEXTMap<sup>®</sup> Edit Rules
- Accuracy Specs

## Data Comparison

- Ground truth points
- Other DEM sources
  - LiDAR, SRTM, MONA Pro Europe, National Elevation Dataset (USA)



## Using software/tools unused or unavailable to Production

- ESRI ArcGIS with Spatial Analyst & 3D Analyst
- Global Mapper

# Validation

- ▀ Ensure Core Products meet application requirements
- ▀ Validate suitability of NEXTMap<sup>®</sup> data in a variety of end-user applications:
  - Hydrology
  - 3-D Visualization
  - Line of Sight Analysis



# NEXTMap<sup>®</sup> IV&V Reports

## Production

Pre-Edit

- Mission Planning/  
Acquisition
- Image Processing/  
DEM Creation

Post-Edit

- Editing/Quality  
Control
- Data Delivery

## IV&V Reports



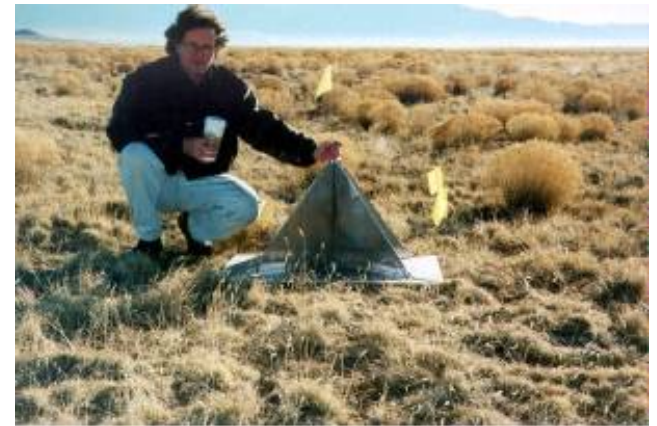
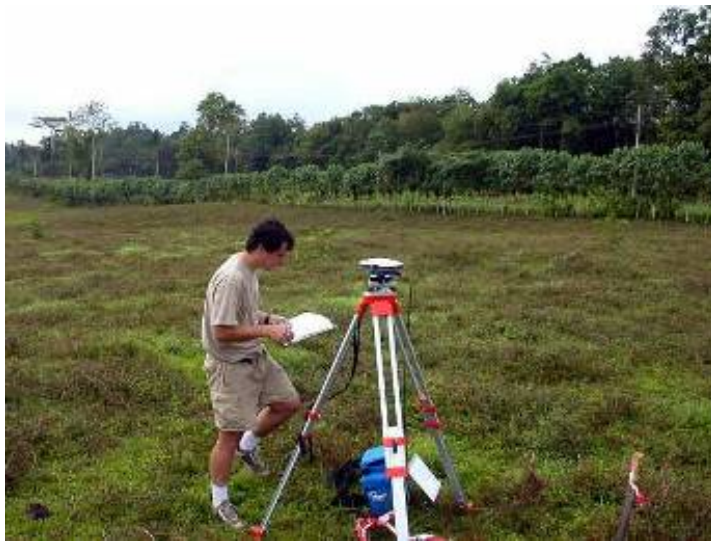
- Pre-Edit Reports



- Post-Edit Reports
  - 10% Tile Review
  - Final Report

# Base Station and Corner Reflectors

- ▀ Established prior to acquisition
- ▀ Ensure the horizontal and vertical accuracy is within 30cm
- ▀ Later used to tie-down the Intermap data



# Aircraft Motion and CORVEC Checks

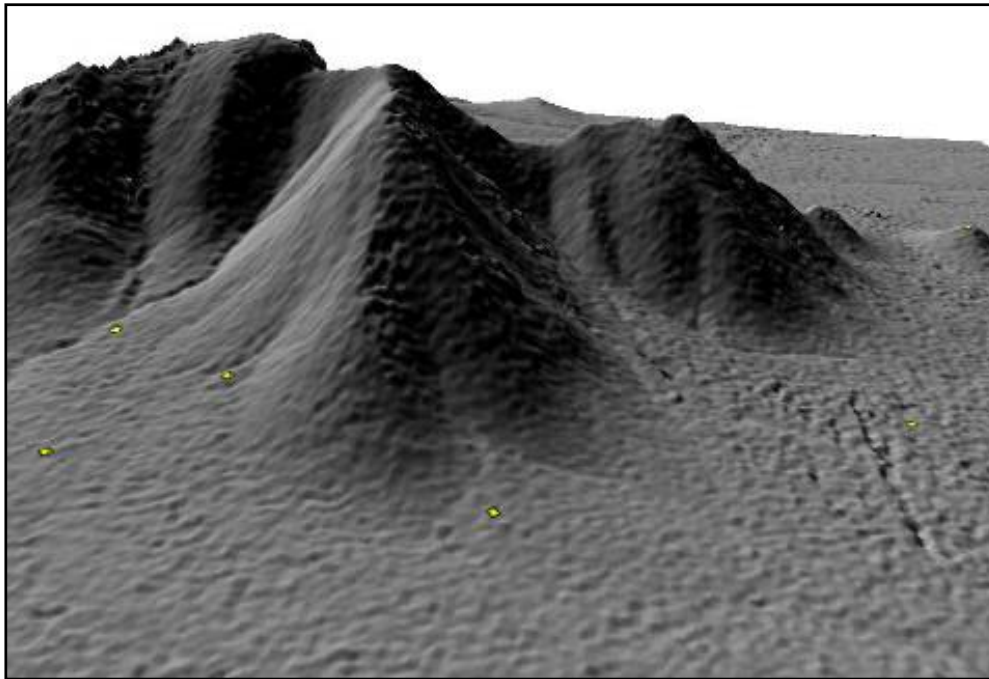
- Ensure that artifacts potentially introduced by the aircraft during acquisition (Motion\CORVEC) are within specified tolerances ( $\pm 1.0\text{m}$ )





# Pre-Edit Vertical Accuracy Assessment

- ▀ Checks vertical accuracy of the unedited data using ancillary ground control points
- ▀ Feedback on the general quality of input data
- ▀ Errors discovered are relayed to Production as early as possible

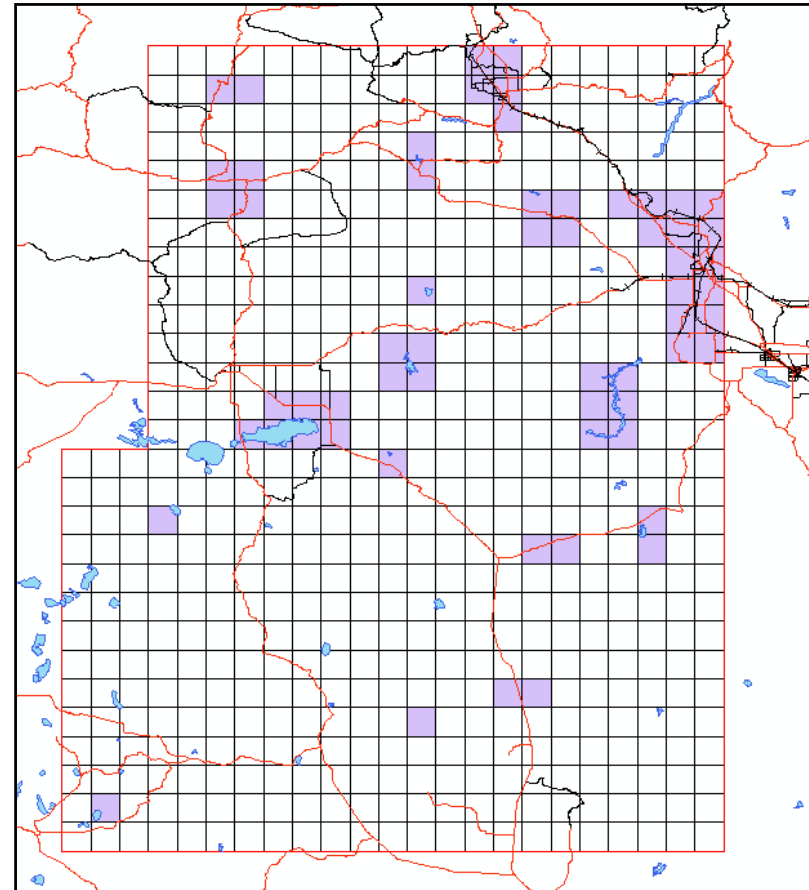




# Post-Edit NEXTMap® Block Initial Report (10% Tile Review)

10% of edited data is fully reviewed for:

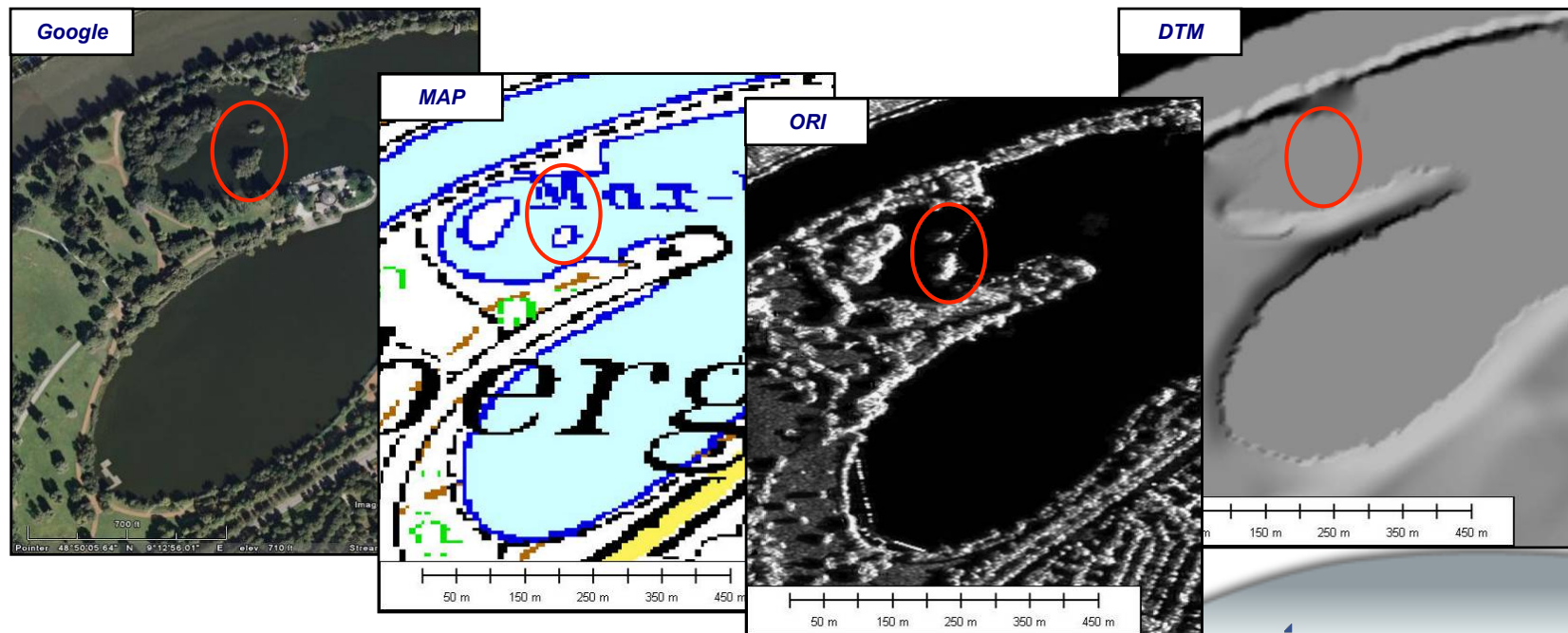
- Adherence to NEXTMap® Edit Rules
- Presence of ORI seam lines
- Degree of decorrelation and saturation
- Ensuring proper flow of streams and rivers



Sample tile selection for NEXTMap® Block

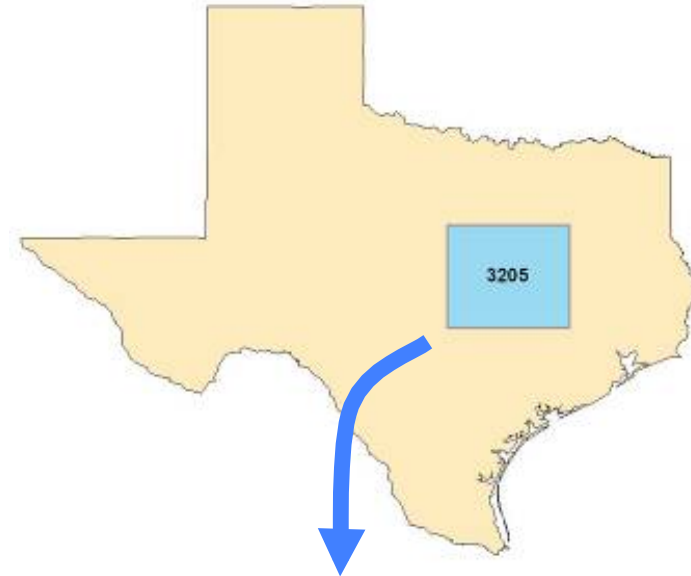
# Final Report

- Full summary of each NEXTMap<sup>®</sup> Block following delivery to Data Store:
  - Radiometric balancing in ORI
  - Invalid negative elevations
  - Block edge checks
  - Missing island checks
  - Completeness of data
  - Data comparisons (DSM and DTM to publicly available ancillary data)



# Final Vertical Accuracy Assessment

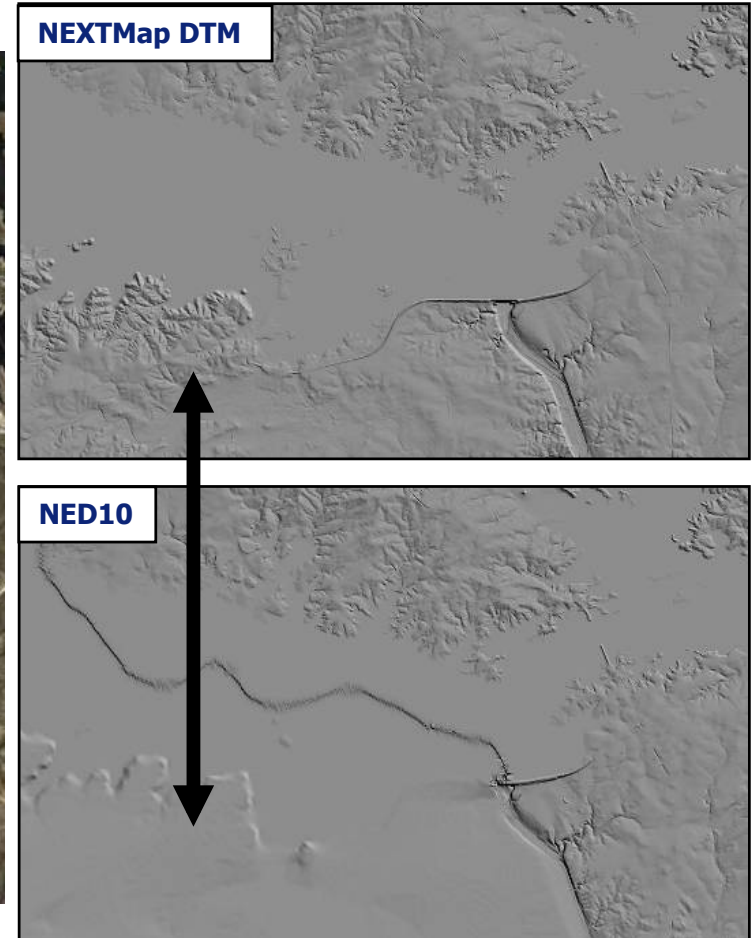
- Ensures DSM and DTM is within stated accuracy
  - Type II = Core Product
  - RMSE less than 1.0m and the 95<sup>th</sup> Percentile less than 2.0m
- Points are removed due to terrain\GPS conditions
  - Slope > 10°
  - Obstructed areas (urban and vegetation)
  - Surveyed point not on ground



Block 3205 - VCP Report

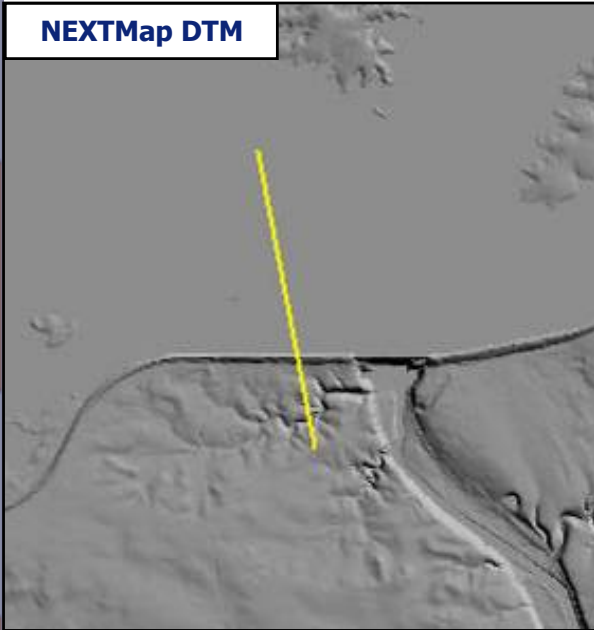
	DSM	DTM	NED30m	NED10m
Number of VCPs	103	103	103	103
Excluded points	13	5	5	5
Included VCPs	90	98	98	98
RMSE	0.65	0.51	1.40	0.92
95 Percentile	1.37	0.98	3.05	1.74

# Data Comparison - Amistad Reservoir



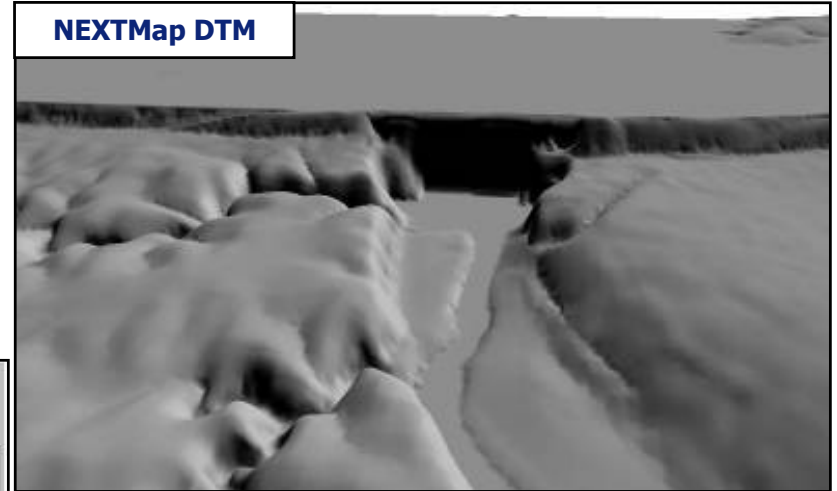


NEXTMap DTM



# Profile Comparison NEXTMap<sup>®</sup> DTM and USGS NED10

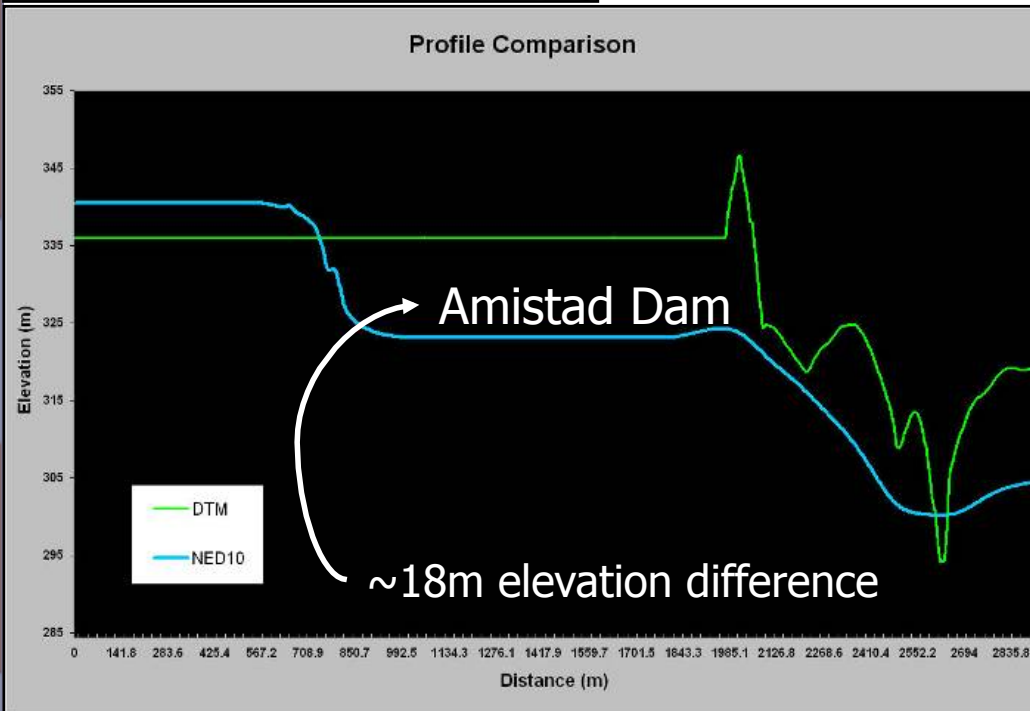
NEXTMap DTM



NED10



Profile Comparison



# Other IV&V Checks

- ▀ Value Added deliveries
- ▀ Core Product Repository (CPR) deliveries
- ▀ 3D Road Products reviews (under development)
  
- ▀ Miscellaneous requests for technical support from
  - PMs
  - Sales
  - LSAD

Questions/Comment?  
Thank You