

Topo and Hydrographic Lidar



United Nations
GGIM – Linking
Data Policy People

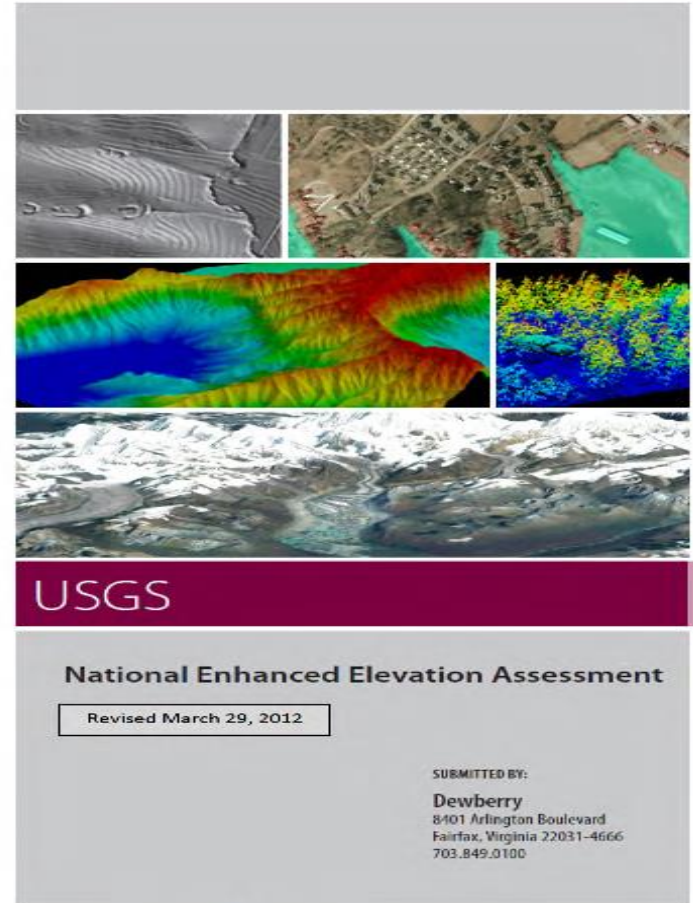
*James Van Rens
Riegl*

July, 2018

RIEGL LIDAR

National Mapping Policy- Background

[nea_final-
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12.pdf](#)



Congressional Information

- [Final Book Print2.pdf](#)

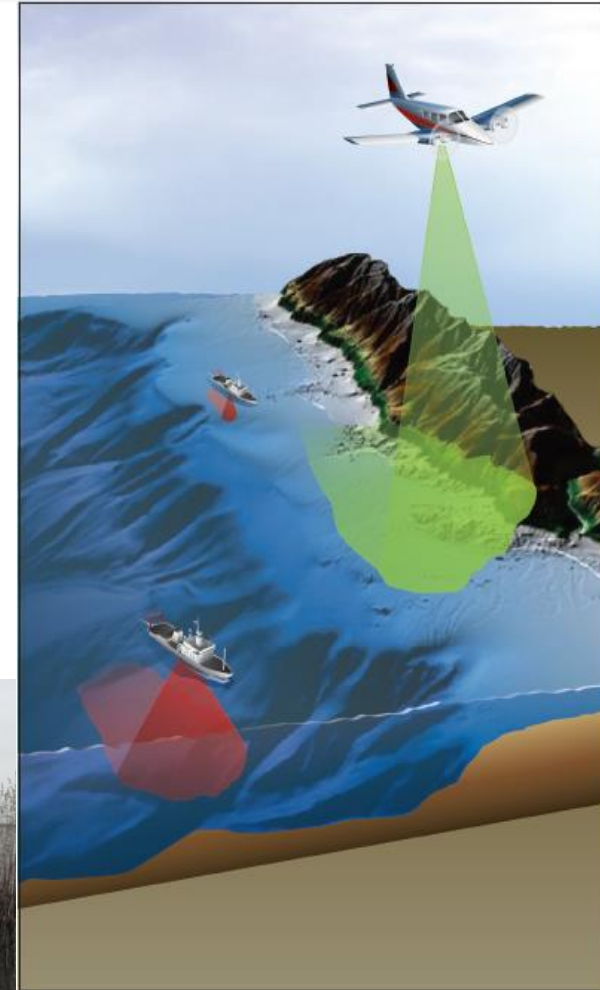


Coastal Mapping – Managing the Future

- ❑ **40% of the worlds population lives in the Coastal Zone – United Nations Data**
- ❑ **Most of the world’s Mega Cities are in the Coastal Zone**
- ❑ **The world has 356,000 KM of coastline –World Factbook**
- ❑ **Shoreline morphology is constantly changing**
- ❑ **The Benthic Zone management is critical to Human Survival**
- ❑ **Aggradation Zone and Flood Mapping for rivers and coasts impacts humans world wide**

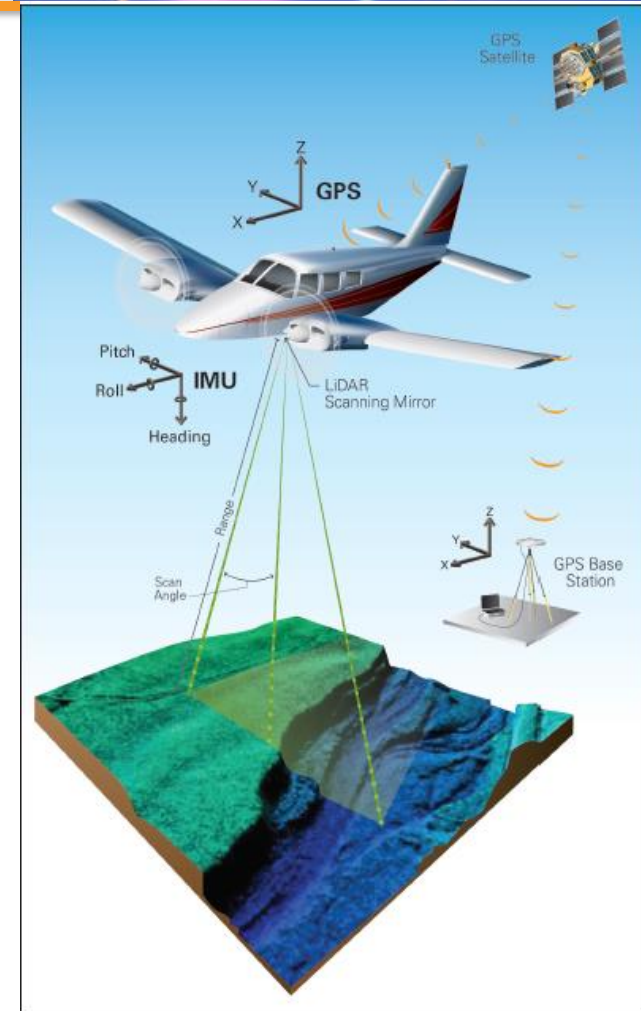
Why Topo- Hydrographic LiDAR?

- ❑ Complements Marine acoustic (multi-beam sonar) technology
- ❑ Airborne Topo-Hydro LiDAR is of high value in filling the “0 to 10 m” depth gap in coastal and riverine areas
- ❑ Rapid survey of shallow water areas that are difficult, dangerous, or impossible to get using water borne methods
- ❑ •Ability to rapidly assess riverine and estuary environments: channel cross sections, biological habitat, riparian conditions

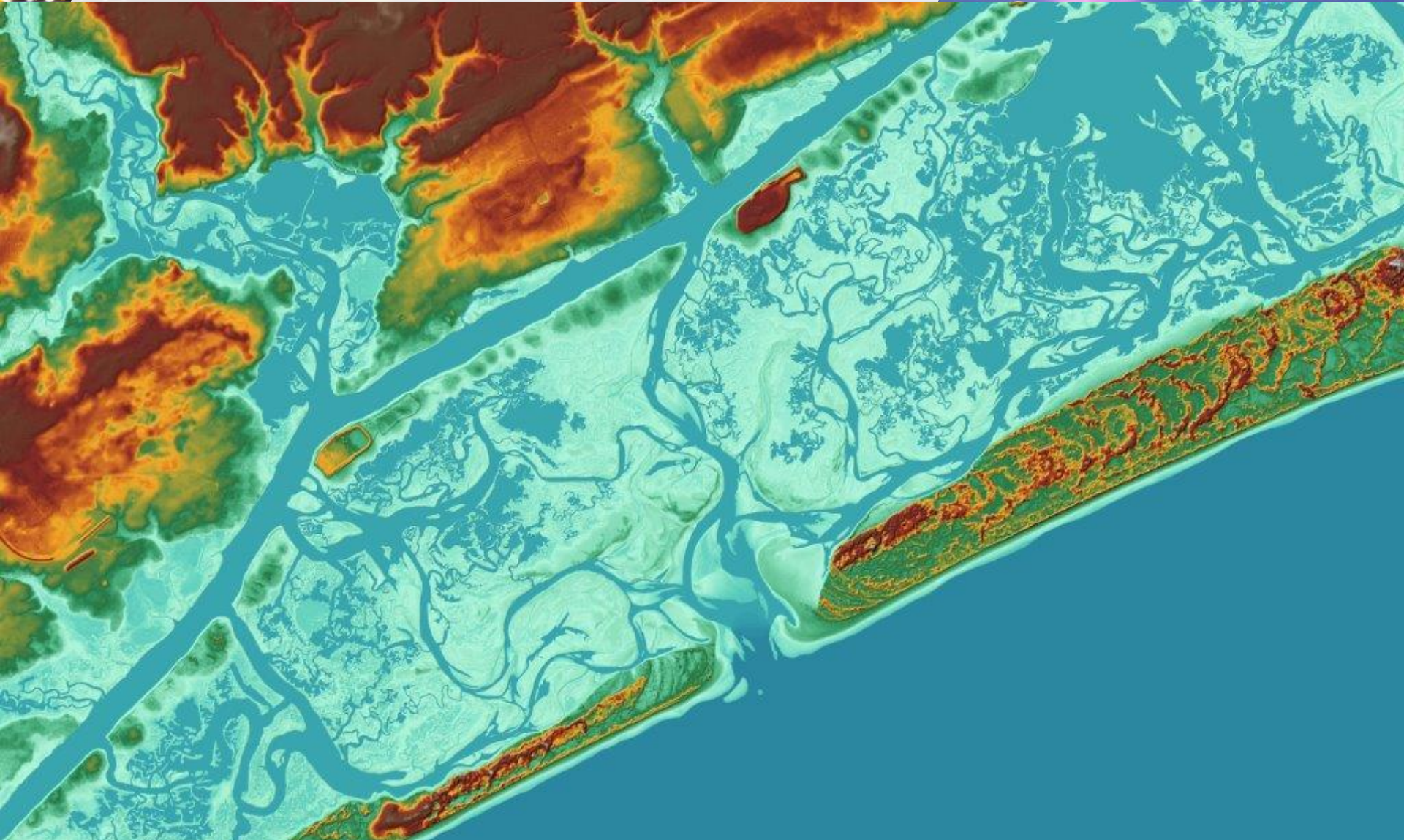


Airborne Topo-Hydro LiDAR

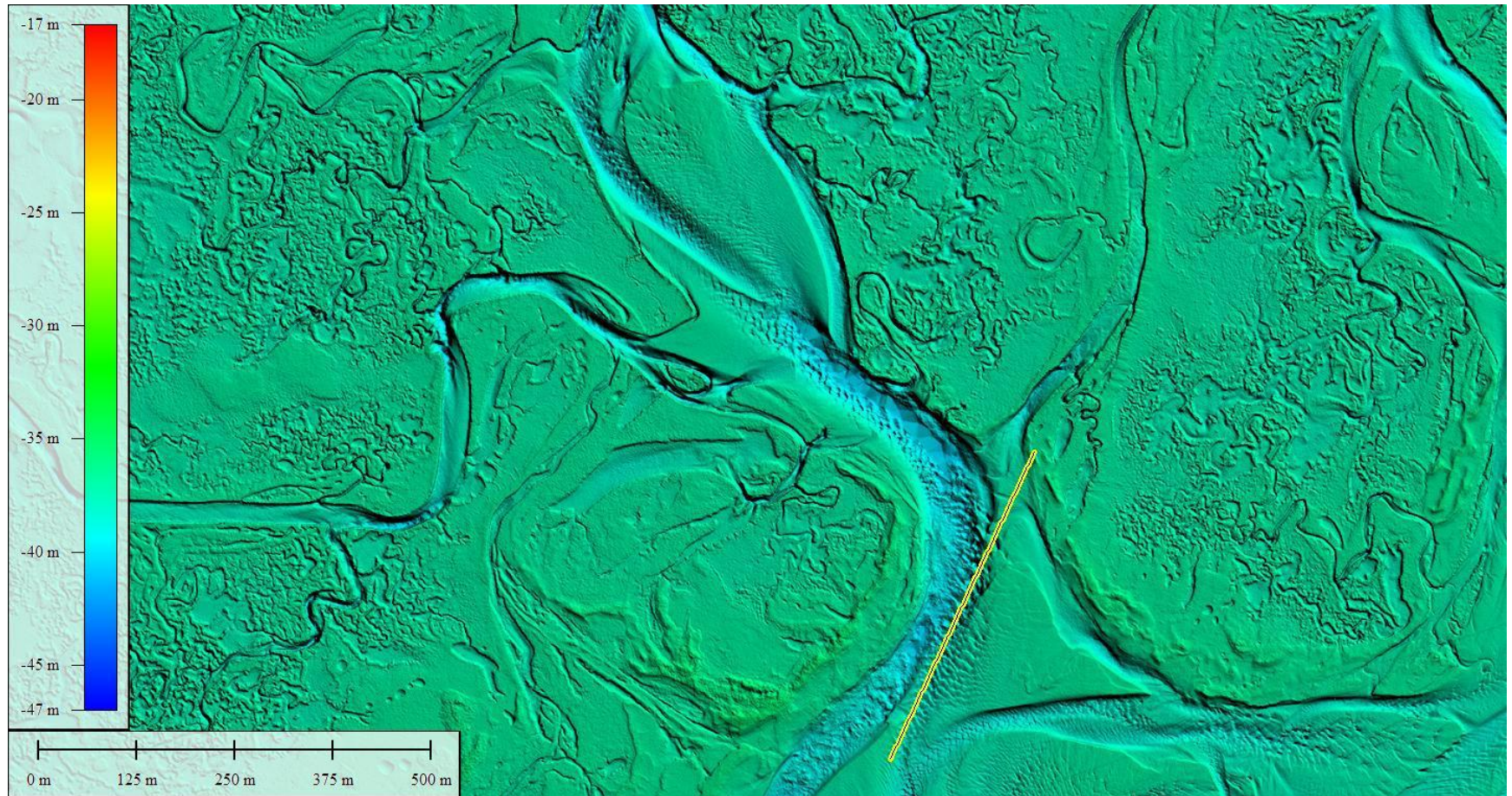
- ❑ Airborne remote sensing technique used to measure the height of the surface on land and underlying streams, rivers, lakes, bays, and shallow coastal waters in moderately clear water column conditions.
- ❑ The depth range of bathy LiDAR systems is primarily limited by
 - ❑ water clarity (turbidity)
 - ❑ bottom reflectivity
 - ❑ type of LiDAR system being used.
- ❑ Current bathy and Topo-Hydro LiDAR systems have depth performance of 1 to 3 times the Secchi depth.



Why Rieggl Topo-Bathy?

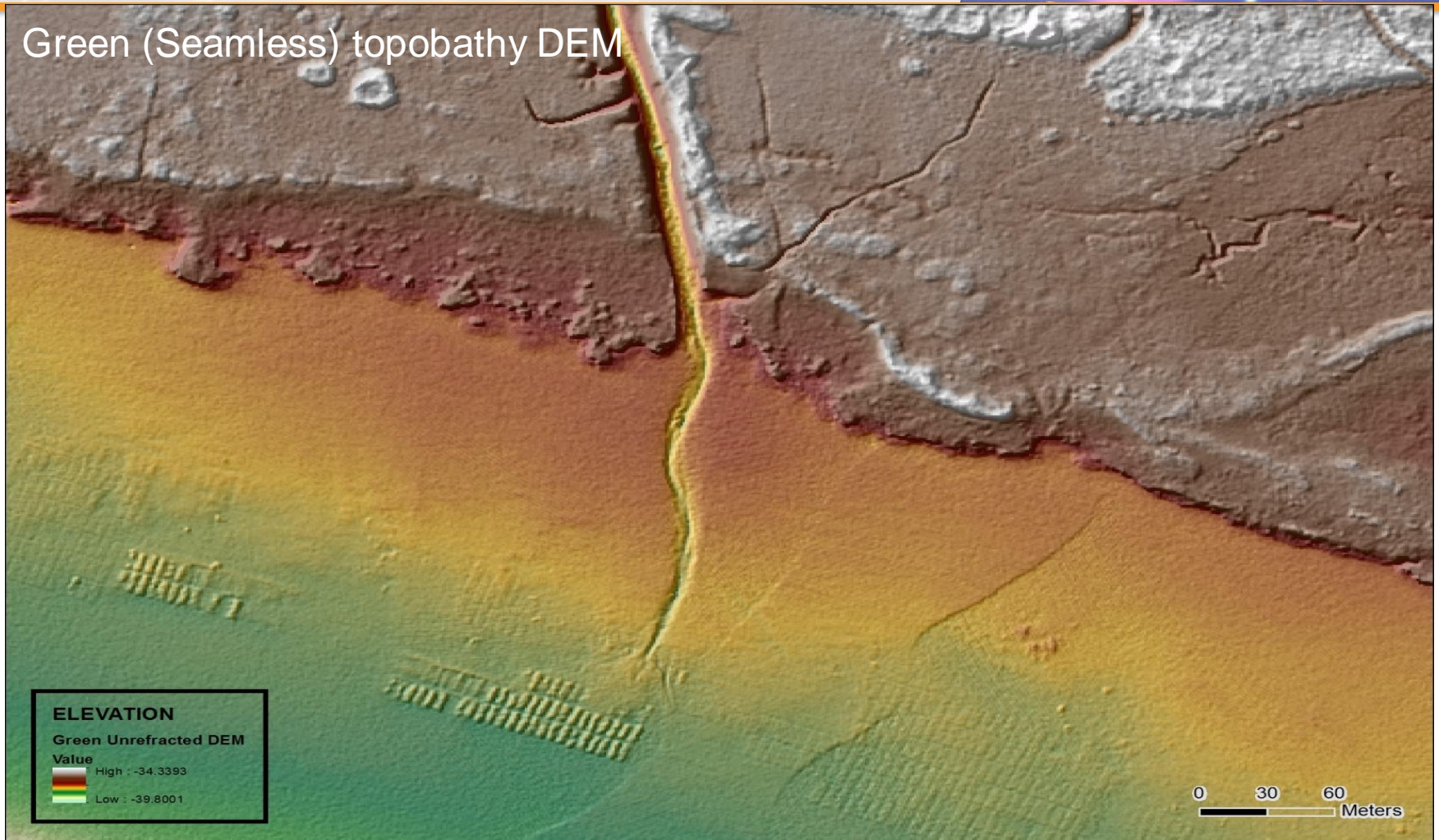


Riverine and Aggradation Zones

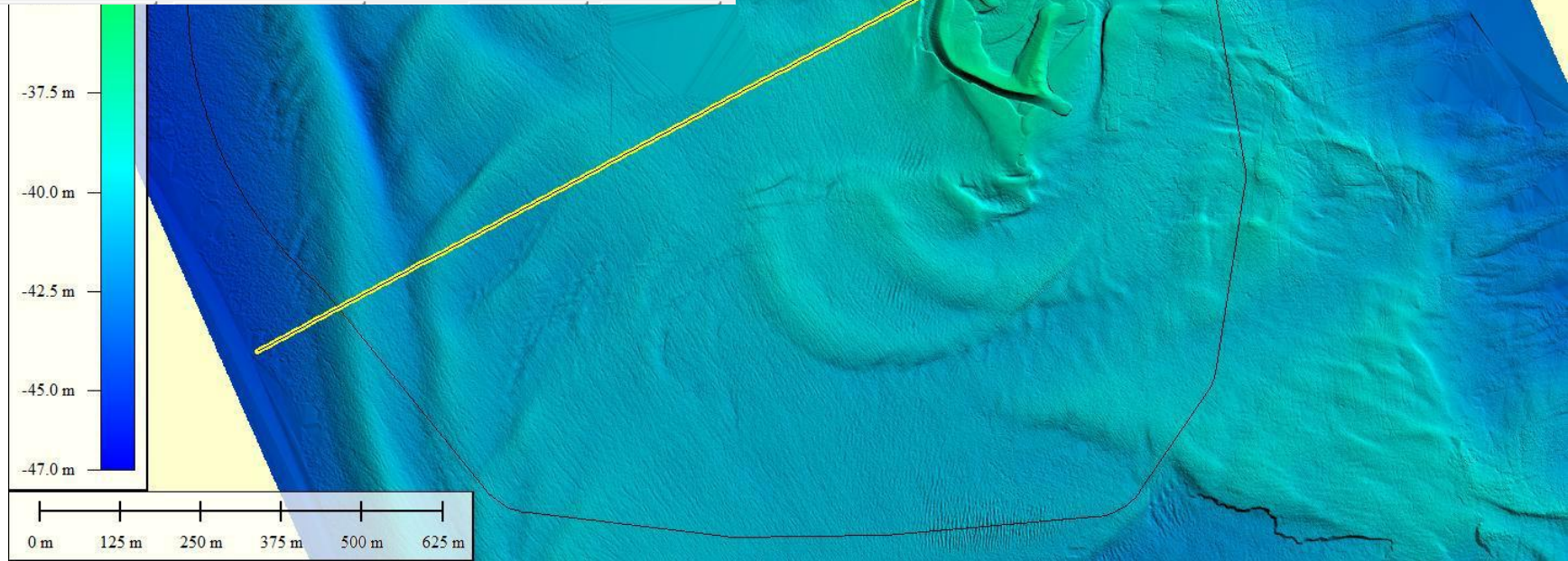
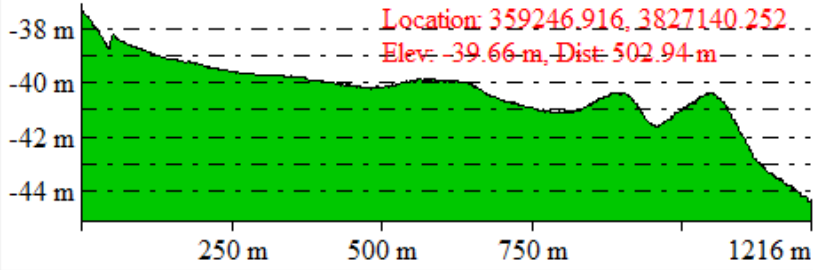


Underwater Features

Green (Seamless) topobathy DEM



Ocean Performance



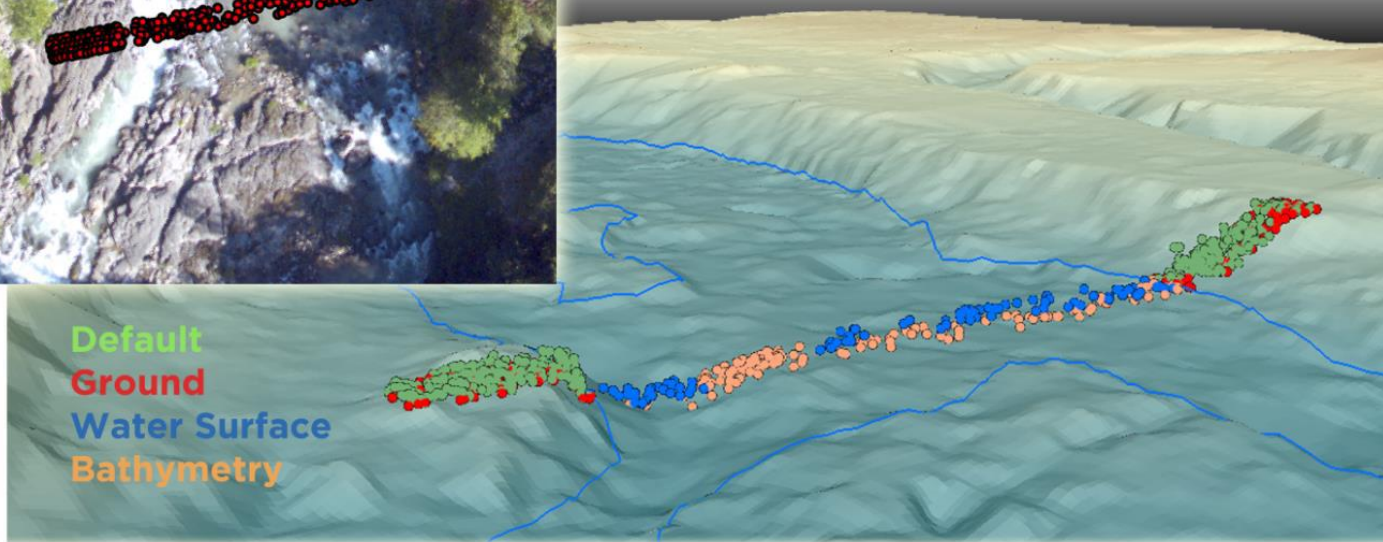
Water Channels



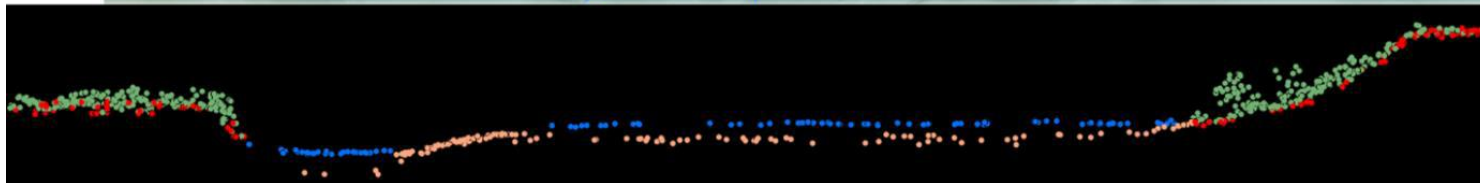
River Mapping



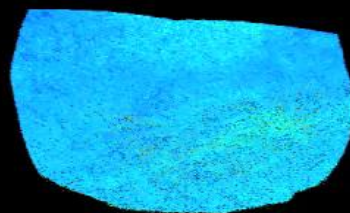
The top left image is the orthoimagery with a cross section of LiDAR returns in red. The middle image is a 3D representation of the gridded bathymetric model with classified LiDAR cross section. The bottom image is the LiDAR alone highlighting two pools in the river.



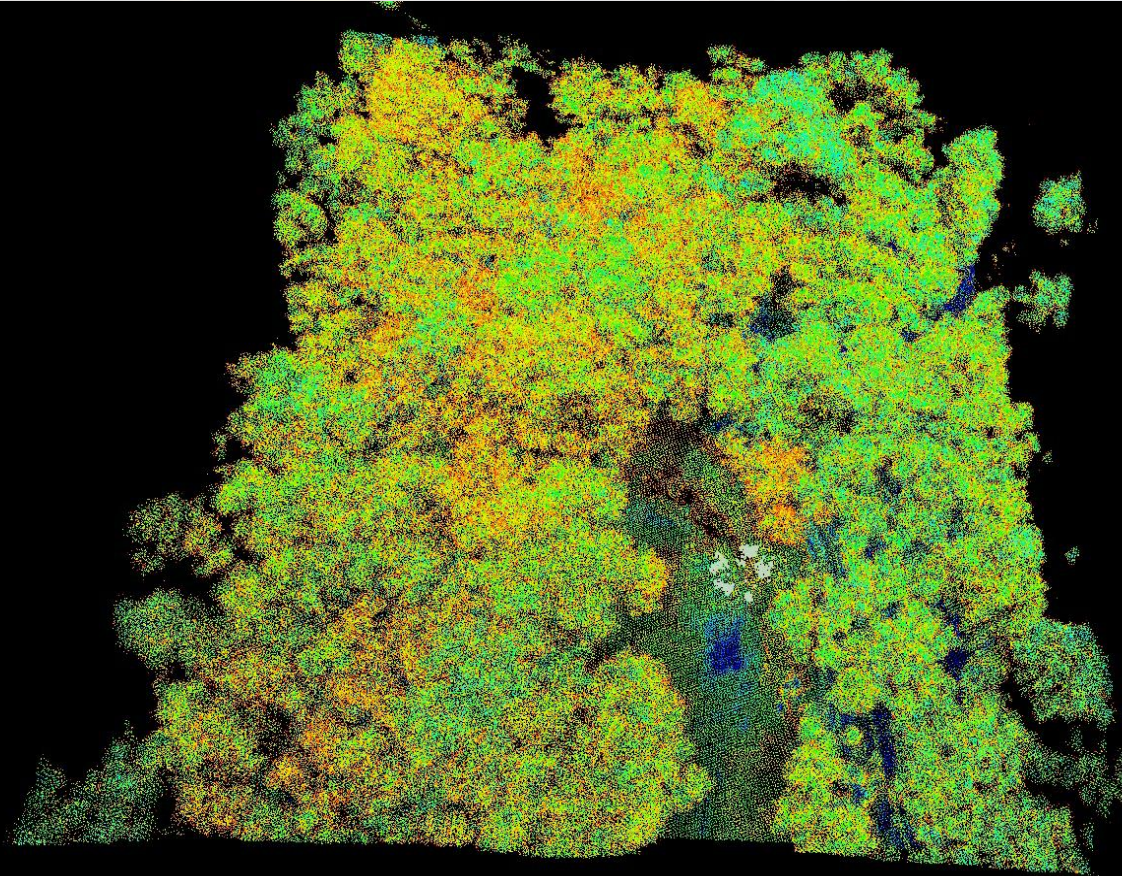
Default
 Ground
 Water Surface
 Bathymetry



Small Caribbean Reef



Florida Springs with Manatees



National Mapping Policy BackGround

[nea_final-report_revised-3-29-12.pdf](#)

1. Executive Summary

National Enhanced Elevation Assessment (NEEA)

The U.S. Geological Survey (USGS) and other members of the National Digital Elevation Program (NDEP) sponsored the first-ever national assessment to document Business Use requirements for and benefits of national enhanced elevation data that would significantly expand national elevation data availability, quality and usability. The goal of the assessment was to develop and refine requirements for a national program and to identify program implementation alternatives, costs and benefits for meeting priority national elevation data needs. The assessment quantifies answers to three key questions.

1. Is it more cost effective for the government to manage these activities within the context of a national program?
2. Are there additional national or agency benefits derived from such a strategy?
3. What does the optimized program look like?

The assessment results provide significant evidence that an enhanced national elevation program could provide conservatively-estimated net benefits between \$116M/year and \$620M/year and Benefit/Cost Ratios between 4.3 to 1 and 4.9 to 1, depending upon options implemented.

RIEGL LIDAR

Coastal Wetlands Restoration



Why Riegl is Better!

- ❑ excellently suited for combined land and hydrographic airborne survey
- ❑ high-accuracy ranging based on echo digitization and online waveform processing with multiple target capability
- ❑ high spatial resolution due to ultra high laser repetition rates
- ❑ compact, rugged and light-weight modular configuration, compatible with standard airborne platforms
- ❑ optional waveform data output, data accessible with RiWAVELib
- ❑ RiHYDRO and RiProcess Processing Software

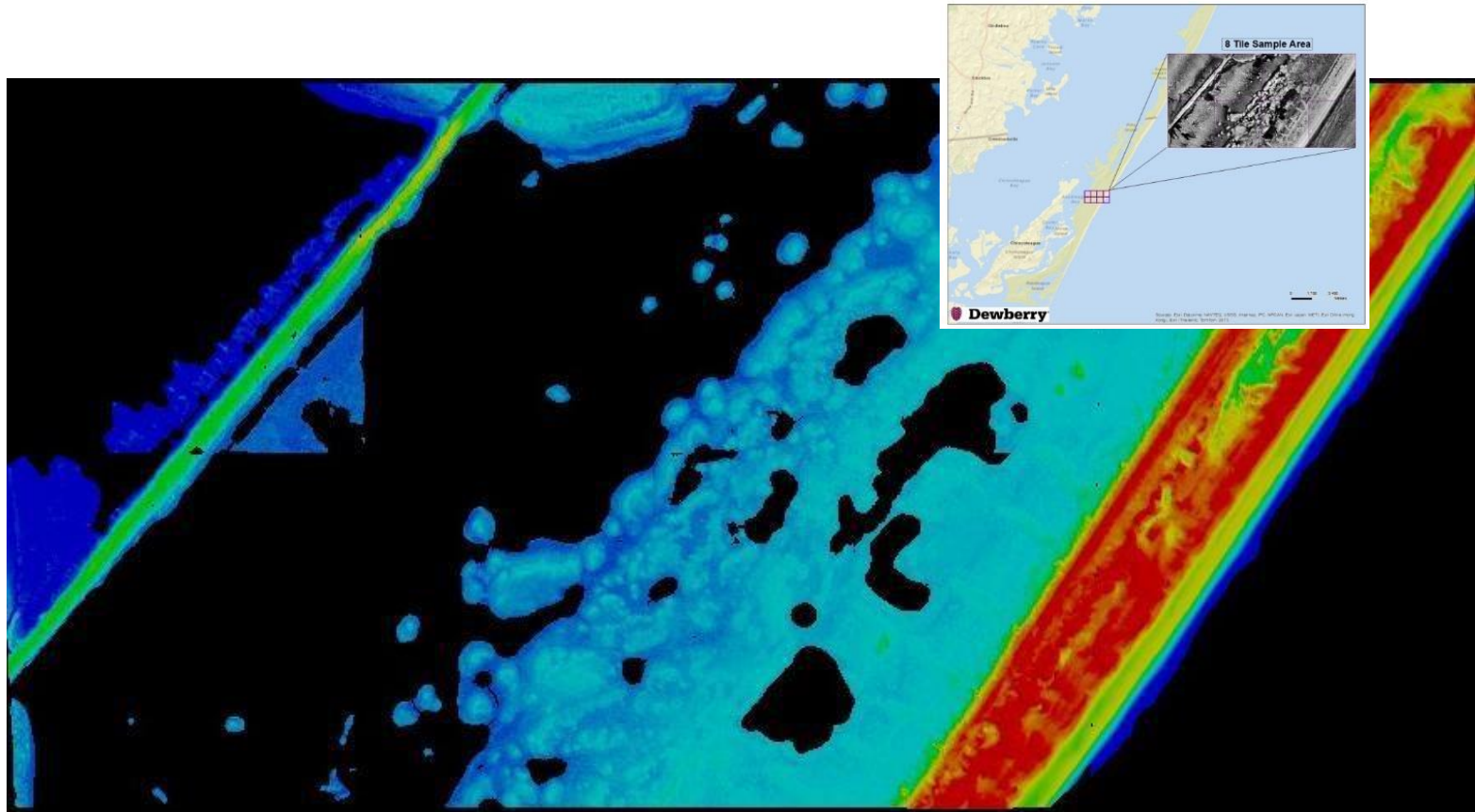
How Does Riegl Do It?

- High Laser Repetition Rates
- Superb signal processing
- Excellent system integration
- Short pulse laser shots
- Complete software package

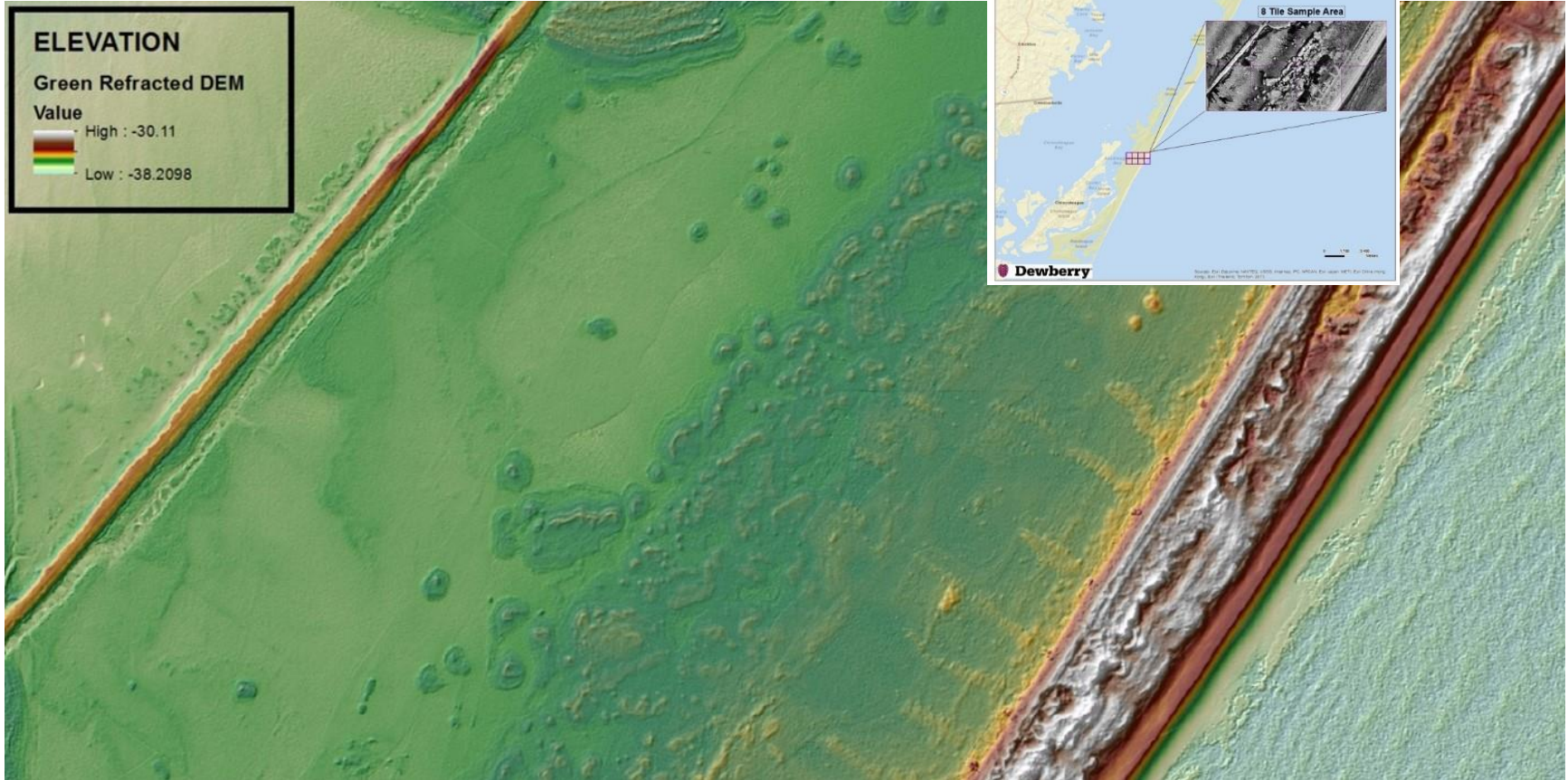
Project Example-Coastal Island – Imagery 7 cm resolution RGB



Topo Lidar Only



Topo-Hydro Seamless DEM



Sea Grass Test – with Document

- ❑ [Analysis of Laser Returns and Waveform on Shallow Underwater Vegetation.pdf](#)
- ❑ Gulf of Mexico near shore test of sea grass mapping to assess the distribution and health of sea grass beds
- ❑ Differentiation of sea grass types
- ❑ Assessment of Reflectance as a tool to replace satellite reflectance mapping

VQ-820G Test in Florida – with Document

- [RIEGL ExecutiveSummary VQ-820-G-Florida](#)
- Reliable coverage of the sea bottom under the water properties
- Beyond 5 m depth, seafloor returns are only achieved for clear water and bright targets (e.g. sand).
- The border between land and water- excellently capturing urban features.
- Comparison to existing data captured by sonar and another bathymetric laser scanner showed excellent agreement of the different results

Multi-Spectral Aspect of Topo-Hydro – with Document

- [multispectralLiDARsummary \(1\).pdf](#)
- ❑ **Vegetation Classification:** Multispectral LiDAR data has been used to judge the optical properties of a tree's leaves and the structure of the tree itself.
- ❑ **Terrain Classification:** Dual-wavelength airborne LiDAR operating capable of classifying common suburban
- ❑ **Ecological Diversity:** Beneficial for ecological impact studies.
- ❑ **Benthic Habitat Complexity:** measure structural complexity in benthic habitats for species diversity and biomass.
- ❑ **Coastal Erosion:** Longitudinal studies of coastal erosion for more complete understanding of the morphological differences across time and changes in the littoral and intertidal zones

Questions?

