Using MoDaC®
To Collect Finish Floor Elevations for IHRM and Sea Level Rise Studies in NC
Presentation Outline

• The Technology
• Project Description and Project Team
• Proof of Concept
• Attribute Extraction
• Pointcloud Examples
• Simultaneous Photography
• Other Coastal Applications for MoDaC
The Technology
Mobile Scanning Components

Two 3D Laser Scanners
Two GPS Units
One Inertial Measurement Unit (IMU)
One Digital Measurement Instrument (DMI)
Two Digital Cameras
The Technology
Dual Sensor System

- Minimize laser shadowing
- Optimize Field of View (FOV)
- Sensor will see everything behind the vehicle
- Sensor will see ~45° in front of vehicle
- Full 360° area coverage, all sides captured
- Sensor arrangement facilitates effective corridor mapping.
Project Description and Team

- NCGTM (North Carolina Geospatial Technology Management)
- Team – AMEC & McKim & Creed
- Objectives - Collect the First Finish Floor Elevation (and Other Attributes) on all Occupied Structures that exist within the 500 Year Floodplain
  - Other Attributes
    - Foundation Type
    - Number of Floors
    - Roof Pitch (flat, moderate, steep)
    - Vegetation
- Data Would be used for IHRM (Integrated Hazard Risk Management) and Sea Level Rise Studies
Data Collection Method
Data Collection Alternative
Proof of Concept
NCDOT - 2009

- Capture hard surface data at highway speeds (up to 70 MPH)
- Vertical accuracies within 0.05’ (1/2” +)
- Bridge clearance information
- Planimetric features (pavement markings, signs, guardrails, manholes, etc.)
Proof of Concept
Grand Conceptor Award for 5 Mobile Scan Roadway Projects (ACEC)
Wrightsville Beach Finish Floor Elevations
Proof of Concept
Proof of Concept
2002 Finish Floor Elevations Study for
USACE / NC Sea Grant
Proof of Concept
2002 Wrightsville Beach Floor Elevations

May 2002:
Test consisted of four parts:

- Comparison of floor elevations using different survey methods of 54 structures.
  1. Directly measuring floor elevations with survey grade GPS X
  2. Differential leveling from GPS established benchmarks ✓
  3. Laser rangefinder elevations linked to GPS ✓
  4. Level rod measurements from a GIS derived ground elevation adjacent to structure X

- Evaluation of laser rangefinder error with distance.
- Evaluation of laser rangefinder repeatability with different operators.
Proof of Concept
2010 Extracted Finished Floor Elevations
Proof of Concept
Point Cloud Top View – Wrightsville Beach
Proof of Concept
Accuracy - MoDaC® vs. Other Methods

Survey Methods (Delta Z)

- Delta Elevation
- Number of Structures

- Diff Levels
- GPS w/ laser
- MoDaC
Proof of Concept
Production - MoDaC® vs. Other Methods

- Differential levels took a 2 man crew on average over 5 minutes per structure (not including the time to set control)

- RTK / VRS w/rangefinder took 1 man more than 2 minutes per structure.

- MoDaC™ collection (with 2 men) took 10–30 seconds per structure. No additional data collection time was needed to get high and low adjacent ground elevations or top of roof elevation.
Point Cloud Examples
Collected from Side by Side
Point Cloud Examples
Collected from 4x4
Point Cloud Examples
Collected from Boat
Point Cloud Examples
Collected from Boat
Point Cloud Examples
Collected from Boat
Point Cloud Examples
Collected from Boat
Point Cloud Examples
Collected from 4x4
Point Cloud Examples
Wrightsville Beach 12’ MSL Simulated Storm Surge
Point Cloud Examples
Adding Aerial Imagery
Point Cloud Examples
MoDaC® on Side by Side
Other Coastal Applications

Beach Profiles and Volumes
Photography
360 Photos and Video

New Camera System

Point Grey - Ladybug 3
- 6 – 12mp cameras
- 12 frames per second
- Onboard compression
Photography
360 Photos and Video
Other Coastal Applications
MoDaC & Multibeam
Other Coastal Applications
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MoDaC & Multibeam
Other Coastal Applications
MoDaC & Multibeam in Civil 3D
Why use MoDaC – Mobile Data Collection

Collect data day or night (cameras restricted at night)
Comprehensive Data, collect millions of points per minute at posted roadway speeds
Faster coordinate acquisition
Safer, field personnel are not in the roadway
Allows data extraction in office environment (Scan in the Can)
Non-Intrusive Surveying
Deliverables in Familiar Formats
What’s Next