NOAA Update

Mike Aslaksen

Chief, Remote Sensing Division

NOAA's National Geodetic Survey

17th Annual JALBTCX Airborne Coastal Mapping & Charting Technical Workshop

National Oceanic and Atmospheric Administration

Outline

- National Geodetic Survey Remote Sensing Division
  - FY15 and16 metrics and plans
  - Riegl VQ-820G to VQ-880G upgrade
  - Oblique imagery (AK, etc.) Emergency Response
- Office of Coast Survey
- Office of Coastal Management
- Natl Centers for Coastal Ocean Science
- Vdatum update

National Ocean Service

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*Donna Rivelli**

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Juliana Blackwell

National Centers for Coastal Ocean Science
Mary Erickson

Office of National Marine Sanctuaries
*John Armor**

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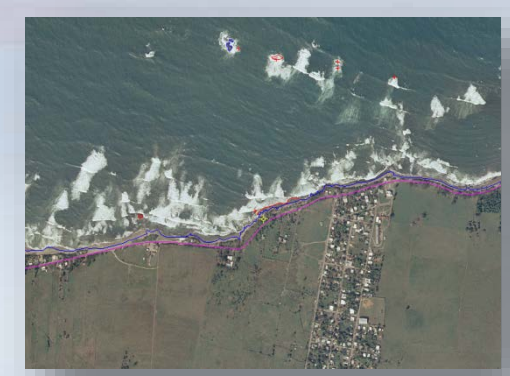
Richard Edwing

NOAA Ocean and Coastal Management Services
Dr. Jeff Payne

*Acting

Background

- U.S. Department of Commerce
  - National Oceanic Atmospheric Administration (NOAA)
    - National Ocean Service
      - National Geodetic Survey
        - Remote Sensing Division
- Primary programs
  - Coastal Mapping Program
  - Aeronautical Survey Program
  - Emergency Response



National Oceanic and Atmospheric Administration

NOAA's Coastal Mapping Program

- Define the National Shoreline and nearshore elevation data
- NOAA nautical charts
- Other important applications:
  - Used in defining the United States' territorial limits
  - Coastal resource management
  - Storm surge and coastal flooding modeling
  - GIS analysis
  - Benthic habitat mapping
- Coastal Intelligence and Resiliency…

National Oceanic and Atmospheric Administration

CMP FY15 Metrics

- 10763 miles* of shoreline compiled (6.5% of US)
- Updated shoreline for >189 nautical charts
- Shoreline updates compiled for >25 ENCs
- 36 ports updated with new shoreline
- 40 ports analyzed for change (CSCAP)

*miles measured at 1:80,000 scale

FY15 CMP Year-end Shoreline Mileage Summary

DONE (QA / Released)	
MN1401 Ⓟ Port of Duluth-Superior CSCAP	74
TX1106A R Northeast Aransas Bay	3
MD0404C R Tangier Sound/Contract	307
PA1502 Ⓟ R Port of Erie CSCAP	46
LA0702D American Bay- Breton Snd AFE/MS	246
AK0901 @ R Pavlof Bay MS	269
AK1201A R Hetta Inlet and Natzuhini Bay MS	156
MA0902 R Merrimack River & Plum Island Sound	166
NY0901A R Lk Champlain/Cham. Canal/Contract	108
NY0901B R Champlain Canal/Hudson R./Contract	163
ME1101K Burnt Coat Harbor	17
NC0801C Kitty Hawk to Rodanthe IOCM	420
AK1501 R S. Baranof Island	1
AK1201B R N Cordova Bay to Klakas Inlet MS	176
NC1001A R ICW, Rich Inlet to Myrtle Grove Snd	236
MA1101A R Nauset Harbor	39
VA0601A South Rappahannock/Contract	182
VA0601C North Rappahannock/Contract	287
FL1508 Ⓟ R Port Canaveral	24
VA0601B Rappahannock/Contract	206
LA1002G Ⓟ Miss., Buras toSixty Mile Pt/Contract	194
GA1402 Ⓟ R Port of Brunswick CSCAP	611
IL1501 R Burnham Park South	2
AK1201C R S Cordova Bay to Brownson Bay MS	172
CA1210-CS-N Ⓟ Stockton Deep Water Chan CSCAP	127
NC1001B R ICW, Myrtle Grove Sound to Oak I.	262
TX1107-CS-N Ⓟ Matagorda Ship Channel CSCAP	95
CA1211A R Smith River	27
AK1408A-CM-T R Falcon and Ford Arms MS	51
CA1212B R Petaluma River	112

CONT'D	
NJ1102B-CM-N Ocean City (w/lidar)	150
NJ1102C-CM-N Atlantic City (w/lidar)	104
MI1501-CS-T Ⓟ Port of St. Clair CSCAP (no comp)	4
CA1401-CS-N Ⓟ Port of Humboldt/Eureka CSCAP	120
TX1102-CS-N Ⓟ Brownsville Ship Channel	66
FL1401-CS-N Ⓟ Port of Key West CSCAP	97
FL1402-CS-N Ⓟ R Port of Panama City CSCAP	19
HI1504-CM-T R Pearl Harbor Entrance	7
NC1002A-CM-N R Coquina Harbor, ICW	2
ME1501-CM-T R Bar Harbor	1
CA1501-CM-T ⓅⓅ R Ports of LA/Long Beach (chgs only)	88
GA1003B-CM-N R Southern Savannah River/Contract	291
GA1003A-CM-N R Savannah River/Contract	216
MS1501B-CS-N Ⓟ R Port of Biloxi CSCAP	68
TX1502A-CS-N Ⓟ R Port of Houston CSCAP	203
FL1303A-CM-N R Marco Island	201
AK1106B-CM-T @ R SW Nunivak Island MS	164
NY1402-CS-T Ⓟ R Port of NY/NJ CSCAP	210
MA0901A-CM-N Ⓟ R Northern Buzzards Bay	244
AK1107C-CM-T R Sumner Strait to Threemile Arm MS	210
TX1401-CS-T Ⓟ Port of Matagorda CSCAP	153
AK1107A-CM-T R Davidson Inlet and Warren I. MS	102
FL1503C-CS-N Ⓟ Port Manatee CSCAP	18
OH1502-CS-N Ⓟ Port of Conneaut CSCAP	18
FL1503A-CS-N Ⓟ Port of Tampa CSCAP	43
MA1101B-CM-N R Chatham Harbor to Monomoy Island	107
SC1401A-CM-N R Southern Edisto Island	103
MS1501C-CS-N Ⓟ Port of Pascagoula CSCAP	82
FL1503B-CS-N Ⓟ Port of St. Petersburg CSCAP	16
TX1402-CS-N Ⓟ Port of Victoria CSCAP	166

CONT'D	
LA1002A-CM-N Mississippi R., SW Pass/Contract	353
FL1513-CM-T R Redfish Pass	10
AK0902B-CM-T Copper River Delta/Contract MS	393
CA0901-CM-N Sacramento River to Colusa	221
FL1403-CS-N Ⓟ Port of Miami CSCAP	61
HI1501-CS-T Ⓟ Port of Hilo CSCAP	8
AK1405-CS-T Ⓟ Petersburg CSCAP	6
HI1502-CS-T Ⓟ Port of Kahului CSCAP	4
HI1503-CS-T Ⓟ Kawaihae Harbor CSCAP	4
FL1504-CS-N Ⓟ Port Everglades CSCAP	104
NY1501-CM-T R Old Inlet, Fire Island	9
AK1401-CS-T Ⓟ Port of Anchorage CSCAP	14
NY1408-CM-C R Rockaway Inlet/Jamaica Bay (chgs only)	122
NJ1302-TB-N Little Egg Inlet (w/lidar)	138
LA0702G Breton Sound to Delacroix I. AFE/MS	97
MD0701C Potomac R. to Ocoquan/Contract	264
FL1301-CM-N R Santa Rosa Sound	51
MD0402B Miles R. to Choptank R./Contract	408
WI1001D-CM-N R Black River Point to Algoma/Contract	119
GA1501-CS-N ⓅⓅ Kings Bay/Fernandina Bch CSCAP	134
MD1401-CS-N Ⓟ Port of Baltimore CSCAP	178
MS1501A-CS-N Ⓟ Gulfport CSCAP (no comp)	13

NEARLY DONE (<6 months)	
ME1301B R Passamaquoddy Bay to Cobscook Bay	238
MD0402D Chester River/Contract	256
AK1407 Ⓟ @ Dutch Harbor CSCAP	20
AK1402 Ⓟ Port of Ketchikan CSCAP	17
WA1206 Ⓟ R Seattle/Lk Washington Ship Canal	120
(from pg. 2)	1181

DONE (1:80k miles) ...	10763	NEARLY DONE ...	1832	OTHER PROJECTED ...	0
% of US shoreline ...	6.5%	% of milestone ...	28.2%	% of milestone ...	0.0%
% of milestone ...	165.6%				

FY15 compilation...	Miles:	Ports:
Done	10763	36
Likely	0	0
In doubt	1832	6
Total projected	12595	42

Expected for FY15	
Miles:	Ports:
10763	36
6.5%	20.6%

FY15 CMP Goal (100%)	
Percent of US shoreline:	3.9%
Miles @1:80,000:	6500
MTS ports:	32
Miles needed for FY15:	0
MTS ports needed:	0

FY16 CMP Year-end Shoreline Mileage Summary

DONE (QA / Released)	
AK1502-CM-T R Skagway Harbor	2
SC1501-CS-N Ⓟ Port of Georgetown CSCAP	117
MA0901B-CM-N R E Buzzards Bay to Waquoit Bay	225
OH1501-CS-N Ⓟ Port of Ashtabula CSCAP	17
VA1601-CM-T R Gilmerton Bridge, Elizabeth River	14
ME1301B-CM-N R Passamaquoddy Bay to Cobscook Bay	238
AK1105B-CM-T R Shuyak I. & N. Afognak I. MS/Contract	340
SC1502A-CM-N R Crab Bank, Charleston Harbor	2
NC1408-TB-C Winyah Bay to Norfolk/Contract	511
WA1206-CM-N Ⓟ RR Seattle/Lk Washington Ship Canal	120
NC0901-CM-N Ⓟ R Newport and North Rivers	182
MD0402D Chester River/Contract	256
VA0701C Ⓟ James River to Hopewell/Contract	183
FL0601E Little Manatee River	177
VA0701B Jame River to Dancing Pt/Contract	298
MD0701B Potomac R. to Mathias Pt/Contract	281
AL0901-CM-N R SE Mobile Bay	157
AL0905-CM-N R Eastern Mississippi Sound	71
FL1512-CS-N Ⓟ R Port Canaveral CSCAP	25
TX1406-CS-T Ⓟ Freeport CSCAP	74
TX1502B-CS-N ⓅⓅ R Texas City/Galveston CSCAP	121
AL0904-CM-N R Western Mobile Bay	100
NJ1303-TB-N R Great Egg Inlet (w/lidar)	99
NJ1501-CS-N Ⓟ Port of Paulsboro CSCAP	27
PA1501-CS-N ⓅⓅ Ports of Marcus Hook /Chester CSCAP	32
GA1502-CS-N Ⓟ Port of Savannah CSCAP	170
NH0901-CM-N Hampton Harbor to Frost Point	47
FL1505-CS-N Ⓟ Port of Palm Beach CSCAP	100
VA1408-TB-C Cape Charles to Delaware Bay/Contract	204
MN1501-CS-N Ⓟ Port of Silver Bay CSCAP	5
DONE (1:80k miles) ...	**9097**
% of US shoreline ...	5.5%
% of milestone ...	100.0%

CONT'D	
MN1502-CS-N Ⓟ Port of Two Harbors CSCAP	4
ME1301C-CM-N Grand Manan Channel	41
ME1301A-CM-N St. Croix River and Oak Bay	69
DE1501-CS-N ⓅⓅ Port of Wilmington CSCAP	24
ME1301D-CM-N Whiting and Dennys Bays	68
FL1502-CS-N Ⓟ Port of Pensacola CSCAP	186
LA0702E R. aux Chenes to Bayou Terre AFE/MS	405
AK1109B-CM-T @ R Eastern St Lawrence Island MS	172
MI1001G-CM-N ⓅⓅ R White Lake to Port Sheldon/Contract	190
NJ1403-TB-C Cape May to Sandy Hook/Contract	150
NJ1502-CS-N ⓅⓅ Ports of Phila. /Camden-Glouc. CSCAP	51
LA0702F Miss R. to River aux Chenes AFE/MS	513
LA0702H Miss. River to Bayou Gentilly AFE/MS	195
AK1012B-CM-T Rocky Bay to Nuka Psg MS/Contract	127
FL1511-CM-N R Florida Bch to Mexico Bch	125
FL1414-CM-N RR ICW, Venice Inlet	68
AK1602-CM-T R Port Wakefield	9
AK1012C-CM-N Nuka Psg to McCarty Fd MS/Contract	135
AK1109A-CM-T @ R Western St Lawrence Island MS	192
AL0902-CM-N RR Perdido Bay	256
AK1012D-CM-N McCarty Frd-Two Arm Bay MS/Contract	192
AK1407-CS-T Ⓟ @ Dutch Harbor CSCAP	20
MD0404B Hooper I. to Nanticoke River/Contract	456
MD0404D Wetipquin Crk to Flatland Cv/Contract	310
CA1502-CS-N ⓅⓅ Ports of LA/Long Beach CSCAP	89
NY1409-TB-C Coney Island to Montauk/Contract	138
CA1213B-CM-N Ⓟ San Francisco	47
AK1013A-CM-T Nakat Bay to Tongass Passage MS	88
FL1506-CS-N Ⓟ Port of Jacksonville/Mayport CSCAP	533
FL1614-CM-T R Shell Key to Egmont Key	25
NEARLY DONE ...	**2873**
% of milestone ...	31.6%

CONT'D	
FL1616-CM-T Ⓟ/2 R Dodge Island, Miami	24

NEARLY DONE (<6 months)	
AK1402-CS-T Ⓟ Port of Ketchikan CSCAP	17
NY1406B-CM-T R Erie Canal, Oneida Lk to Cayuga/Sen Cnl	285
TX1106B-CM-N Ⓟ/2 R Texaco Island, Port Arthur	14
MD0404E Fairmount Nk to Pocomoke/Contract	351
WI1001A-CM-N ⓅⓅⓅⓅ R Burns Int Hrb to Calumet/Contract	151
NY1406D-CM-T R Cayuga and Seneca Lakes/Canal	219
MI1401-CS-T Ⓟ Port of Detroit CSCAP	146
LA1002B-CM-N Mississippi R., Main Pass/Contract	554
LA1002C-CM-N Mississippi R., Pass a Loutre/Contract	479
LA1002D-CM-N Mississippi R., South Pass/Contract	502
MI1001H-CM-N Ⓟ Holland Hbr to Michigan City/Contract	155

OTHER PROJECTED	
CA1212C-CM-N R Carquinez to Suisun Bay	105
CA1503A-CS-N Ⓟ Port of San Francisco CSCAP	65
SC1502B-CS-N Ⓟ Port of Charleston CSCAP	302
NY1406C-CM-T R Erie Canal, Cayuga/Sen Cnl to Tonawand	288
ME0702A Schoodic Head to Moose Neck	215
CA1505-CS-N Ⓟ Port of San Diego CSCAP	122
CA1506-CS-N Ⓟ Port of Redwood City CSCAP	161
PR1502/5-CS-T Ⓟ Port of Ponce CSCAP	20
WI1001G-CM-N Ⓟ Green Bay to Peshtigo Pt/Contract	247
FL1510A-CM-N R Big Carlos Pass	68
FL0601A Clearwater Harbor (chgs only)	87
FL1601A-CM-N RR Gordon Pass	50
NC1502-CS-N Ⓟ Port of Morehead City CSCAP	76
TX1501B-CS-N Ⓟ Port Arthur CSCAP	60
OTHER PROJECTED ...	**1866**
% of milestone ...	20.5%

FY16 compilation...	*Miles:*	*Ports:*
Done	**9097**	**28.5**
Likely	**3043**	**8.5**
In doubt	**1696**	**7.0**
Total projected	**13836**	**44.0**

***Expected** for FY16*

Miles:	Ports:
12140	37.0
7.3%	21.1%

FY16 CMP Goal (100%)

Percent of US shoreline:	**5.5%**
Miles @1:80,000:	**9100**
MTS ports:	**35**
Miles needed for FY16:	**3**
MTS ports needed:	**7**

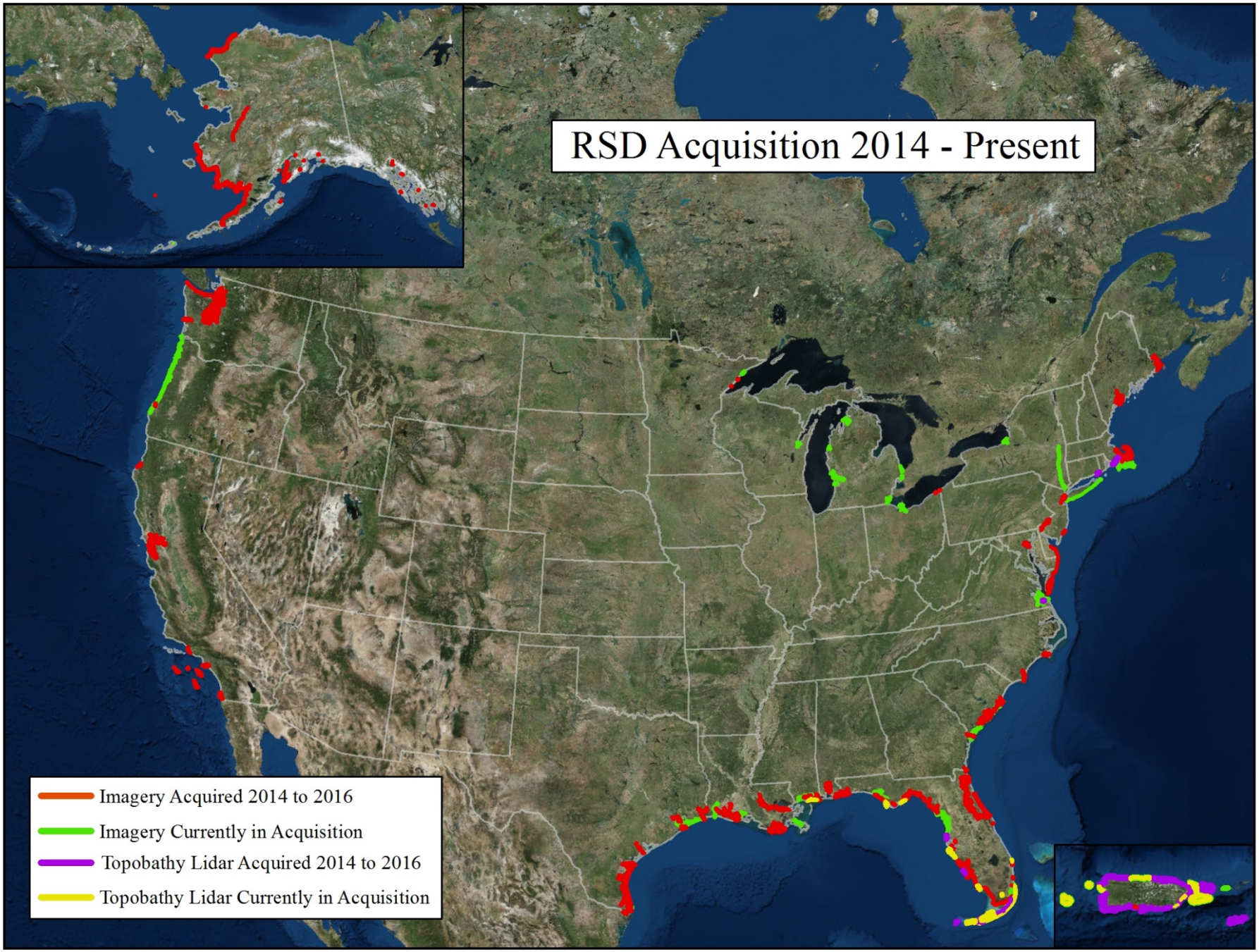
RSD Acquisition 2014-present

Imagery Acquired 2014 to 2016			
AK1603-CS-N	DE1501-CS-N	NC0901-CM-N	TX1403-CU-N
AK1604-CS-N	FL1303A-CM-N	NC1501-CS-N	TX1404-CU-N
AK1605-CS-N	FL1303-CU-N	NC1502-CS-N	TX1405-CU-N
AK1606-CS-N	FL1401-CS-N	NJ1102C-CM-N	TX1501-CS-N
AK1607-CS-N	FL1402-CS-N	NJ1501-CS-N	TX1502A-CS-N
AK1608-CS-N	FL1403-CS-N	NJ1502-CS-N	TX1502B-CS-N
AK1609-CS-N	FL1414-CM-N	NY1402-CS-N	TX1504-CS-N
AK1610-CS-N	FL1415-CM-N	OH1051-CS-N	VA1408-TB-N
AK1611-CS-N	FL1416-CM-N	OH1502-CS-N	VA1502-CU-N
AK1612-CS-N	FL1417-CU-N	MA1101B-CM-N	WA1002-CM-N
AK1613-CS-N	FL1421-CM-N	MA1101-CM-N	WA1206-CM-N
AK1615-CS-N	FL1501-CM-N	MD1401-CS-N	WA1401-CM-N
AK1616-CS-N	FL1502-CS-N	ME1301A-CM-N	WA1402-CM-N
AK1617-CS-N	FL1503A-CS-N	ME1301B-CM-N	WA1403-CM-N
AK1618-CS-N	FL1503B-CS-N	ME1301C-CM-N	WA1404-SP-N
AK1619-CS-N	FL1503-CS-N	ME1301D-CM-N	WA1405-CM-N
AK1620-CS-N	FL1504-CS-N	ME1502-CM-N	WA1406-CM-N
AK1621-CS-N	FL1505-CS-N	MN1501-CS-N	WA1501-CS-N
AK1622-CS-N	FL1506-CS-N	MN1502-CS-N	WA1502-CS-N
AK1623-OB-N	FL1507-CU-N	MS1401-CM-N	
AK1624-SP-N	FL1510-CM-N	MS1501B-CS-N	
AL0902-CM-N	FL1511-CM-N	OR1401-SP-N	
AL0903-CM-N	FL1512-CS-N	PA1501-CS-N	
AL1501-CS-N	FL1601-CU-N	PR1502-CS-N	
CA1212B-CM-N	GA1501-CS-N	SC1104-CM-N	
CA1212-CM-N	GA1502-CS- N	SC1401A-CM-N	
CA1213-CM-N	LA1304-CM-N	SC1401-CU-N	
CA1401-CS-N	LA1401-CU-N	SC1405-CM-N	
CA1402-CU-N	LA1501-CM-N	SC1406-CM-N	
CA1502-CS-N	LA1503-CS-N	SC1407-CM-N	
CA1503-CS-N	LA1507-CS-N	SC1501-CS-N	
CA1504-CS-N	MA1101A-CM-N	SC1502A-CM-N	
CA1505-CS-N	MS1501C-CS-N	SC1502-CS-N	
CA1506-CS-N	MS1501-CS-N	TX1402-CS-N	

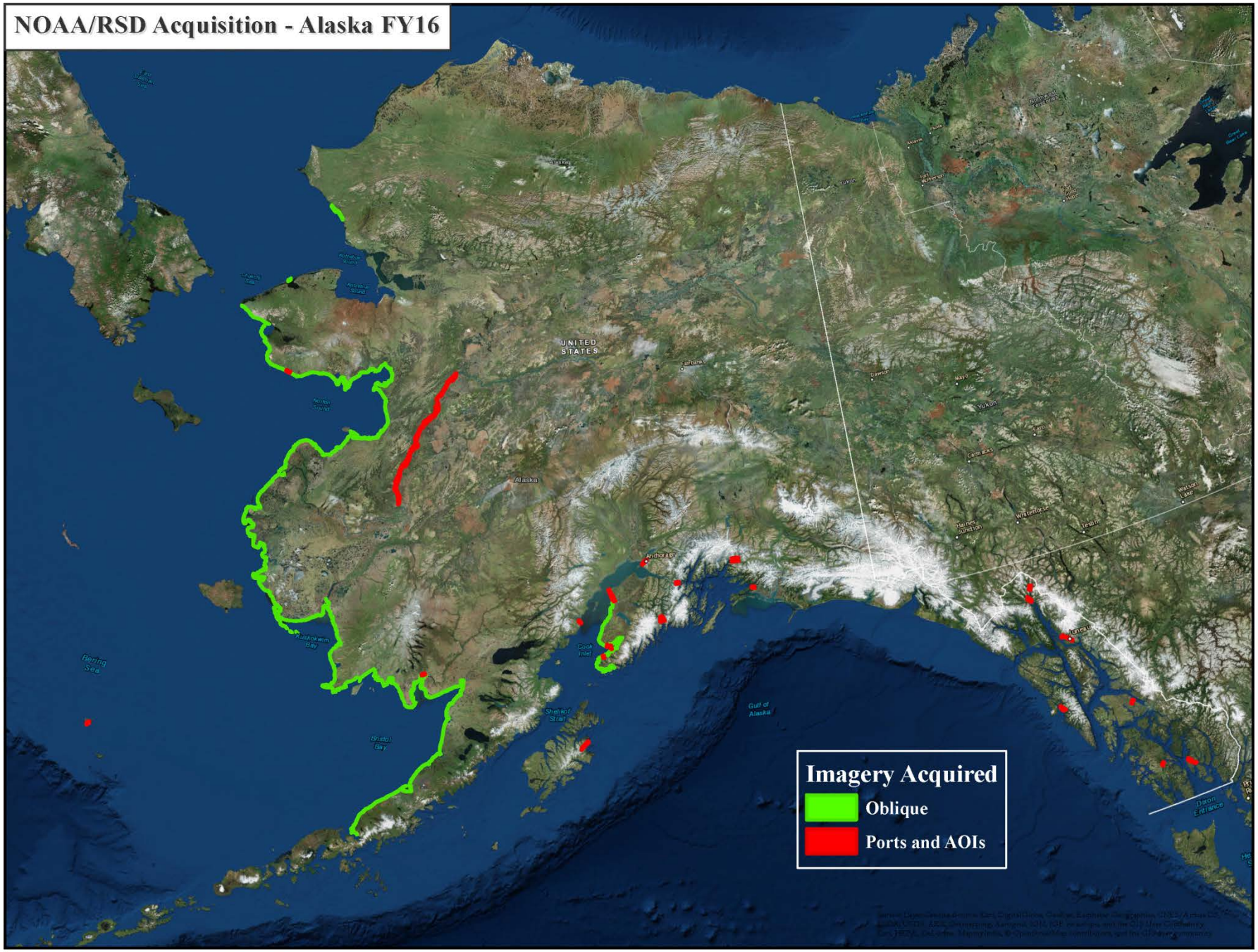
Imagery Currently in Acquisition
FL1305-CM-N
FL1602-CM-N
FL1603-CM-N
LA1504-CS-N
LA1505-CS-N
LA1506-CS-N
MI1601-CS-N
MI1602-CS-N
MI1603-CS-N
MI1604-CS-N
MI1605-CS-N
MN1601-CS-N
MS1502-CM-N
MS1503-CM-N
NY1601-CS-N
NY1602-CM-N
OH1601-CS-N
OR1201-CM-N
OR1210-CM-N
PR1501-CM-N
PR1503-CS-N
TX1503-CS-N
TX1505-CM-N
TX1601-CM-N
VA1602-SP-N
VI1501-CS-N
WI1601-CS-N

Topobathy Lidar Acquired 2014 to 2016
CT1401-TB-N
FL1418-TB-N
FL1423-TB-N
FL1604-TB-N
FL1605-TB-N
FL1607-TB-N
FL1610-TB-N
FL1611-TB-N
MA1602-TB-N
VA1401-TB-N
VI1401-TB-N

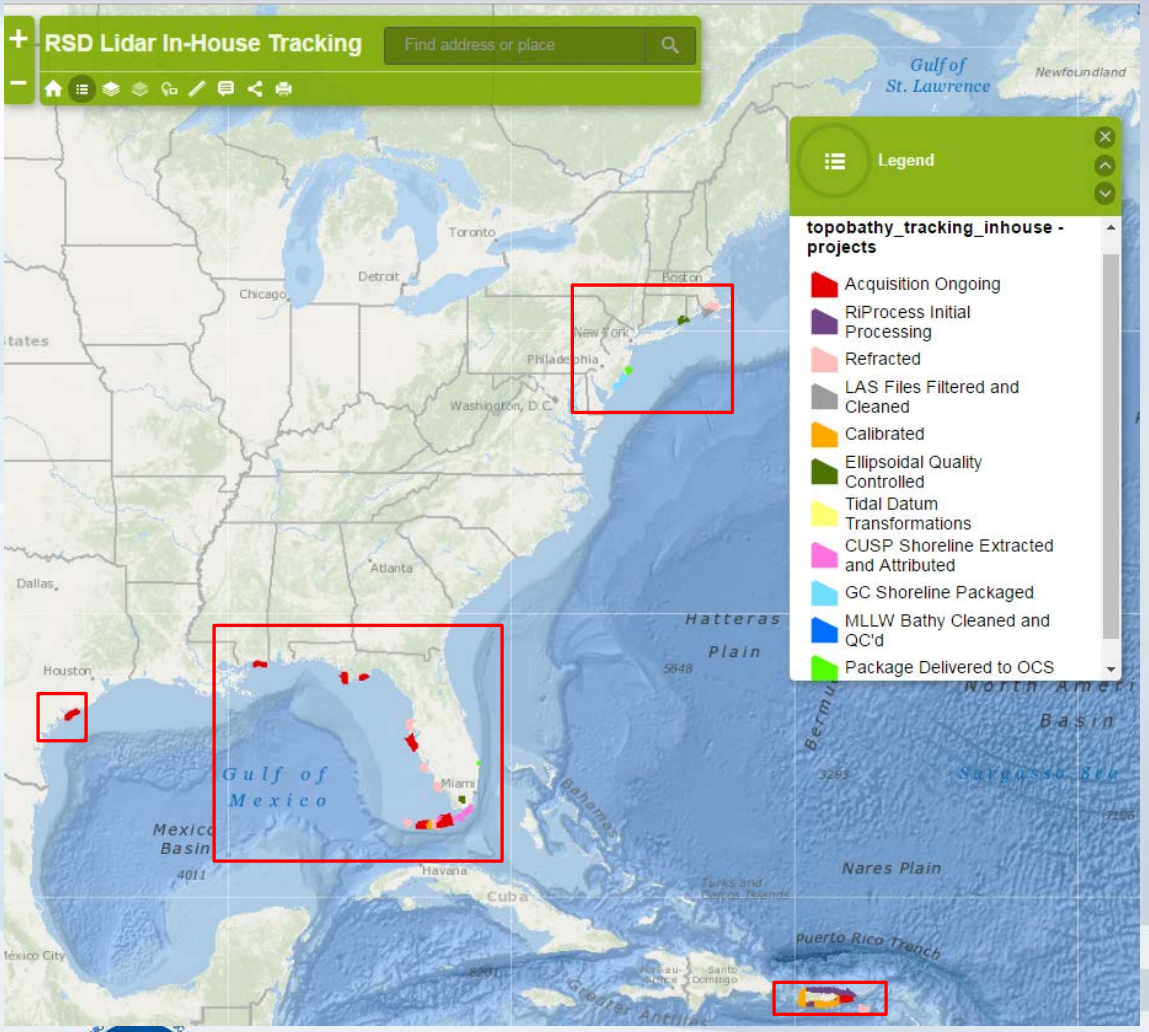
Topobathy Lidar Currently in Acquisition
FL1422-TB-N
FL1606-TB-N
FL1608-TB-N
FL1609-TB-N
FL1613-TB-N
MS1602-TB-N
PR1401-TB-N

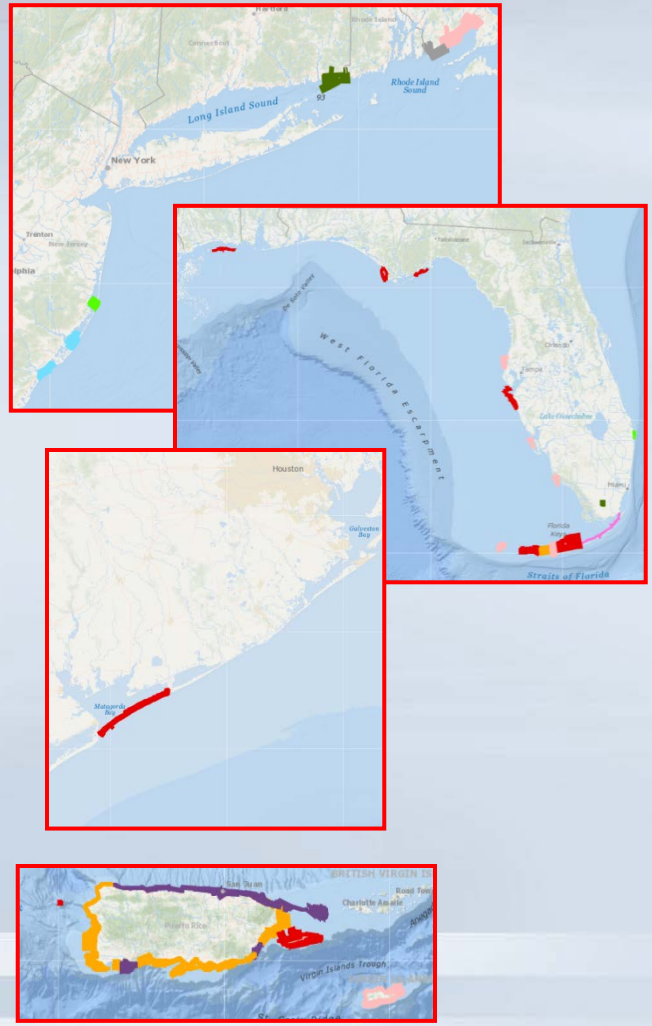

RSD Acquisition 2014 - Present
Imagery Acquired 2014 to 2016
Imagery Currently in Acquisition
Topobathy Lidar Acquired 2014 to 2016
Topobathy Lidar Currently in Acquisition

NOAA/RSD Acquisition - Alaska FY16



RSD In-house topobathy lidar Operations





National Oceanic and Atmospheric Administration

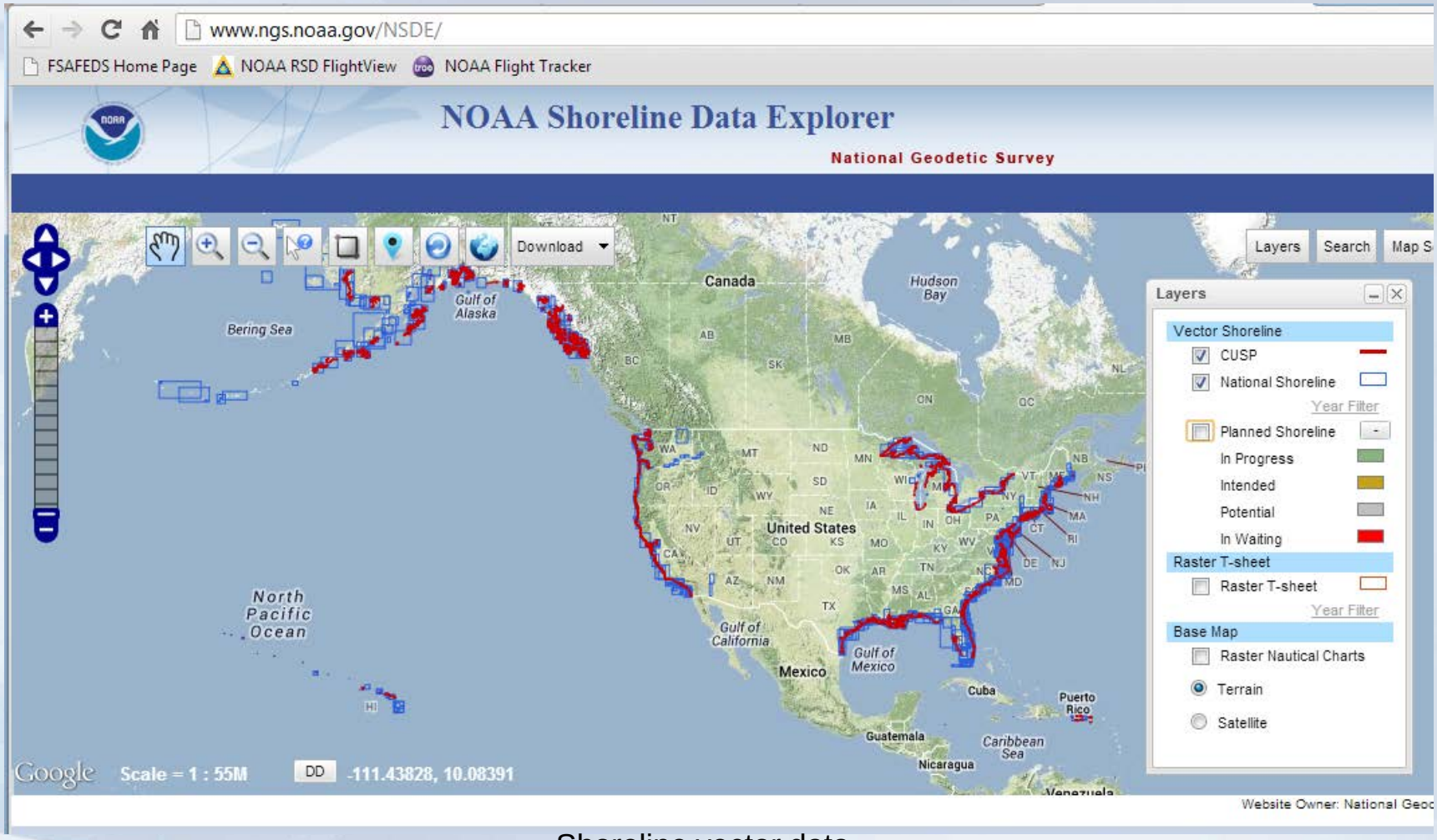
FY15 300nm²
FY16 960nm²

RSD Lidar Contracts

~ 800nm²

National Oceanic and Atmospheric Administration

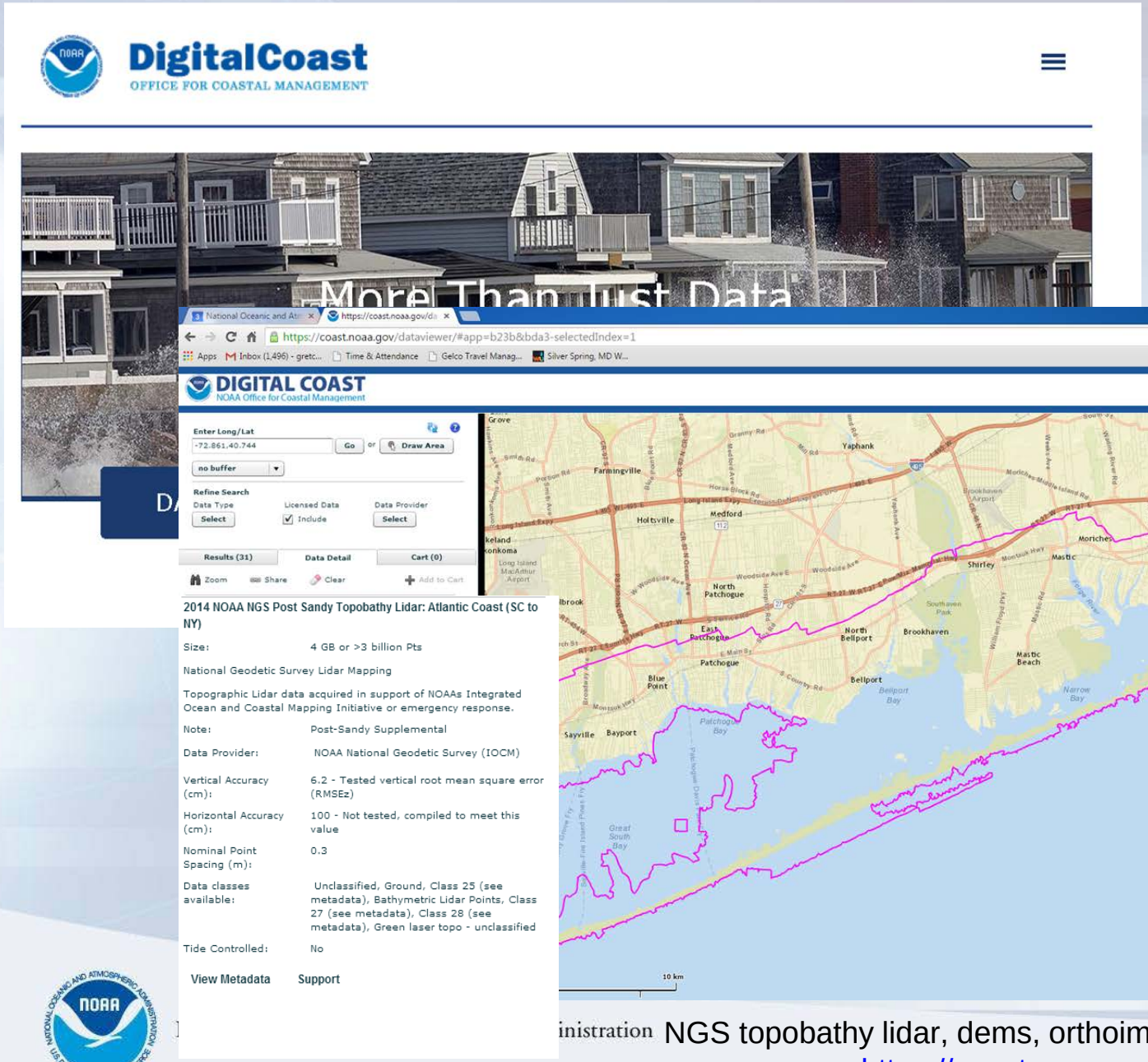
Access to the data



Shoreline vector data

http://www.ngs.noaa.gov/NSDE/

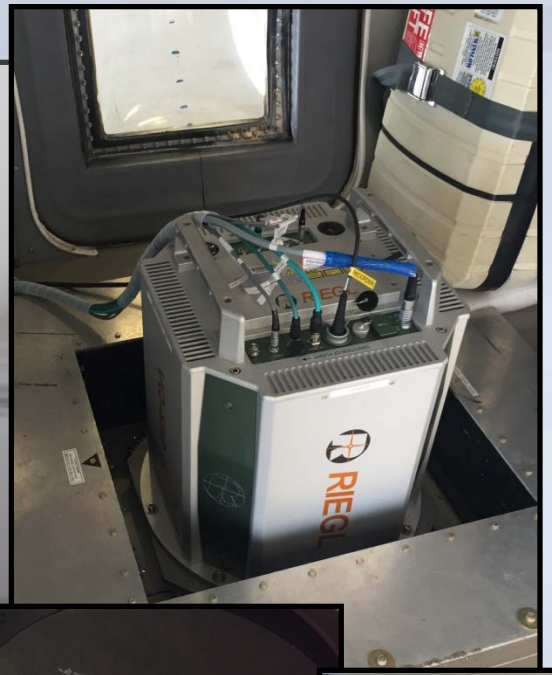
National Oceanic and Atmospheric Administration

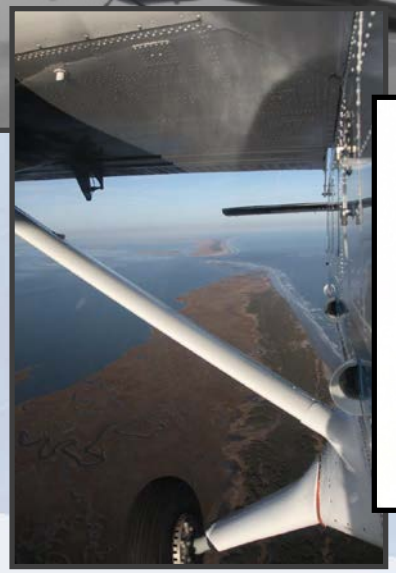


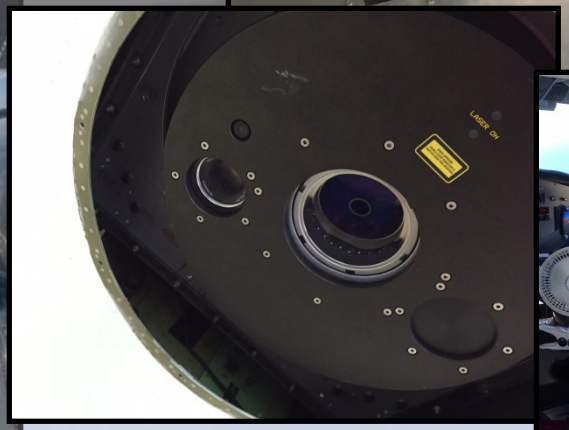
NGS topobathy lidar, dems, orthoimagery, and oblique imagery

https://coast.noaa.gov/digitalcoast/

Riegl VQ-880-G Upgrade Fall 2015 – Sandy Supplemental







National Oceanic and Atmospheric Administration

RIEGL VQ-880-G

The *RIEGL* VQ-880-G is a fully integrated airborne laser scanning system for combined hydrographic and topographic surveying.
The system is offered with integrated and factory-calibrated high-end GNSS/IMU system and cameras.
An optionally integrated infrared laser scanner complements the data from the green laser scanner and supports the detection of the water surface.
The design allows flexible adaptation of these components to specific application requirements.
Complemented by a *RIEGL* data recorder, the *RIEGL* VQ-880-G is a complete LIDAR system to be installed on various platforms in a straightforward way.

Fully Integrated Topo-Hydrographic Airborne Laser Scanning System

Typical Applications

- Coastline and Shallow Water Mapping
- Acquiring Base Data for Flood Prevention
- Habitat Mapping
- Measurement for Aggradation Zones
- Surveying for Hydraulic Engineering
- Hydro-Archeological-Surveying

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RIEGL VQ-880-G Technical Data

- combined topographic & hydrographic scanning
- pulse repetition rate PRR (burst)
- waveform data output
- online waveform processing
- multiple target capability
- not intrinsically eye safe

Eye Safety Class	Laser Class 3B*
Hydrography: typ. measurement range typ. operating flight altitude AGL	 1.5 Secchi depth 600 m (1,970 ft.)
Topography: max. range @ target reflectivity 20% / 60% typ. operting flight altitude AGL	 2,500 m / 3,600 m 2,200 m (7,200 ft.)
Minimum Range	10 m
Accuracy / Precision	25 mm
Effective Measurement Rate	up to 550,000 meas./sec
Field of View / Scan Angle	± 20° = 40°

*Class 3B Laser Product according to IEC60825-1:2007

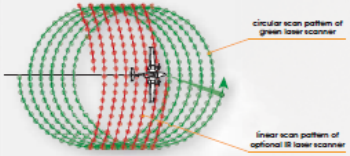
RIEGL VQ-880-G Installation Examples

RIEGL VQ-880-G installed in the nose pod of fixed-wing aircraft **DIAMOND DA42 MPP**

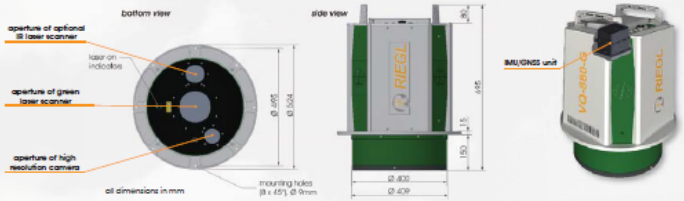
RIEGL VQ-880-G installed on GSM-3000 stabilized platform

RIEGL VQ-880-G Scan Pattern

forward & backward look for collecting data of vertical structures



Mechanical Drawings



Main Features

- designed for combined topographic and hydrographic airborne survey
- high accuracy ranging based on echo digitization and online waveform processing with multiple-target capability
- multiple-time-around processing for straightforward mission planning and operation
- concurrent full waveform output for all measurements for subsequent full waveform analysis
- high spatial resolution due to measurement rate of up to 550 kHz and high scanning speed of up to 160 scans/sec
- integrated inertial navigation system
- integrated digital camera(s)
- optional integrated IR laser scanner
- compact and robust housing compliant with typical hatches in aircrafts and with stabilized platforms

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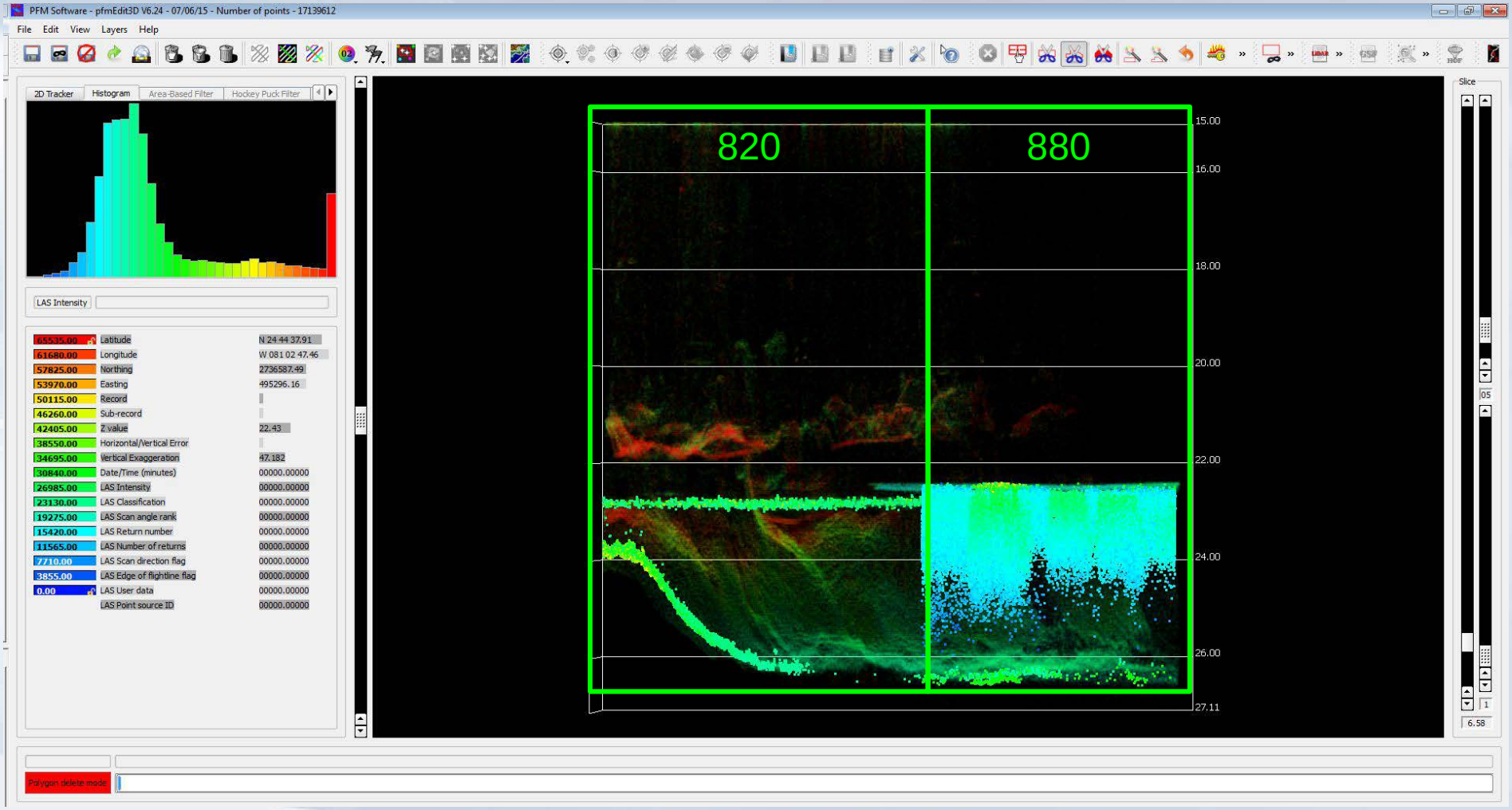
www.riegl.com

RIEGL®

Riegl 880-G and 820-G

	880-G	820-G
System Weight and Power	150 lbs, 28 VDC @ 15 amps, 400 W	60 lbs, 28 VDC @ 10 amps, 185 W
Sample Rate and Method	Selectable 145, 245, 550 kHz, real-time waveform processing, fragmented waveform recording	200000 meas/s @ 510 kHz
Nominal Operating Altitude	600 m	600 m
Swath Width at Nominal Altitude	436 m circular	230-346 m section of ellipse
Scan Angle	20 Deg	42-60 Deg
Laser Energy per pulse	20 MicroJoule	20 MicroJoule
Receiver Diameter	7cm	5cm
Nominal Illuminated Surface Spot	0.6 m	0.6 m
Deep Bathy Channel	No	No

880 vs 820 Marathon, FL

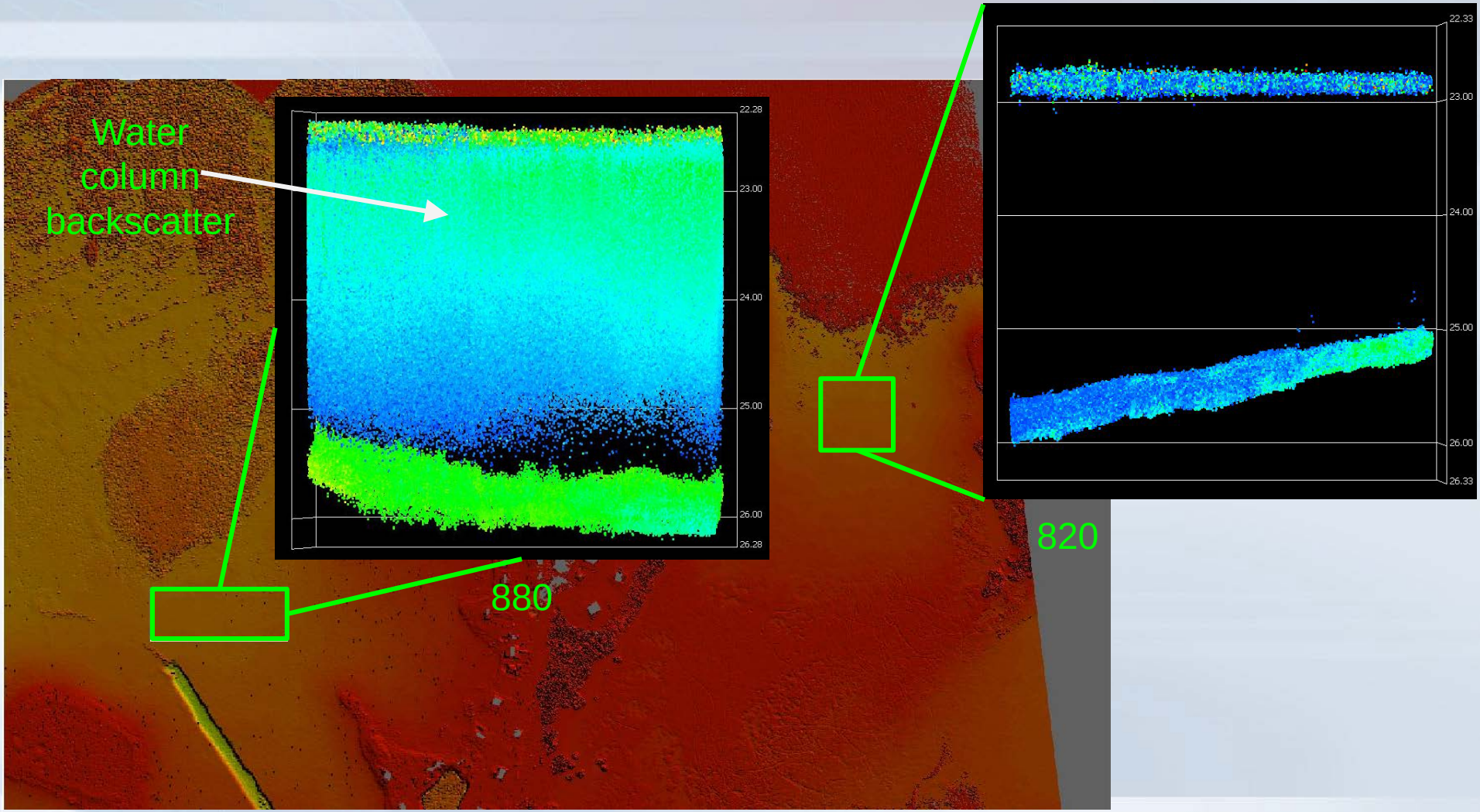


National Oceanic and Atmospheric Administration

820 - Low water column backscatter, rapid bottom return extinction

880 - High water column backscatter, stronger bottom return signal under similar conditions

880 vs 820 Marathon, FL



National Oceanic and Atmospheric Administration

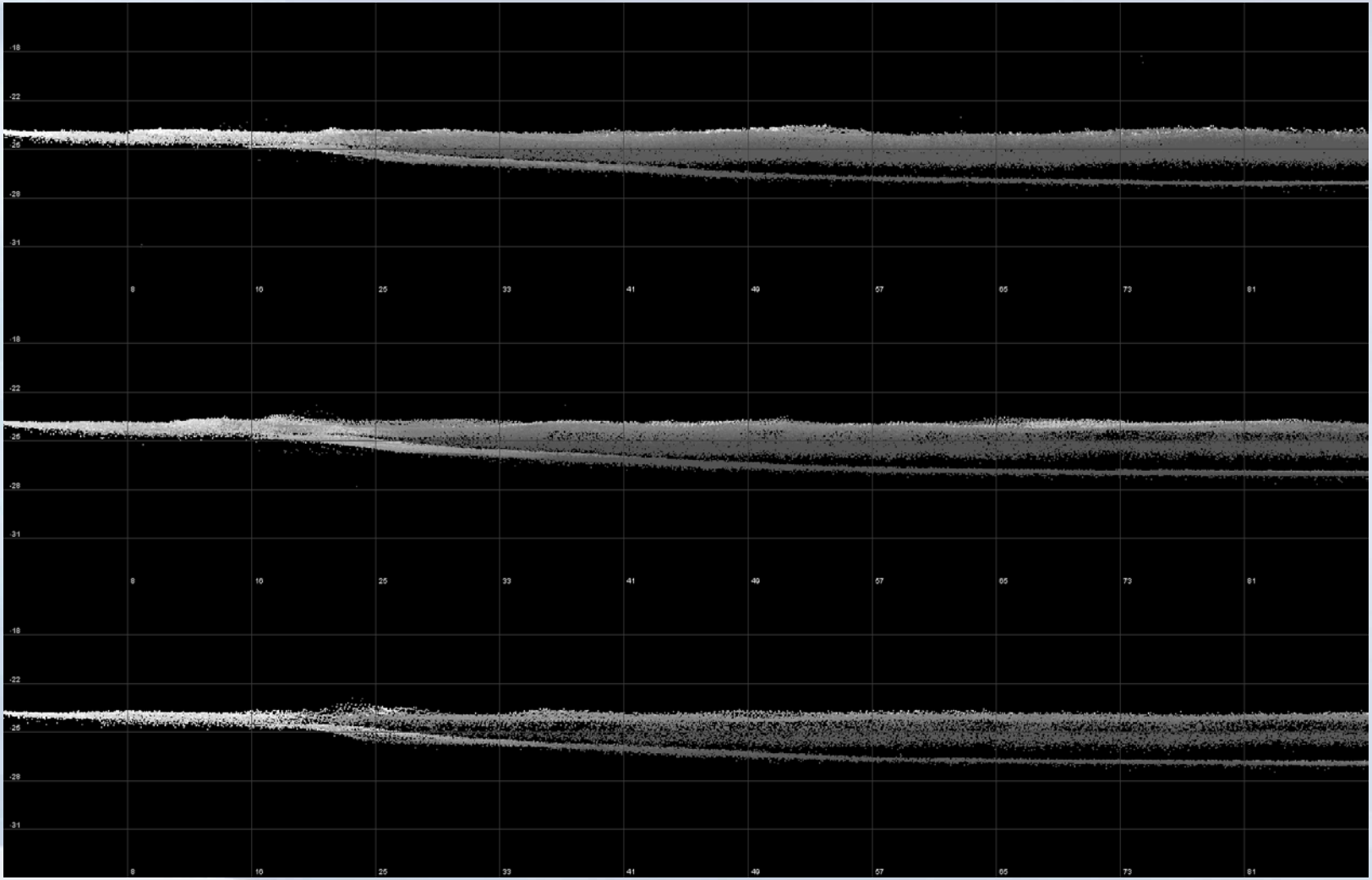
The 880 generates significant signal larger LiDAR receiver, lower threshold, more sensitive detector

880 550kHz vs 245kHz vs 145kHz

550

245

145



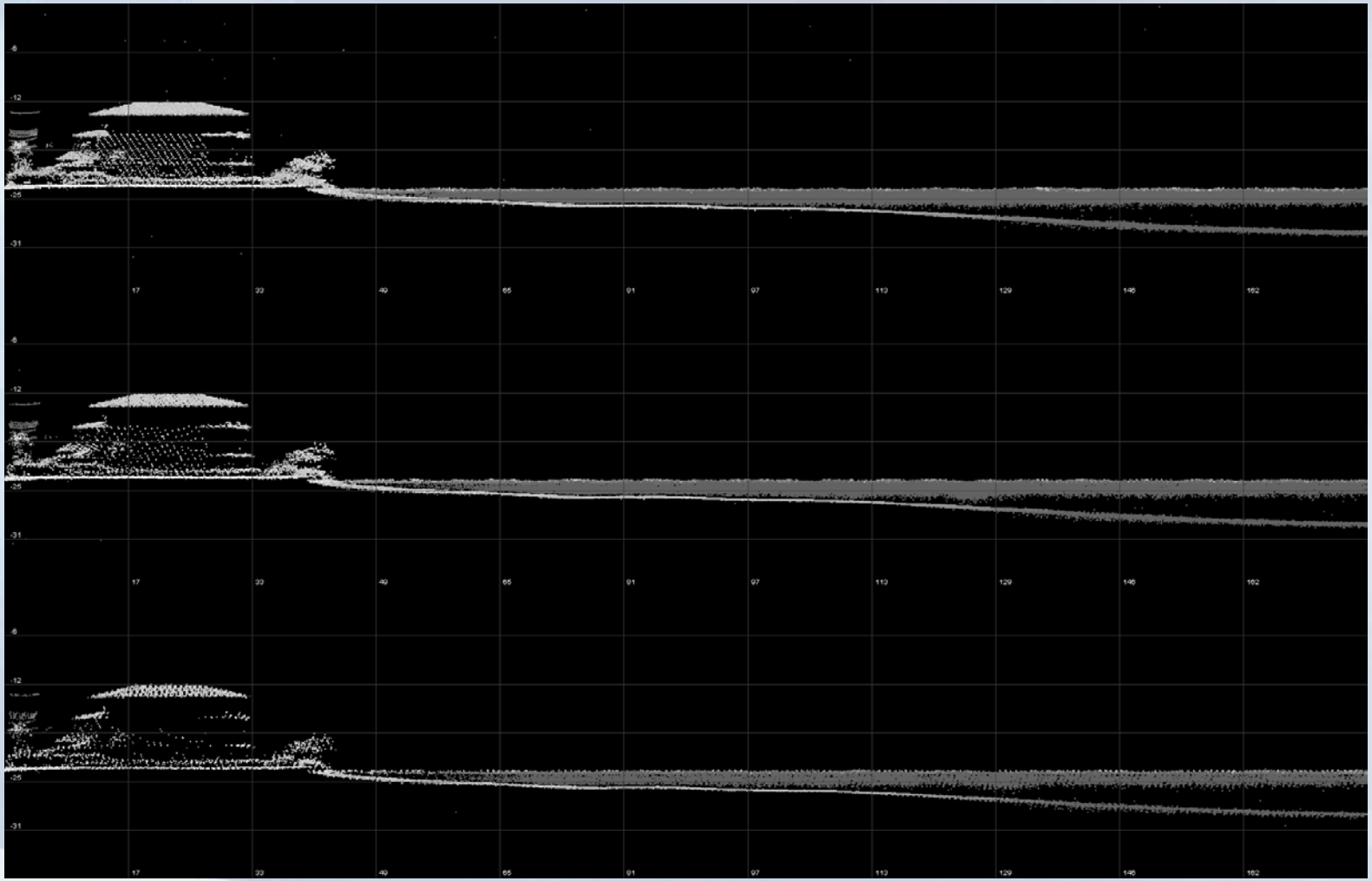
National Oceanic and Atmospheric Administration

880 550kHz vs 245kHz vs 145kHz

550

245

145



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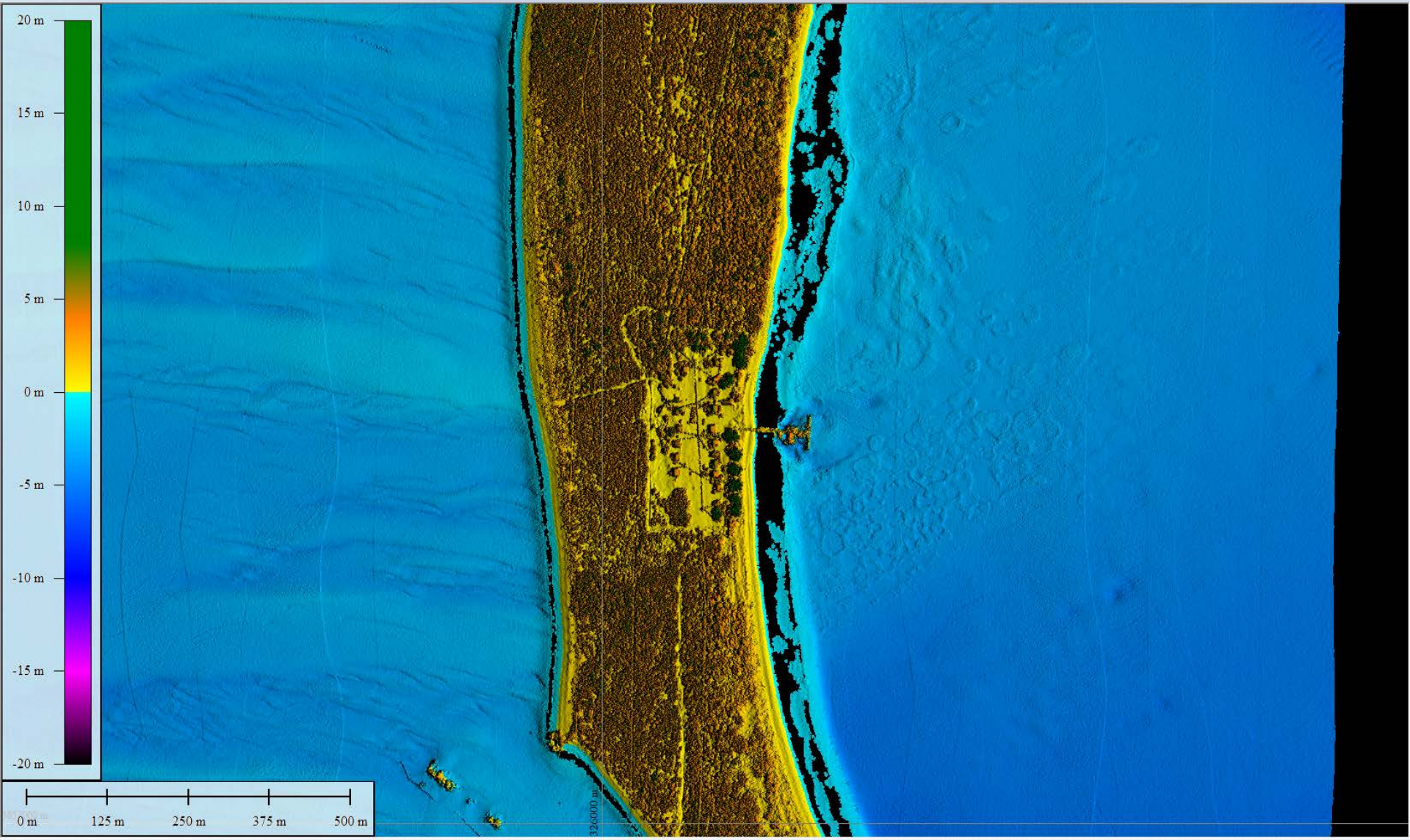
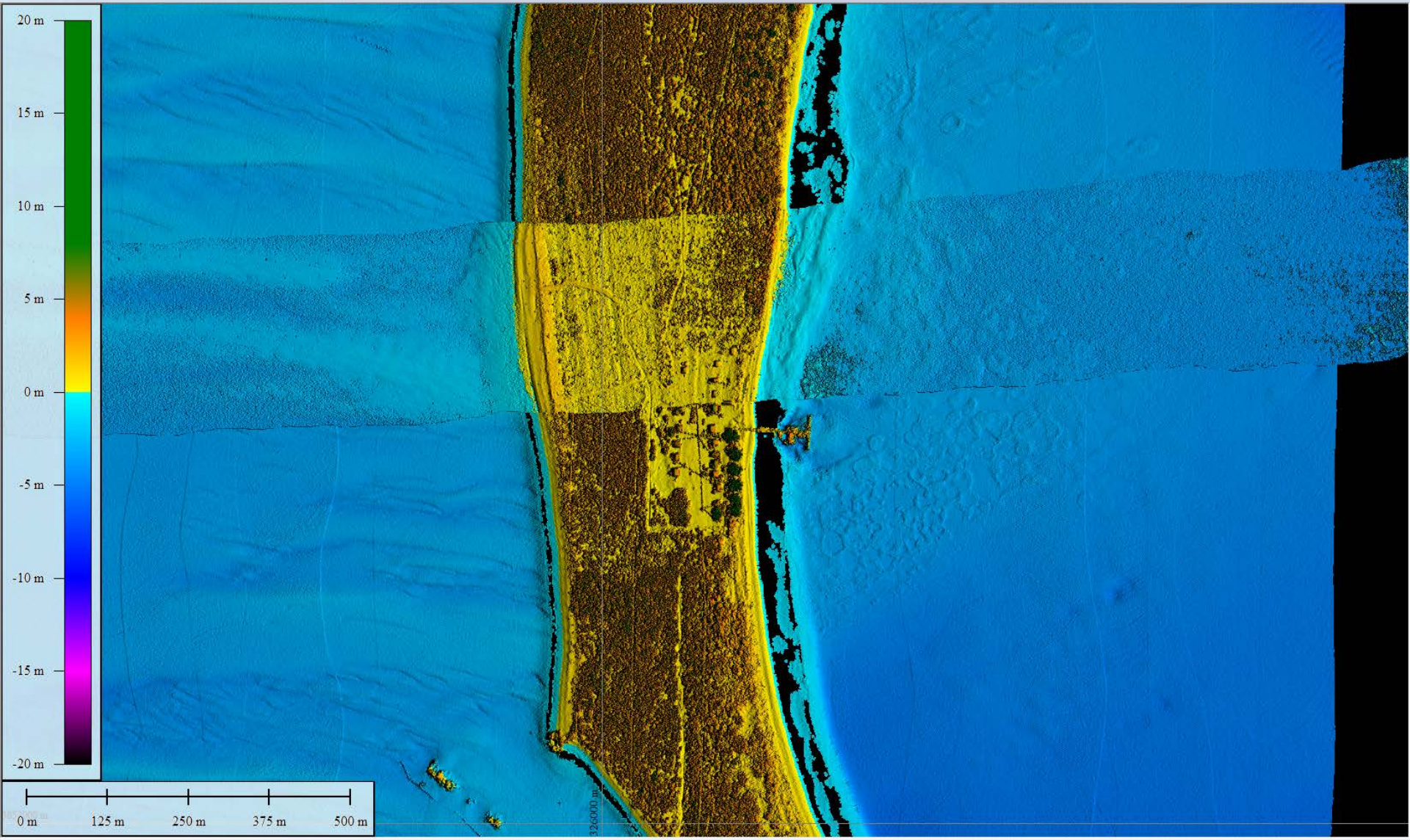
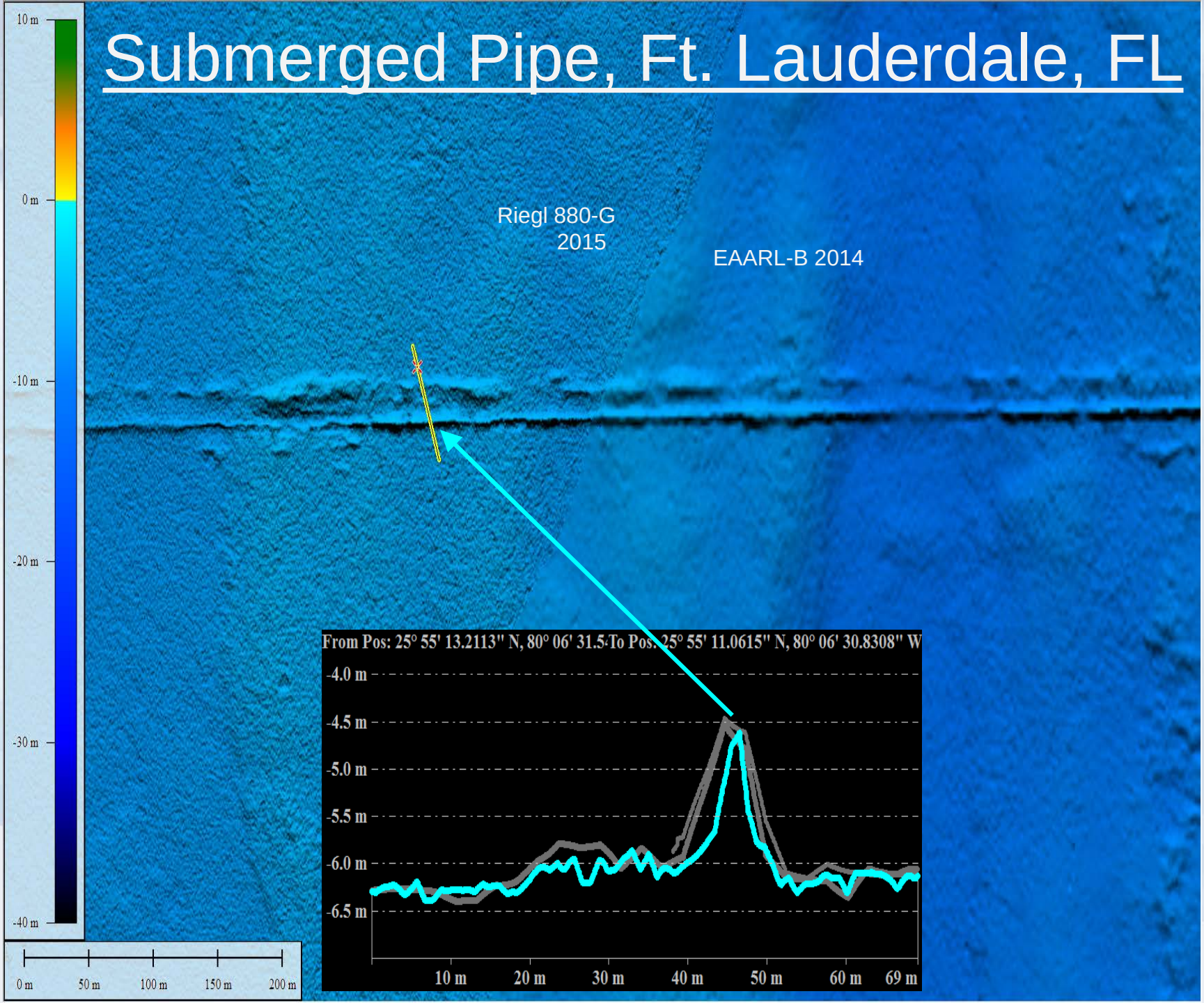
CZMIL Data Tampa Bay, FL



CZMIL Data Tampa Bay, FL with 880 overpass

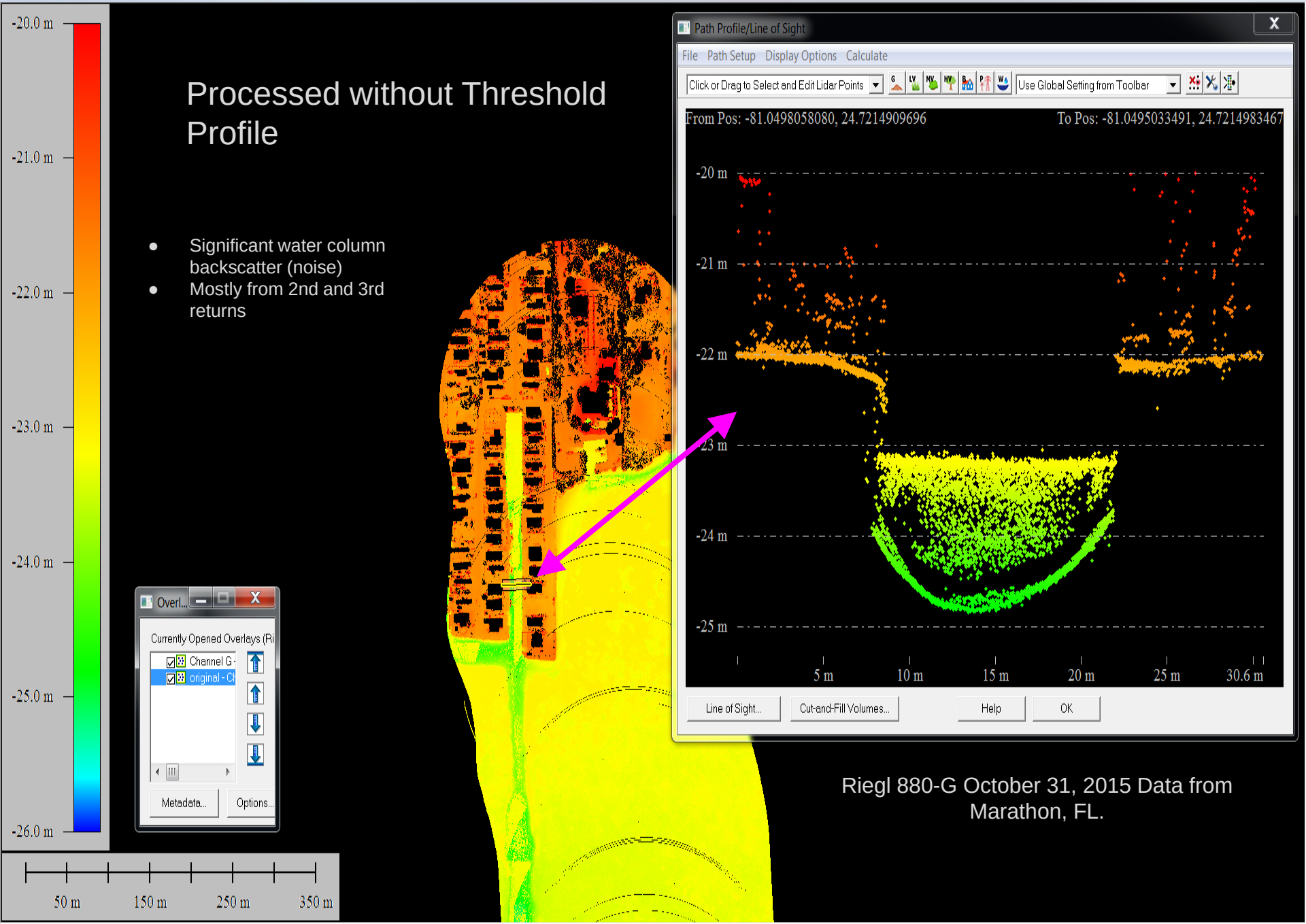


Submerged Pipe, Ft. Lauderdale, FL



Processed without Threshold Profile

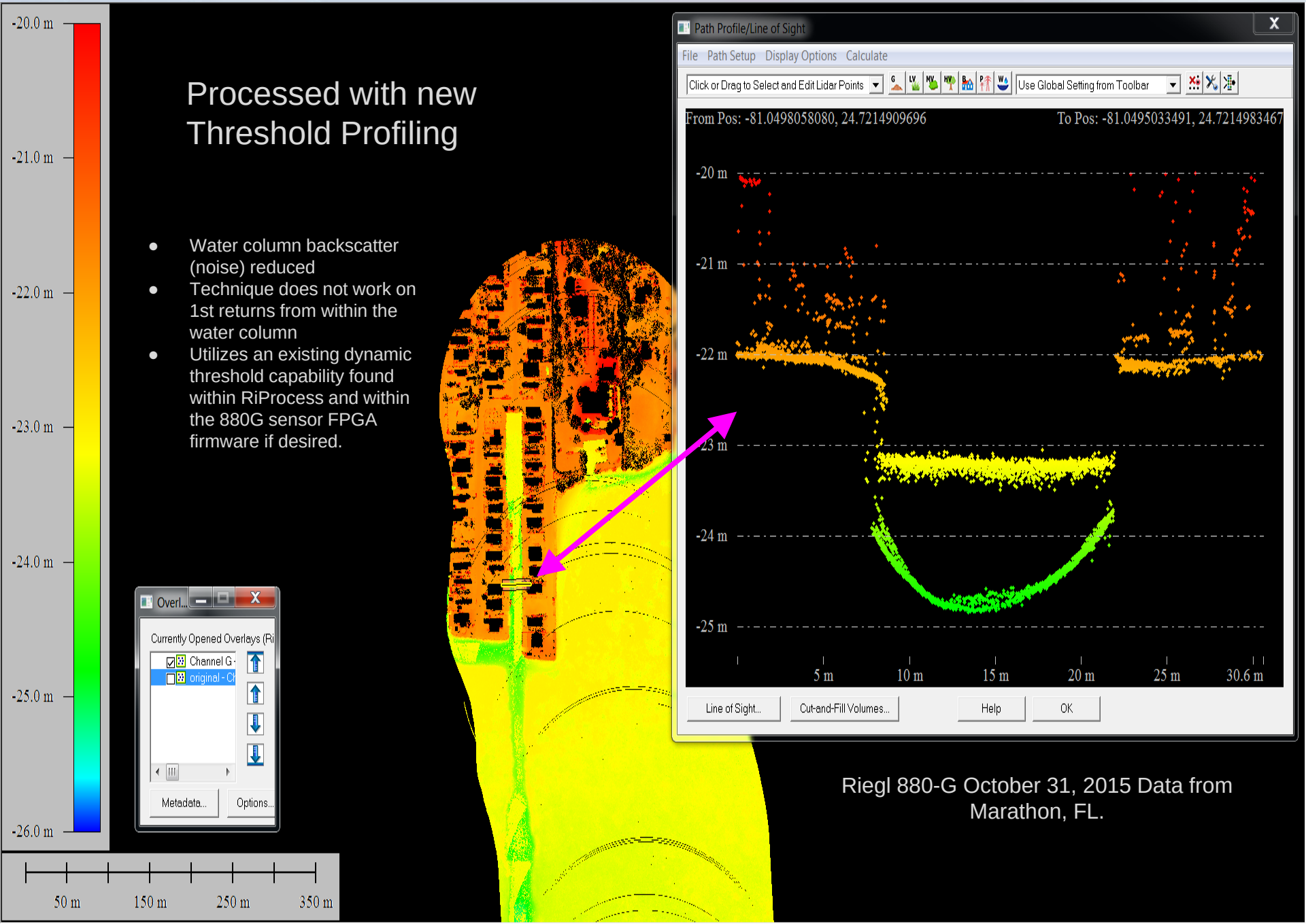
- Significant water column backscatter (noise)
- Mostly from 2nd and 3rd returns



Riegl 880-G October 31, 2015 Data from Marathon, FL.

Processed with new Threshold Profiling

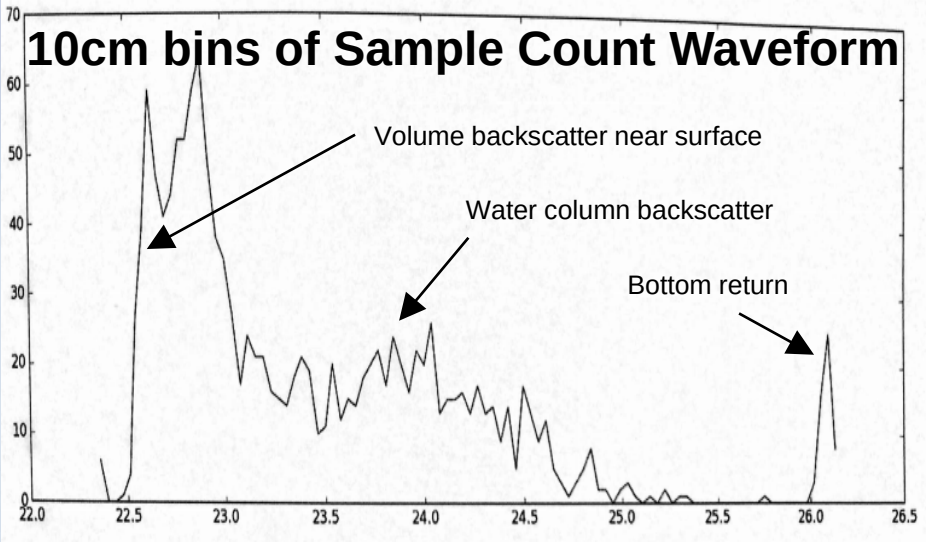
- Water column backscatter (noise) reduced
- Technique does not work on 1st returns from within the water column
- Utilizes an existing dynamic threshold capability found within RiProcess and within the 880G sensor FPGA firmware if desired.



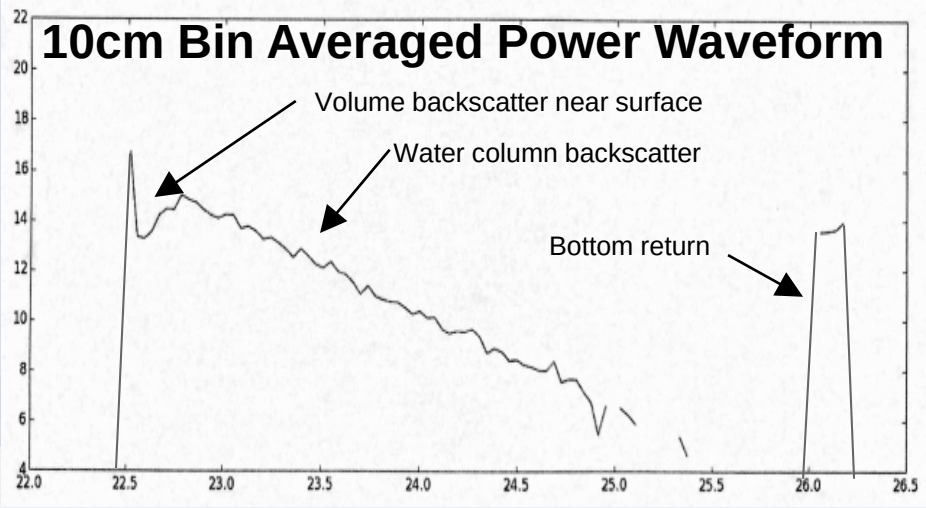
Riegl 880-G October 31, 2015 Data from Marathon, FL.

Synthetic waveforms

- 5x5m Synthetic Waveform
- Y axis is the number of counts per 10 cm depth bin



- 5x5m Synthetic Waveform
- Y axis is the average return intensity per 10 cm depth bin in units of deciBels (dB) above the trigger threshold

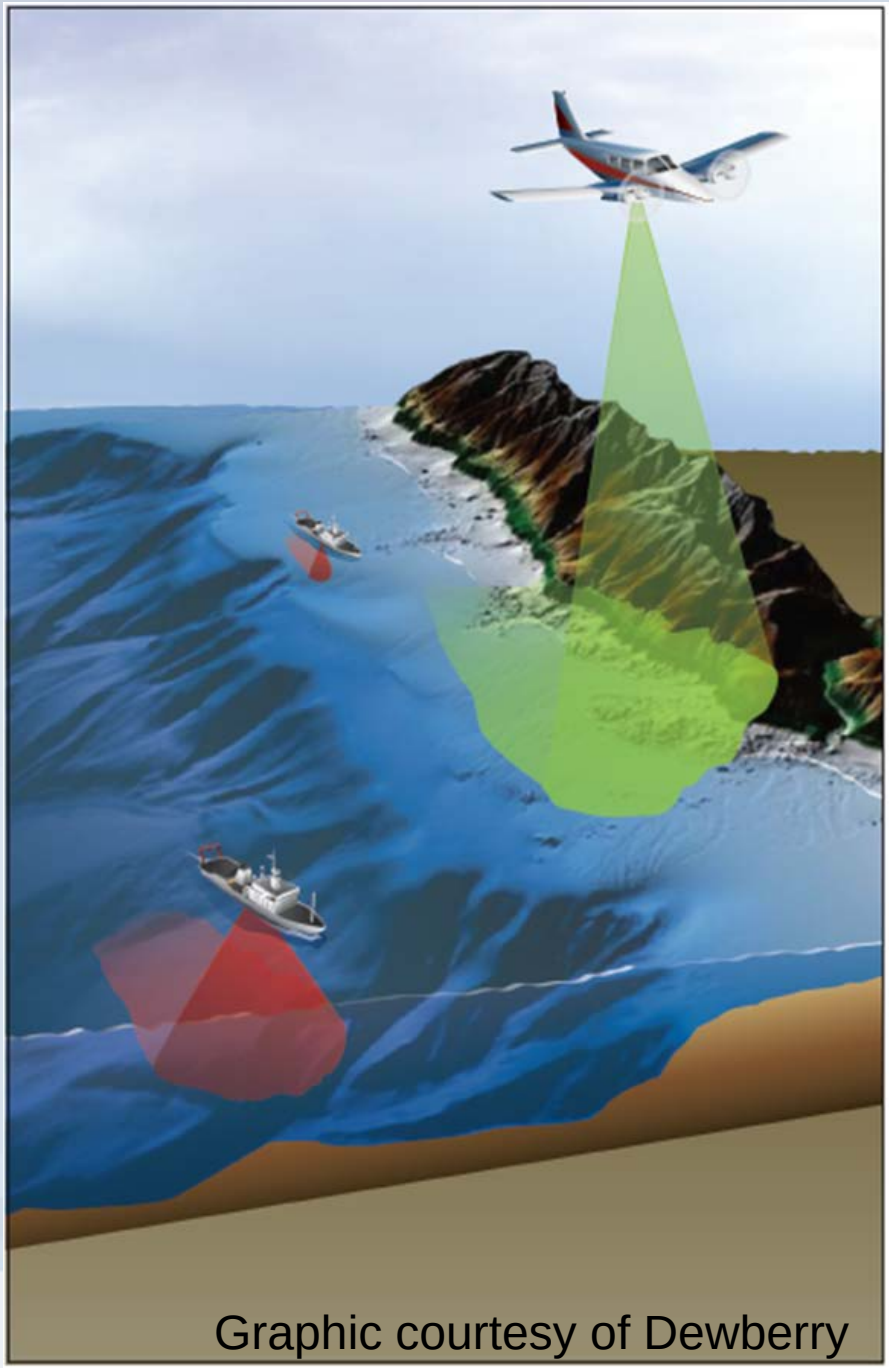


Moving forward

- Continue operations with existing workflows (reduced prf, thresholding, etc)
- Continue working with manufacturer to refine existing enhancements and implement synthetic waveforms
- Continue development internally and with 3rd party software providers on data cleaning options.

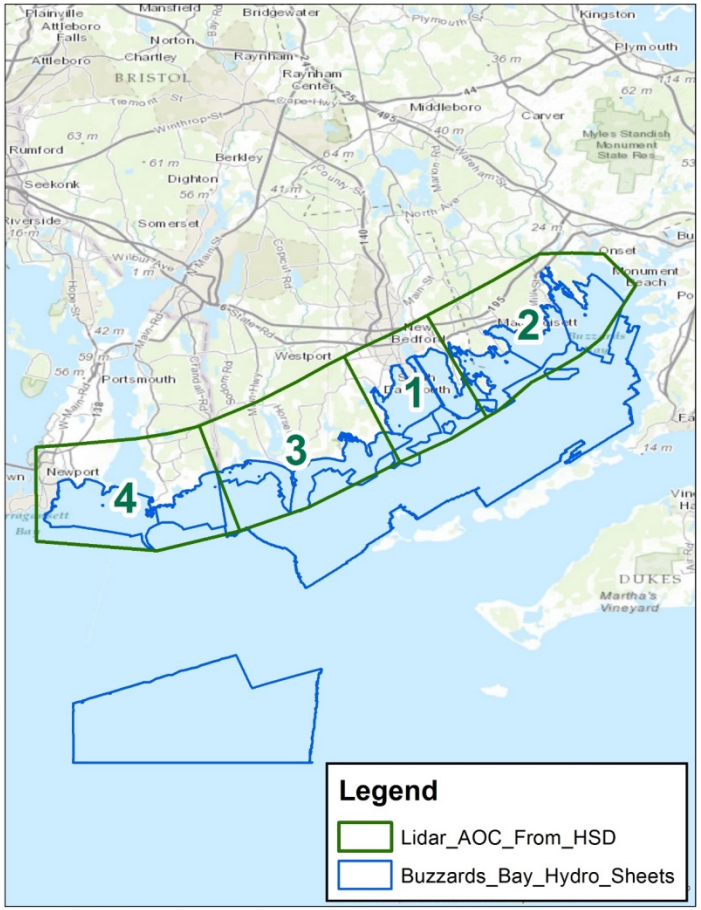
Buzzards Bay Survey to support the NOAA Ship Thomas Jefferson multi-year hydrographic survey

- RSD collects nearshore topobathy lidar to the 4m NALL in the year prior to ship ops
- RSD will provide both shoreline and nearshore bathymetry
- Hydro operations will use this data to plan operations and overall situational awareness
- Increases efficiency and safety of launch and ship operations


Graphic courtesy of Dewberry

National Oceanic and Atmospheric Administration

Buzzards Bay, MA

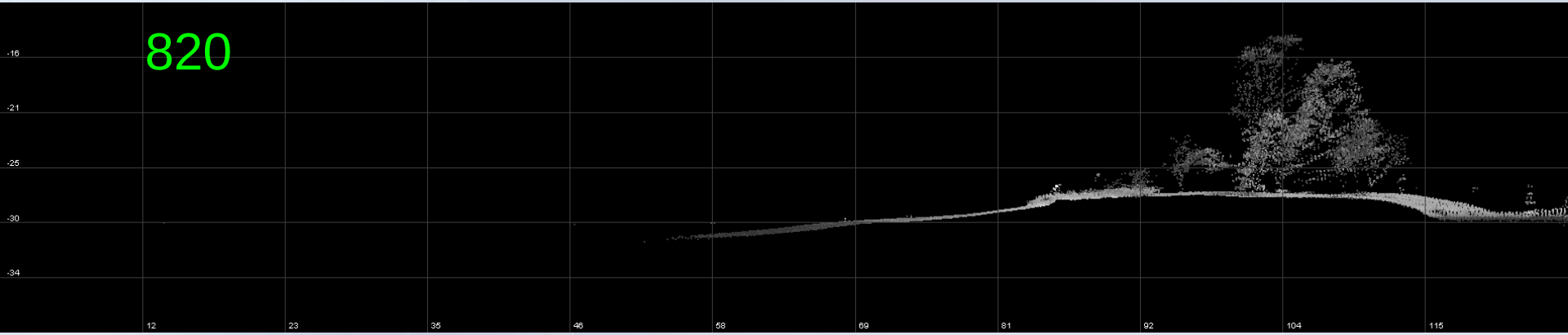


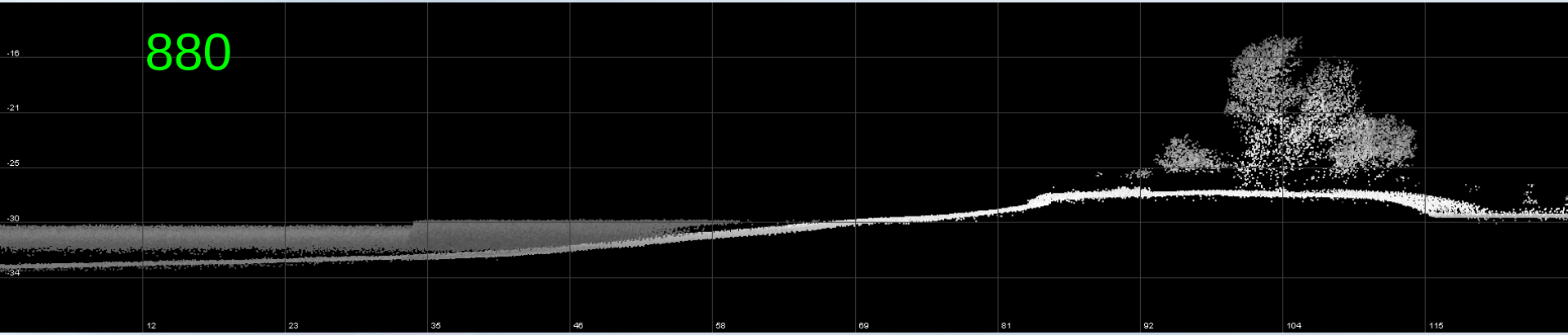
Buzzards Bay bathymetric lidar Survey (green) and NOAA Ship Thomas Jefferson multi-year hydrographic survey (blue)

- **RSD completed priority areas 1-3**
- **Priority 4 was previously contracted out**
- **Priority area 1 was flown twice with the 820 and 880 Riegl topobathy lidar**

National Oceanic and Atmospheric Administration

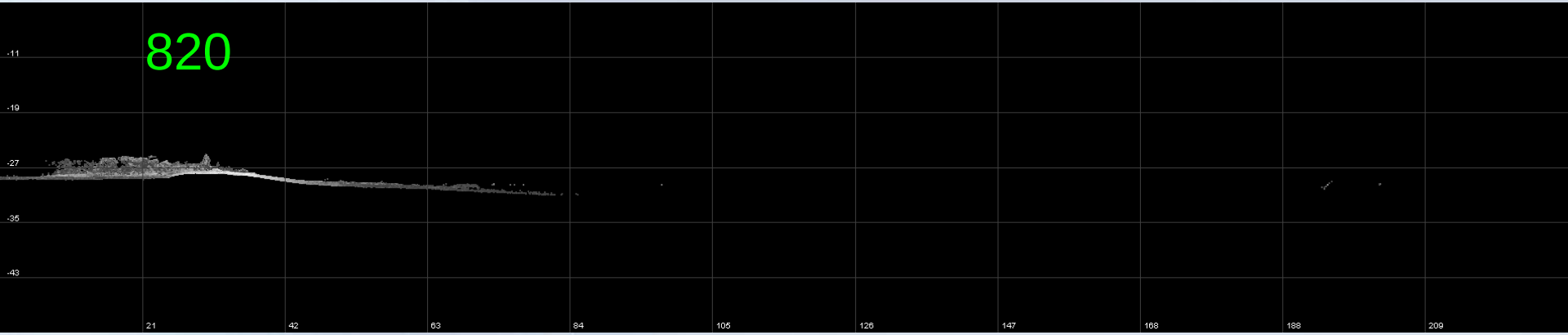
880 vs 820 Buzzard's Bay

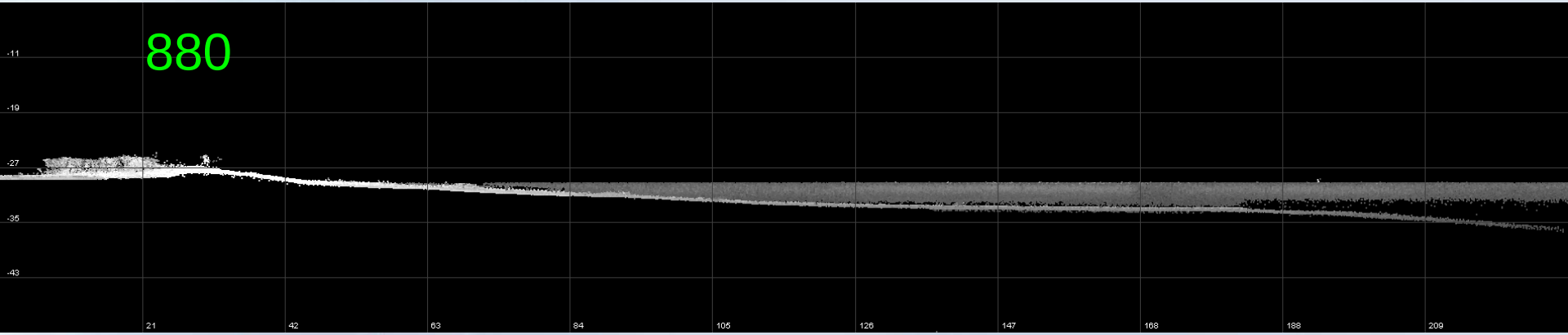




National Oceanic and Atmospheric Administration

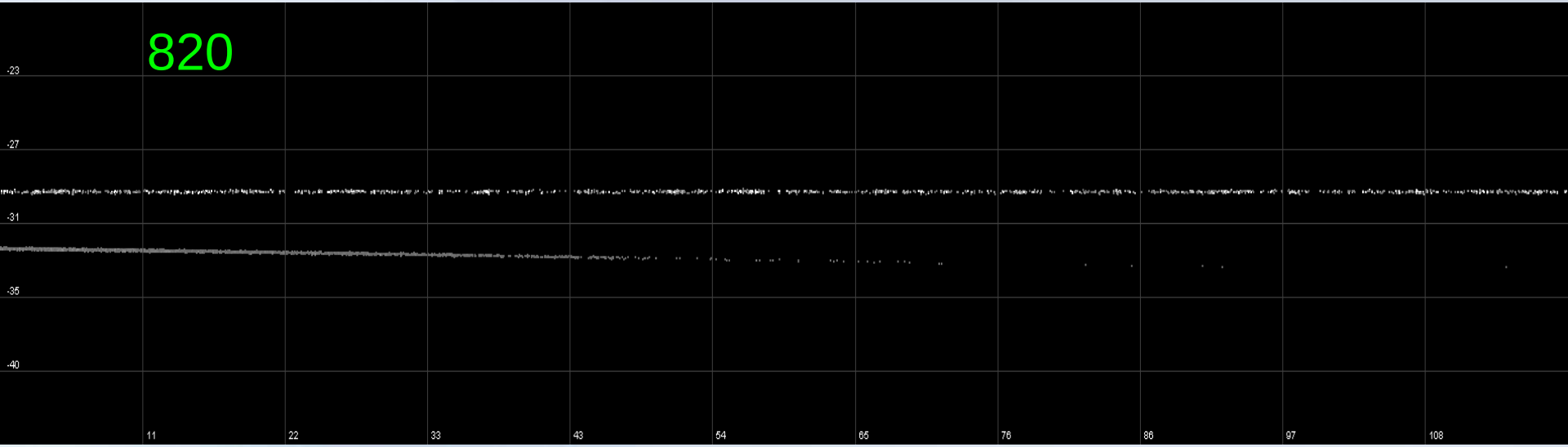
880 vs 820 Buzzard's Bay

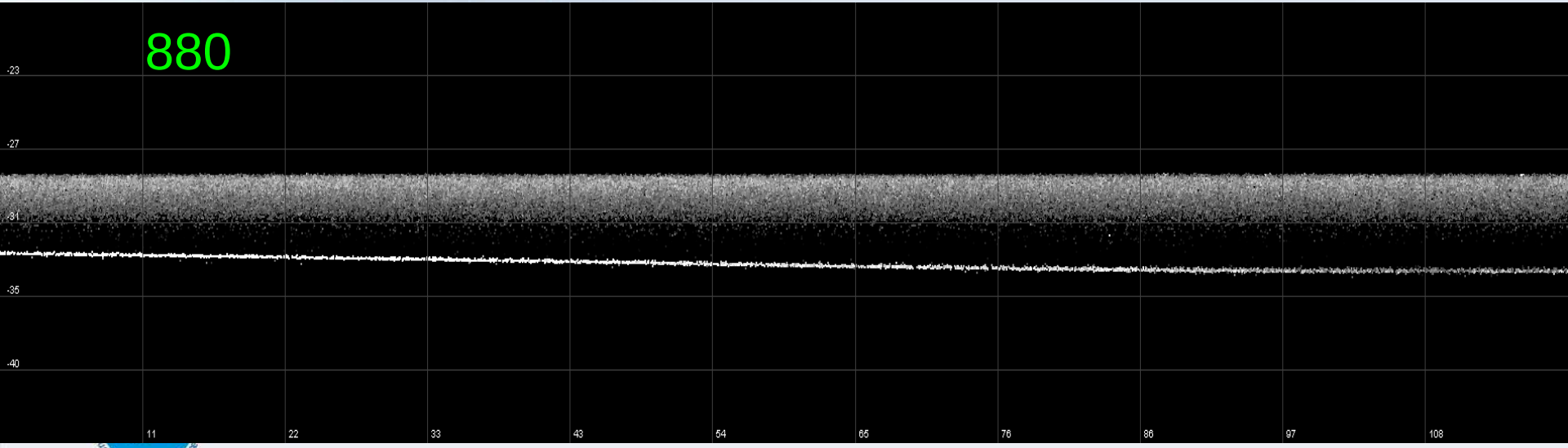




National Oceanic and Atmospheric Administration

880 vs 820 Buzzard's Bay





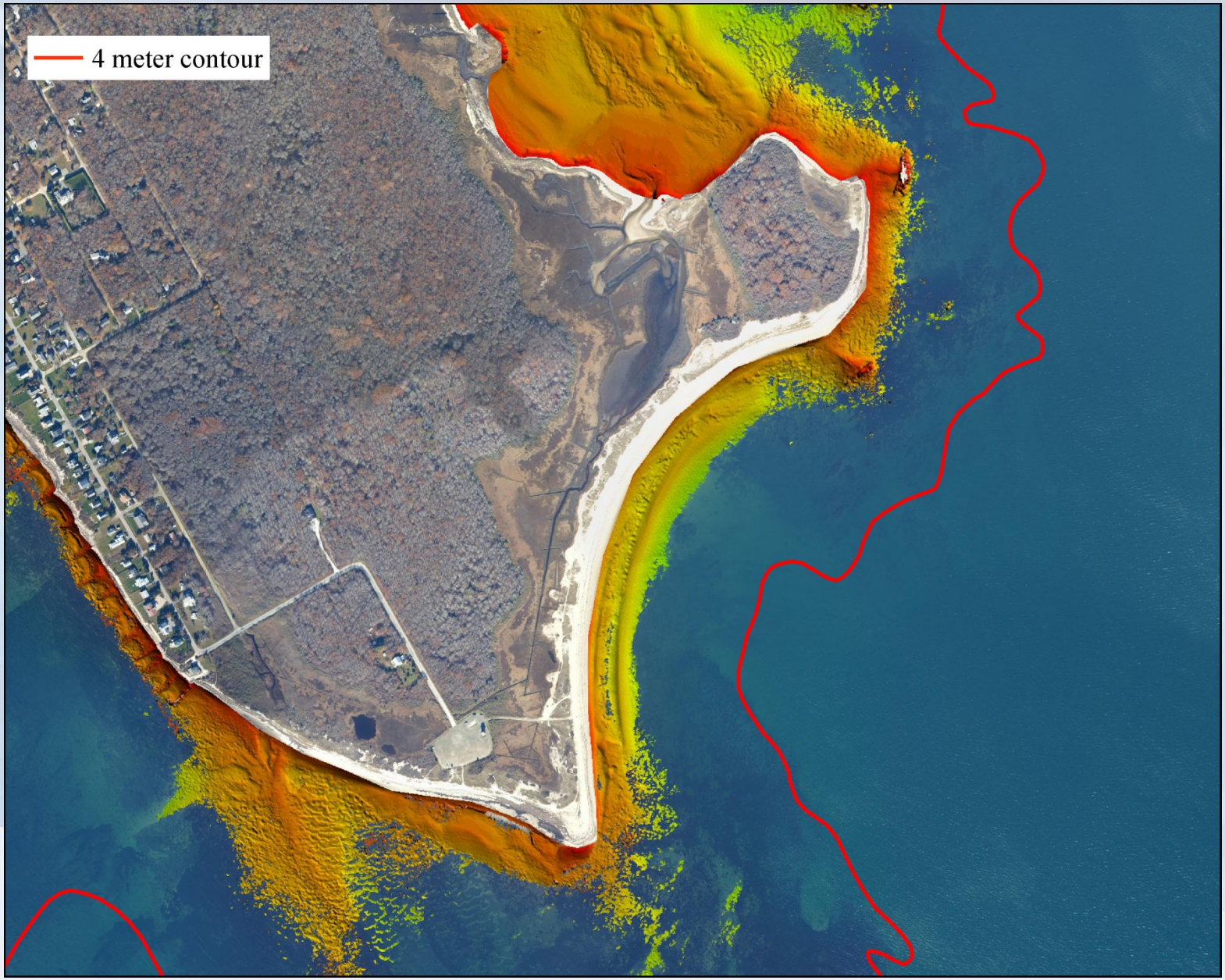
820 Clarks Cove

880 Clarks Cove

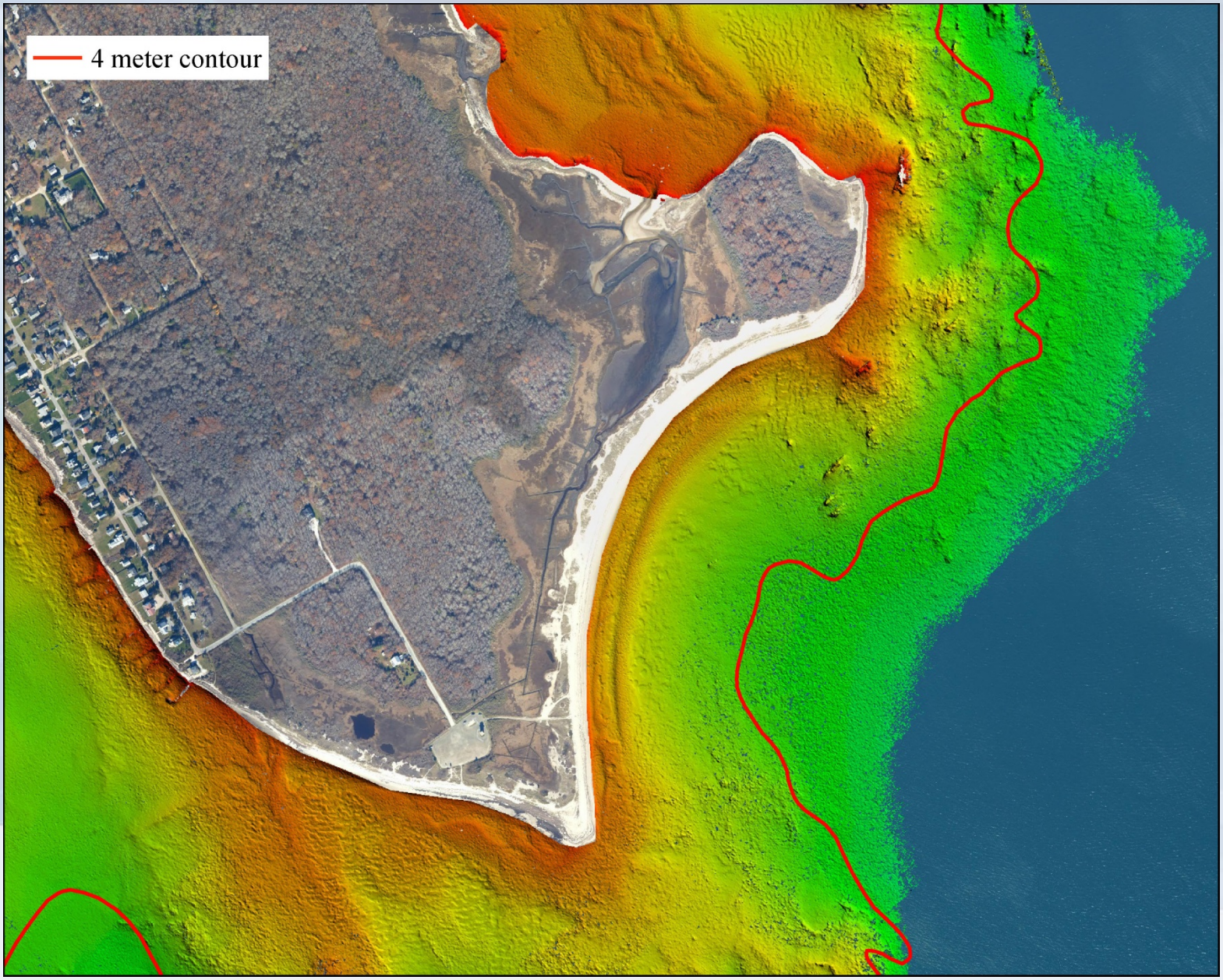
820 New Bedford Harbor Entrance

880 New Bedford Harbor Entrance

820 West Island



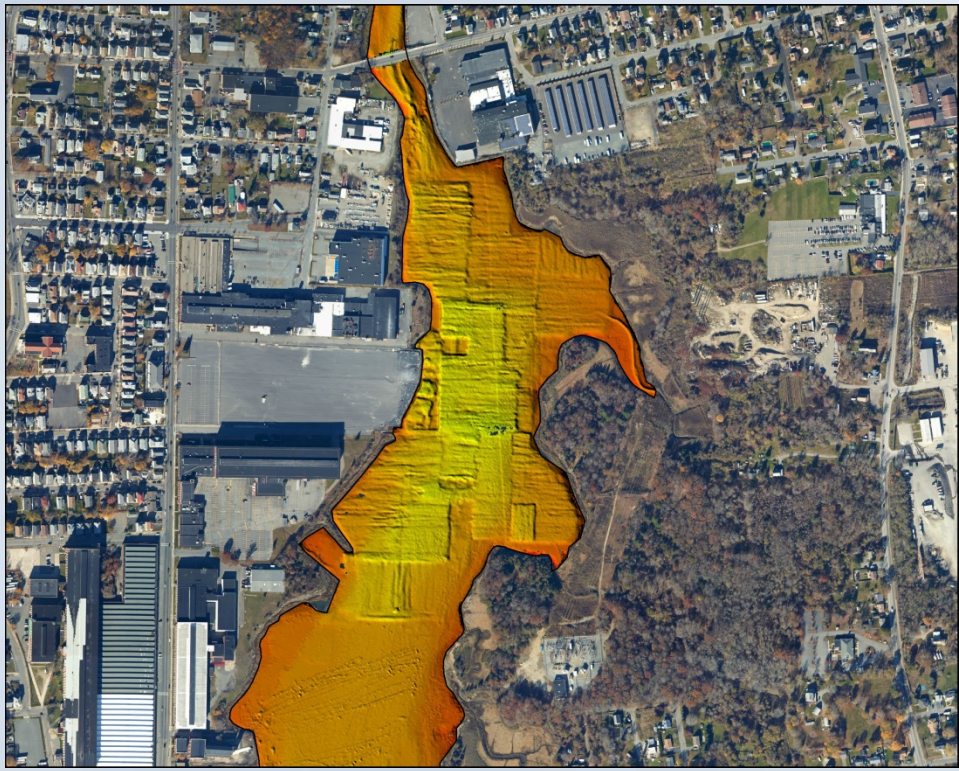
880 West Island



820 vs 880 New Bedford Harbor

820

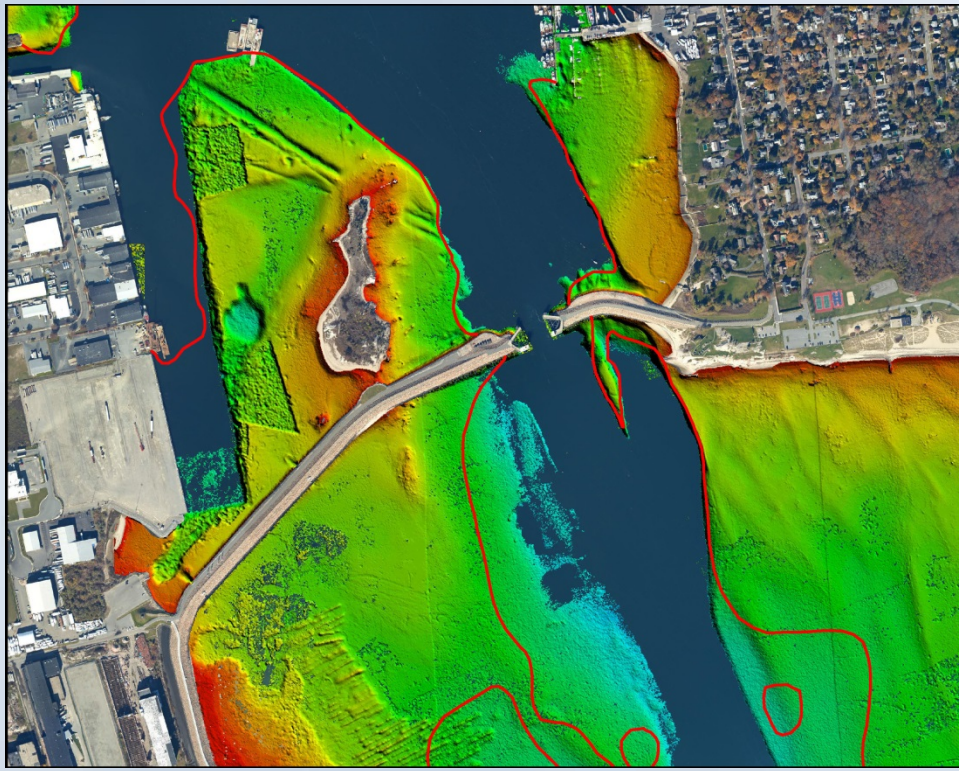
880



National Oceanic and Atmospheric Administration

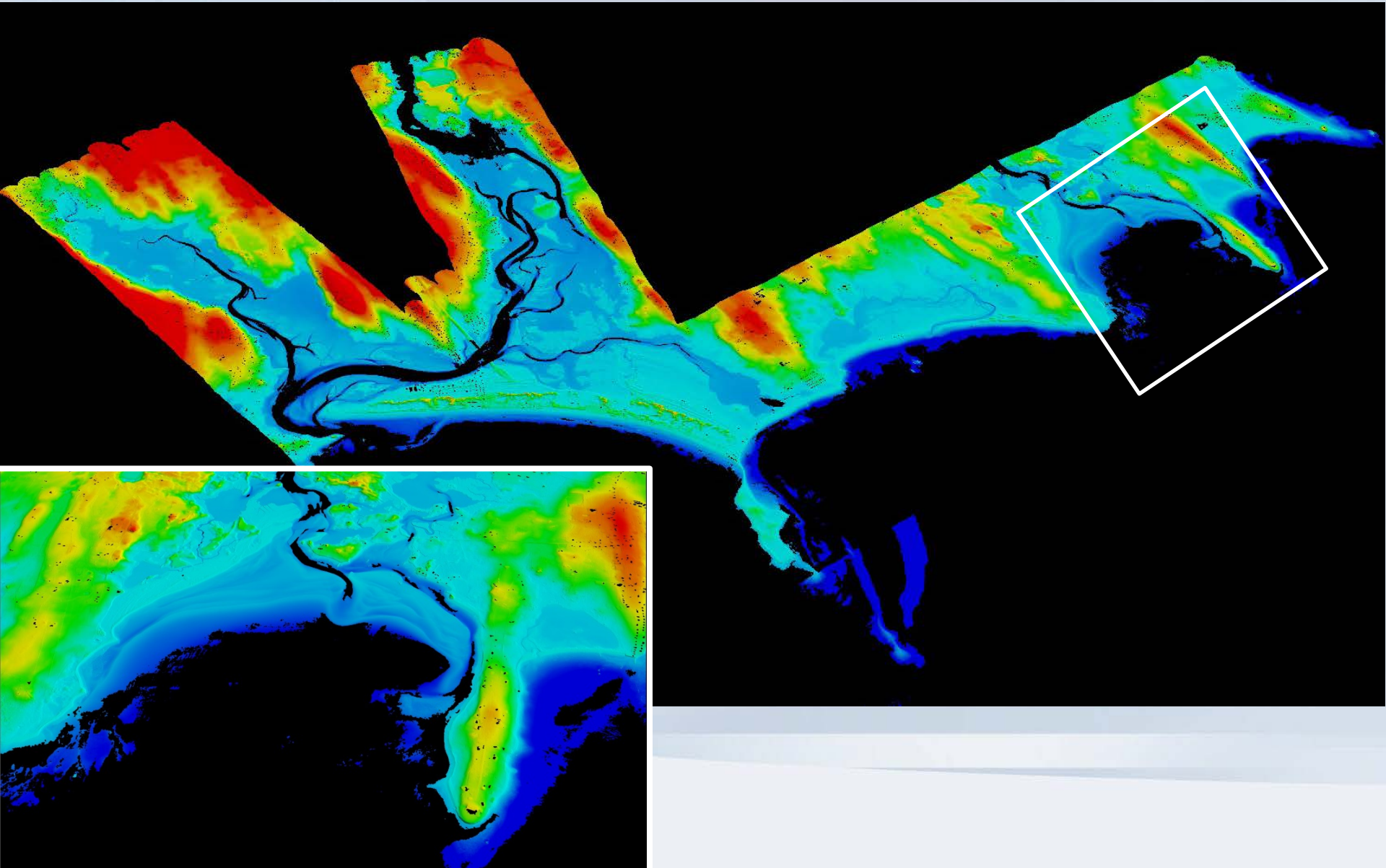
820 vs 880 New Bedford Harbor Entrance

820 880

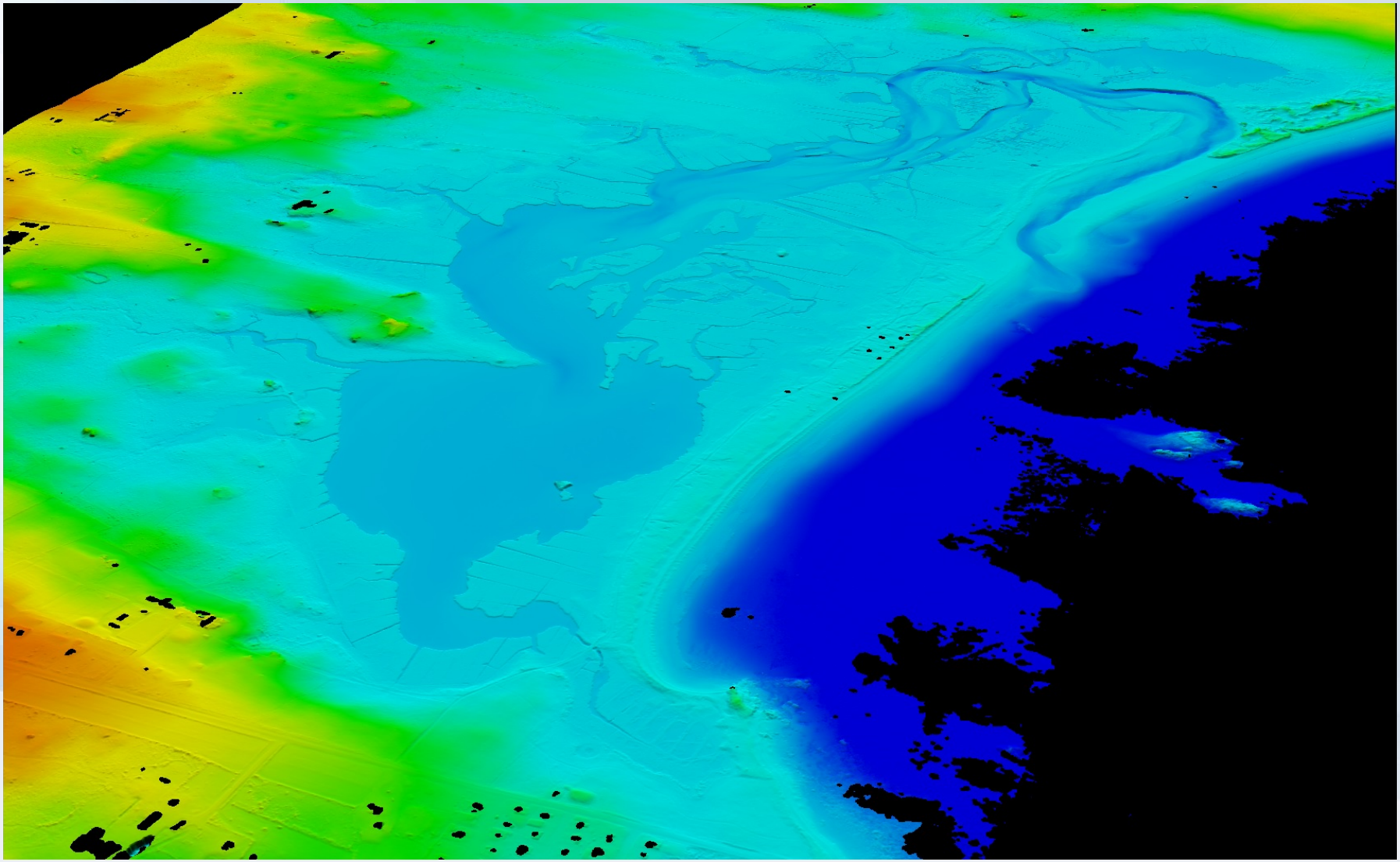


National Oceanic and Atmospheric Administration

Buzzards Bay



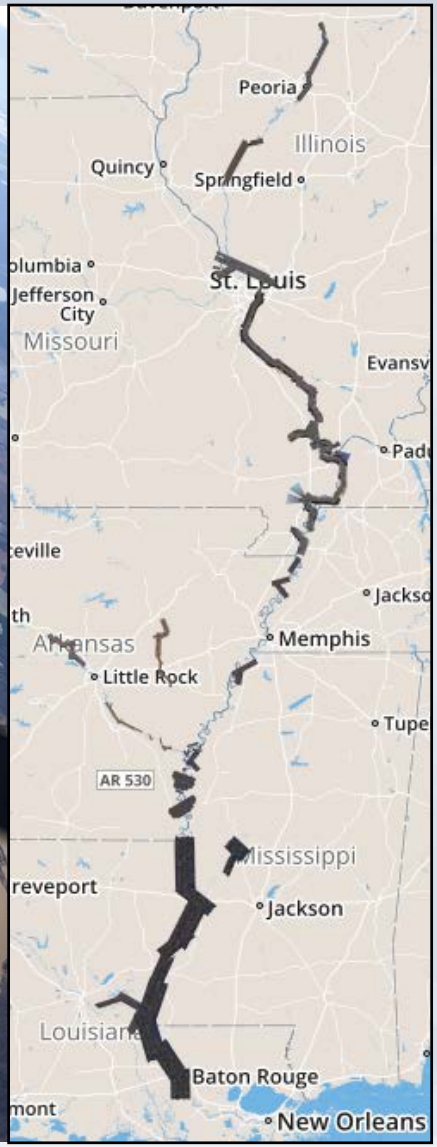
Buzzards Bay



Emergency Response

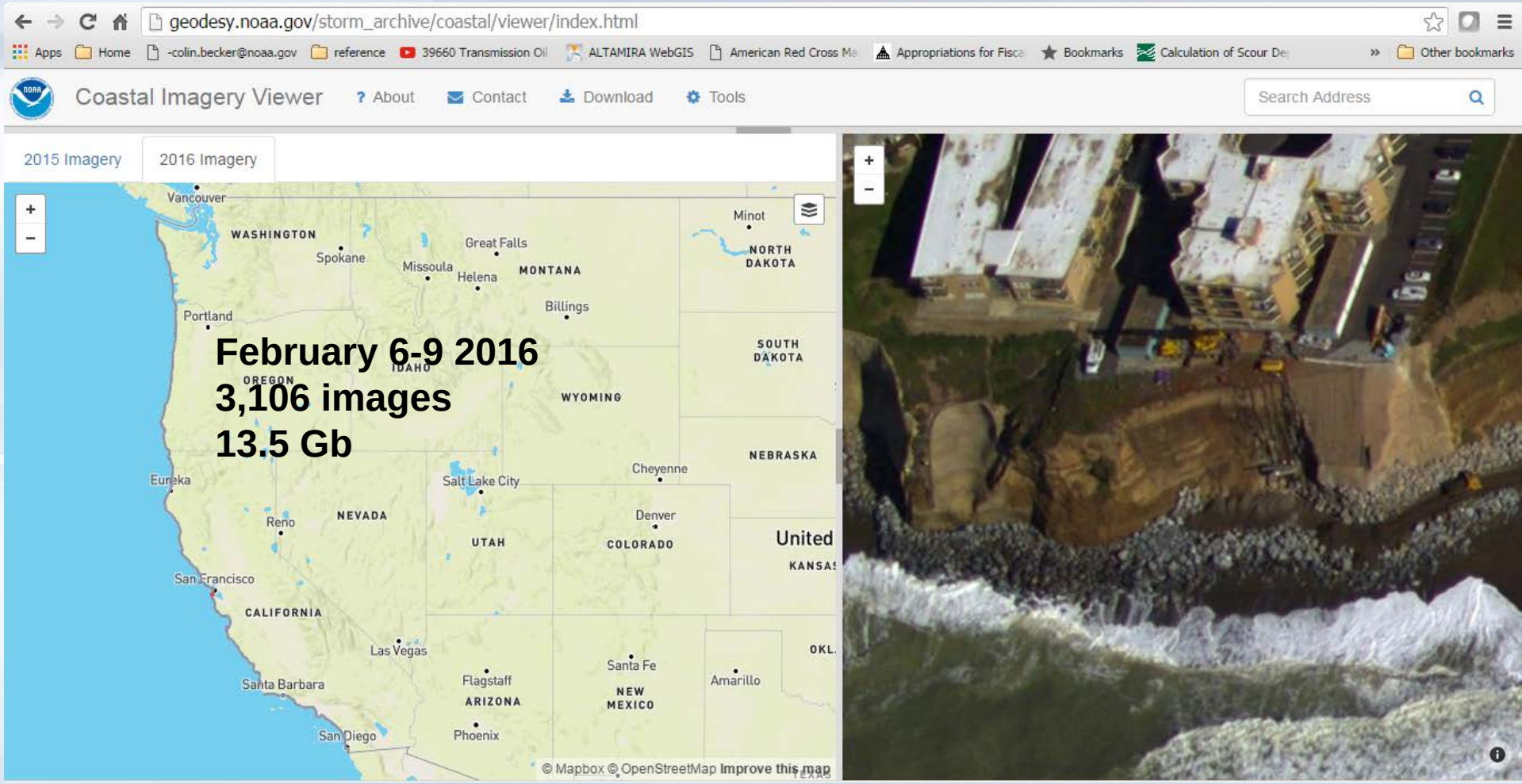
Number of images:
RGB 4,710
NIR 2,713
PORT OB 1,322
STBD OB 1,322
Total 10,067

Area imaged:
~ 19,359 square km
~ 7,475 square miles



NGS Midwest flood imagery

Emergency Response

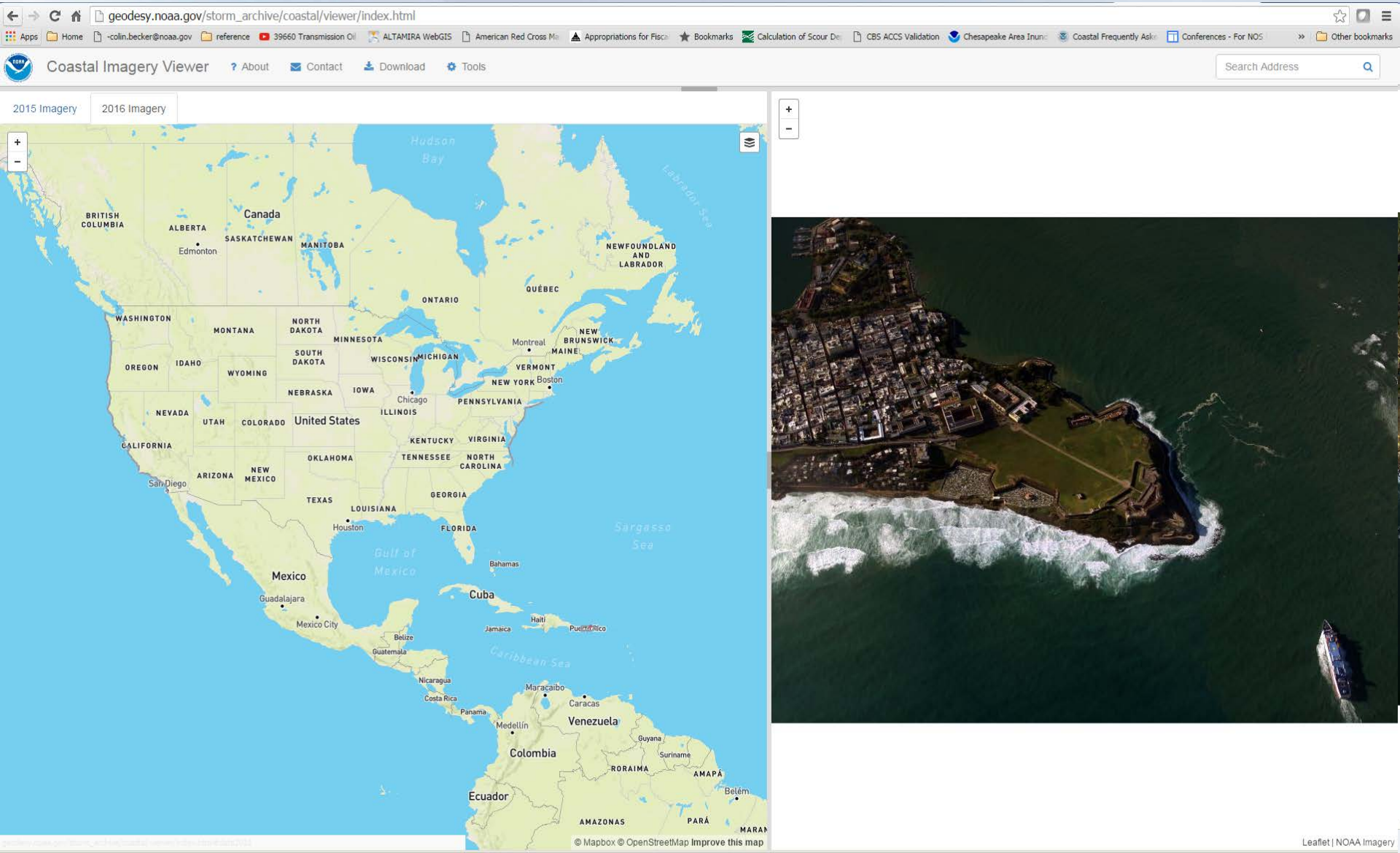


Aerial Oblique Imagery collected to Assess Impact to Navigation and Coastal Zone Management from the 2016 El Nino event

National Oceanic and Atmospheric Administration

http://geodesy.noaa.gov/storm_archive/coastal/viewer/index.html

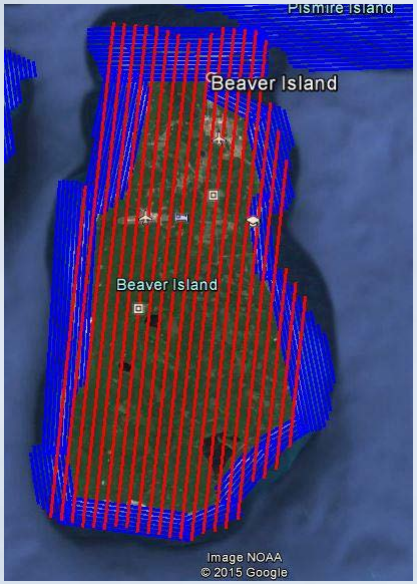
2015/2016 Coastal Obliques

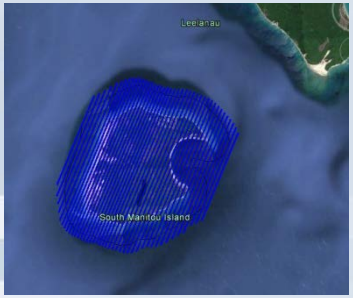


NOAA’s Office for Coastal Management

National Oceanic and Atmospheric Administration

NOAA Office for Coastal Management Topo/Bathy LIDAR Collect for Beaver Islands and S. Manitou Island, MI





National Oceanic and Atmospheric Administration

NOAA’s National Center for Coastal Ocean Science (NCCOS)

National Oceanic and Atmospheric Administration

Evaluating the Utility of EAARL-B Lidar Waveforms for Characterizing Benthic Habitats

- *Objective:* Investigate whether EAARL-B Lidar waveforms can enhance our ability to map benthic habitats in support of ocean planning & management
- *Who:* NOAA NCCOS, Oregon State U., U. of New Hampshire
- *Timeline: 2015 – 2017*
- *Where*: Flat Cay, St. Thomas
- *Presentation on Wednesday, 20 July at 10:55 am*

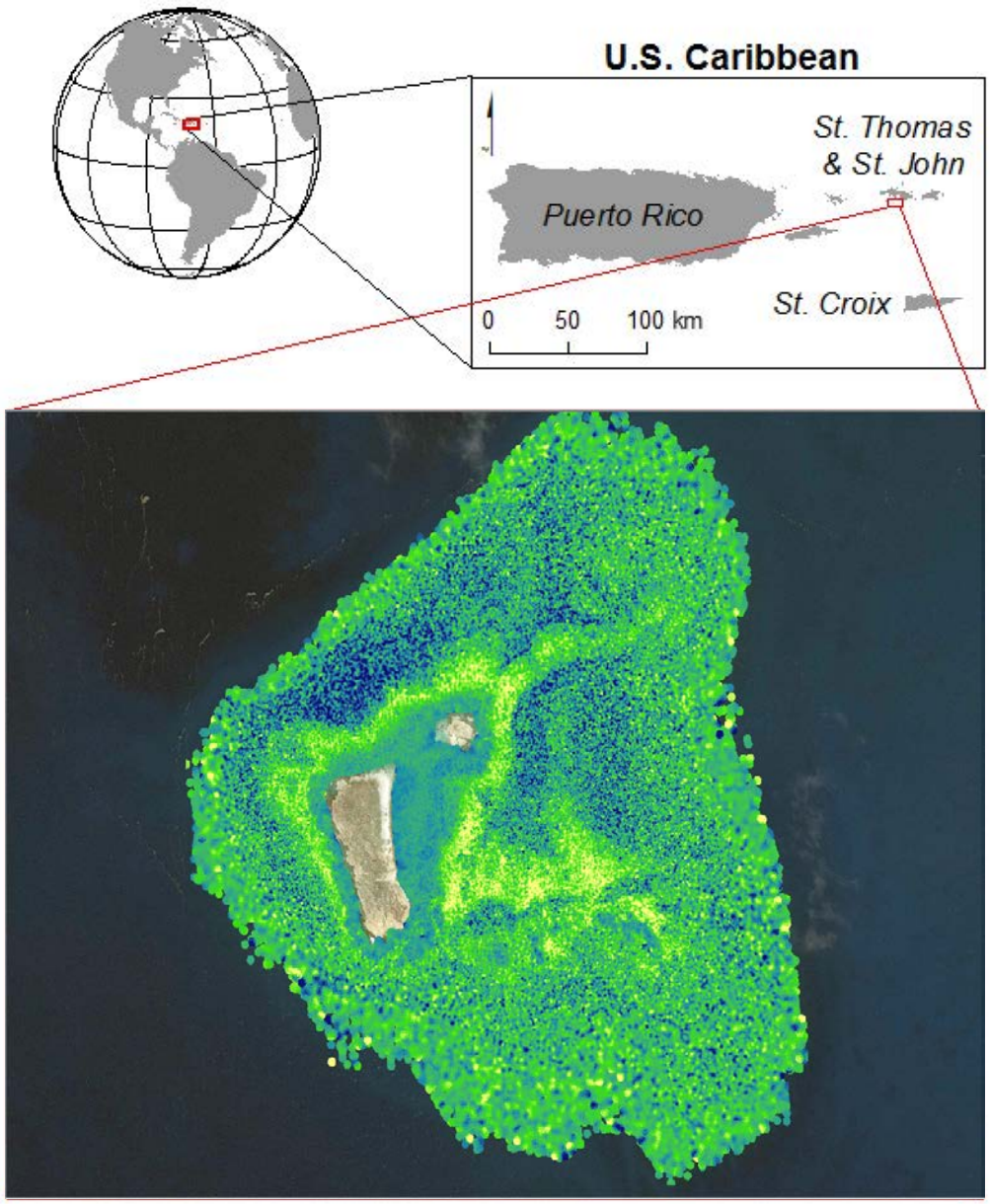
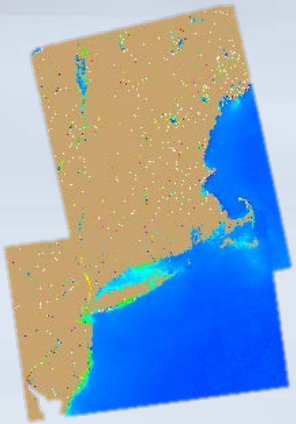


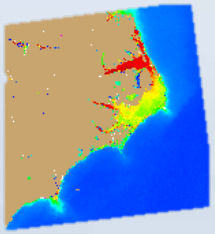
Fig. 1 – Draft, corrected EAARL-B waveform products

NOAA NCCOS Kd Climatology/SDB International Database Product



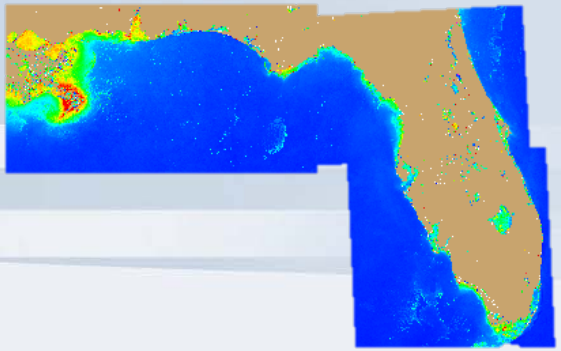
Background

- Prototype with **300 m** climatology
- Combined with SDB International database project for Coast Survey needs
- Became SDB International database per request of the Marine Chart Division (much larger scope!)



Status

- NE, SE, Gulf (to Texas) completed
- Alaska just starting (NW - Bristol Bay, Yukon area)
- Using Azure to process data



NOAA NCCOS Kd Climatology/ SDB International Database Alaska Priorities

National Oceanic and Atmospheric Administration

Adding SDB to Climatology work flow

Year 1: Proof of Concept (understanding the deliverables)

- Gather good Landsat images
- Create a MODIS Database and test MODIS algorithm
  - MODIS climatology for turbidity - to ID turbid areas
  - Radiometric correction (sun glint)
    - Use NIR to for sun glint
- Begin Prototype using ALB data in on the west coast of FL and Cape Ann, MA

Year 2: Expand the coverage (process evaluation)

- Expand coverage to:
  - East GOM areas
  - Caribbean areas
  - Cape Cod, MA to NJ
  - Pamlico, NC (backbays)
- Areas will be separated to: Stable bathymetry, dynamic and optically-deep
- In each image, identify the usable areas (masking the turbid areas in each image)

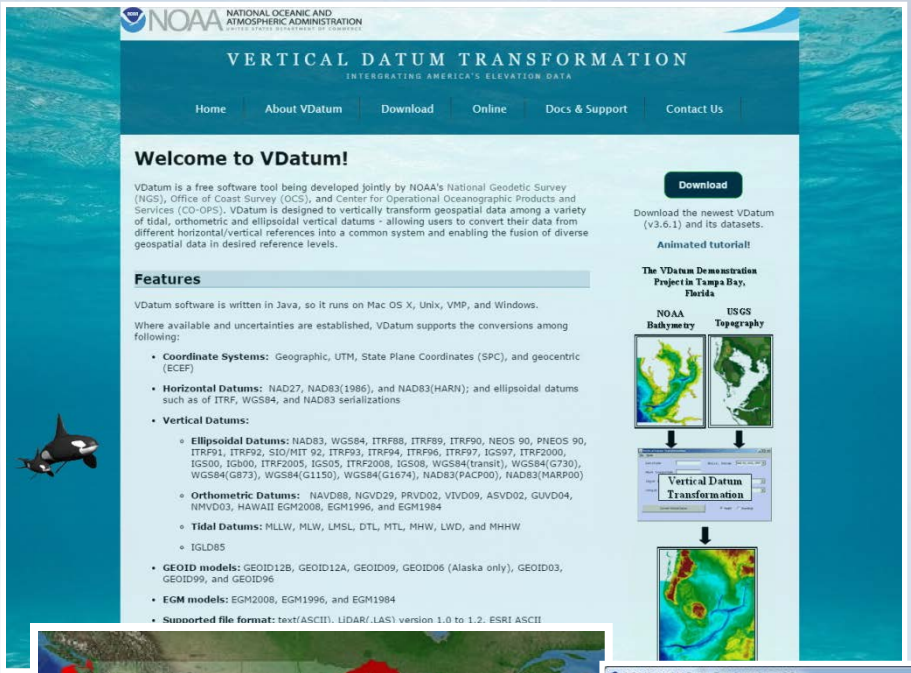
Year 3 – Deliverables at the end of FY2019

- Tool Development (for ESRI environment)
- SDB national/International database

*The RSD shoreline (MLLW) can be used to mask land for the US.

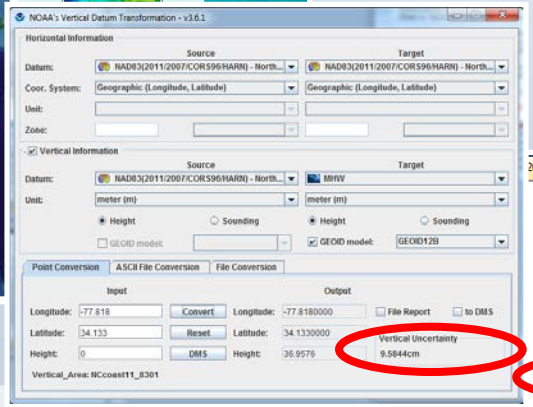
*Satellite IR imagery will be used to mask land for the international areas.

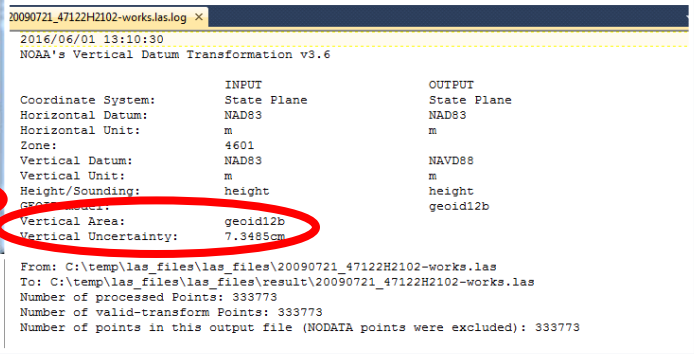
VDatum: http://vdatum.noaa.gov



(Version 3.6 Released, May 13, 2016)

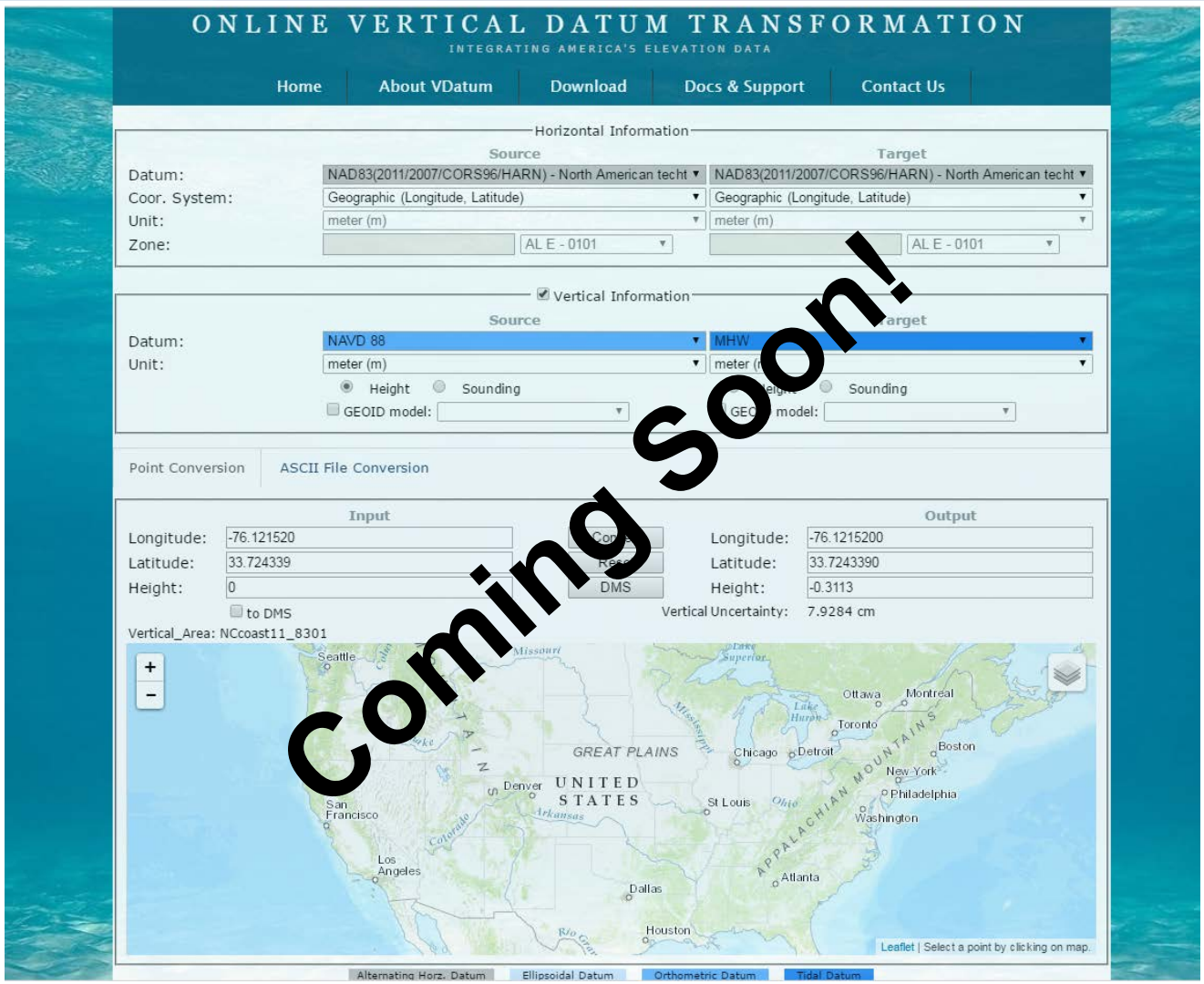
- Updated San Francisco Bay Tidal Region
- ESRI 3D Shapefile Support
- Phase 1 Uncertainty Implementation
- New support for EGM1984, EGM1996, and EGM2008





National Oceanic and Atmospheric Administration

VDatum: Web Interface



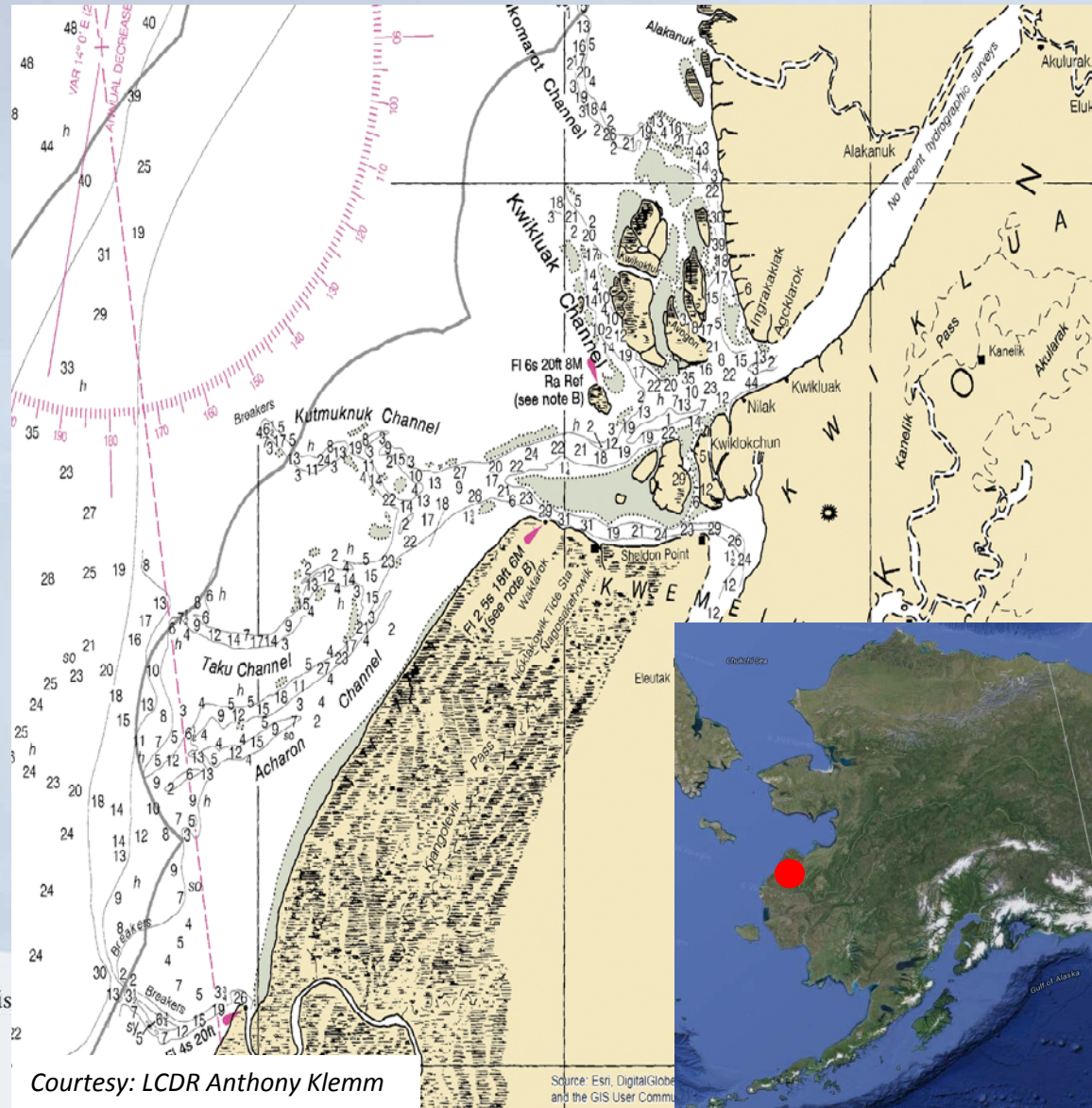
National Oceanic and Atmospheric Administration

NOAA’s Office of Coast Survey

Need for SDB - gaps/issues

Yukon River

- Existing largest scale chart was unusable for navigation
- Scale - 1:300,000
- Last surveys – 1899
- maritime traffic using Google Earth images for navigation



Courtesy: LCDR Anthony Klemm

National Oceanic and Atmospheric Adminis

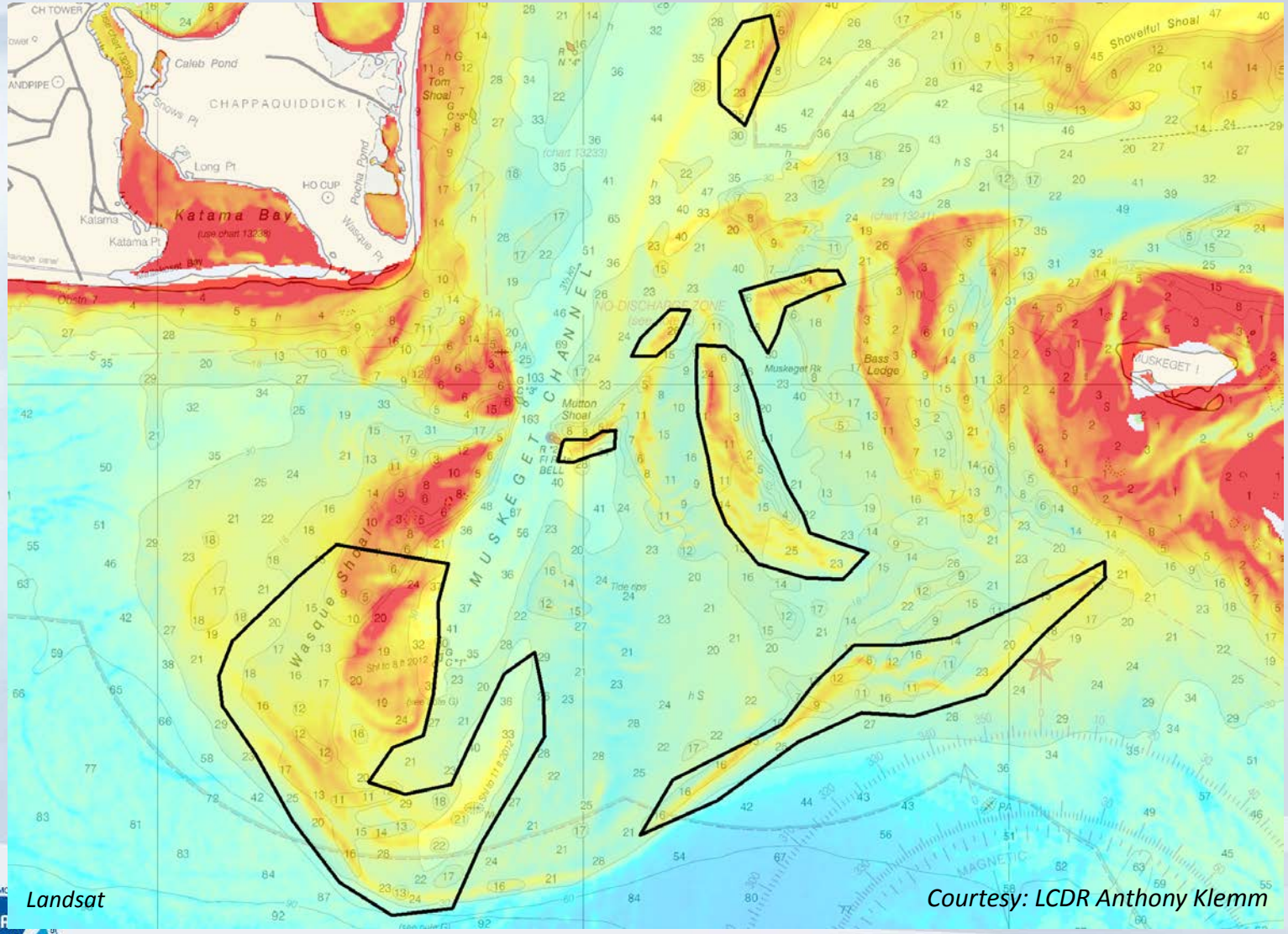
Yukon River provisional ENCs

- Land area from NOAA's Continually Updated Shoreline Product (CUSP) and Landsat8 Infrared derived land-water interface
- Shoals detected in SDB extracted and shown cartographically as obstruction areas
- No depths - no known sounding datum
- Charts will be updated yearly using most recent imagery available after the spring thaw

Courtesy: LCDR Anthony Klemm

National Oceanic and Atmospheric Administration

Reconnaissance Value of SDB

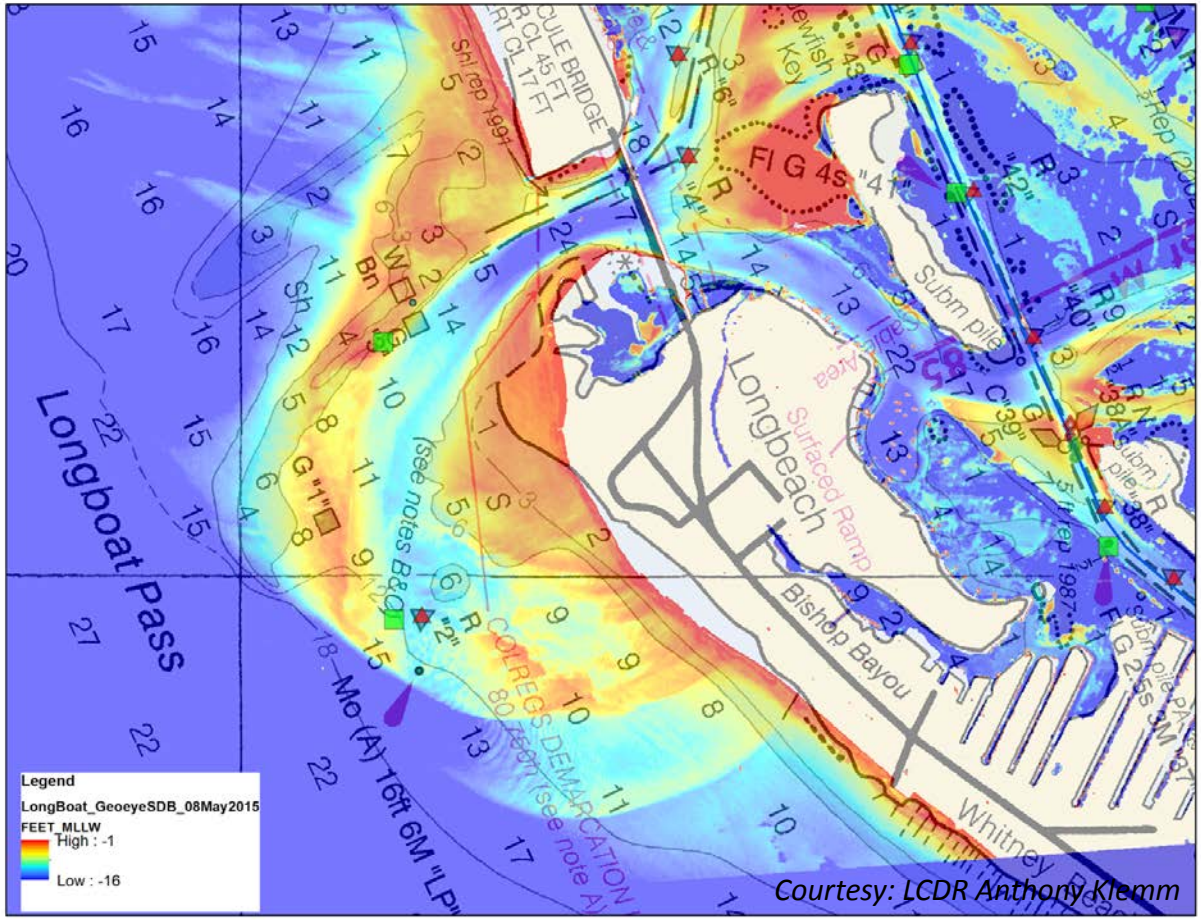


Landsat

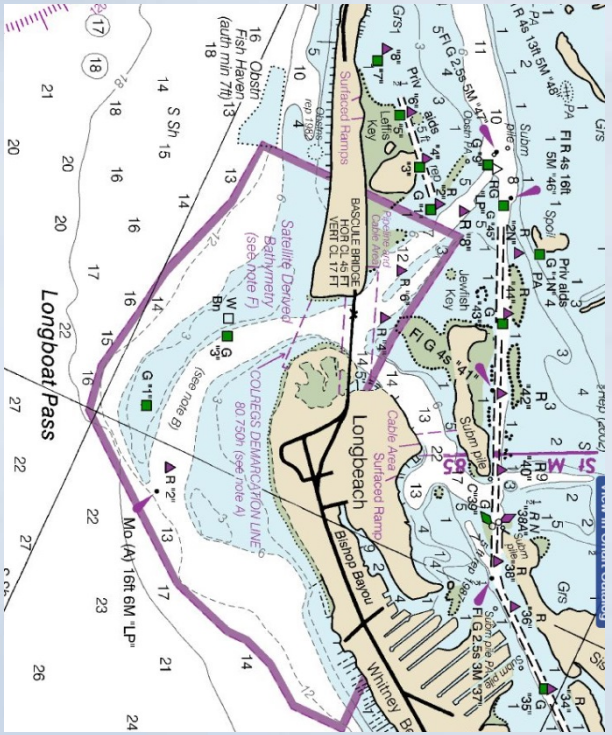
Courtesy: LCDR Anthony Klemm

National Oceanic and Atmospheric Administration

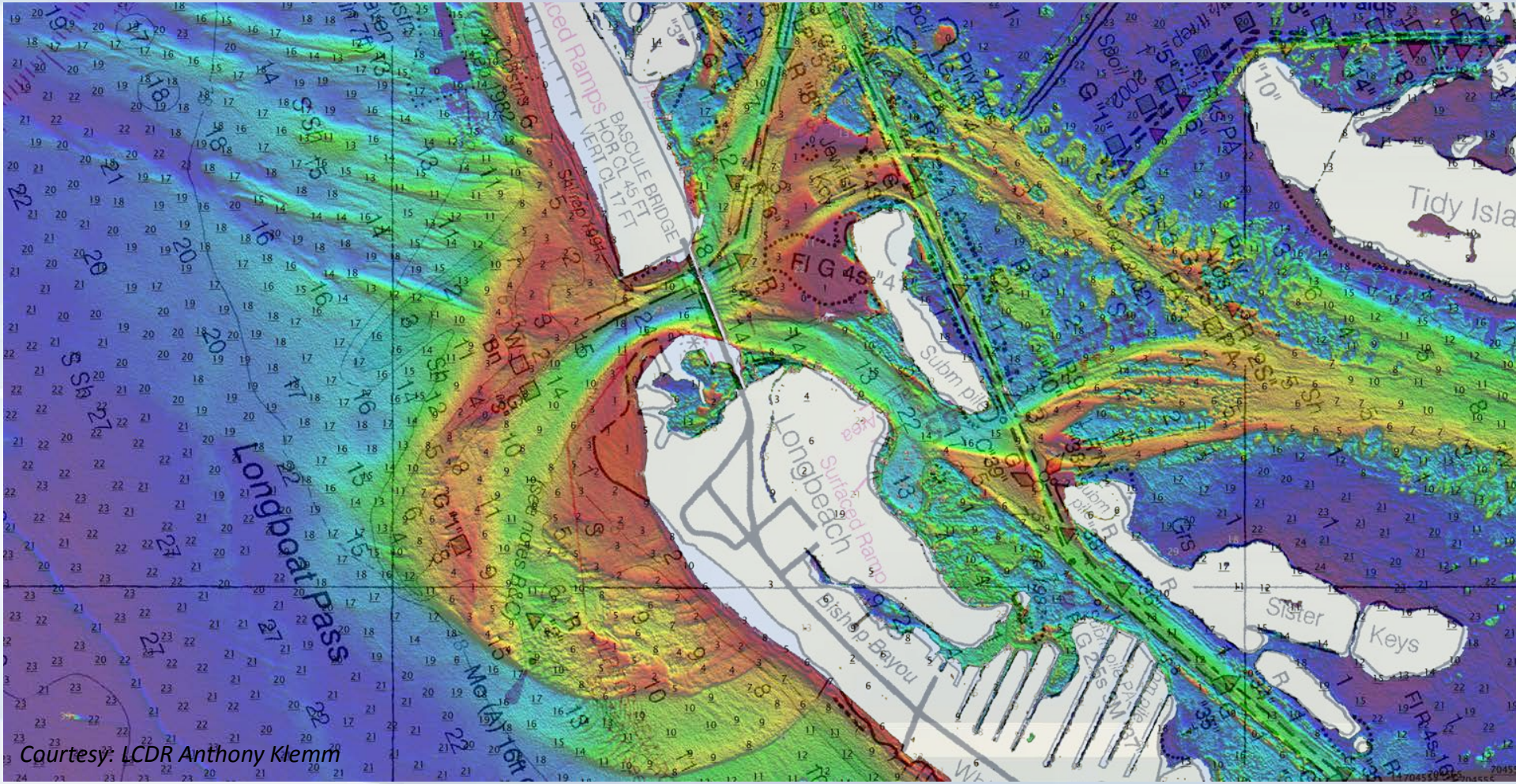
Reconnaissance tool
Chart Adequacy



Courtesy: LCDR Anthony Klemm



Reconnaissance tool
Chart Adequacy



Courtesy: LCDR Anthony Klemm

National Oceanic and Atmospheric Administration

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