NDIA – 2005 Tri-Service Infrastructure System Conference & Exhibition
The America's Center
St. Louis, MO
Event #5150

Wednesday, August 3rd, 2005
H&H Community of Practice
Track 4 Session 4D (4:30 – 5:00)

High Resolution Visualizations of Multibeam Data of the Lower Mississippi River

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US Army Corps
of Engineers®
New Orleans District

High Resolution Visualizations of Multibeam Data of the Lower Mississippi River

Tom Tobin & Heath Jones
August 3rd, 2005

Typical Equipment on Survey Boat Performing River Engineering Surveys on the Mississippi and Inland Rivers

- **SeaBat 8101** - 240 kHz Multibeam Bathymetric and Sidescan Imaging Sonar (**Reson, Inc**.)
- **SeaBat 8125 -** 455kHz Multibeam Bathymetric and Sidescan Imaging Sonar (**Reson, Inc**.)
- **HYPACK** and **HYSWEEP** software (HYPACK, Inc.)
- **P**osition **O**rientation **S**ystem with a Trimble Differential and RTK GPS aided Inertial Block to collect Position along with Heave, Pitch, Roll and Heading Corrections (TSS-UK Ltd.)
- **A**coustic **D**oppler **C**urrent **P**rofiler - 600 kHz and 1200 kHz (RD Instruments)
- **WinRiver** Current Profile Acquisition Software (RD Instruments)
- Model **448** - 210 kHz Single Beam Echo Sounder (Innerspace Technology)
- Model **850** - 210 kHz Single Beam Echo Sounder with Portable Transducer (ROSS Laboratories)
- **CTD – 1820** Sound Velocity Probe with Salinity and Temperature Recorder (Marimatech)
- **DT 5000** 120 kHz Dual Beam System for Locating Fish or Biomass (BioSonics)
- **DT 4000** 200 kHz Dual Beam System for Identifying Bottom Classification (BioSonics)
- **RoxAnn** Seabed Identification Sonar to Identify Bed Material Types (Stenmar Sonavision)
- **Data Collection Computer** - 3.06 GHz CPU Processor, 120 Gb Harddrive, 1 Gb RAM, Quad Monitor Card, (10) Hi-Speed Com ports, (2) Ethernet (NIC) ports, (1) Floppy Drive, (1) 250 Mb ZIP Drive, (1) CD ROM Drive, (1) CD-RW and DVD Drive (Dell)

Variable Position Multibeam

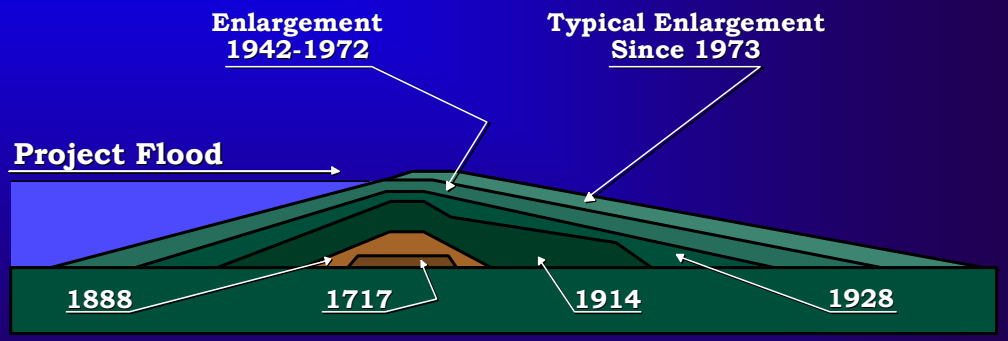
Note: Recording Head can be adjusted for Forward Sensing Capability. To Increase Survey Speed, Shave Head. For Reduced Drag, Bald Headed Model available


Carrollton Wrecks
2003

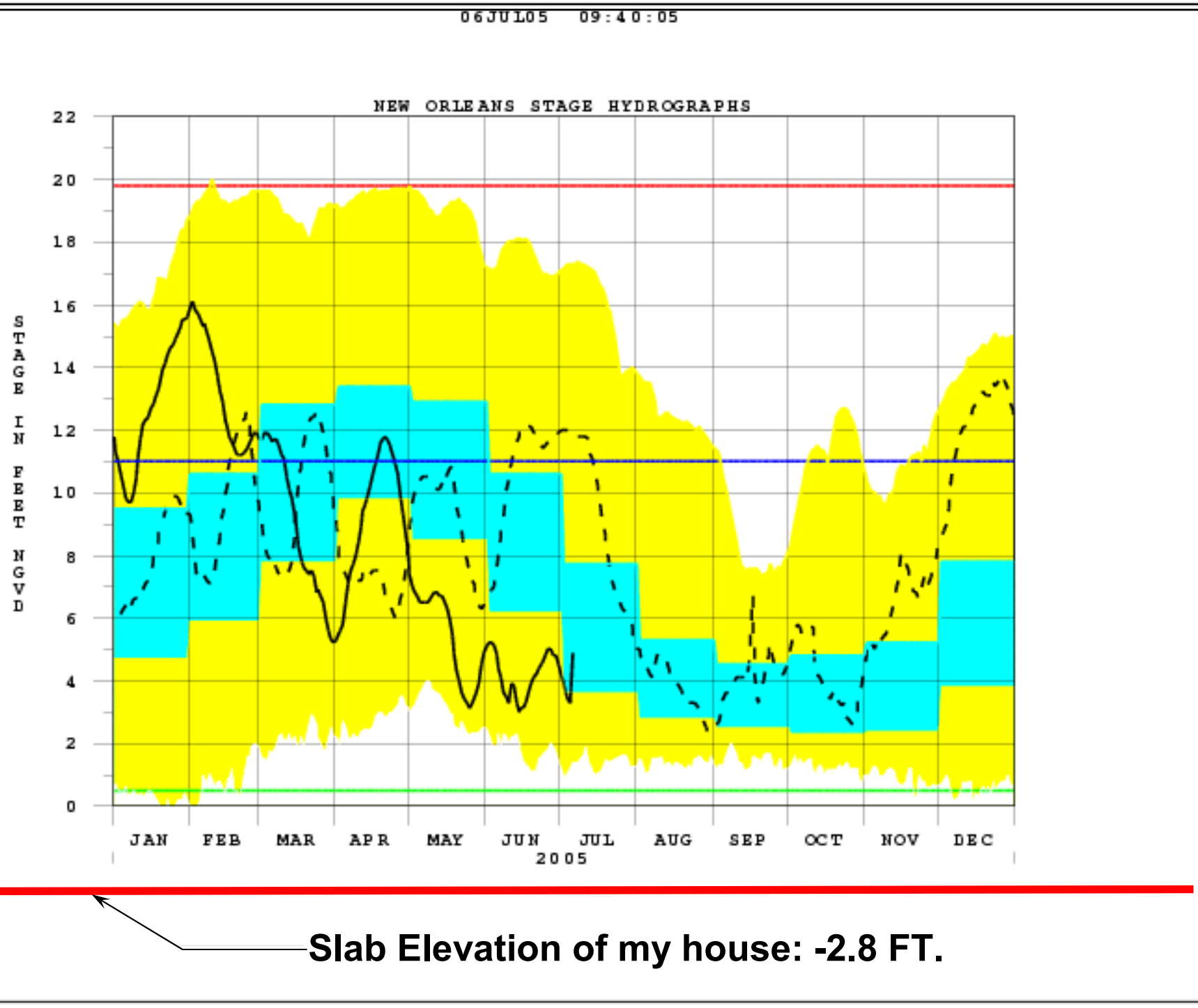
Mississippi River Levee/Bank Monitoring

- The New Orleans District, partnered with the state levee boards, maintains 486 miles of levee along the Mississippi River (512 miles including the floodwalls).
- 84 existing revetment sites comprise approximately 361 miles of revetment, with 16,000(+) survey ranges.

Evolution Of Mississippi River Levees



Maintaining the levee system and providing sufficient draft for navigation requires a continuous river monitoring effort.

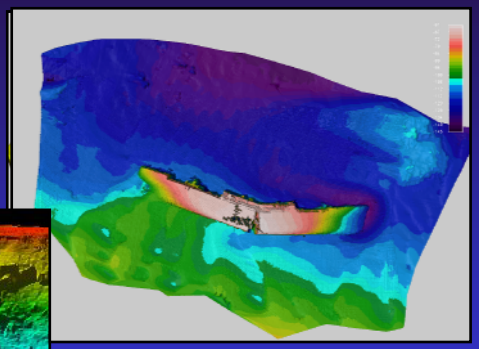

06JUL05 09:40:05
NEW ORLEANS STAGE HYDROGRAPHS
STAGE IN FEET NGVD
22
20
18
16
14
12
10
8
6
4
2
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
2005
Slab Elevation of my house: -2.8 FT.

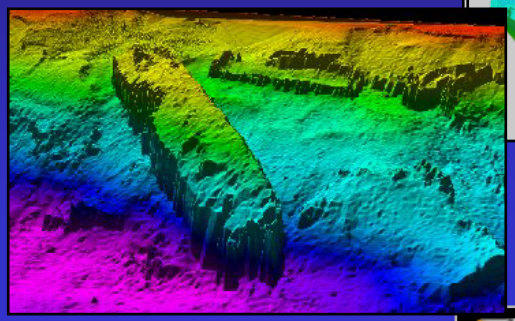
Maintaining Our Levees

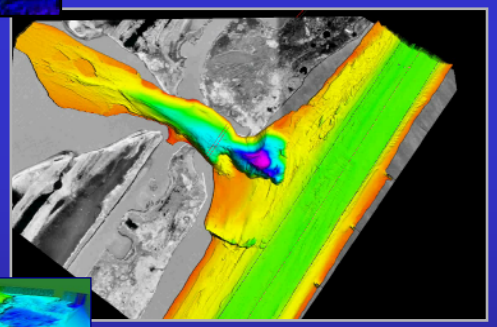
- Bank Stability is one of the keys. In addition to visual levee inspections, we take bathymetric surveys that enable us to see what is going on under the water.
- Approximately 16,000 ranges along 361 miles of revetment at 84 sites on the Mississippi River are surveyed annually.
- Comparing current surveys with previous years surveys shows us where scour/shoaling problems are occurring.
- Traditionally these ranges were surveyed using single beam technology with one point reported every 20 feet along the revetment range line.
- With the advent of multibeam technology, we began using it to survey underneath barges.
- Since 2003, we have been receiving our revetment maintenance survey data in multibeam format.

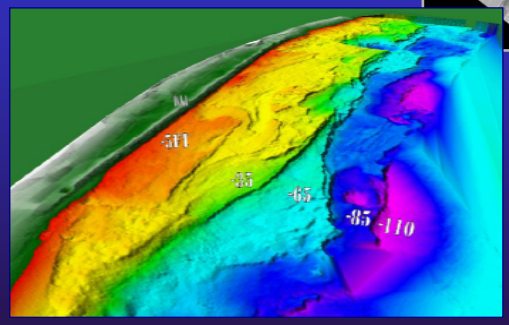
Benefits of Multibeam Visualizations

- Visual aid in locating:
  - Submerged obstructions
    - sunken vessels
    - pipelines
    - structures
  - Scour holes / shoals
  - Steep banks / hard points
  - Channel elevations
- Identify Environmental Habitats
  - Areas of sediment transport
  - Sandy bottoms and sandwaves
- Volumetric computations
  - Dredging
  - Bank degrading

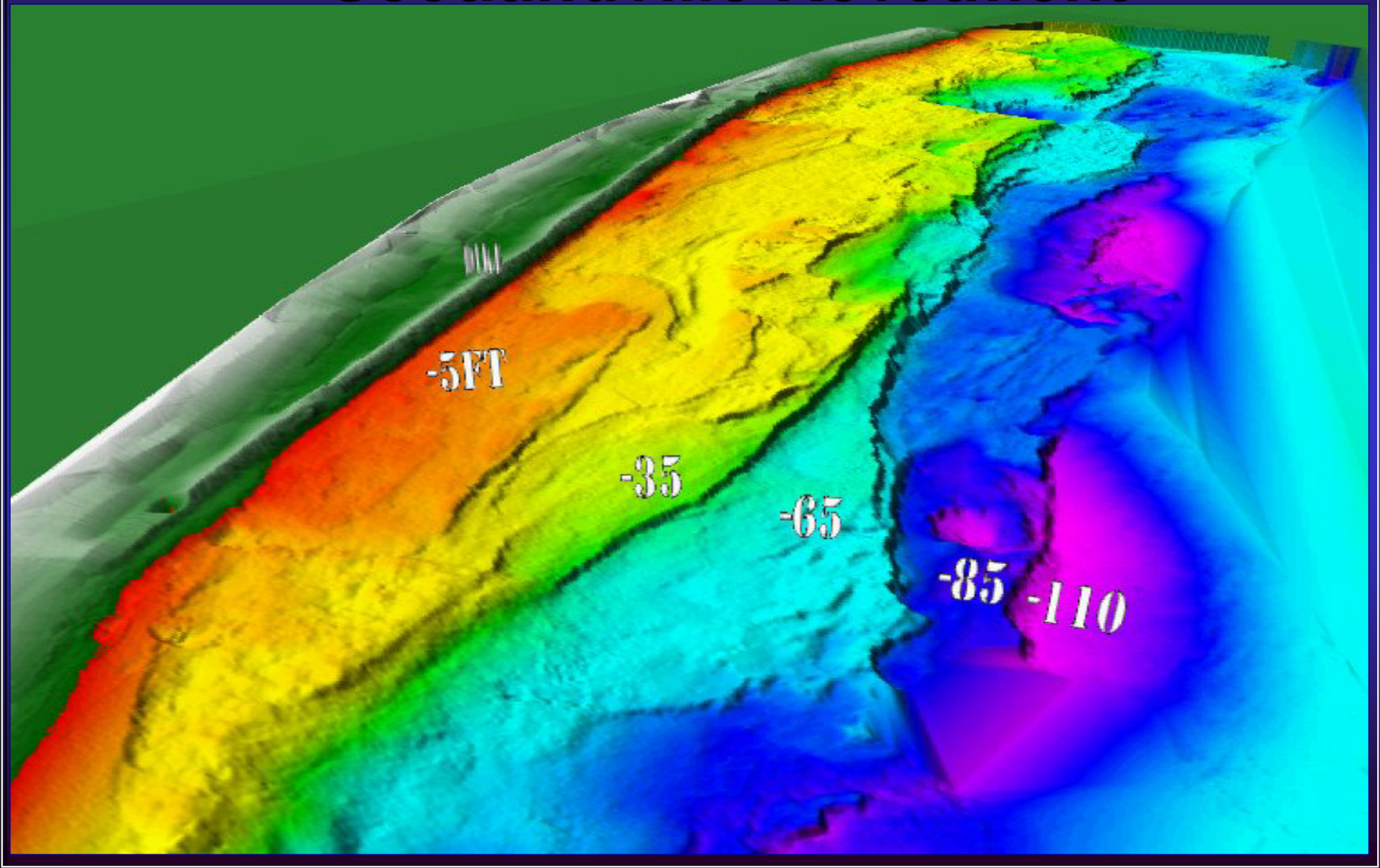


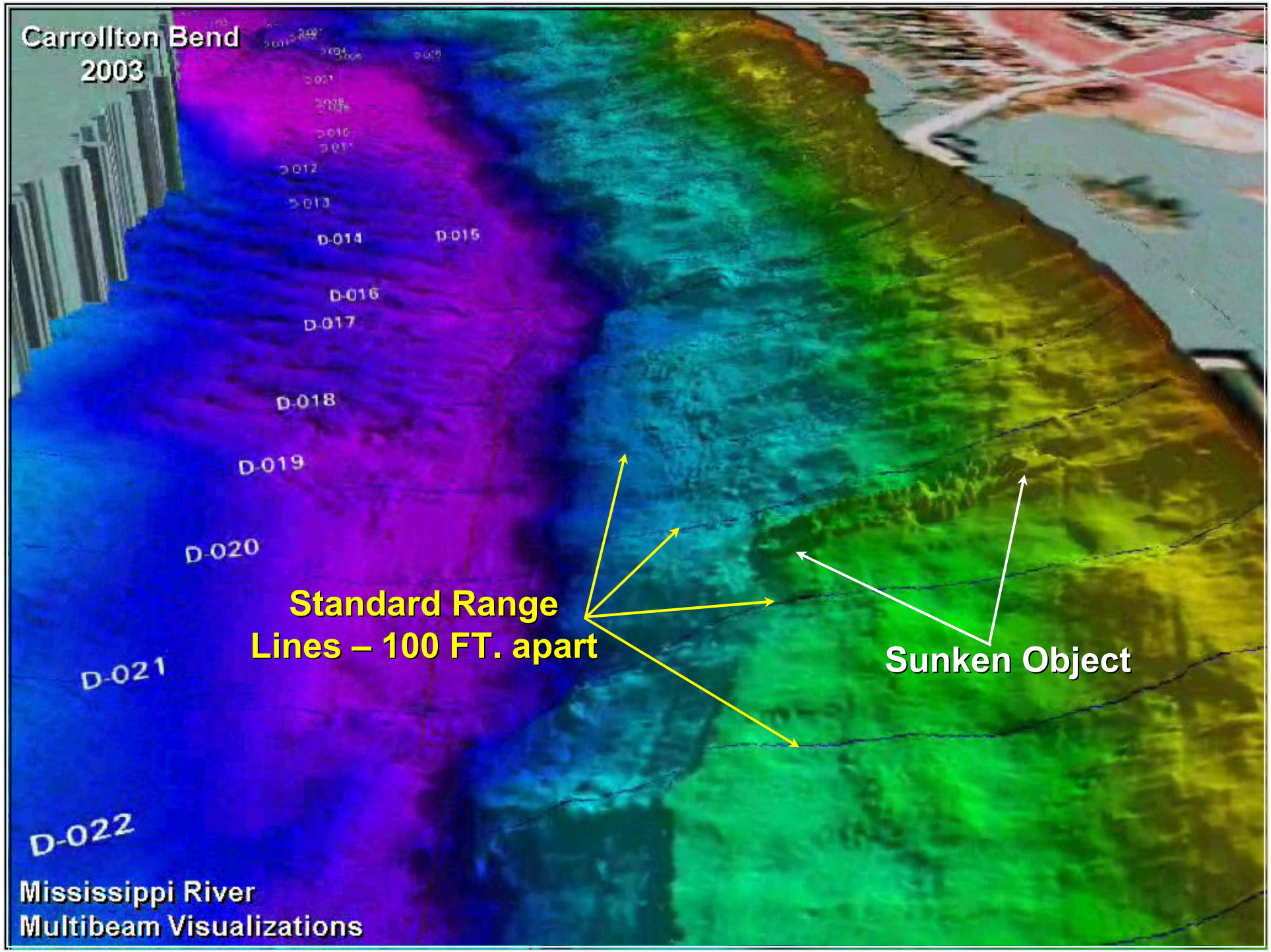




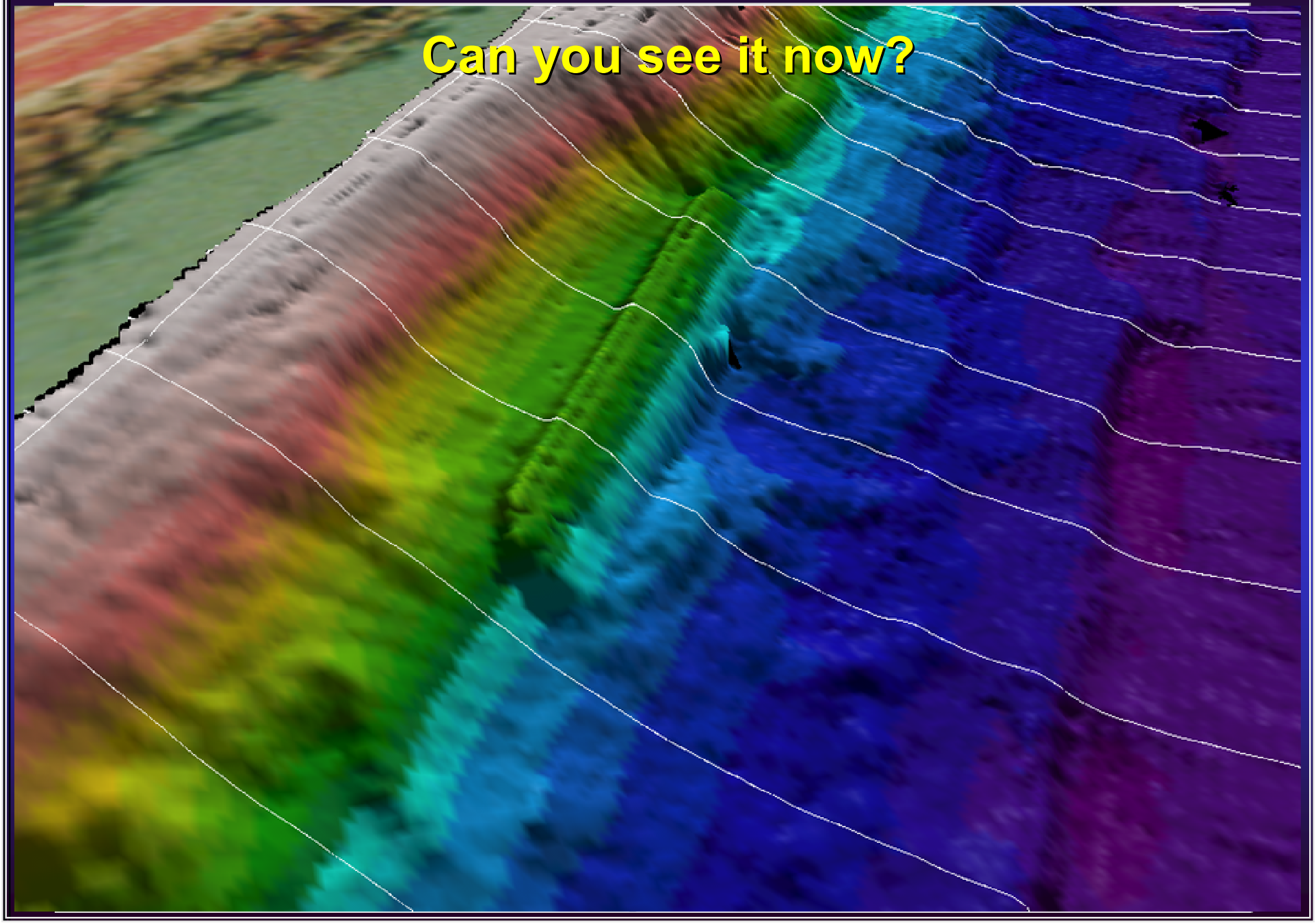


Distinctive Geologic Formations - Scotlandville Revetment

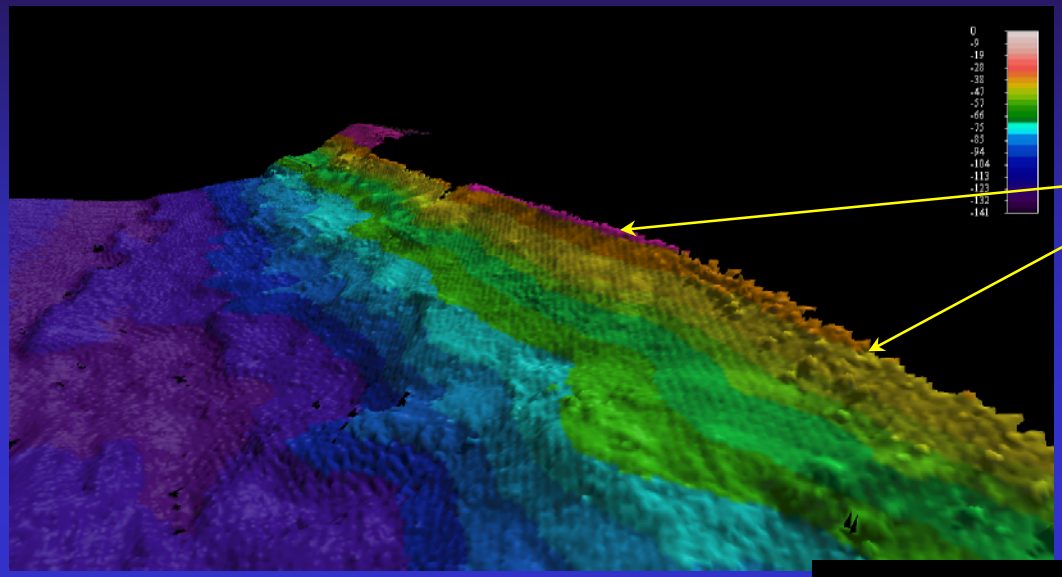



Carrollton Bend
2003
D-014
D-015
D-016
D-017
D-018
D-019
D-020
D-021
D-022
Standard Range
Lines – 100 FT. apart
Sunken Object
Mississippi River
Multibeam Visualizations

Where's the sunken vessel?

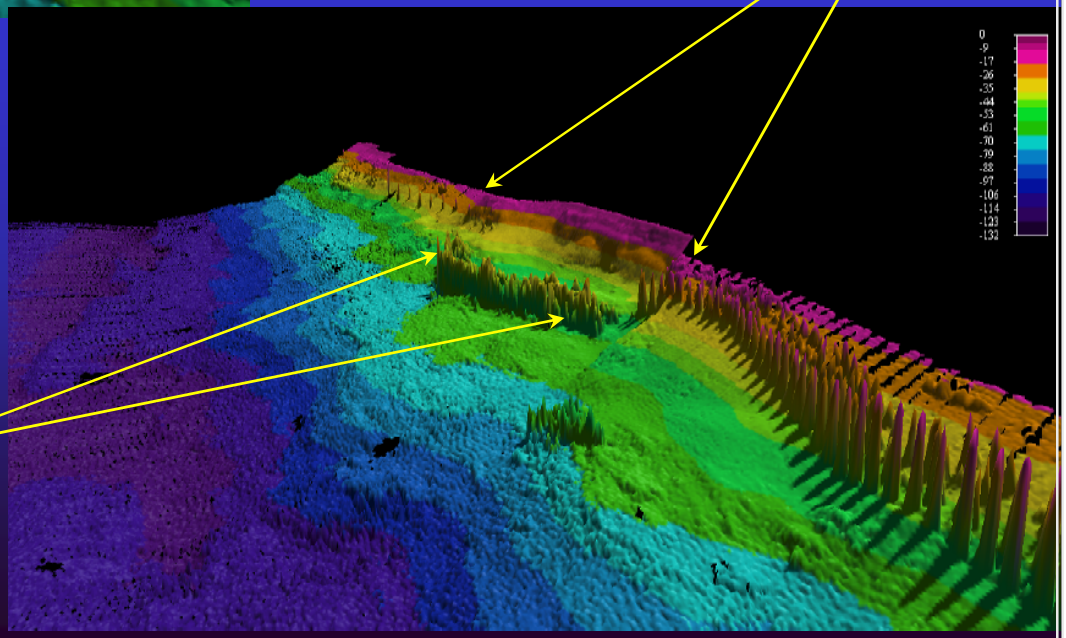


Port Sulphur Bank Failure



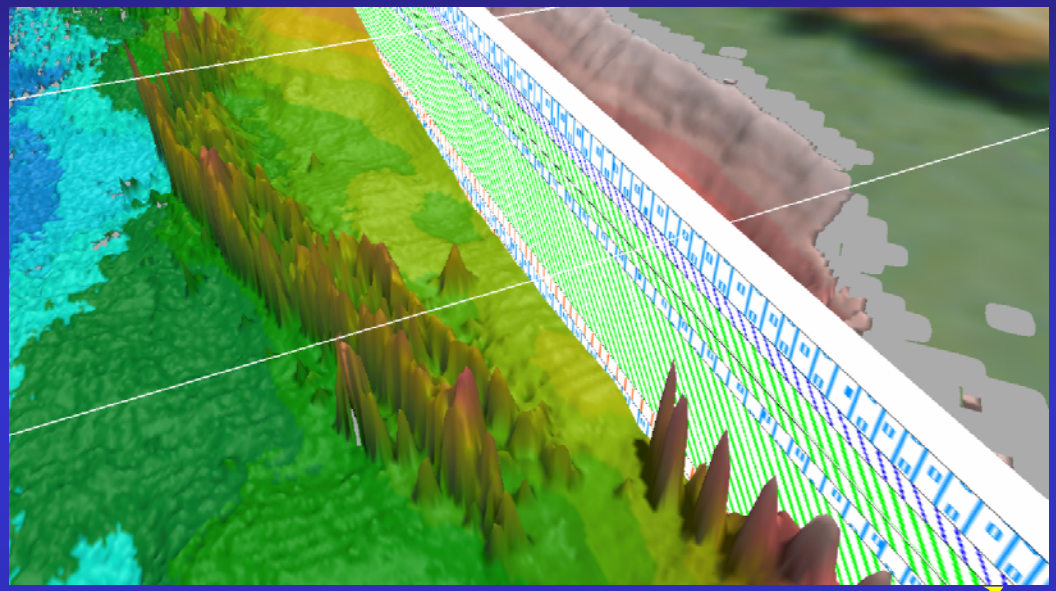
Pre-Failure Bank

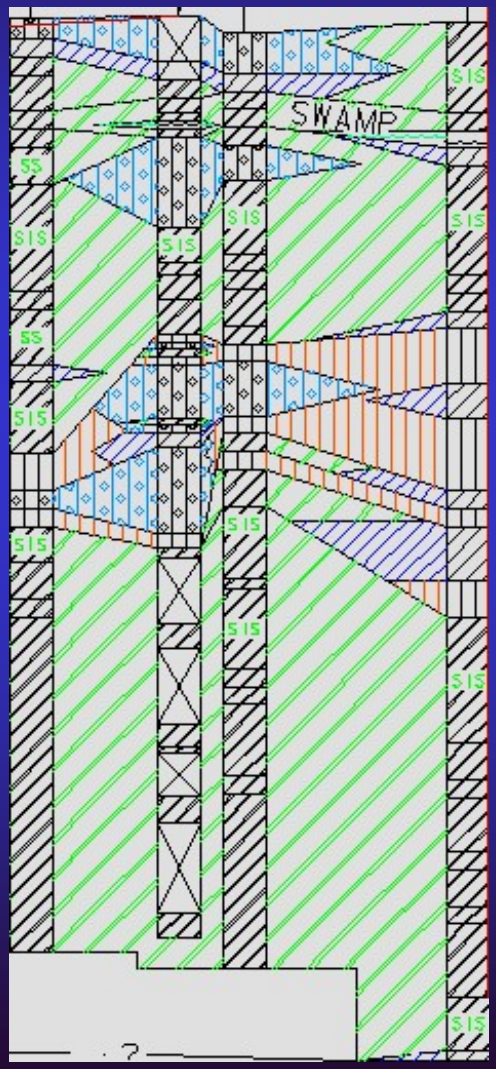
Post-Failure Bank



Piers of Failed Dock

Port Sulphur Bank Failure

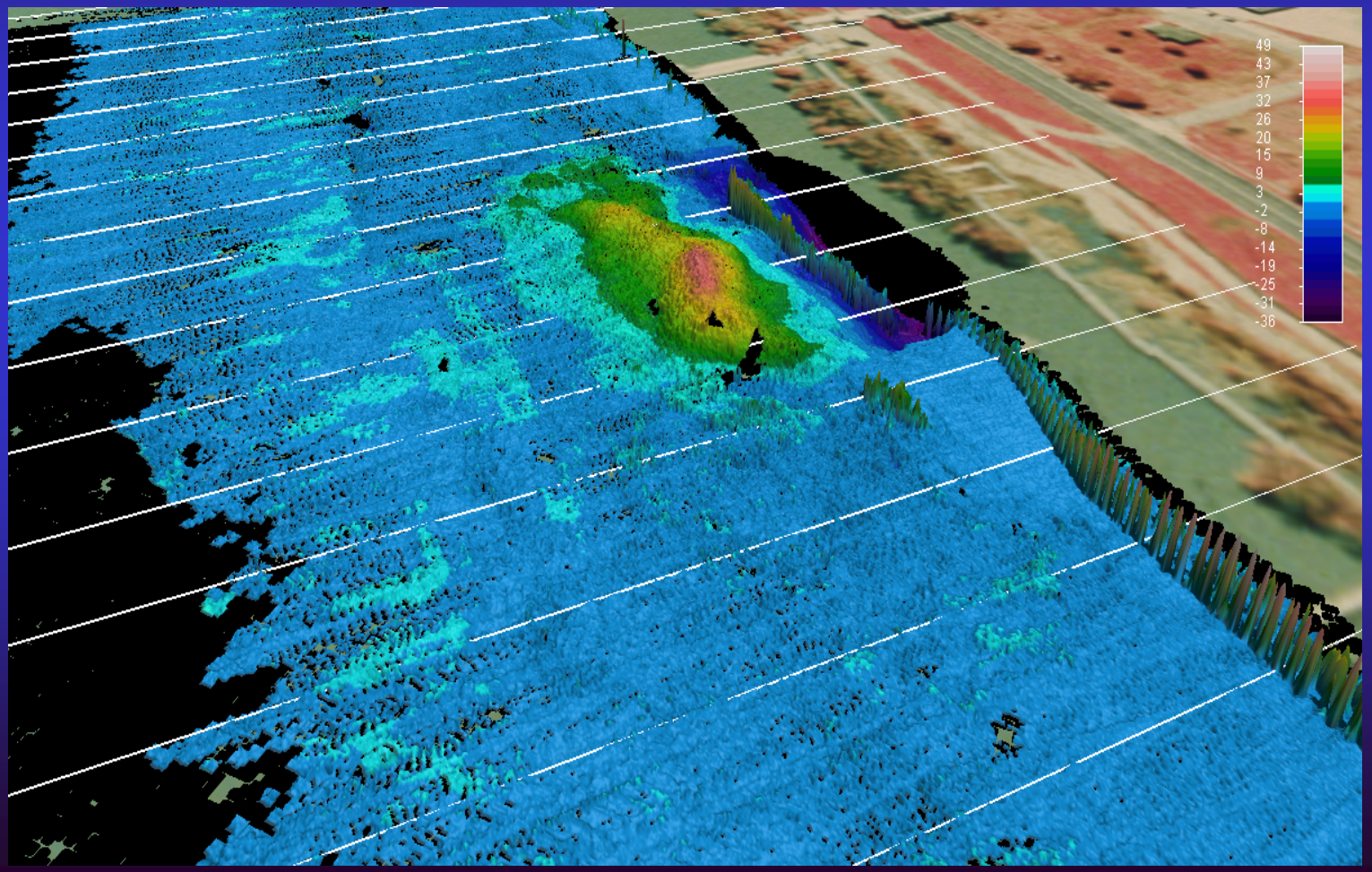




Soil Profile Superimposed

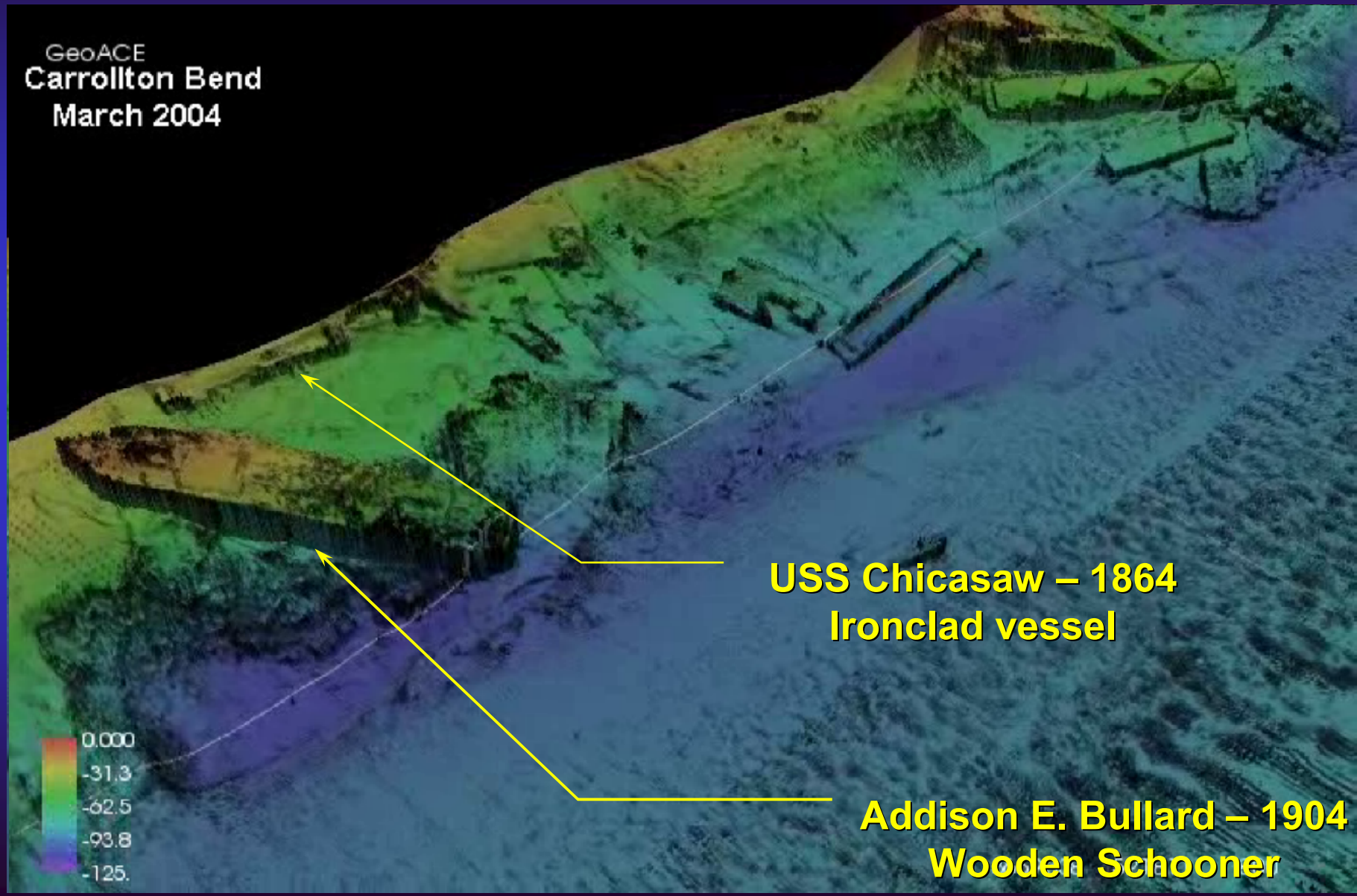
Port Sulphur Bank Failure

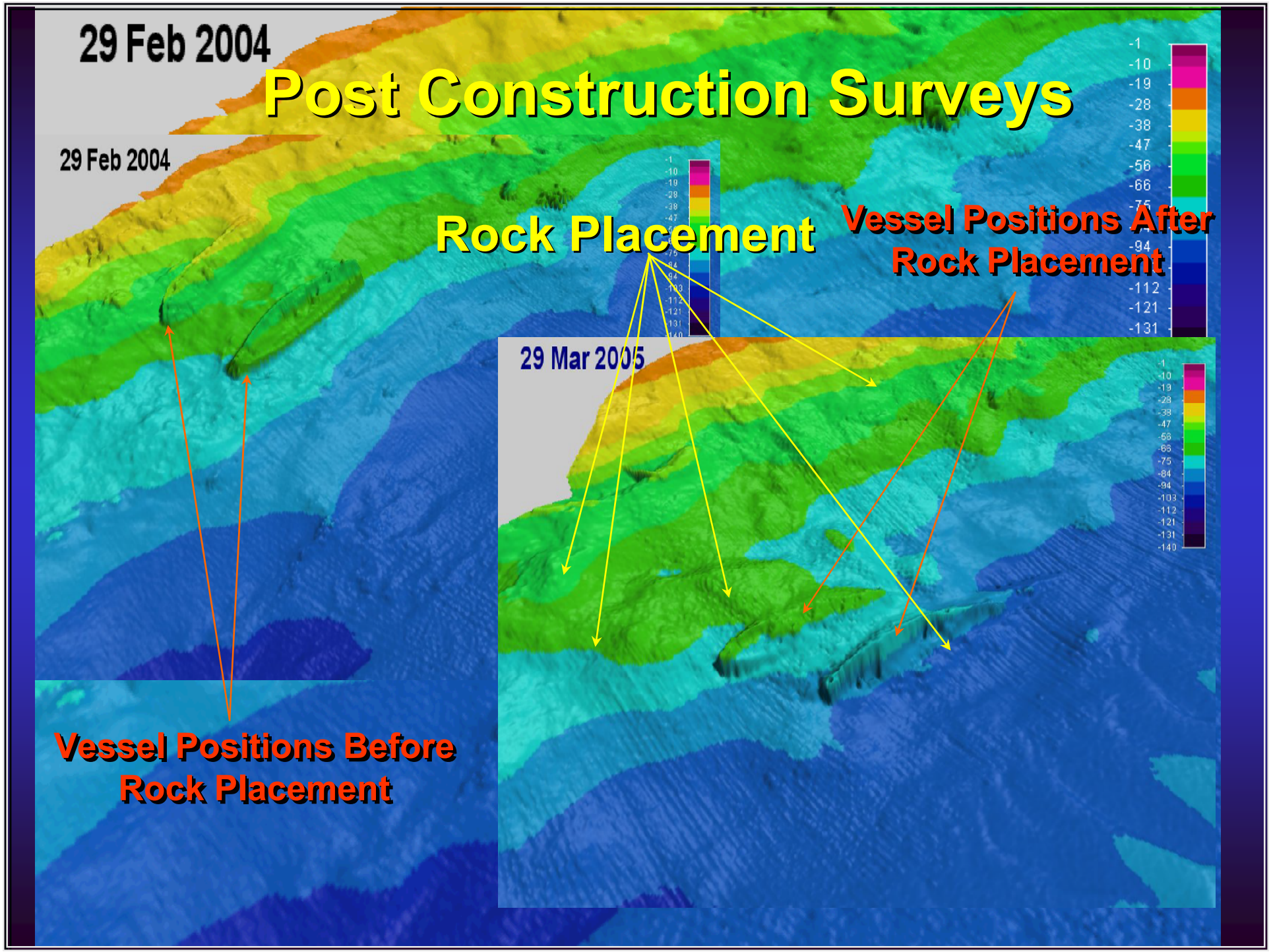
Isopach of Pre/Post Failure Surveys

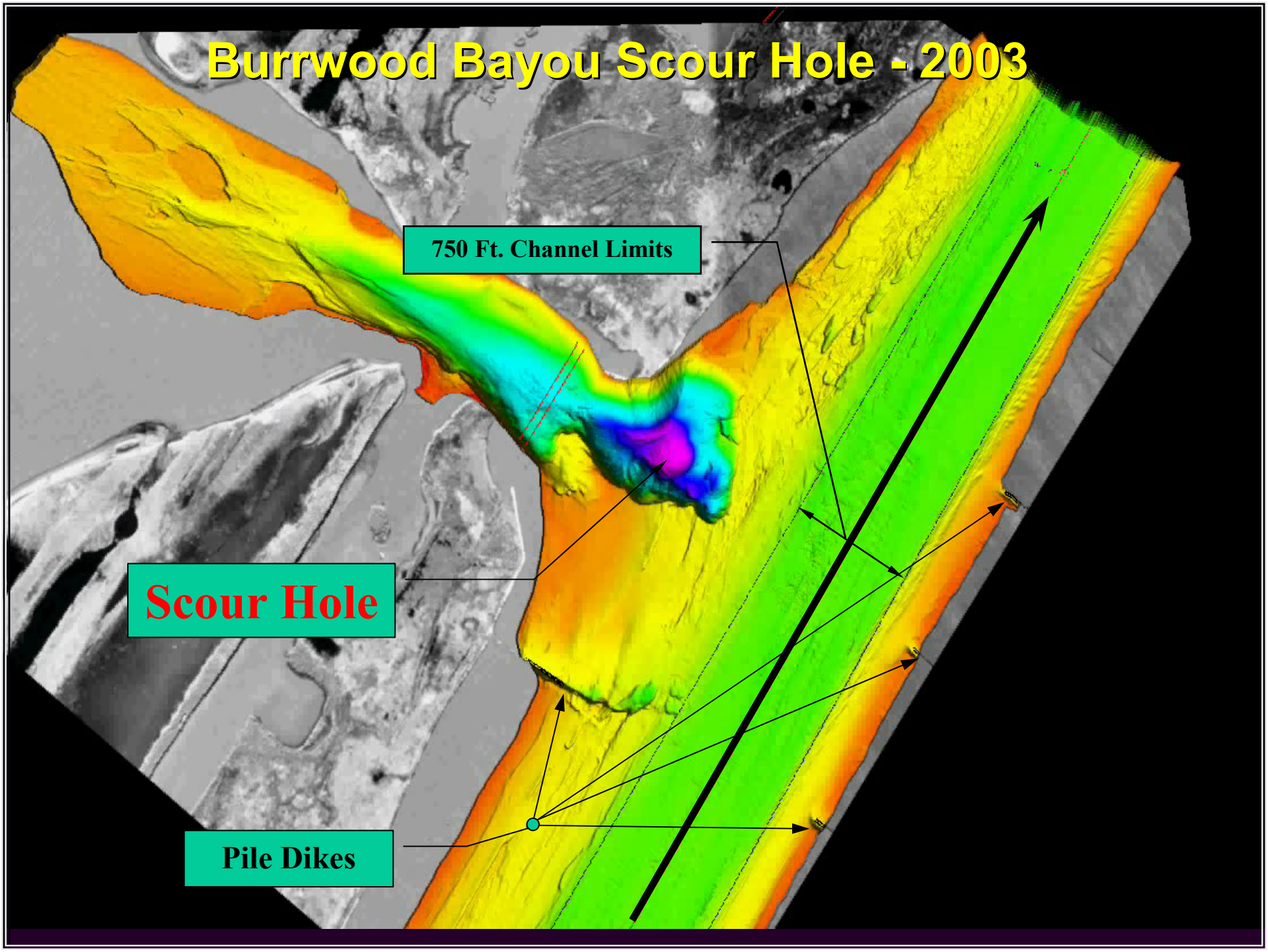



D_002
D_003
D_004
D_005
_006
007
008
009
10
1

Carrollton Bend – 2004 RTK Survey




29 Feb 2004
Post Construction Surveys
29 Feb 2004
Rock Placement
Vessel Positions After
Rock Placement
29 Mar 2005
Vessel Positions Before
Rock Placement


Burrwood Bayou Scour Hole - 2003
750 Ft. Channel Limits
Scour Hole
Pile Dikes

Merging LiDAR Data with traditional Survey Data

Problem: No current way to merge LiDAR with other surveying techniques and preserve the topology of the stream.

Solution: Contractor working at MVN developed a program to handle merging operations and much more.

What the program will do.

Collect surveys of varying formats

- .EM format
- .830 format
- Comma seperated xyz format

Make one shape file from up to 500 survey input files.

Shape file has both horizontal and vertical data.

Interpolation

Program will interpolate a channel while preserving the original topology of the stream.

Uses both the stream centerline and survey extents to determine the bounding box of the stream.

HEC-RAS will not preserve the sinuosity of the stream through it's interpolation routine.

Channel/LiDAR Merger

Program will then merge the newly created channel with existing LiDAR Data

LiDAR can be in varying formats.

- Shapefile
- GeoTiff
- Grid or TIN

Sampling Cross Sections along merged Data Set

Allows user to sample points along a predefined set of cross section lines.

Gives user control on how defined each cross section will be.

Allows differing density of sampled points in the overbanks and channel.

Outputs sampled lines into a .sdf file which can be directly imported into HEC-RAS

Presenters:

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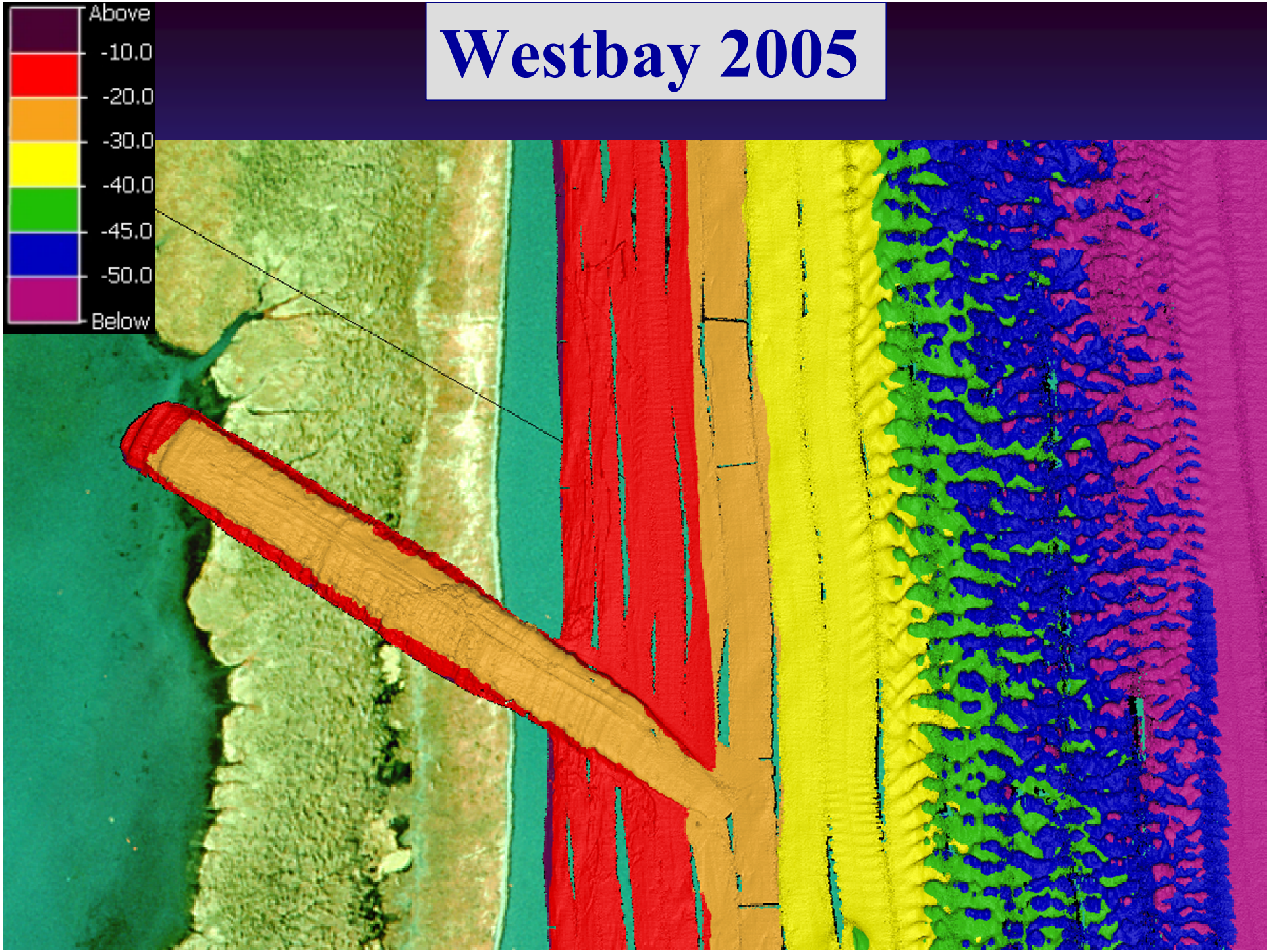
New Orleans District

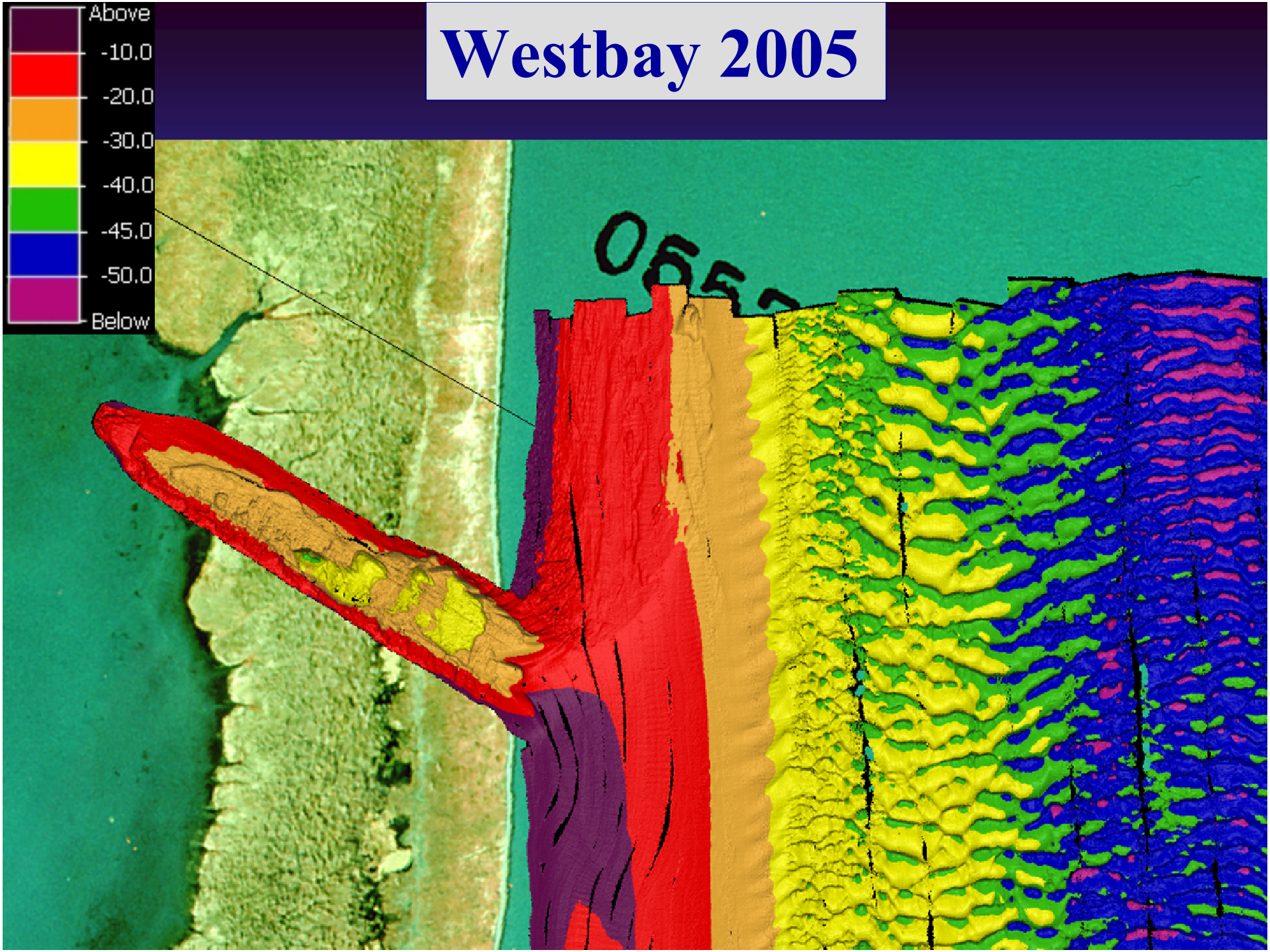
http://www.mvn.usace.army.mil


SERVICE TO THE PUBLIC
Navigation
River Flood Control
Hurricane Flood Control
Environmental Enhancement
Wetlands Restoration
Support for Others

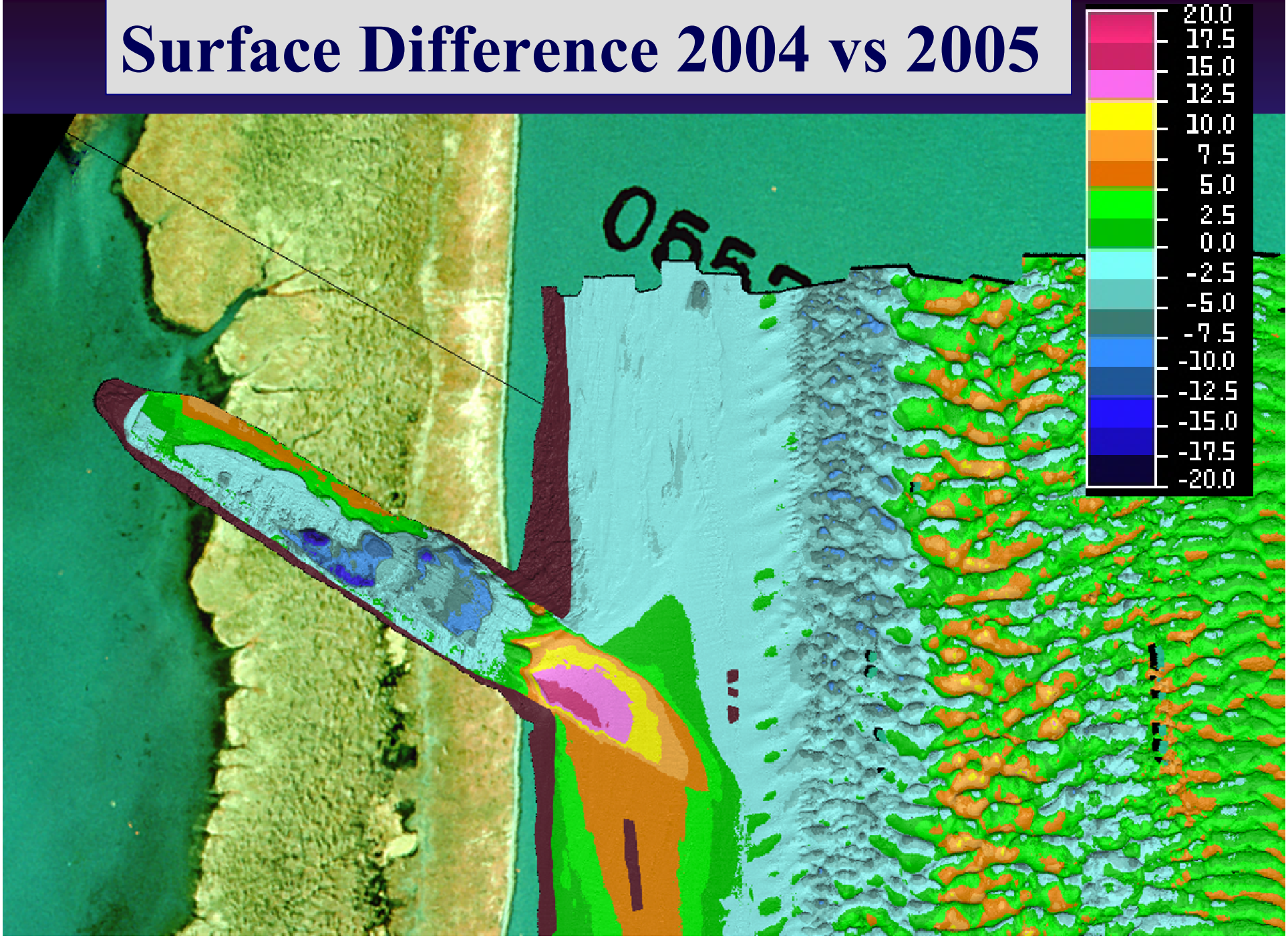
Westbay 2005



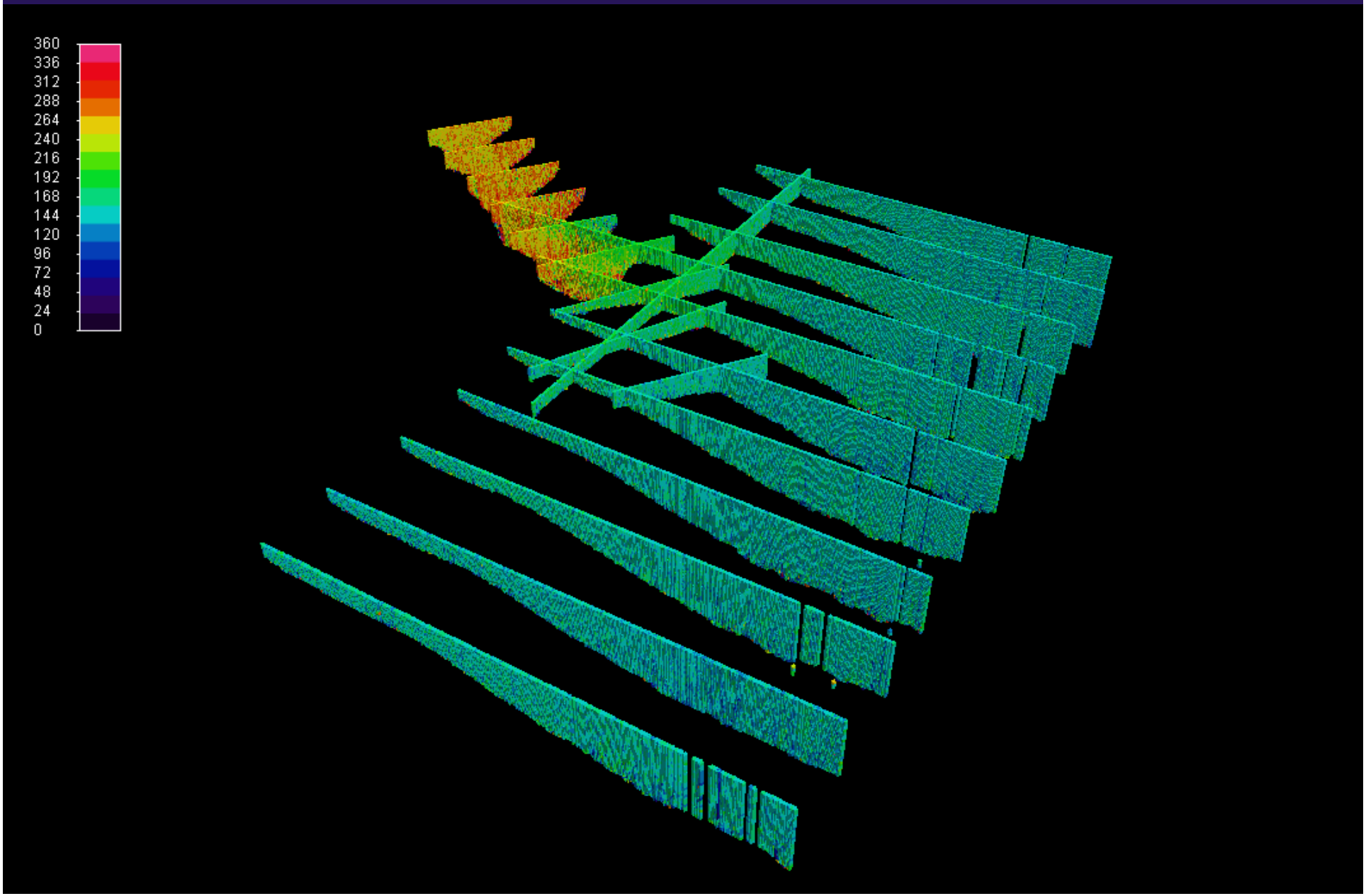
Westbay 2005



Surface Difference 2004 vs 2005



ADCP Direction



ADCP Direction