Magnolia Marine Transport Tank Barge MM53 Case Study January 2006

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Incident Description

- Ohio River, Louisville KY, January 26, 2006
- Towing Vessel – M/V Kelly Lee
- Three-barge Tow:
  - MM 53
  - MM 54B
  - MM 55

Incident Description (cont.)

- Tow allides with the vane dike at the entrance to the McAlpine Locks
- All three barges break loose
- MM 54B recovered near vane dike.
- MM 55 strikes L&I bridge, travels over McAlpine Dam, strikes K&I bridge, recovered downriver.

Incident Description (cont.)

- MM 53 strikes L&I bridge, then strikes and comes to rest near the LG&E hydro plant.
- After nearly one hour against the hydro plant, the MM53 travels over McAlpine Dam.

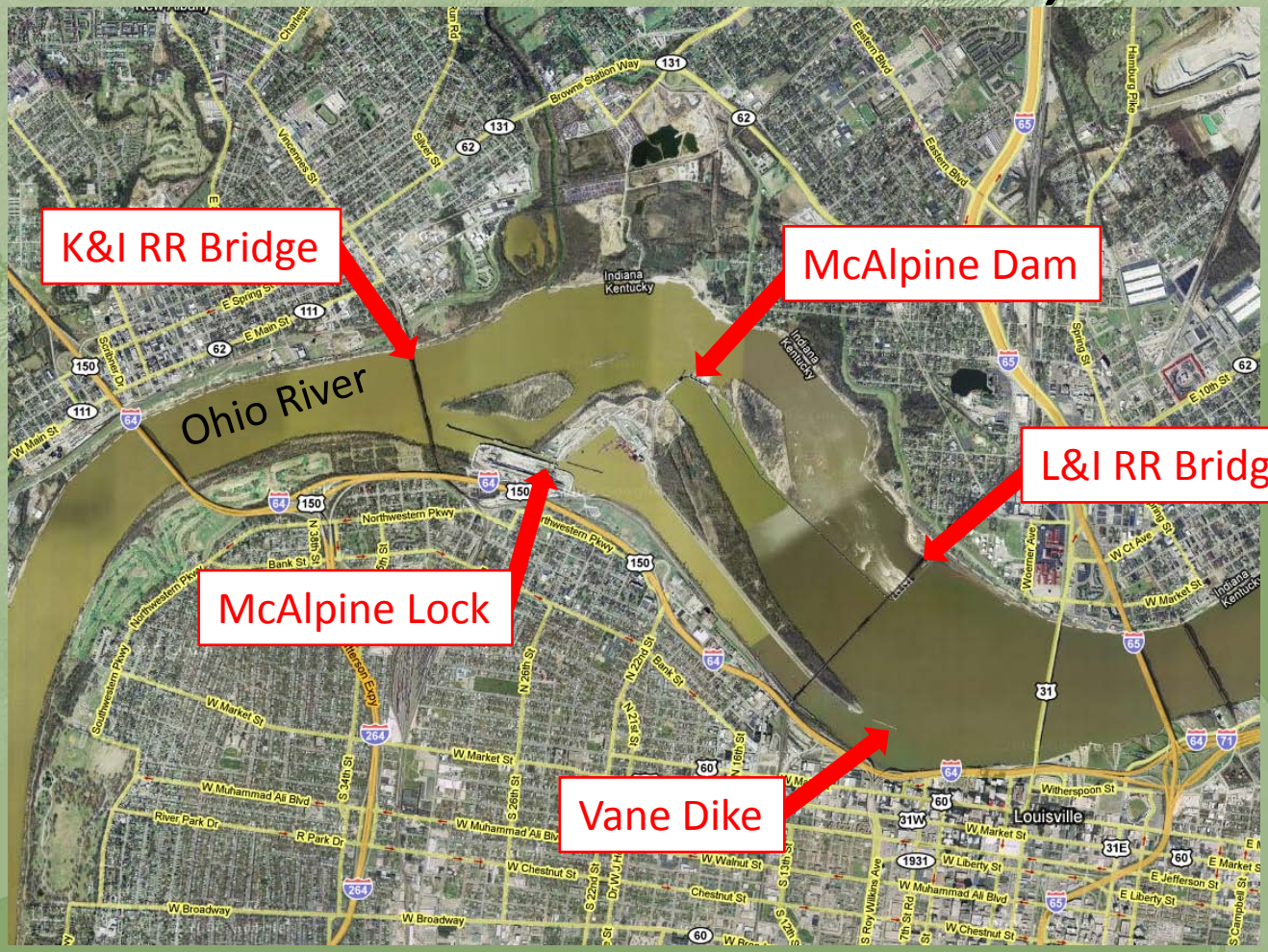
Incident Description (cont.)

- After passing over the McAlpine Dam, the MM53 strikes the right descending bank of the Ohio River.
- The MM53 then travels downriver, perpendicular to the river flow, and strikes the K&I bridge.
- The MM53 is pinned between two piers of the K&I bridge at river mile 607.4.

Incident Description (cont.)

- The barge begins taking on water on the port side due to the high current.
- The force on the port side eventually flips the MM53 90 degrees, and is pinned between the piers.

Incident Location
Ohio River - Louisville, KY




Lat: 38° 17' 2.03" Long: -85° 48' 6.25"
IMG_1739 29 Jan 2006 12:21:43


Lat: 38° 17' 1.98" Long: -85° 48' 6.16"
IMG_1738 29 Jan 2006 12:21:35


Lat: 38° 17' 1.21" Long: -85° 48' 6.58"
IMG_1736 29 Jan 2006 12:19:26


Lat: 38° 17' 2.77" Long: -85° 48' 6.69"
IMG_1741 29 Jan 2006 12:24:35

Potential Spill Volumes

- Liquid Asphalt: 798,000 gallons
- Diesel Fuel: 11,500 gallons
- Thermal Heating Oil: 4,000 gallons

Estimated Discharge

- 220,000 gallons liquid asphalt
- 5,000 gallons diesel
- 4,000 gallons thermal heating oil

Liquid Asphalt Behavior

- The liquid asphalt that was released from the barge took on several forms.
- Depending on the size and amount of air entrained in these various formations determined how far downriver the asphalt would travel.

“Funnel Cake”

- 6-12” diameter, 1” thick extruded patty
- Significant air entrainment and voids allowed product to float.

“Icicle”

- ½-1” diameter, 1-4’ long extruded strand.
- Minimal air entrainment provided for submergence after a short period of time.

“Taffy”

- Entangled strands of extruded asphalt.
- Minimal air entrainment provided for submergence after a short period of time.

“Barge Droppings”

- Accumulations of extruded asphalt.
- Formed when product collected on the river bottom and rolled downriver with the current.

“Pancake-Zilla”

- Mother of all Barge Droppings!
- Found over one mile from the barge, 15 feet up the bank.

Photos and oiling “characterization” courtesy of Steve Lehman, NOAA SSC.

Other Products

- 5,000 gallons of diesel were released from the port tank almost immediately when the barge flipped 90°.
- 4,000 gallons of thermal heating oil was released from the damaged heating coils.
- Small amounts of heating oil continued to leak from the damaged piping for about a week.

Thermal Heating Oil Release

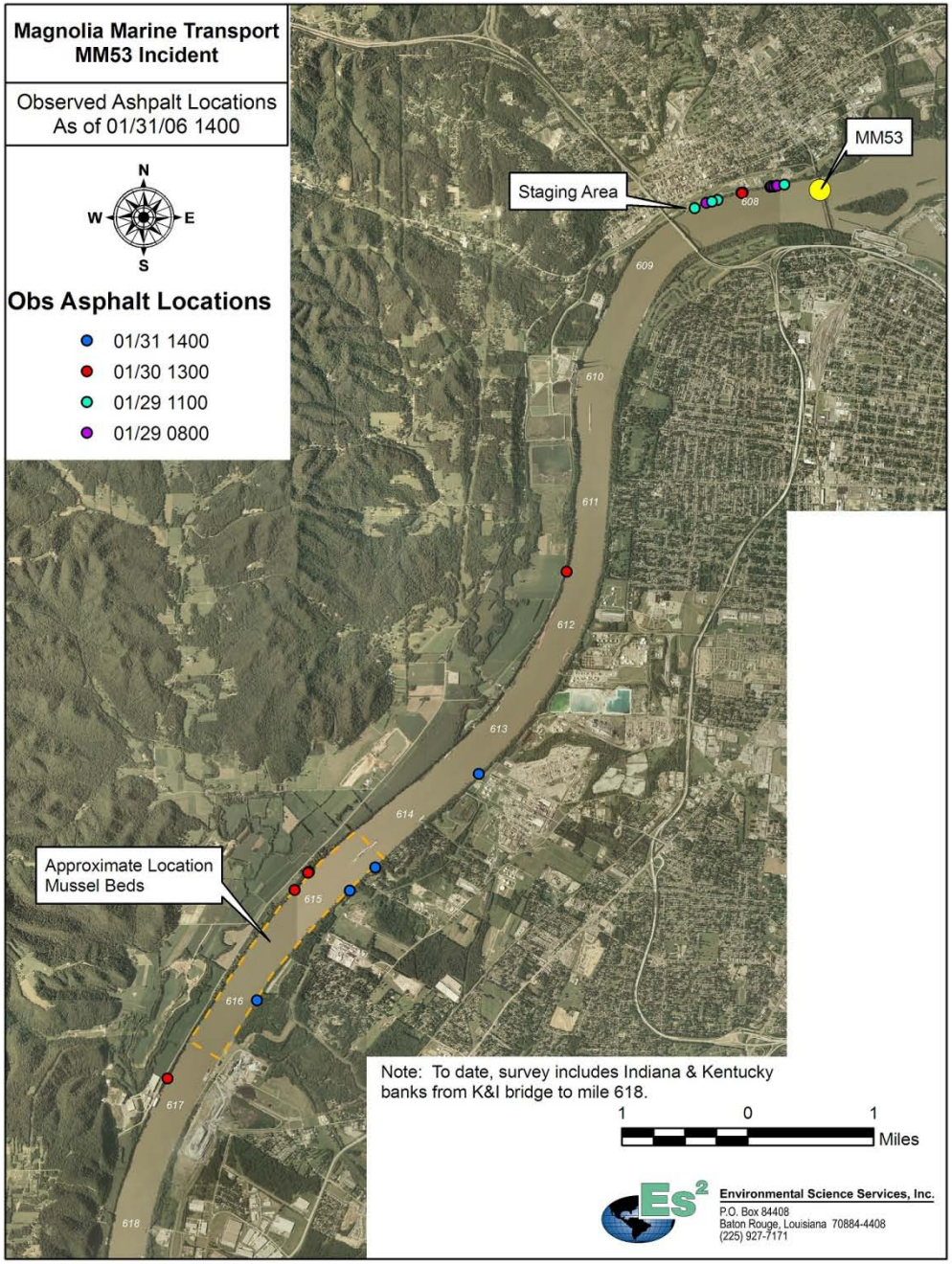
Water Column Sampling

- Biological concerns: mussel beds located 7.5 miles downriver from barge near mile 615.
- Two sampling events were conducted:
  - Feb 2, 2006 by the Ohio River Valley Sanitation Commission (ORSANCO) at mile 607.0, 608.0, 615.7, and 629.4.
  - Feb 15, 2006 by the RP at mile 607.0, 607.4, and 608.7.

Water Sample Collection by ORSANCO Using a Kemmerer Sampler

Shoreline Survey

- River level dropped rapidly in the days following the incident.
- Assessment teams surveyed the river banks from miles 607.4 to 646 to locate asphalt depositions.


Magnolia Marine Transport
MM53 Incident
Observed Ashpalt Locations
As of 01/31/06 1400
N
W
E
S
Obs Asphalt Locations
01/31 1400
01/30 1300
01/29 1100
01/29 0800
MM53
Staging Area
608
609
610
611
612
613
614
615
616
617
618
Approximate Location
Mussel Beds
Note: To date, survey includes Indiana & Kentucky
banks from K&I bridge to mile 618.
1
0
1
Miles
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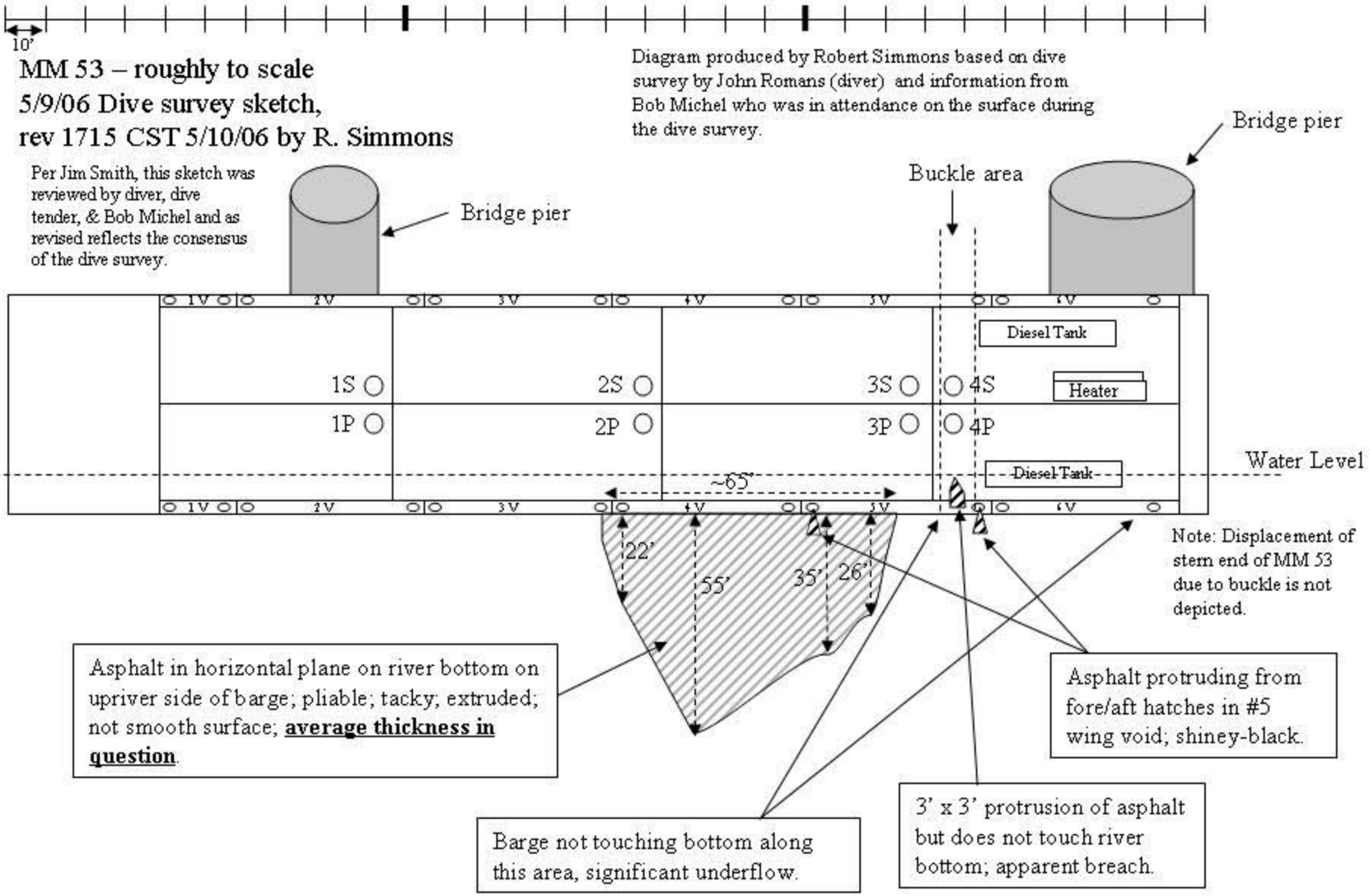
Baton Rouge, Louisiana 70884-4408
(225) 927-7171
01/31/06A

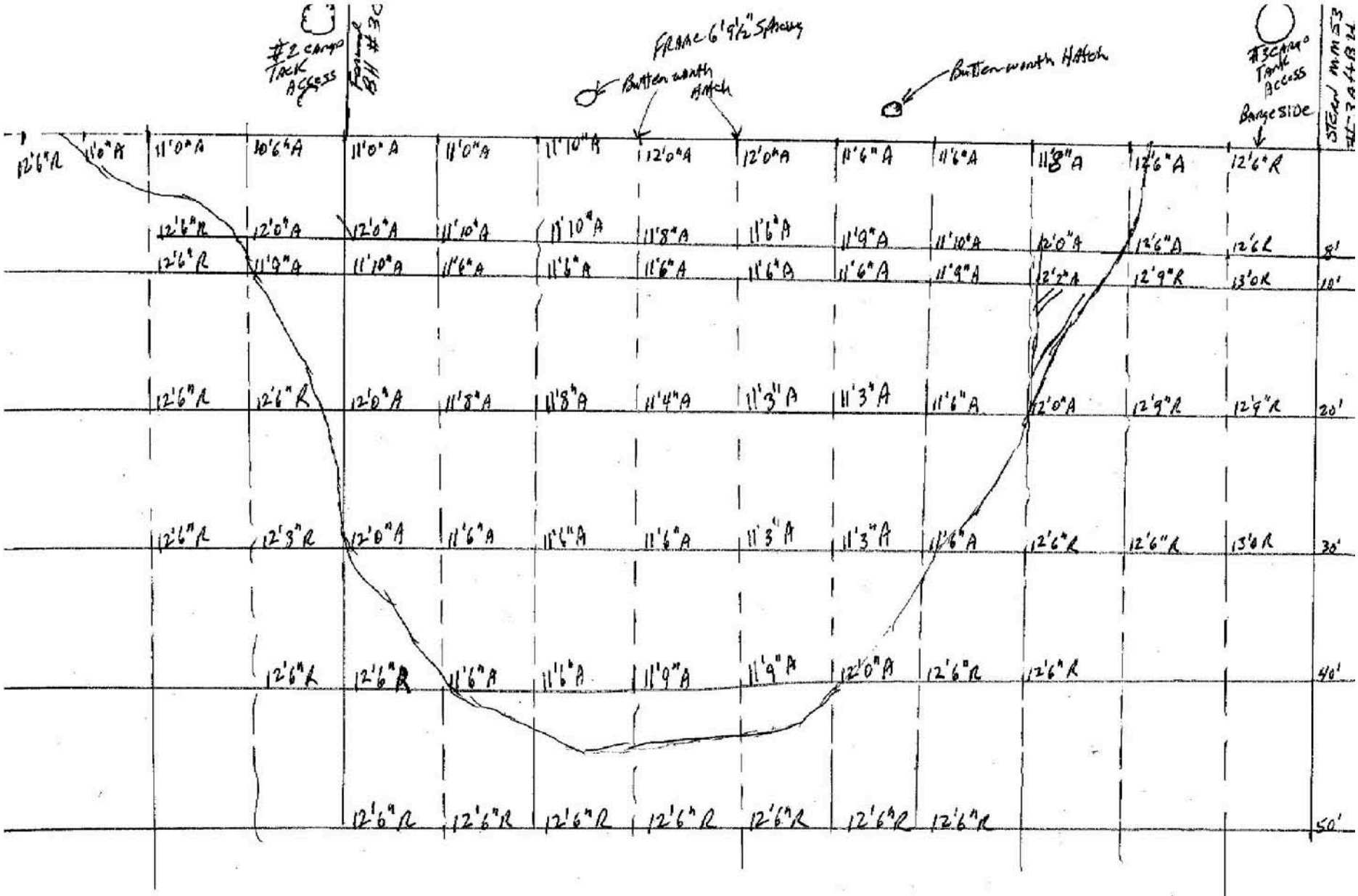
Dive Survey

- Dive survey was conducted to determine location and quantity of asphalt on river bottom, in front of the barge.
- Large asphalt mat located in front of barge – thickness unknown.


10'
MM 53 – roughly to scale
5/9/06 Dive survey sketch,
rev 1715 CST 5/10/06 by R. Simmons
Diagram produced by Robert Simmons based on dive survey by John Romans (diver) and information from Bob Michel who was in attendance on the surface during the dive survey.
Per Jim Smith, this sketch was reviewed by diver, dive tender, & Bob Michel and as revised reflects the consensus of the dive survey.
Bridge pier
Buckle area
Bridge pier
1V
2V
3V
4V
5V
6V
Diesel Tank
Heater
Diesel Tank
1S
2S
3S
4S
1P
2P
3P
4P
Water Level
~65'
22'
55'
35'
26'
Note: Displacement of stern end of MM 53 due to buckle is not depicted.
Asphalt in horizontal plane on river bottom on upriver side of barge; pliable; tacky; extruded; not smooth surface; **average thickness in question**.
Asphalt protruding from fore/aft hatches in #5 wing void; shiney-black.
Barge not touching bottom along this area, significant underflow.
3' x 3' protrusion of asphalt but does not touch river bottom; apparent breach.

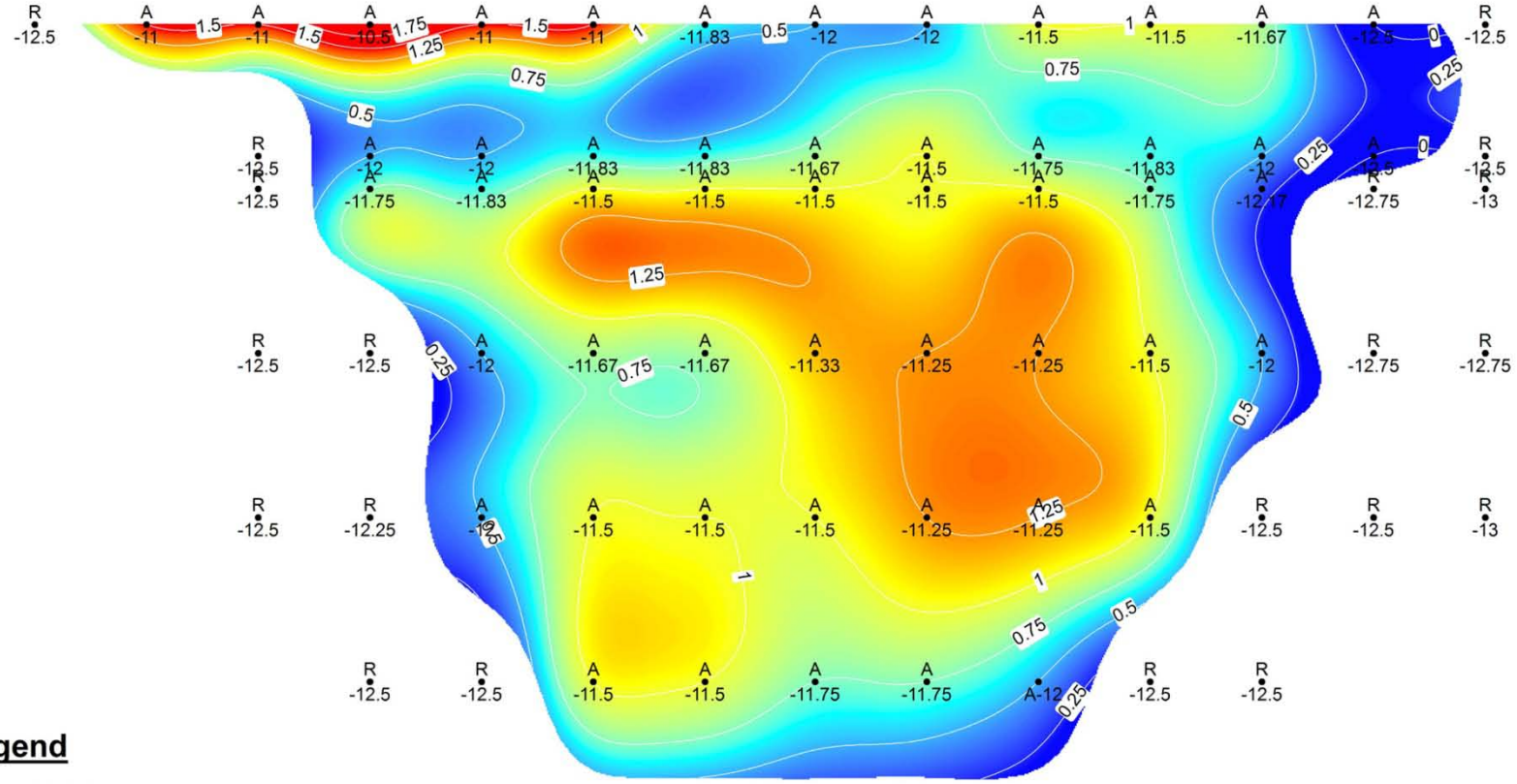
Pike Pole Survey

- Based on information obtained during the dive survey, a “pike” pole survey was conducted to determine the thickness of the asphalt mat in front of the barge.



5/13/06
13:00 to 15:00 hr.
RAR Model

05/13/06 Bob Michel Spike Pole Survey



Legend

Survey Points

- (bottom type & water depth in ft)

Ashpalt Thickness

2.0 ft

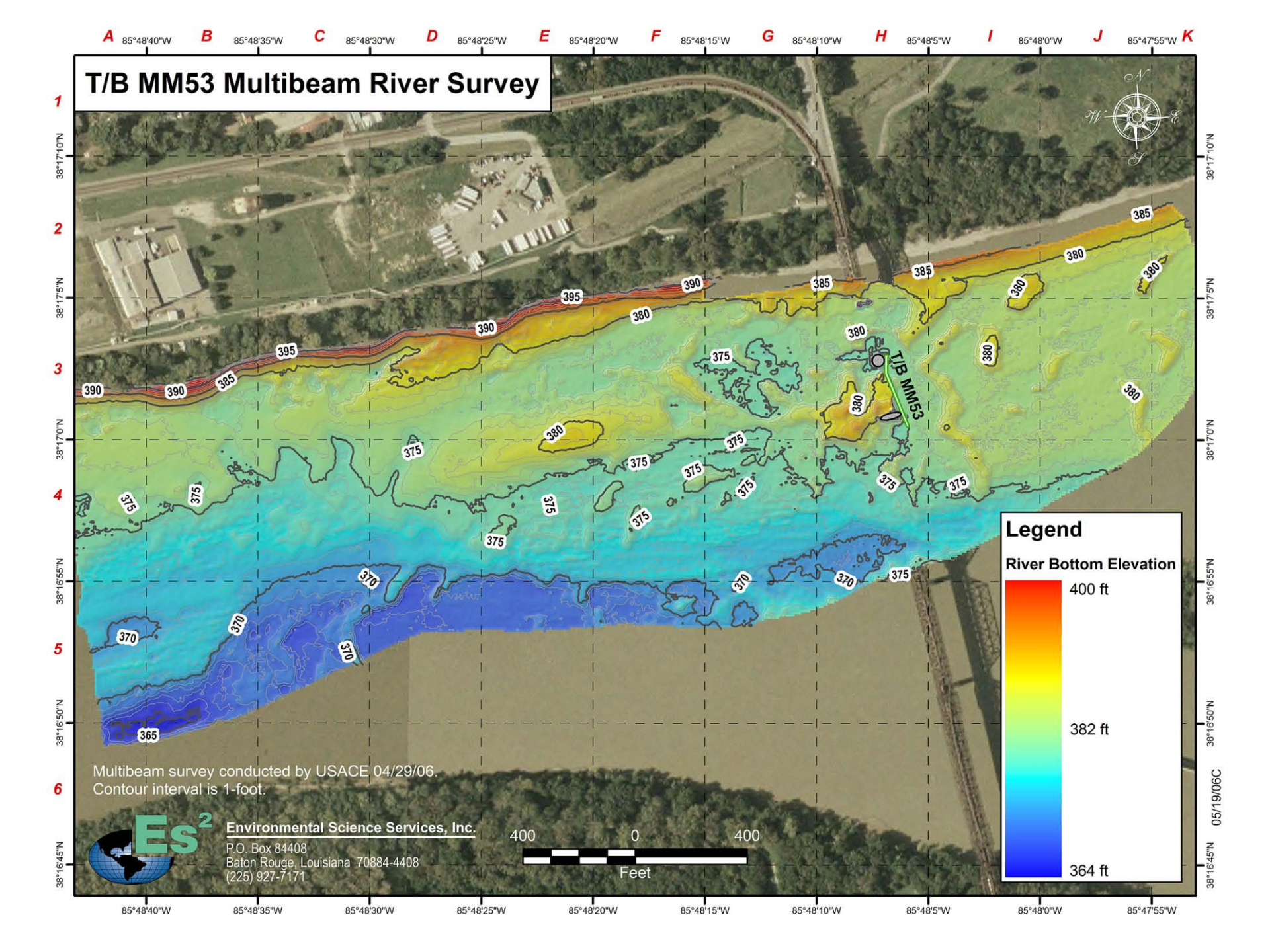
0.0 ft

10 5 0 10

Feet

Multibeam Sonar Survey

- To augment the pike pole survey, and to potentially locate additional asphalt depositions, the USACE conducted a multibeam sonar survey.
- Approximately ¾ mile was surveyed.


T/B MM53 Multibeam River Survey
A B C D E F G H I J K
85°48'40"W 85°48'35"W 85°48'30"W 85°48'25"W 85°48'20"W 85°48'15"W 85°48'10"W 85°48'5"W 85°48'0"W 85°47'55"W
1 2 3 4 5 6
38°17'10"N 38°17'5"N 38°17'0"N 38°16'55"N 38°16'50"N 38°16'45"N
N W E S
T/B MM53
Legend
River Bottom Elevation
400 ft
382 ft
364 ft
Multibeam survey conducted by USACE 04/29/06.
Contour interval is 1-foot.
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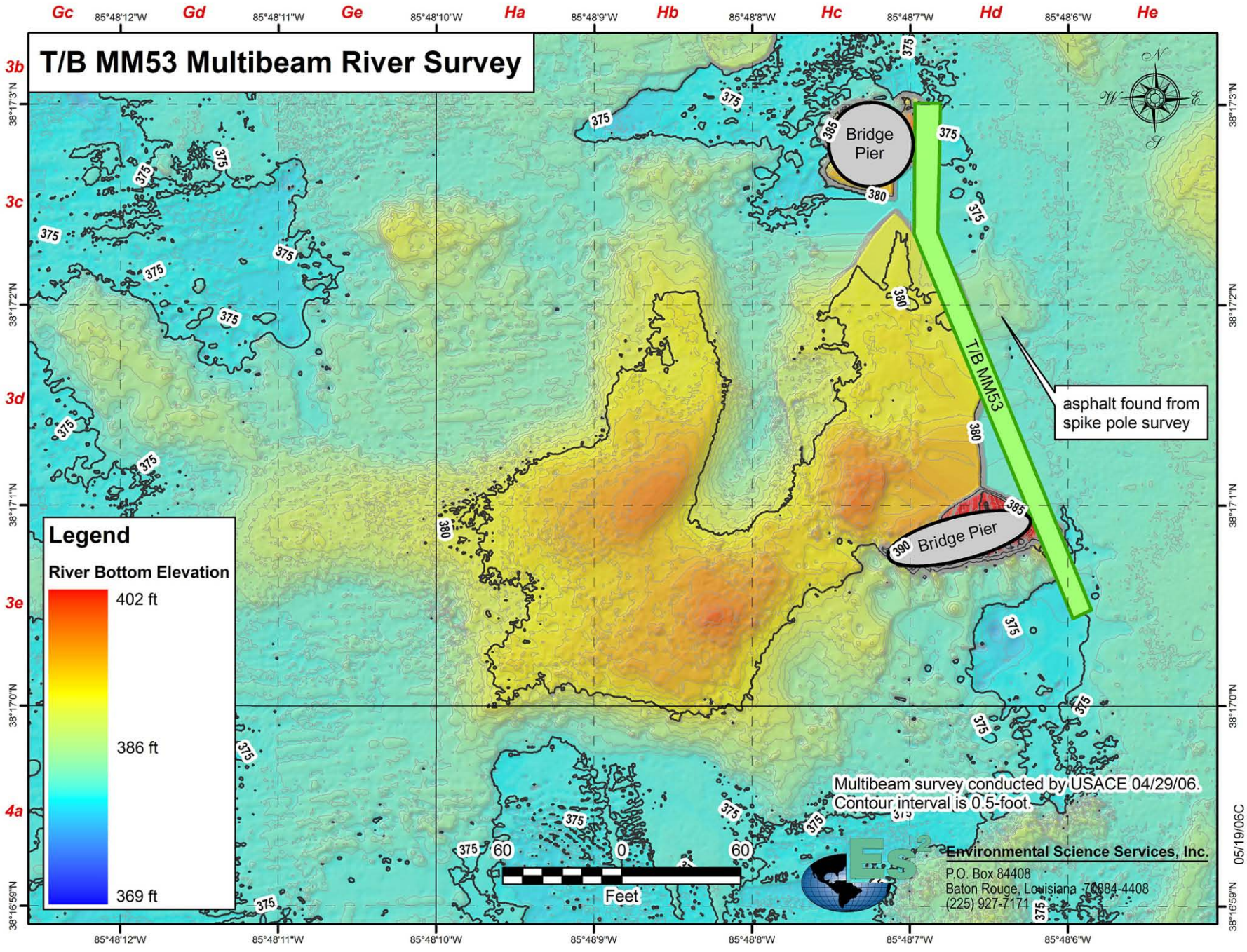
400 0 400
Feet
05/19/06C


T/B MM53 Multibeam River Survey
Gc
Gd
Ge
Ha
Hb
Hc
Hd
He
85°48'12"W
85°48'11"W
85°48'10"W
85°48'9"W
85°48'8"W
85°48'7"W
85°48'6"W
3b
3c
3d
3e
4a
38°17'3"N
38°17'2"N
38°17'1"N
38°17'0"N
38°16'59"N
Bridge Pier
Bridge Pier
T/B MM53
asphalt found from spike pole survey
Legend
River Bottom Elevation
402 ft
386 ft
369 ft
Multibeam survey conducted by USACE 04/29/06.
Contour interval is 0.5-foot.
60
0
60
Feet
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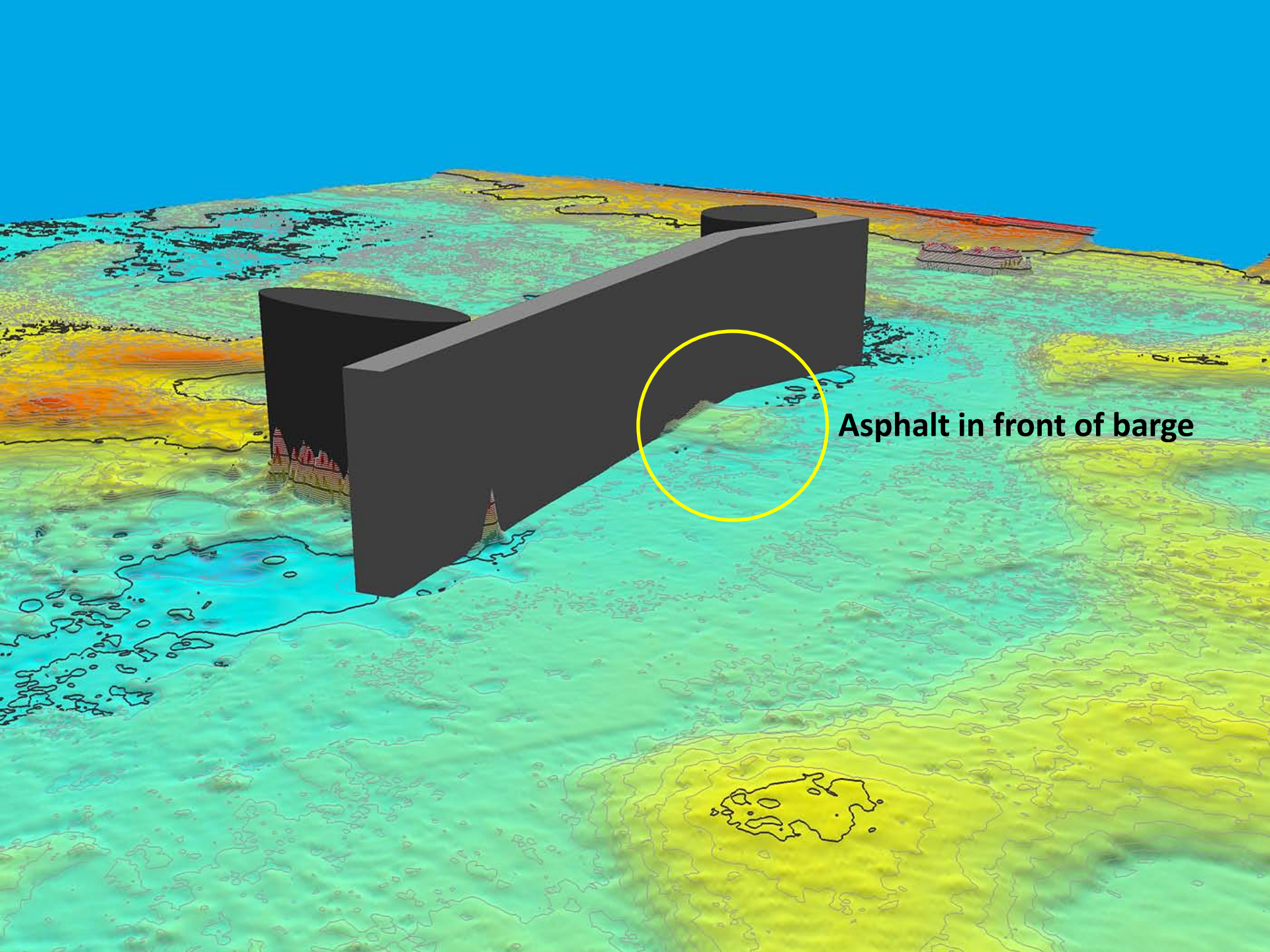
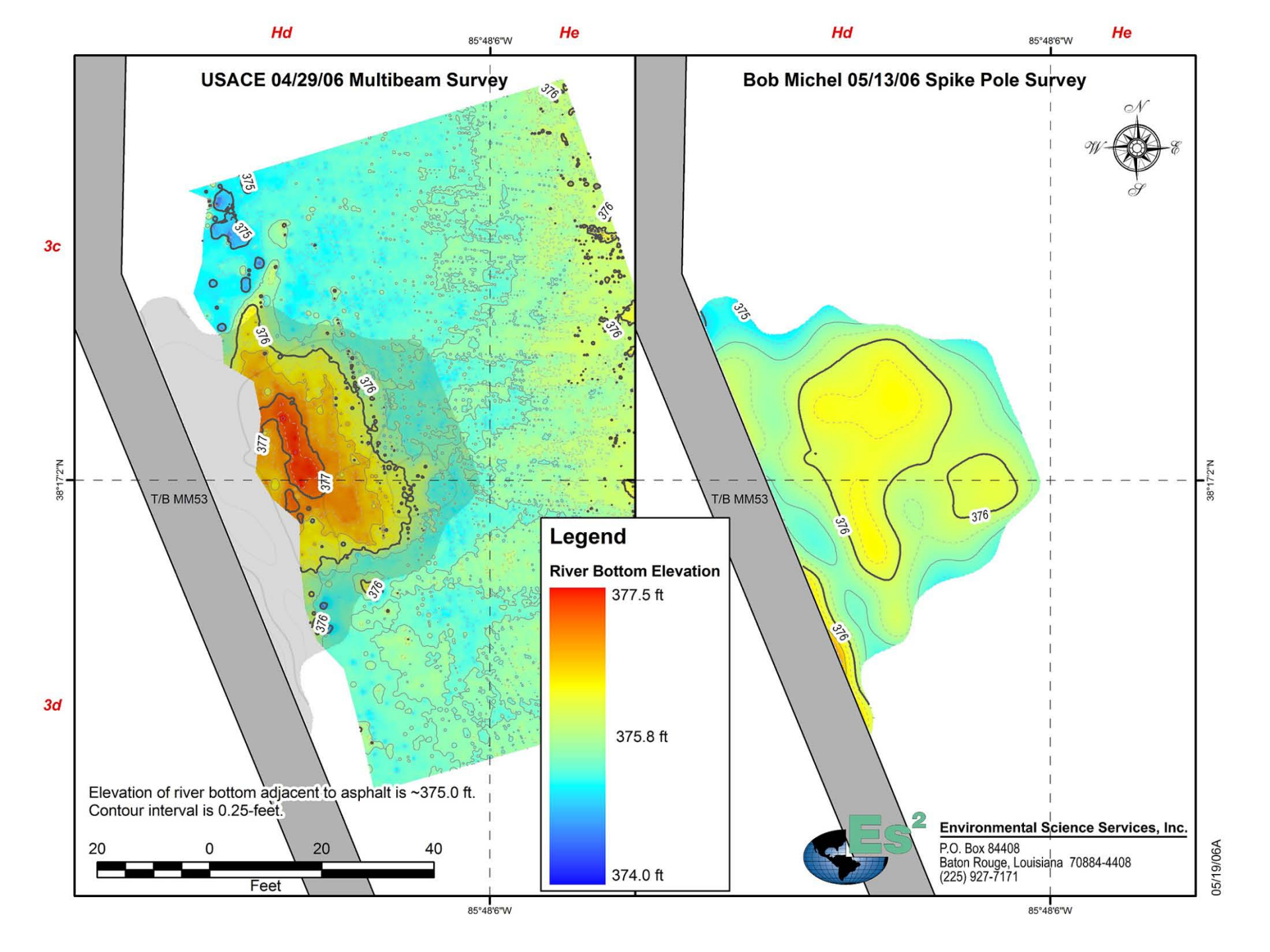
05/19/06C


Asphalt in front of barge


Hd
He
Hd
He
85°48'6"W
85°48'6"W
USACE 04/29/06 Multibeam Survey
Bob Michel 05/13/06 Spike Pole Survey
N
W
E
S
3c
3d
38°17'2"N
38°17'2"N
T/B MM53
T/B MM53
375
376
377
Legend
River Bottom Elevation
377.5 ft
375.8 ft
374.0 ft
Elevation of river bottom adjacent to asphalt is ~375.0 ft.
Contour interval is 0.25-feet.
20
0
20
40
Feet
Es2
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Asphalt Recovery

Salvage Challenges

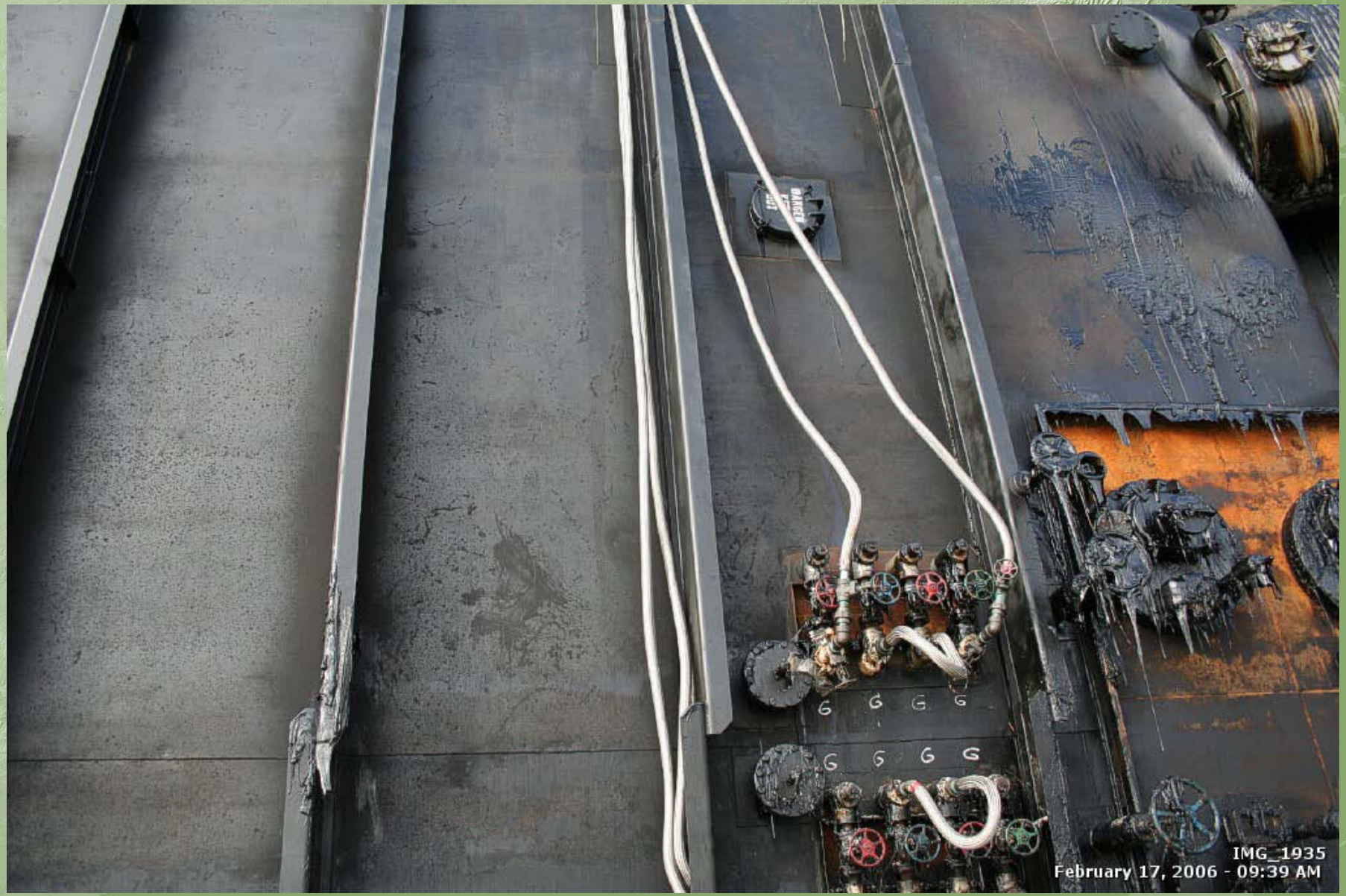
- Large portion of remaining cargo needed to be lightered prior to salvage, due to weight.
- MM53 barge heating system no longer functioning, therefore remaining asphalt cooled and hardened.
- River levels fluctuated greatly, causing many delays due to safety concerns.

Salvage

- Install “Spectra” lines to secure barge to bridge piers to prevent tipping.

Salvage (cont.)

- Pressure test compartment heating coils on MM53 to determine integrity.
- Use heating system from sister barge (MM54B) to re-heat remaining cargo on MM53.
- Install flexible heating lines from the MM54B to the manifolds on the MM53 for compartments with intact coils.


IMG_1935
February 17, 2006 - 09:39 AM

Salvage (cont.)

- Cut windows in bottom (back side) of barge to install valves into cargo compartments.
- Use these new valves to drain reheated cargo into the MM54B.

"Windows" cut into bottom of MM53 for cargo lightering.

Salvage (cont.)

- Heating coils in #4 port compartment were compromised.
- A “stinger” was constructed to heat the compartment.

Salvage (cont.)

- All cargo, diesel, and heating oil removed by May 19.
- Two A-frames, rigging a “rolling hitch”, in-place for salvage.
- May 29, MM53 righted and floating.