The Texas General Land Office Sand Source Investigations Off of Galveston Island- 2005- Project Overview and Results

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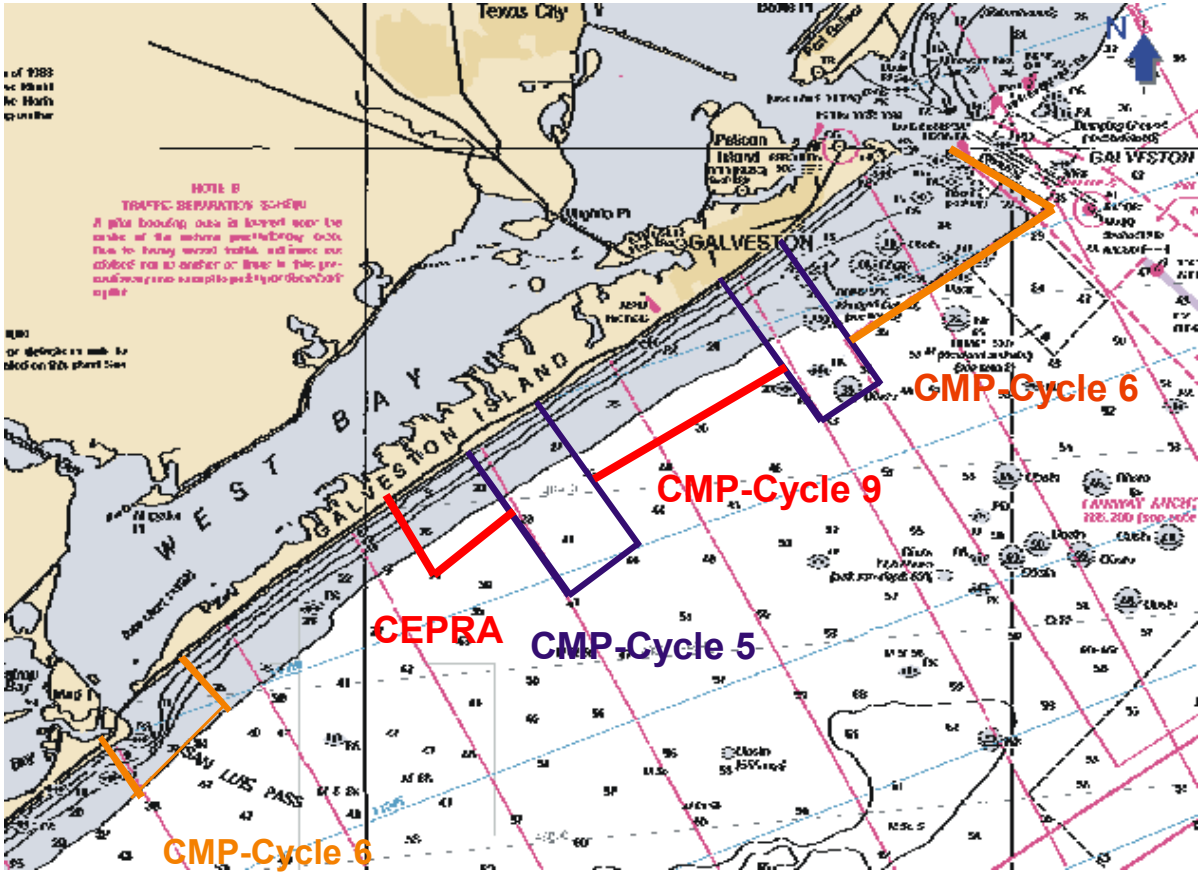
Sand Source Investigation

- Determine potential target areas
- Delineate deposit
  - Geophysical survey
  - Coring
- Collect data to support permit
  - Geohazards survey
  - Archeological survey
  - Contaminated Sediments survey

Seabed Mapping Efforts conducted at TAMUG



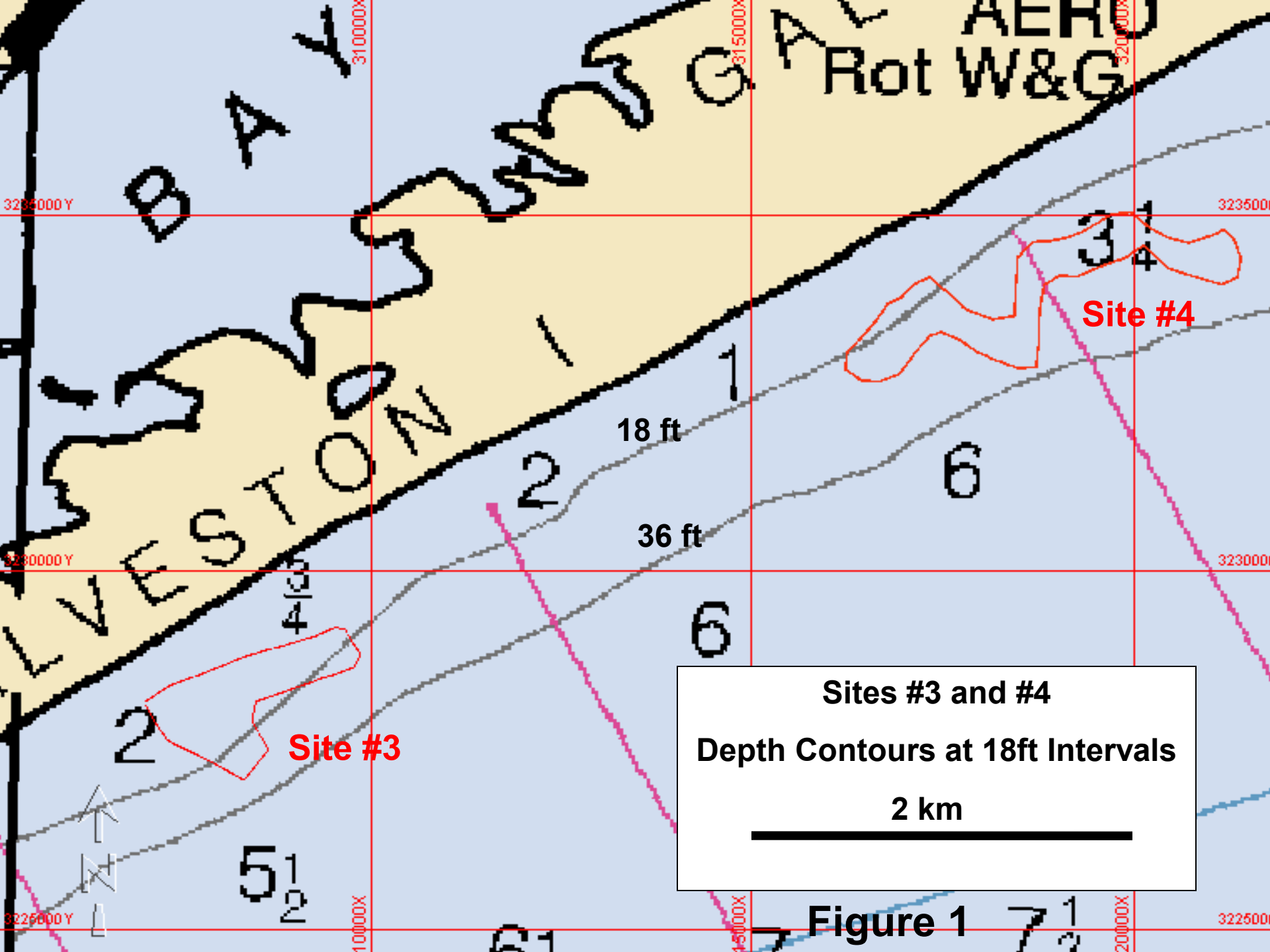
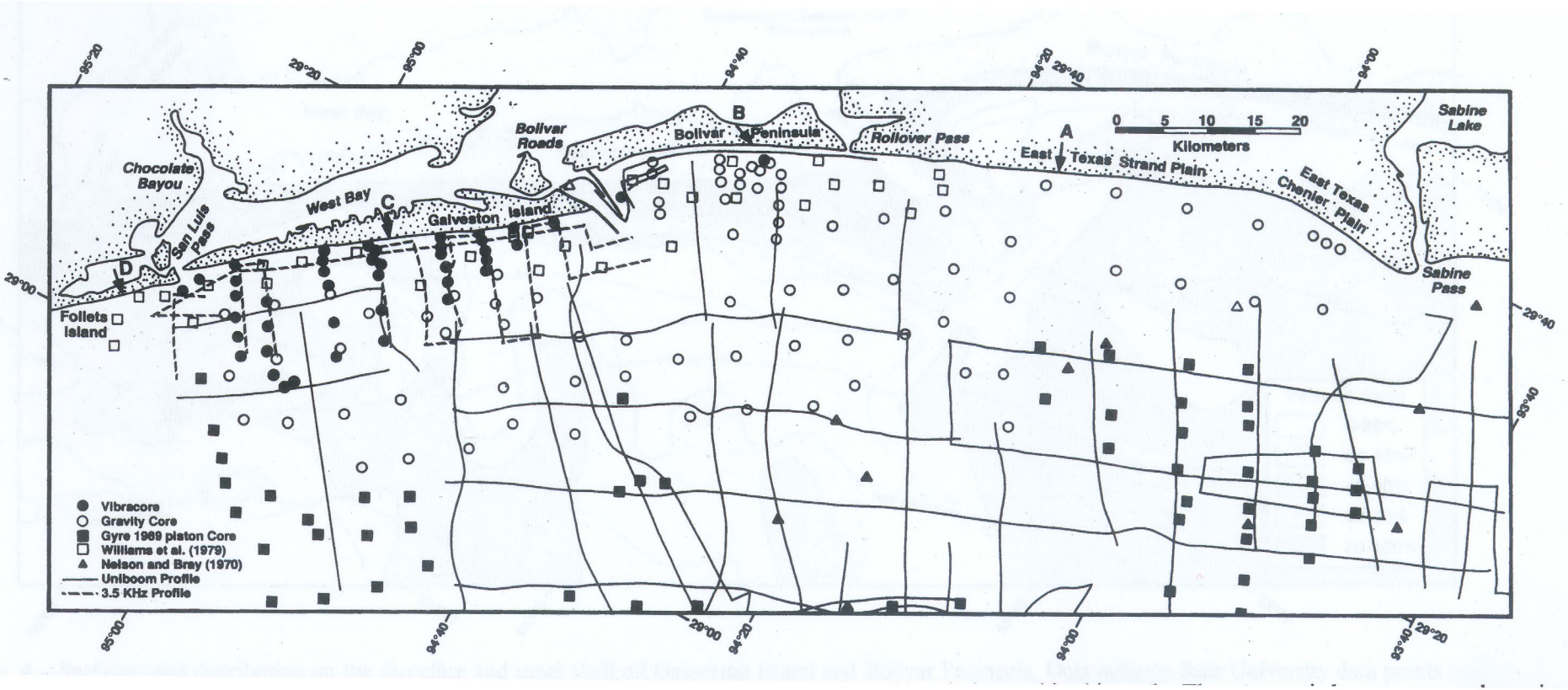

Site #4
Site #3
18 ft
36 ft
Sites #3 and #4
Depth Contours at 18ft Intervals
2 km

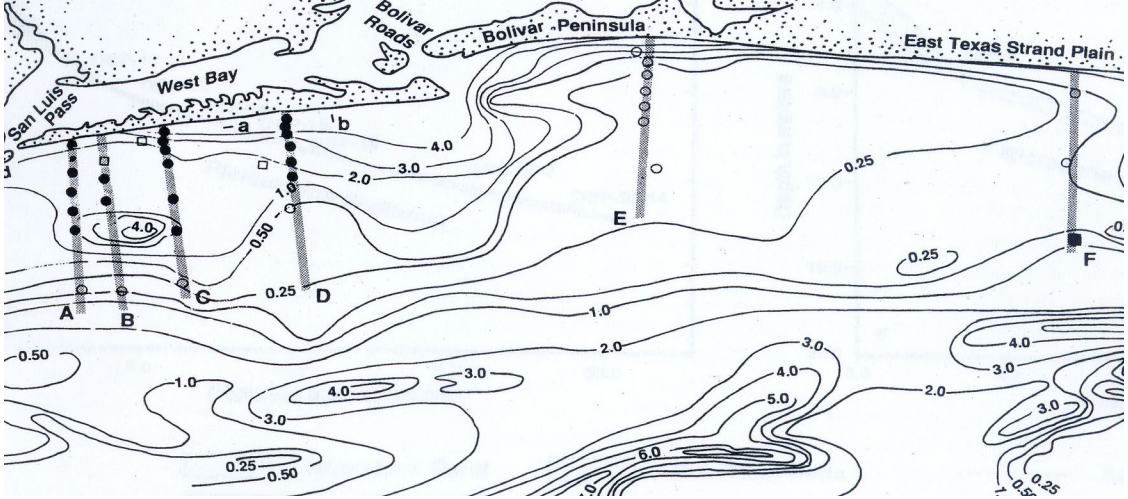
Figure 1



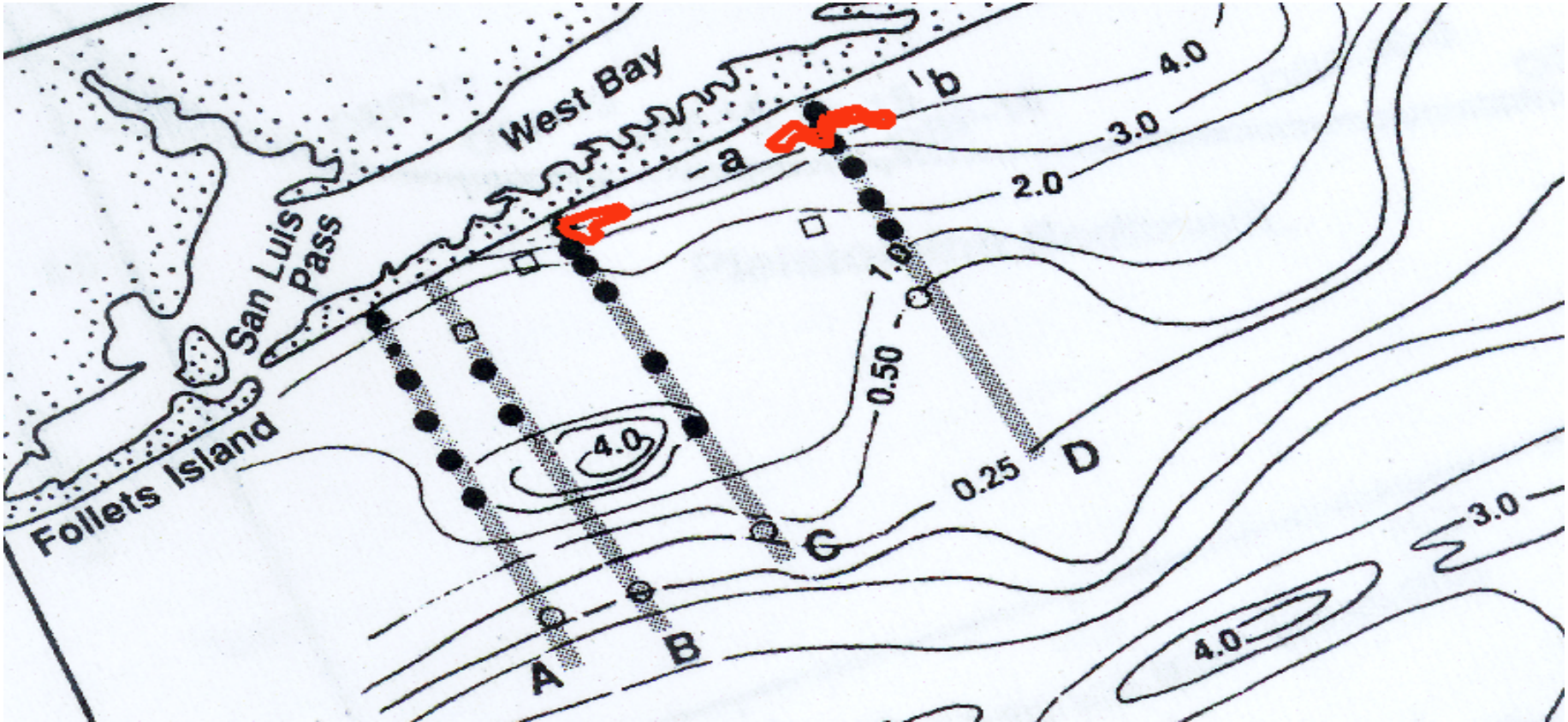
Locations of seismic lines, cores, and selected boreholes from Siringan and Anderson, 1994.

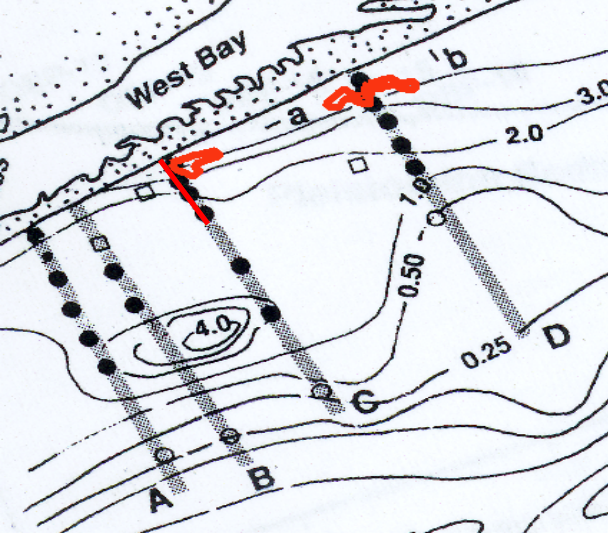
Figure 5

Figure 7



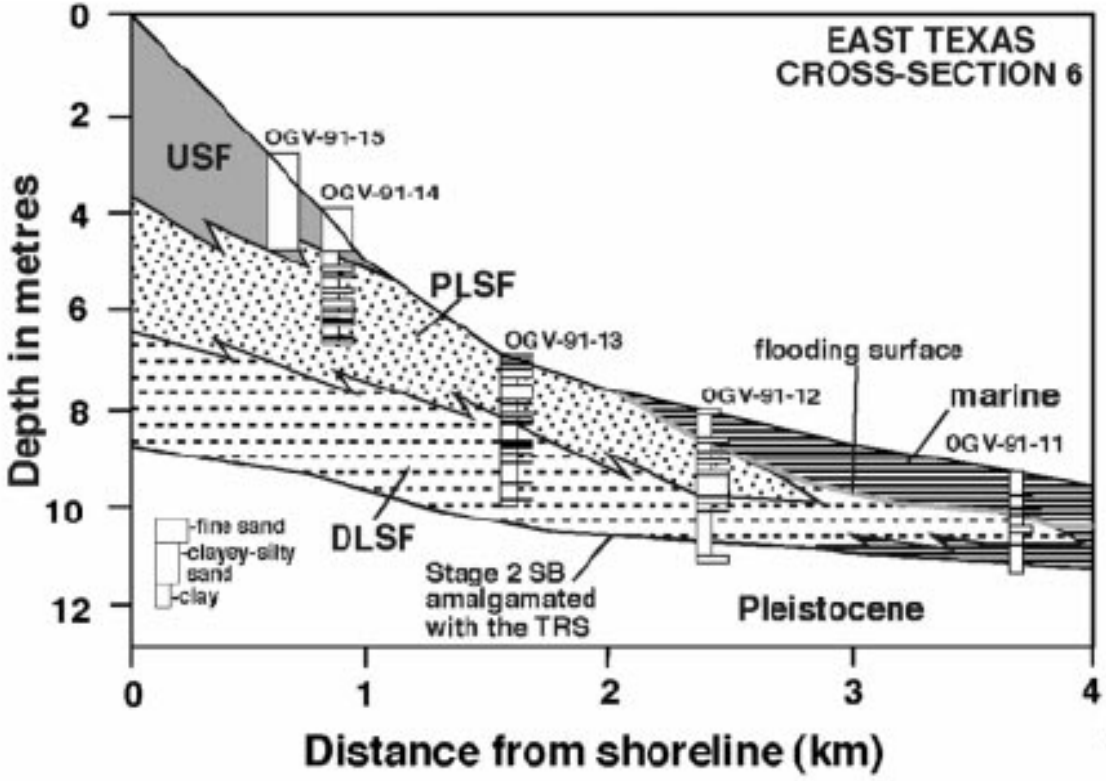
Isopach map of Holocene marine sediments





Cross sections 6 with some corresponding cores from Rodriguez et al., 2004.

USF-upper shoreface, PLSF-proximal lower shoreface, DLSF-distal lower shoreface, SB-sequence boundary, TRS-transgressive ravinement surface



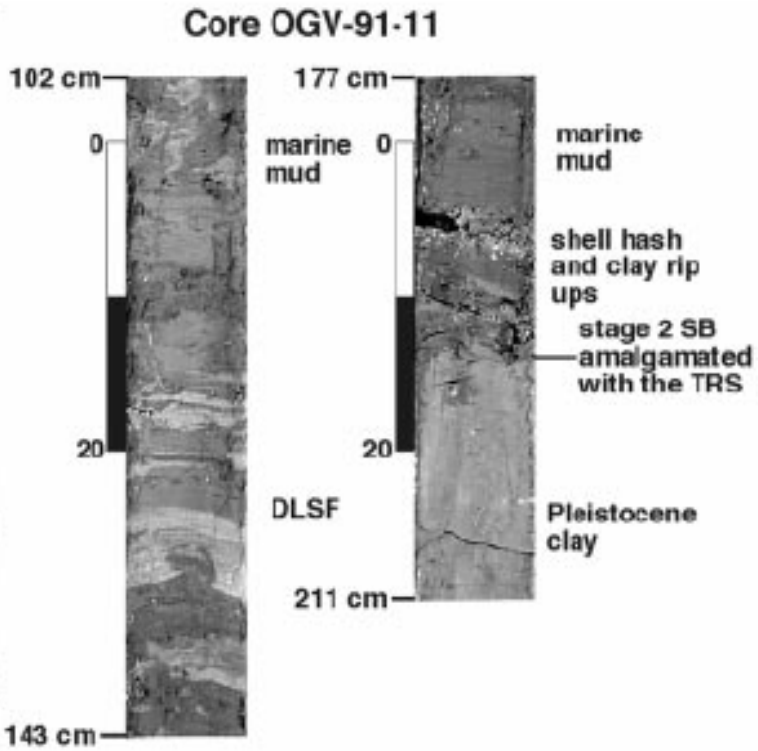
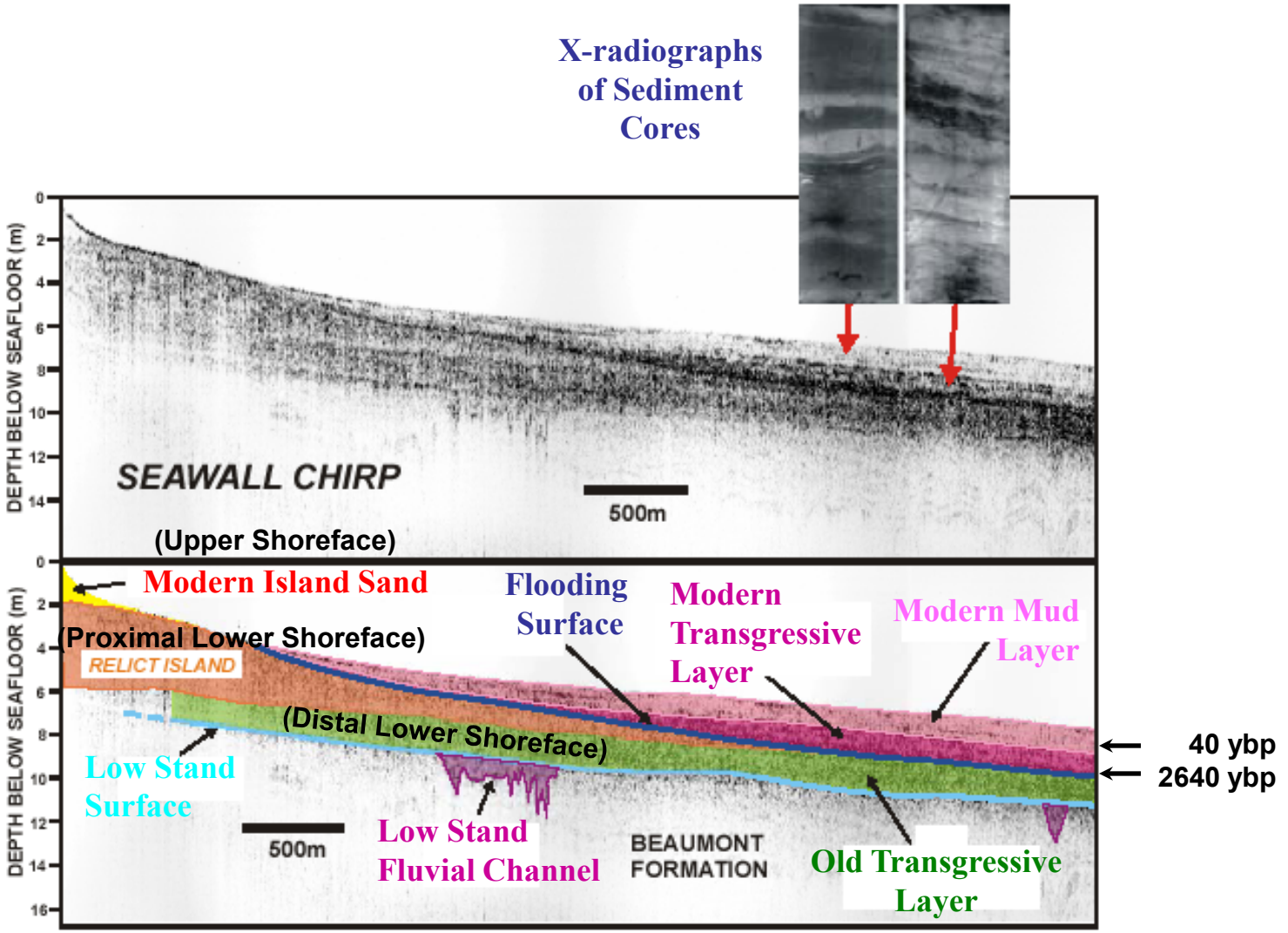


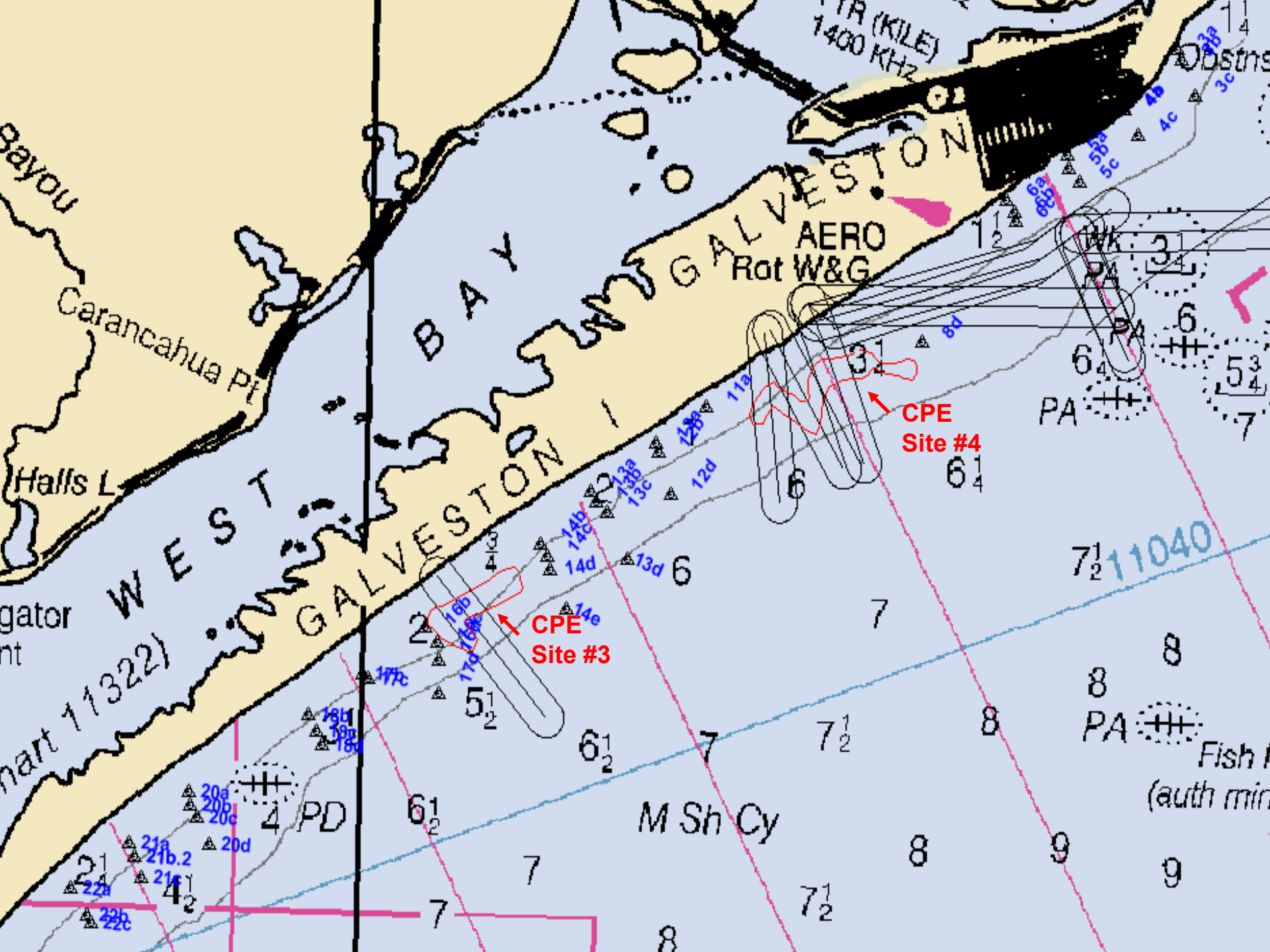
Figure 8



CHIRP cross-shore profile of a shoreface transect (location in Fig. 1). X-radiographs negatives (white=coarse) of typical 30 cm lengths of the modern mud and underlying transgressive mud.

Robb et al., 2003

Figure 9


GALVESTON BAY
WEST GALVESTON I
Carancahua Pt
Halls L
gator
nt
nart 11322)
AERO
Rot W&G
TR (KILE)
1400 KHz
Obstns
PA
Wk
CPE
Site #4
CPE
Site #3
11040
M Sh Cy
PD
Fish
(auth min

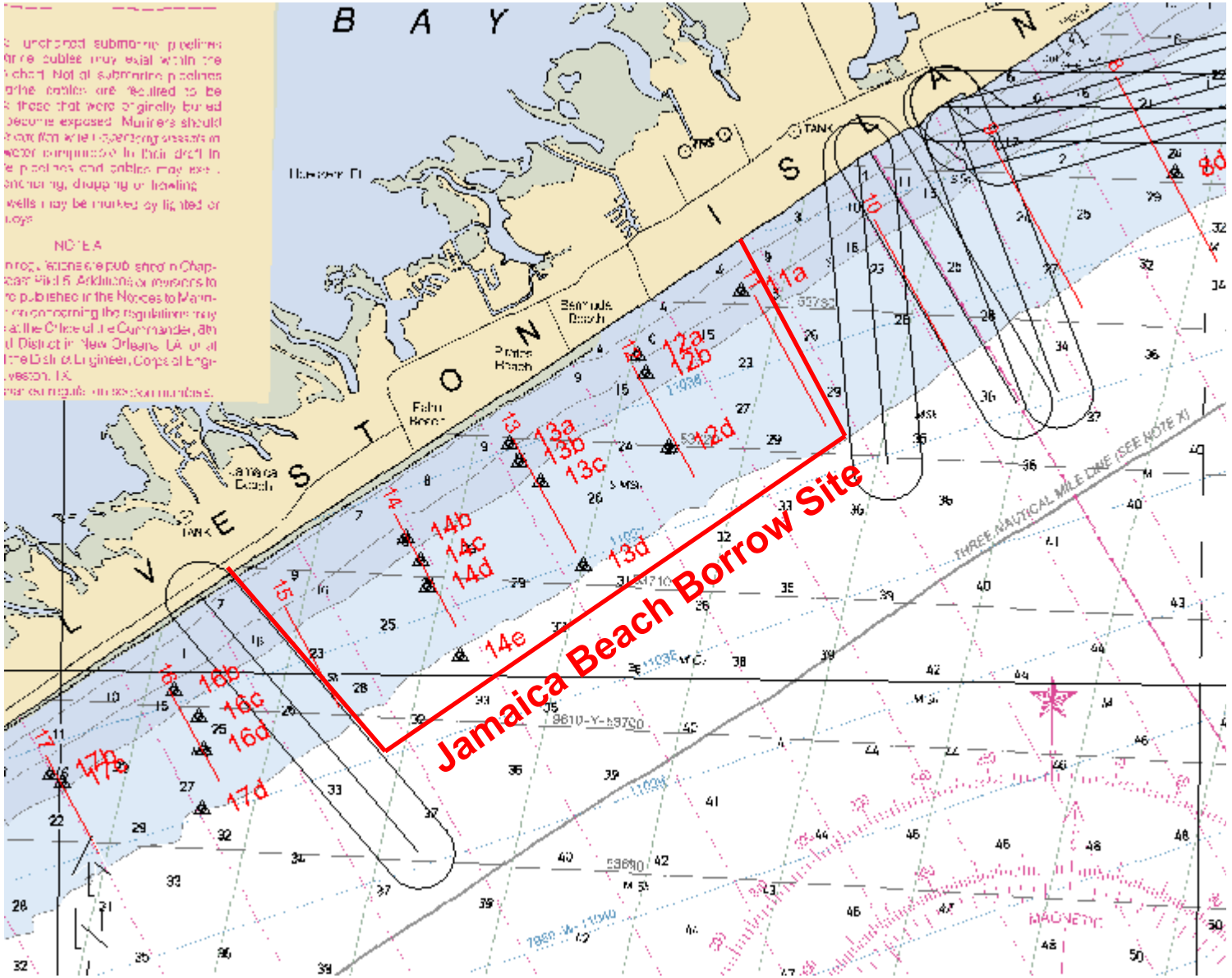

B A Y
I S L E S
T O N
Jamaica Beach Borrow Site
11a
12a
12b
12d
13a
13b
13c
13d
14b
14c
14d
14e
16b
16c
16d
17b
17d
8d
THREE NAUTICAL MILE LINE (SEE NOTE X)
MAGNETIC
0
2
4
6 km

Figure 16-

Lift Boat Ponthchatrain rigged with a submersible vibra core rig, situated off of West Galveston Island.

The deck of Lift Boat Ponthchatrain rigged with a submersible vibra core rig, the crew is rigging new core barrel.

Figure 17

The deck of Lift Boat Ponthchatrain rigged with a submersible vibra core rig, the crew is rigging new core barrel.

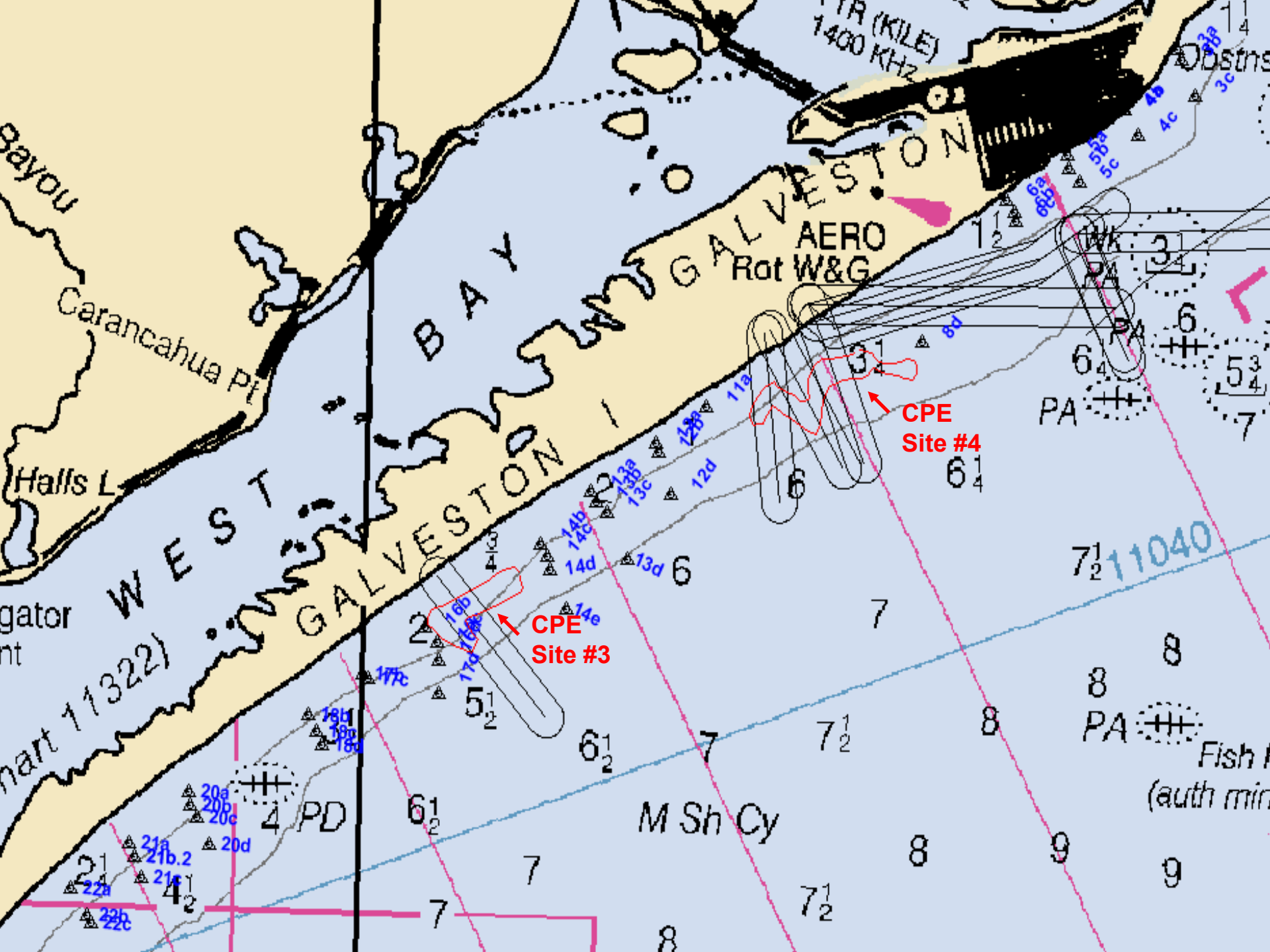
Figure 18

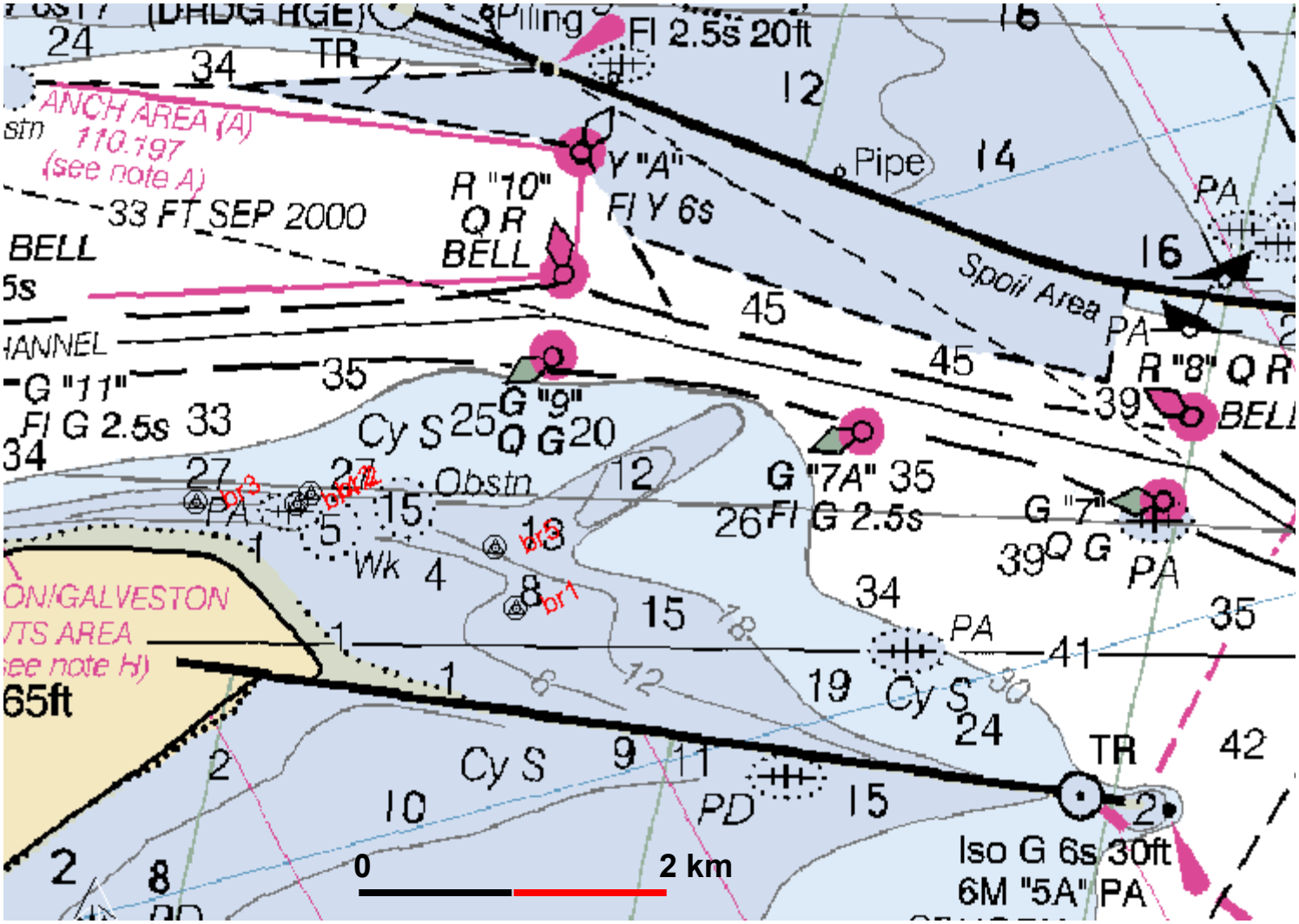
The deck of Lift Boat Ponthchatrain rigged with a submersible vibra core rig being deployed for core acquisition.

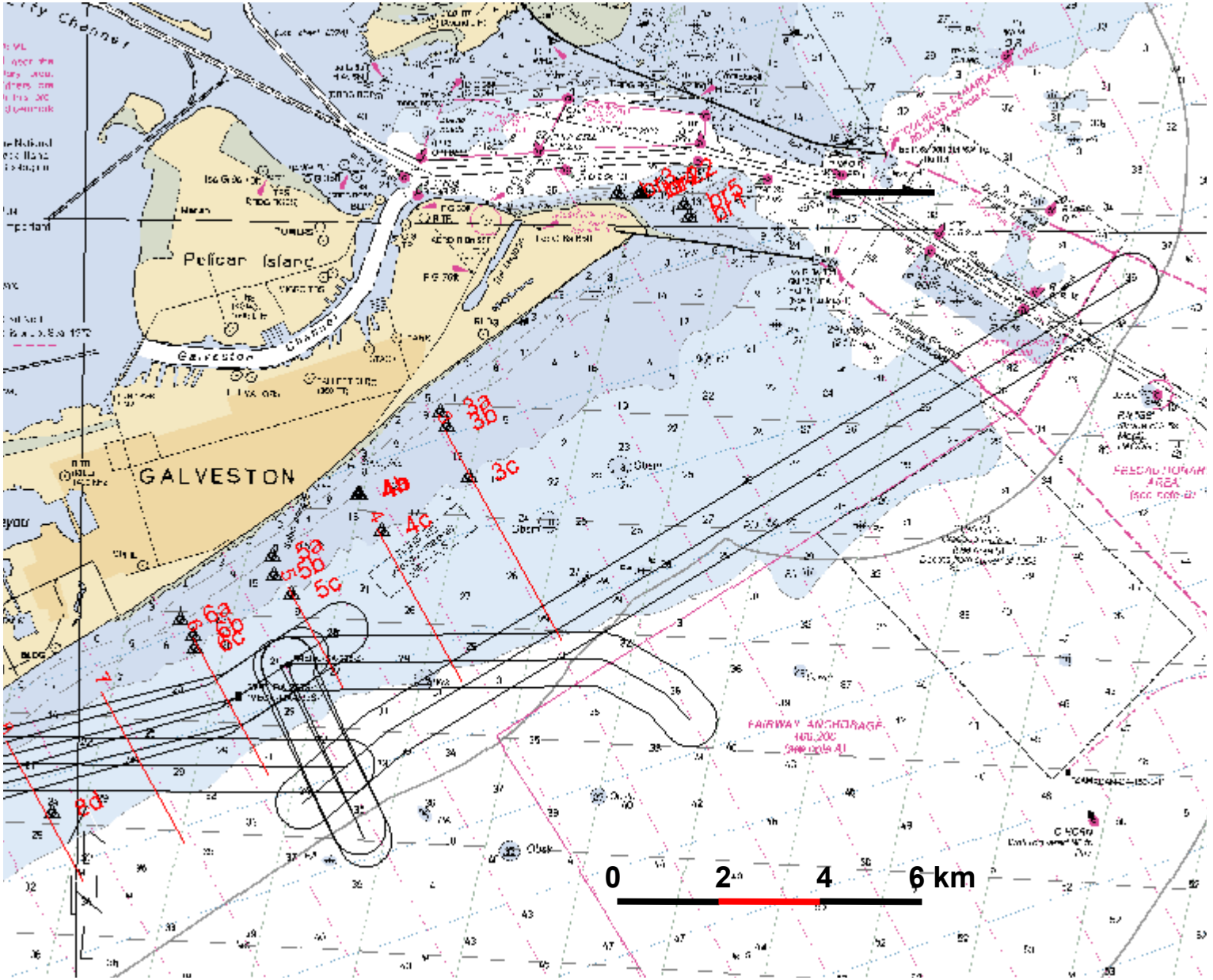
Figure 19

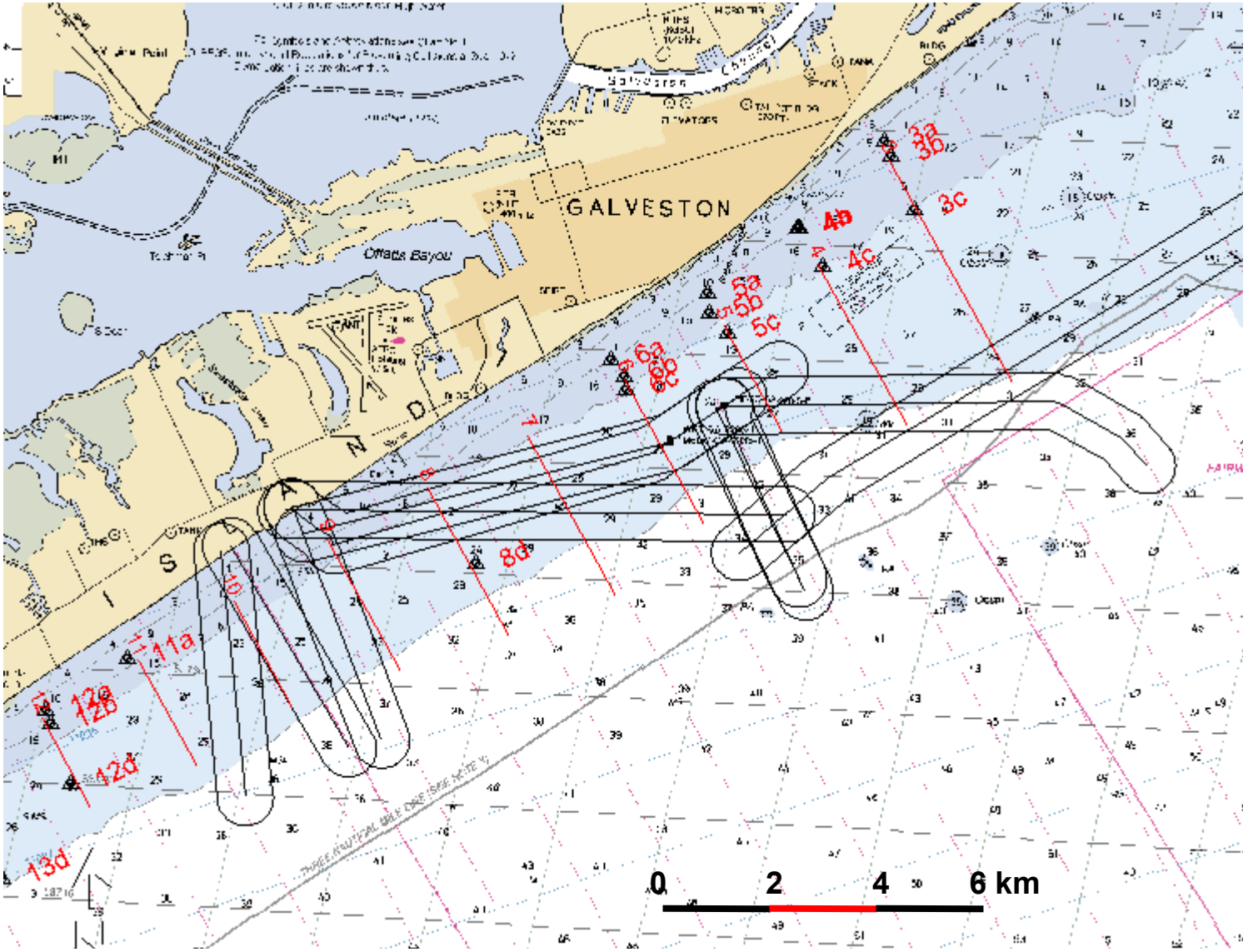
The deck of Lift Boat Ponthchatrain rigged with a submersible vibra core rig being deployed for core acquisition.

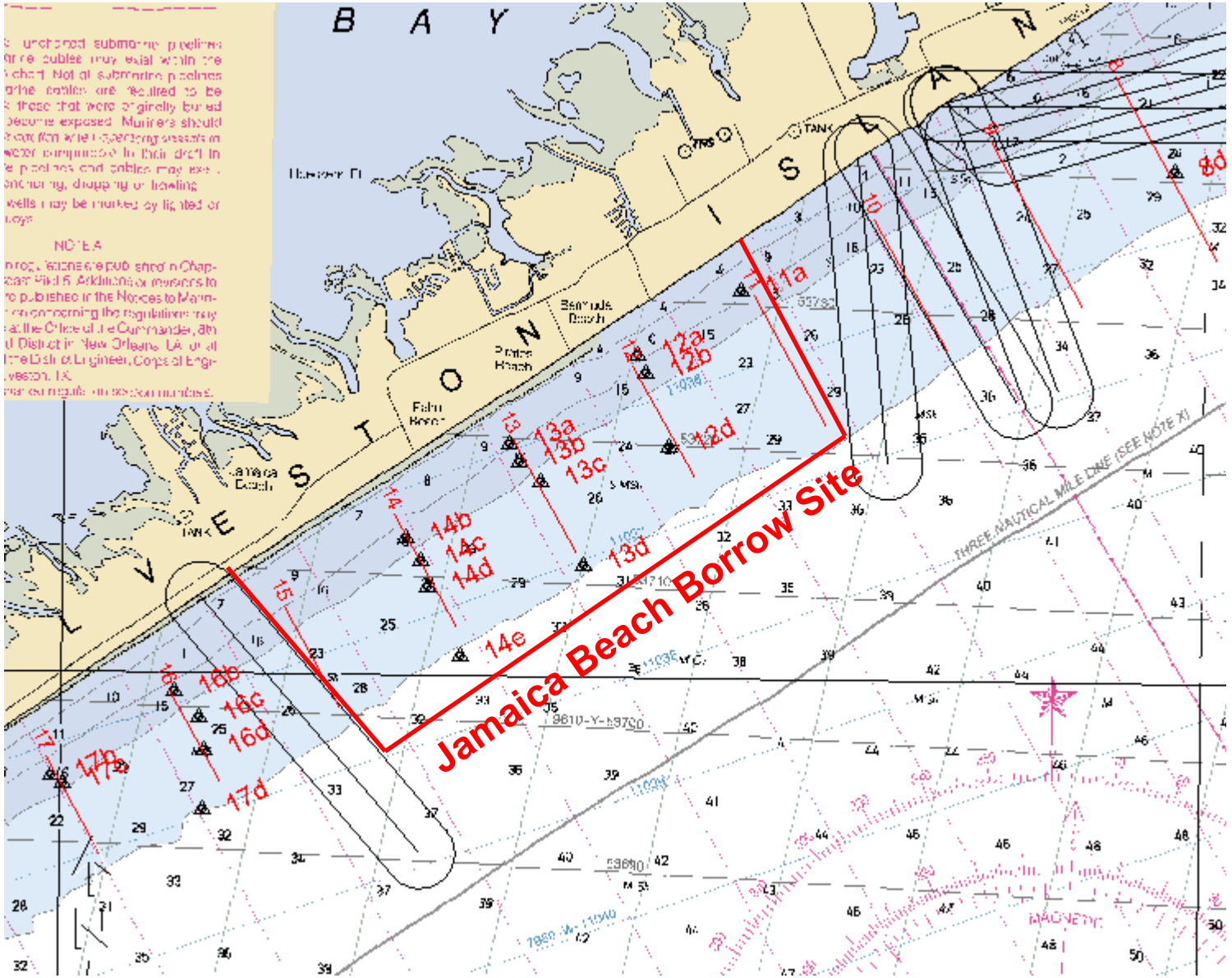
Figure 20


GALVESTON BAY
WEST GALVESTON I
Carancahua Pt
Halls L
gator
nt
nart 11322)
AERO
Rot W&G
TR (KILE)
1400 KHz
Obstns
PA
Wk
CPE
Site #4
CPE
Site #3
11040
M Sh Cy
PD
Fish
(auth min


(DHDG HGE)
Piling
Fl 2.5s 20ft
24
34
TR
12
16
ANCH AREA (A)
110.797
(see note A)
33 FT SEP 2000
Y "A"
Fl Y 6s
Pipe
14
PA
R "10"
Q R
BELL
BELL
5s
Spoil Area
16
45
45
PA
HANNEL
G "11"
Fl G 2.5s
35
G "9"
Q G
Cy S
25
20
33
34
39
R "8" Q R
BELL
27
27
Obstn
12
G "7A" 35
26 Fl G 2.5s
G "7"
39 Q G
PA
15
5
Wk
4
18
8
15
34
35
ON/GALVESTON
/TS AREA
ee note H)
1
41
PA
65ft
6
12
19
Cy S
30
24
TR
42
2
Cy S
9
11
10
PD
15
2
2
8
0
2 km
Iso G 6s 30ft
6M "5A" PA


Pelican Island
Galveston Channel
GALVESTON
FAIRWAY ANCHORAGE
0
2
4
6 km


GALVESTON
Offatts Bayou
3a
3b
3c
4b
4c
5a
5b
5c
6a
6b
6c
8d
11a
12a
12b
12d
13d
0
2
4
6 km


B A Y
I S L E S
T O N
Jamaica Beach Borrow Site
11a
12a
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12d
13a
13b
13c
13d
14b
14c
14d
14e
16b
16c
16d
17b
17d
8d
THREE NAUTICAL MILE LINE (SEE NOTE X)
MAGNETIC
0
2
4
6 km

CHIRP Line 12

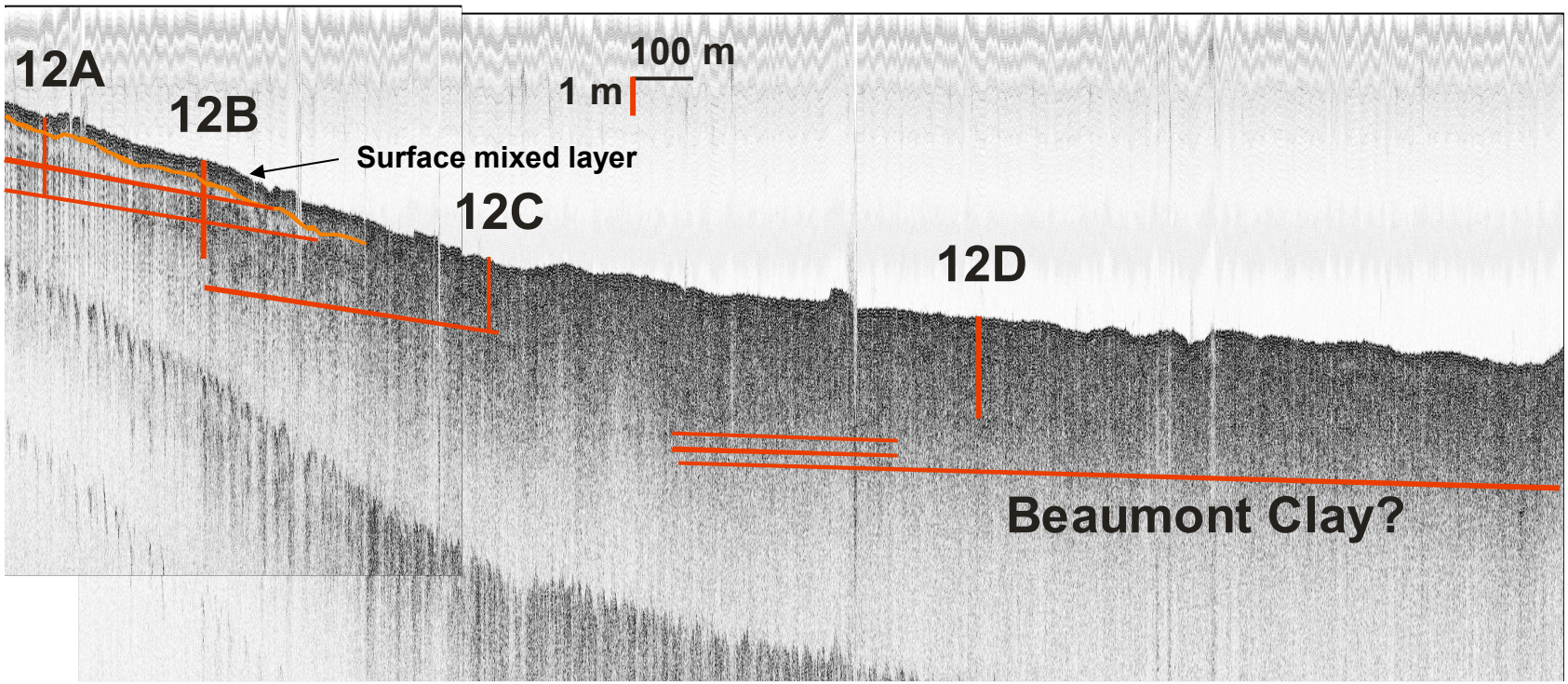


Figure 21

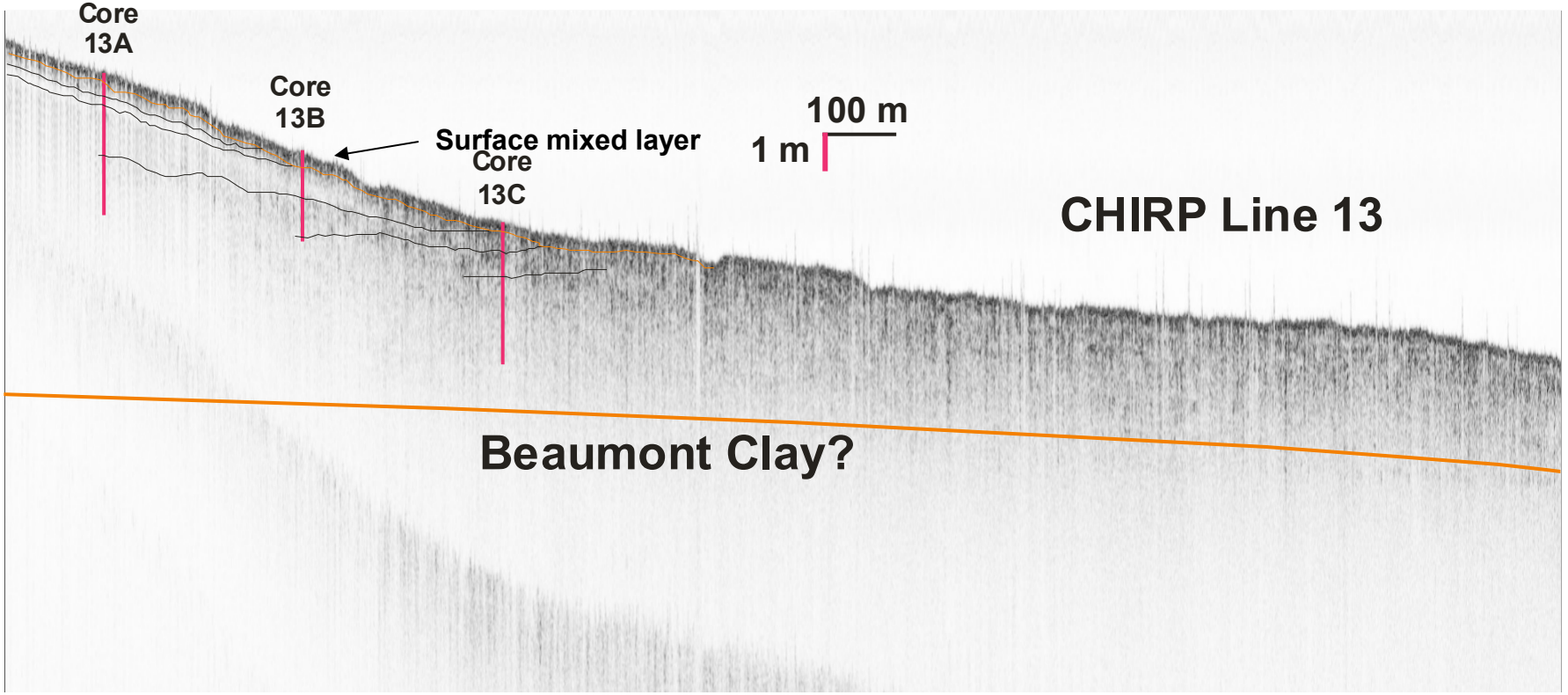

Core
13A
Core
13B
Surface mixed layer
Core
13C
100 m
1 m
CHIRP Line 13
Beaumont Clay?

Figure 22

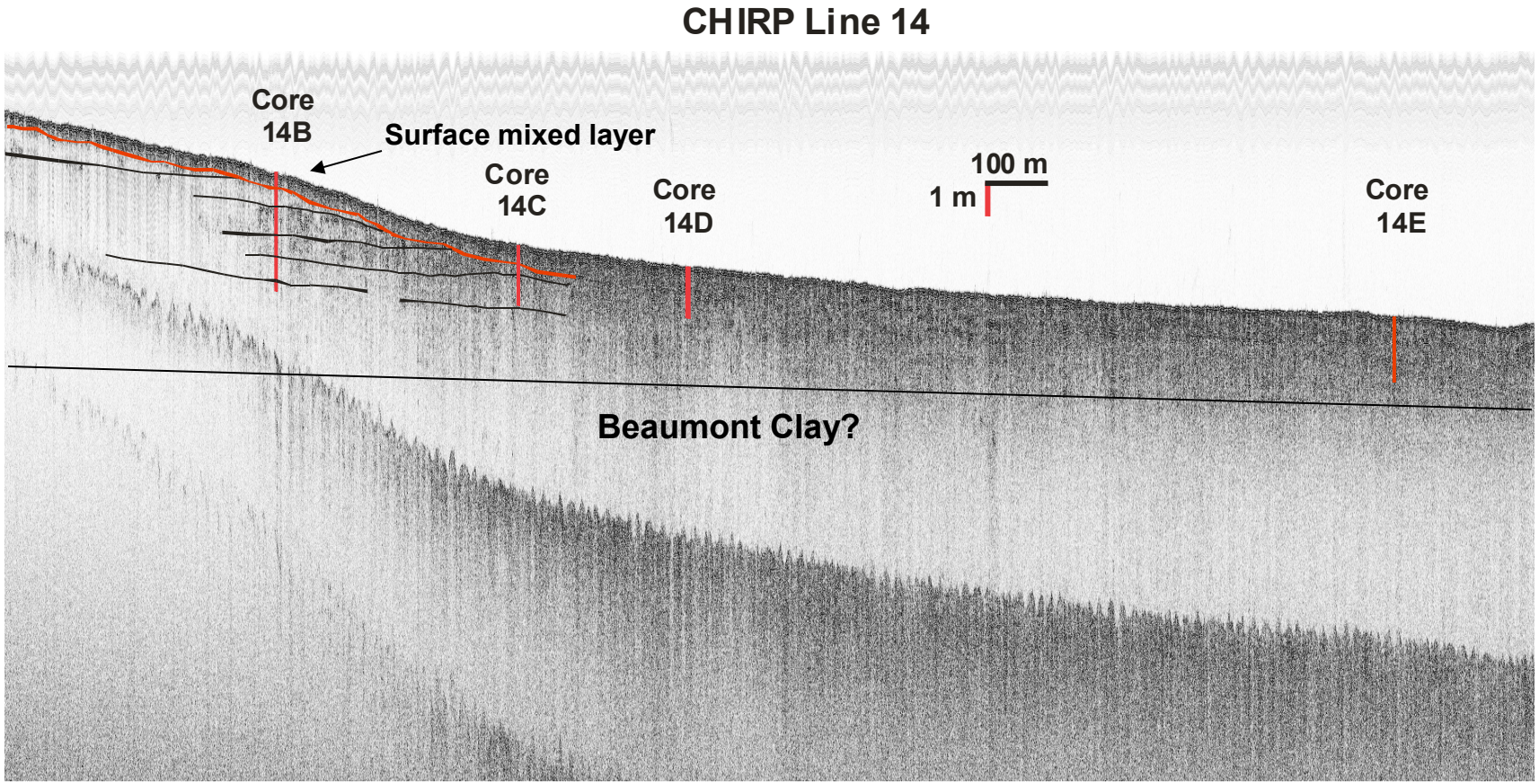

CHIRP Line 14
Core
14B
Surface mixed layer
Core
14C
Core
14D
100 m
1 m
Core
14E
Beaumont Clay?

Figure 23

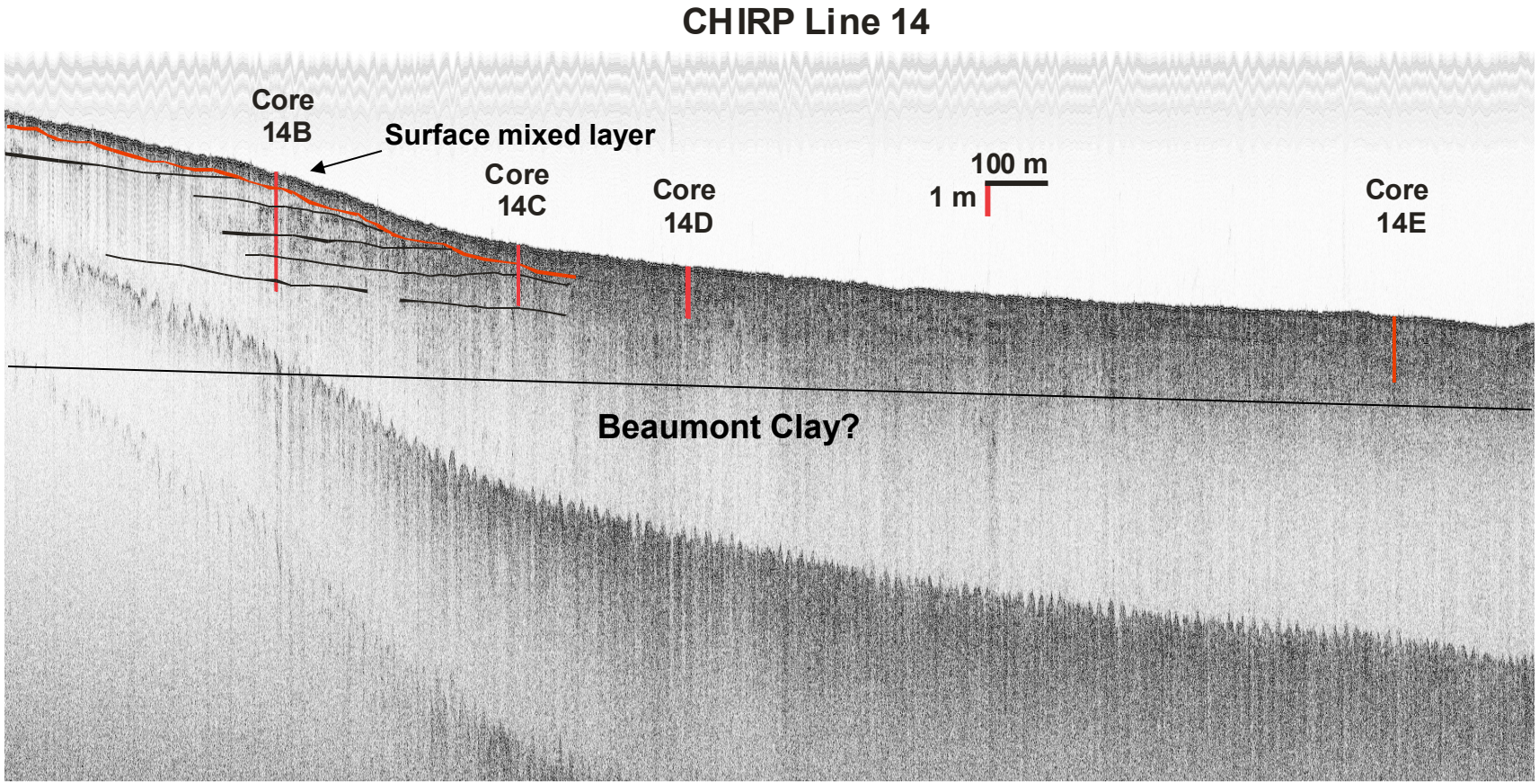
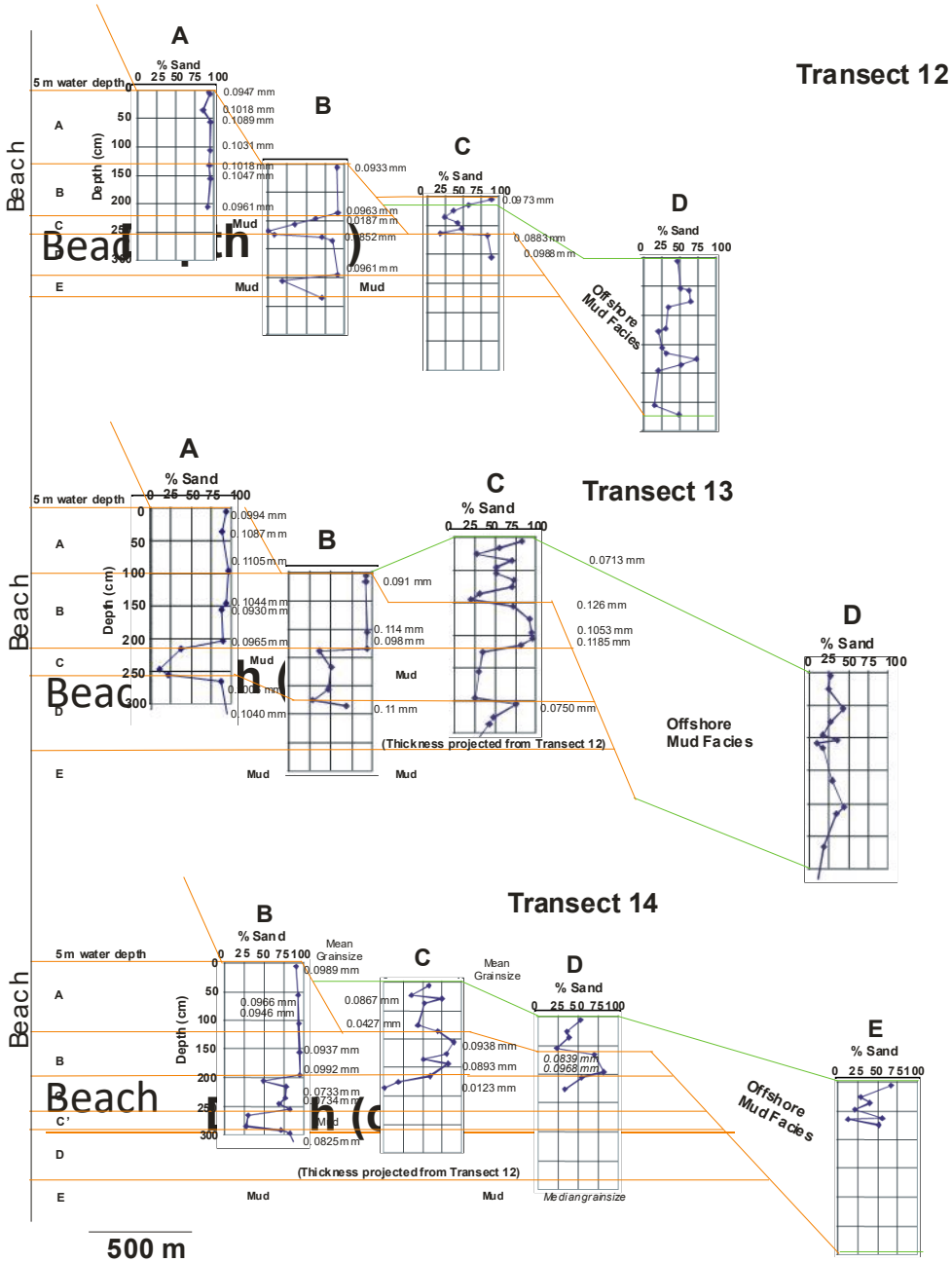

CHIRP Line 14
Core
14B
Surface mixed layer
Core
14C
Core
14D
100 m
1 m
Core
14E
Beaumont Clay?

Figure 23



All distances measured between graphs

Stratigraphic cross section showing stratigraphic correlations between cores

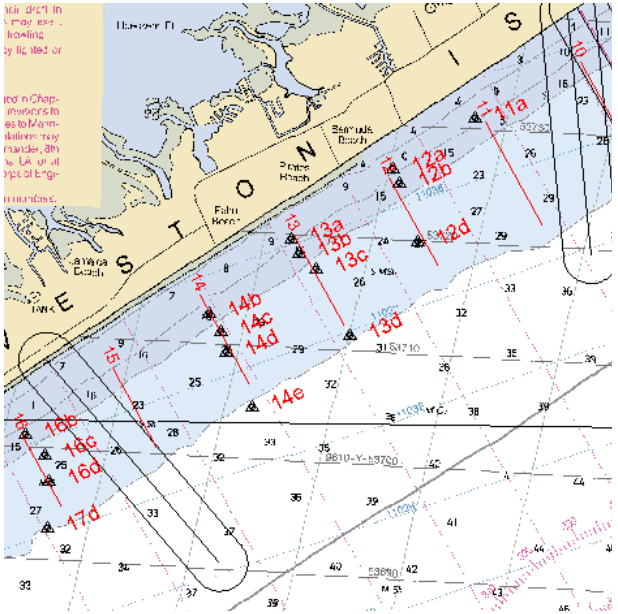
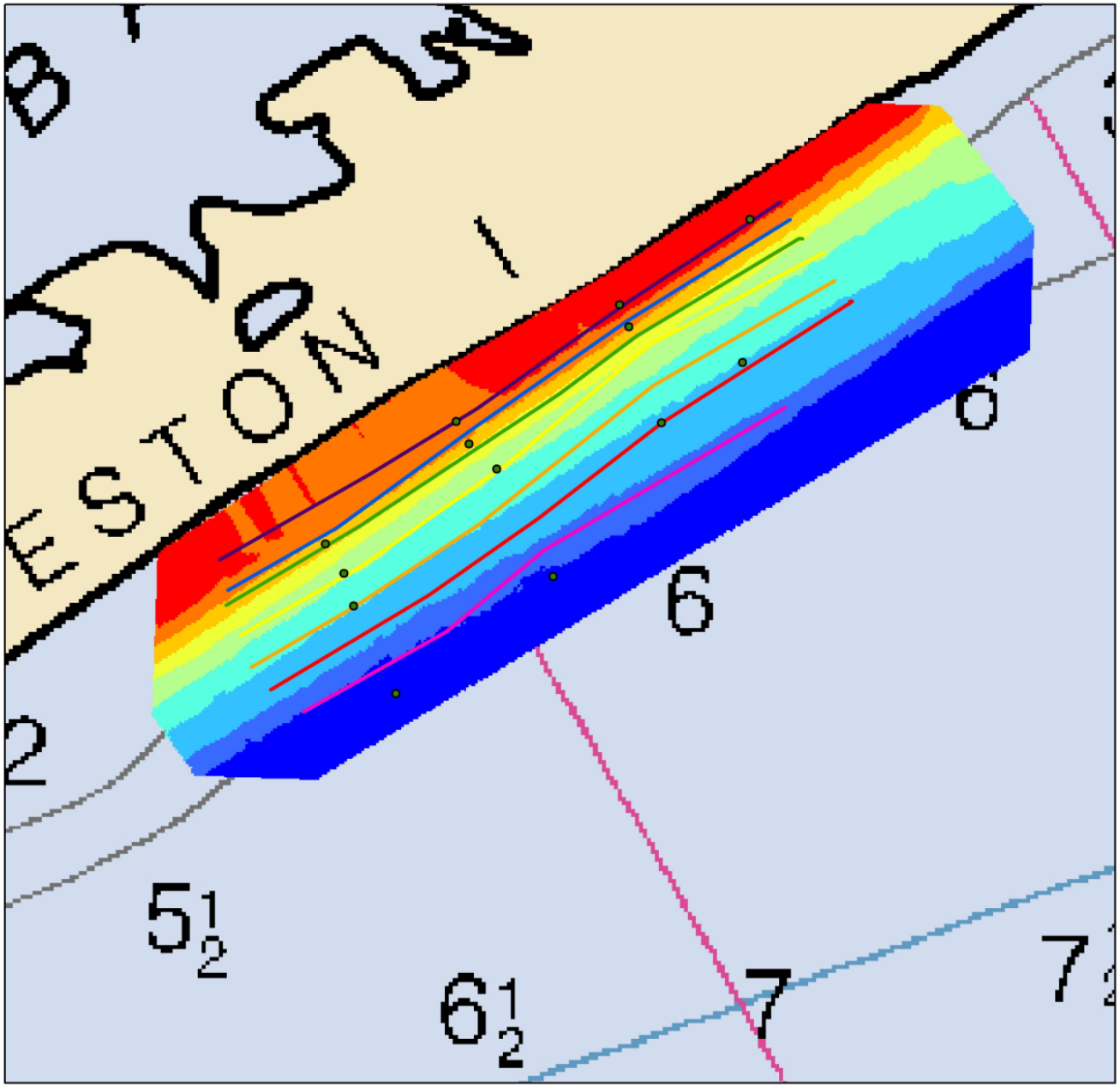


Figure 24


Inshore Sand Facies
Outcrop belt of Holocene Sand Layers
Offshore Mud Facies
0
1
2
3
4
Kilometers
Galveston Sand Resource Study Site
Sidescan Sonar Mosaic
Prepared By: Marc Torres, Coastal Geology Lab, Texas A&M at Galveston
Datum: WGS 1984
Projection: UTM Zone 15N

Figure 26



Thickness of Off Shore Gross Surface Sand Layer

N
W E
S

Legend

- Core Locations
- 0.0m of Gross Sand
- 0.5m of Gross Sand
- 1.0m of Gross Sand
- 1.5m of Gross Sand
- 2.0m of Gross Sand
- 2.5m of Gross Sand
- 3.0m of Gross Sand

Bathymetry

- 2.9- 3.7m
- 3.7 - 4.5m
- 4.5 - 5.2m
- 5.2 - 6.0m
- 6.0 - 6.8m
- 6.8 - 7.6m
- 7.6 - 8.3m
- 8.3 - 9.1m
- 9.1 - 9.9m

0 1 2 3
Kilometers

Projection: Texas State Plane Southcentral
Datum:NAD 1983

Figure 27

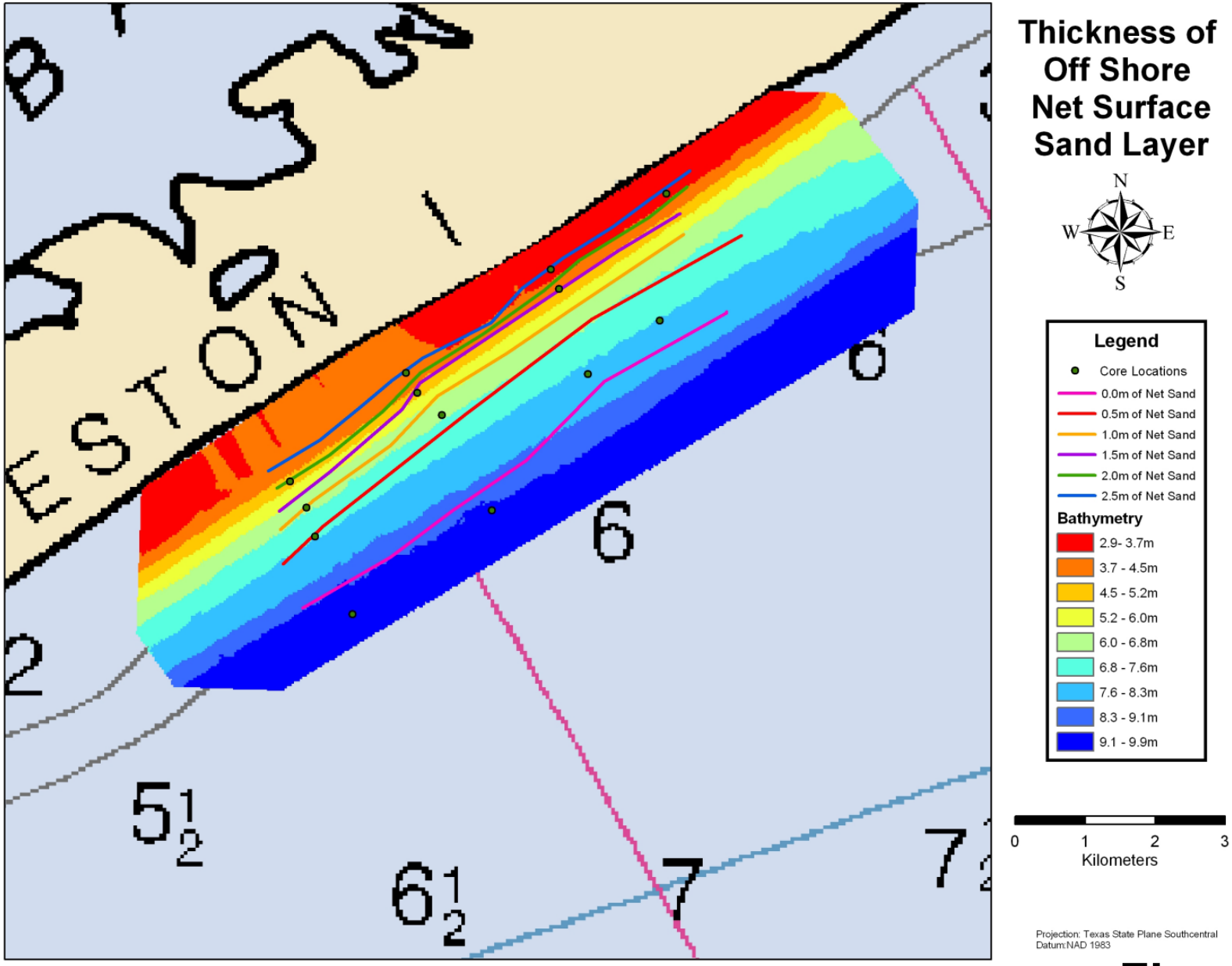

Thickness of Off Shore Net Surface Sand Layer
N
W
E
S
Legend
Core Locations
0.0m of Net Sand
0.5m of Net Sand
1.0m of Net Sand
1.5m of Net Sand
2.0m of Net Sand
2.5m of Net Sand
Bathymetry
2.9- 3.7m
3.7 - 4.5m
4.5 - 5.2m
5.2 - 6.0m
6.0 - 6.8m
6.8 - 7.6m
7.6 - 8.3m
8.3 - 9.1m
9.1 - 9.9m
0
1
2
3
Kilometers
Projection: Texas State Plane Southcentral
Datum:NAD 1983

Figure 28

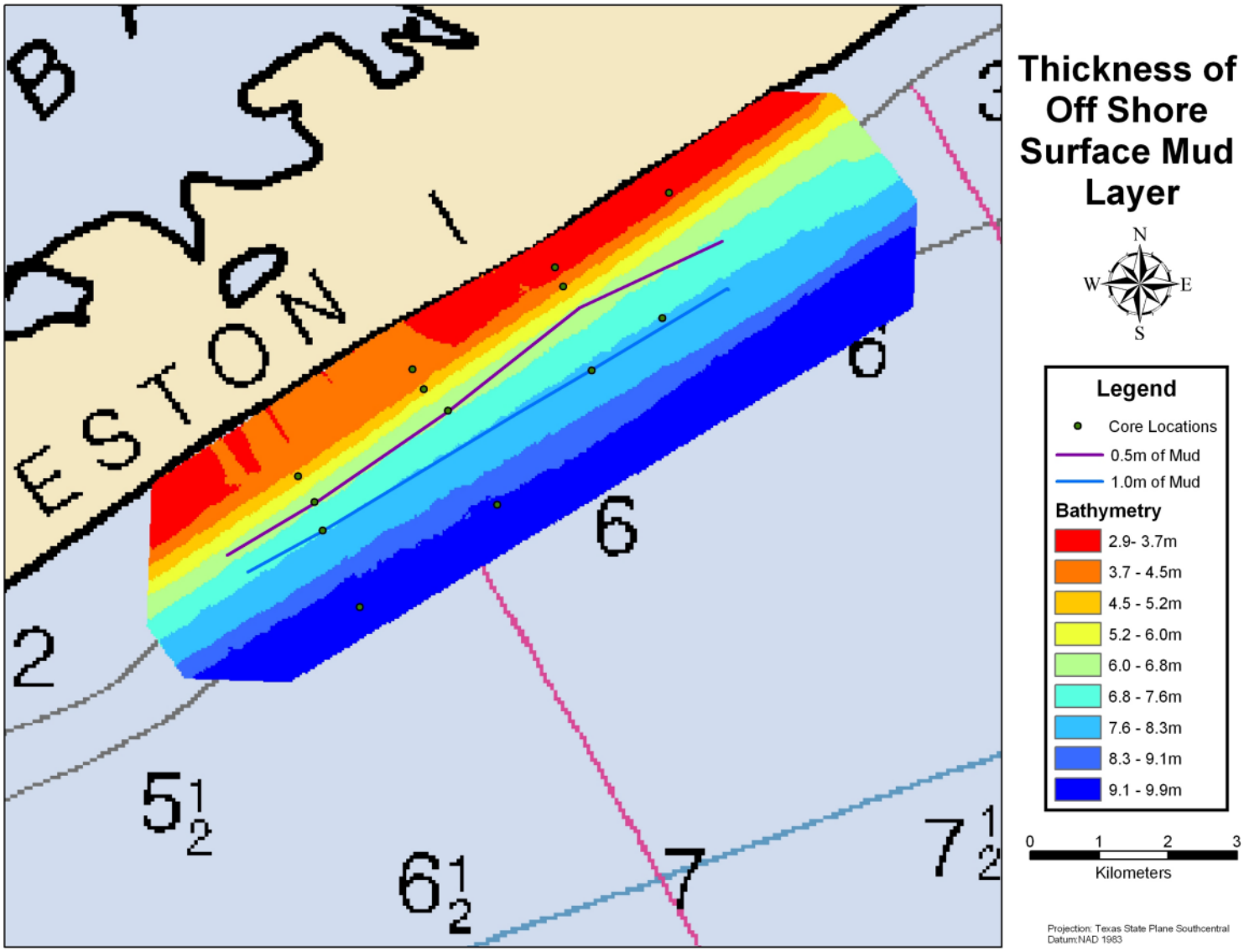
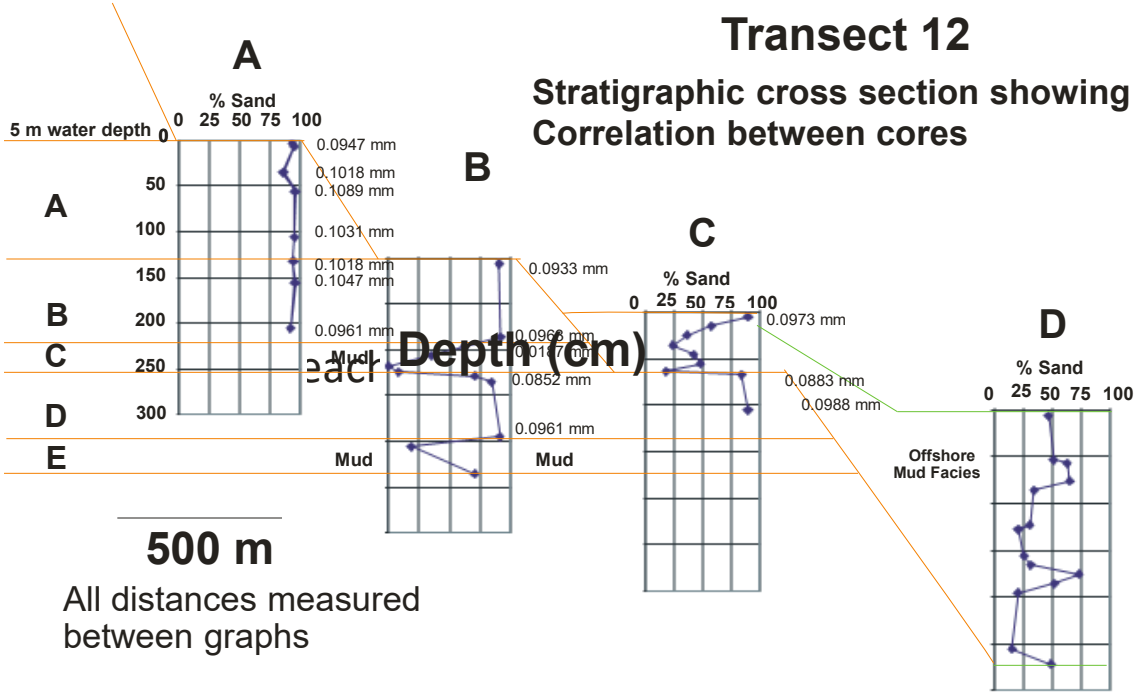

Thickness of Off Shore Surface Mud Layer
N
W
E
S
Legend
Core Locations
0.5m of Mud
1.0m of Mud
Bathymetry
2.9- 3.7m
3.7 - 4.5m
4.5 - 5.2m
5.2 - 6.0m
6.0 - 6.8m
6.8 - 7.6m
7.6 - 8.3m
8.3 - 9.1m
9.1 - 9.9m
0 1 2 3
Kilometers
Projection: Texas State Plane Southcentral
Datum:NAD 1983
ESTON
6
2
5 1/2
6 1/2
7
7 1/2

Figure 29

Transect 12

Stratigraphic cross section showing stratigraphic Correlation between cores



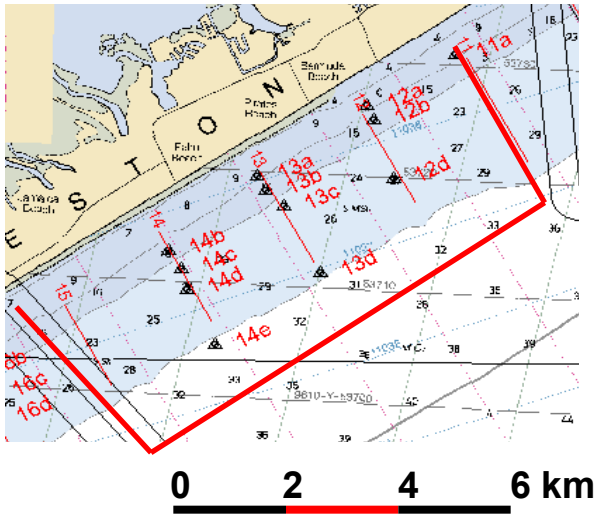
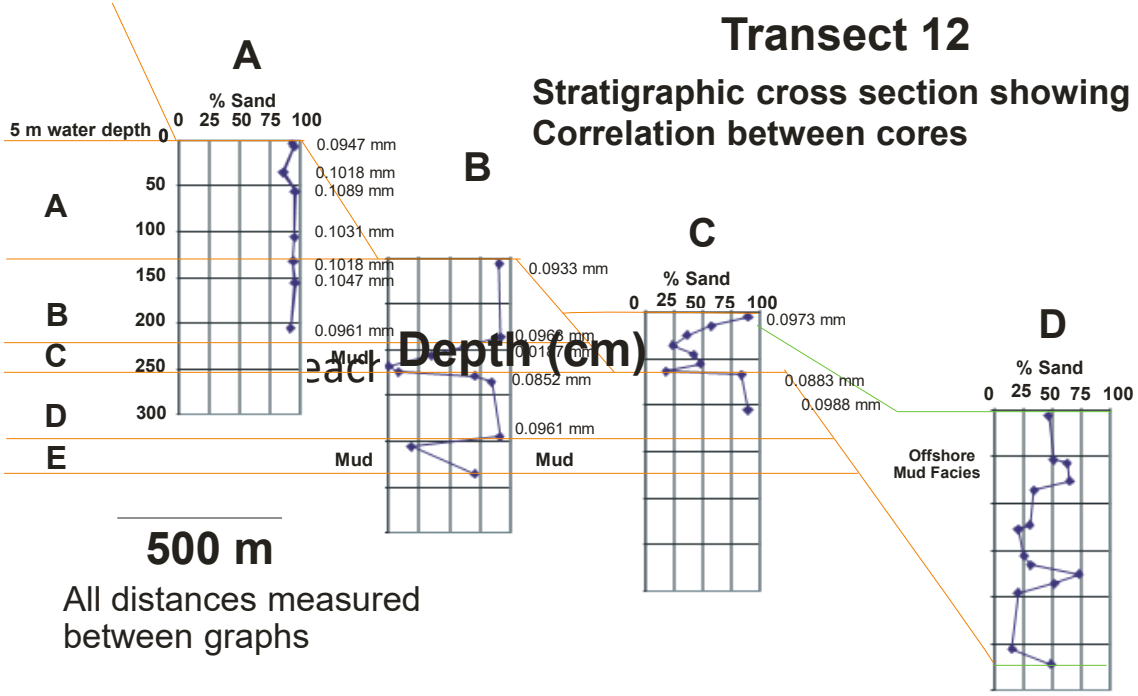


Table 1 –Summary of Stratigraphic Layer Thickness and Sand Quality

Layer	Mean Thickness	Mean Sand Diameter	% Sand	Lithology
Beach		134- 115 µm	100%	Sand
A	125 cm	94.6- 110.5 µm	90-98%	Sand
B	200 cm	93.0- 104.7 µm	90-98%	Sand
C	40 cm	n/a	<50%	Mud
D	75 cm	85.2- 104.0 µm	>75%	Sand
E	40 cm	n/a	<50%	Mud

Transect 12

Stratigraphic cross section showing stratigraphic Correlation between cores



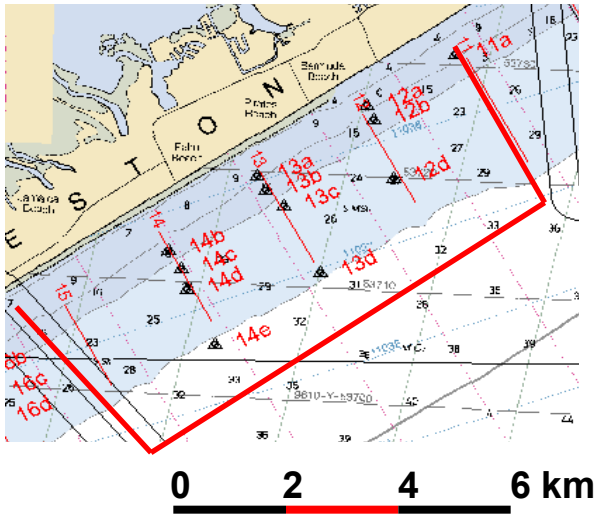
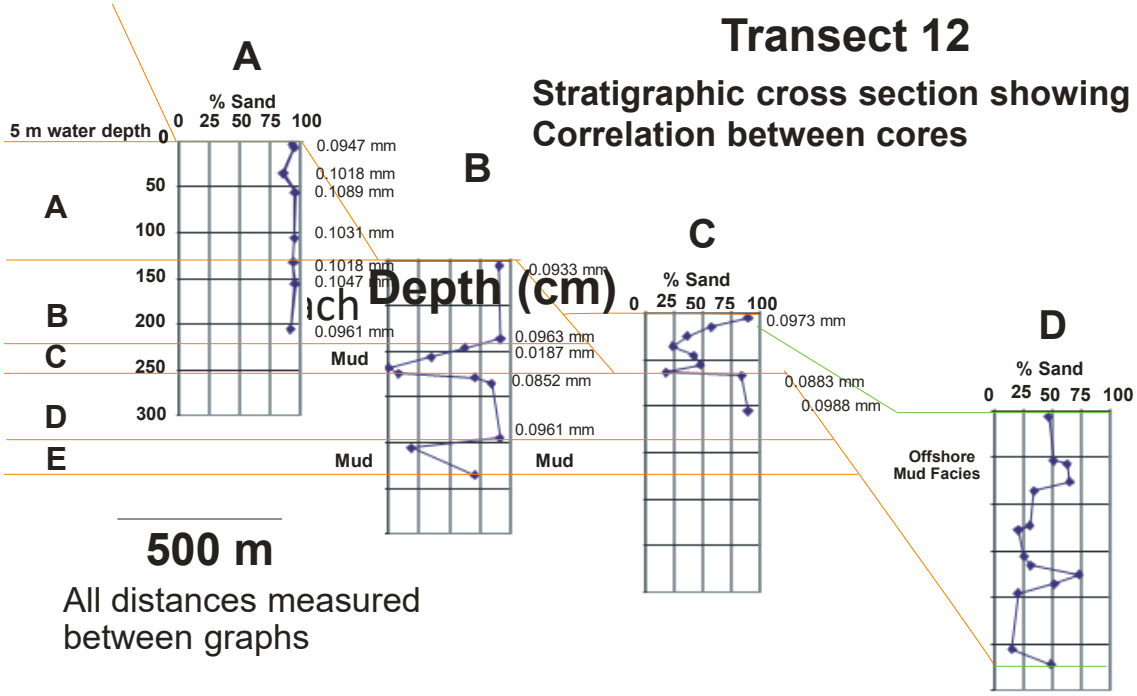


Table 2- Summary of Average Thickness of Sand Deposits along each 5 foot Isobath

Layer	Core A	Core B	Core C	Core D	Core E
Offshore Mud Facies	0 cm	0 cm	60 cm	300 cm	300 cm
A-Sand	125 cm	0 cm	0 cm	0 cm	0 cm
B-Sand	200 cm	100 cm	60 cm	0 cm	0 cm
C-Mud	40 cm	60 cm	60 cm	0 cm	0 cm
D-Sand	75 cm	75 cm	75 cm	0 cm	0 cm
Gross Interval	400 cm	235 cm	255 cm	300 cm	300 cm
Net Sand	360 cm	175 cm	135 cm	0 cm	0 cm

Transect 12

Stratigraphic cross section showing stratigraphic Correlation between cores



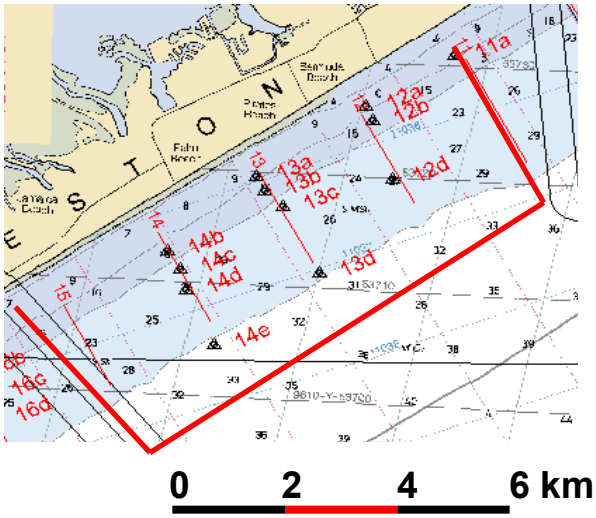
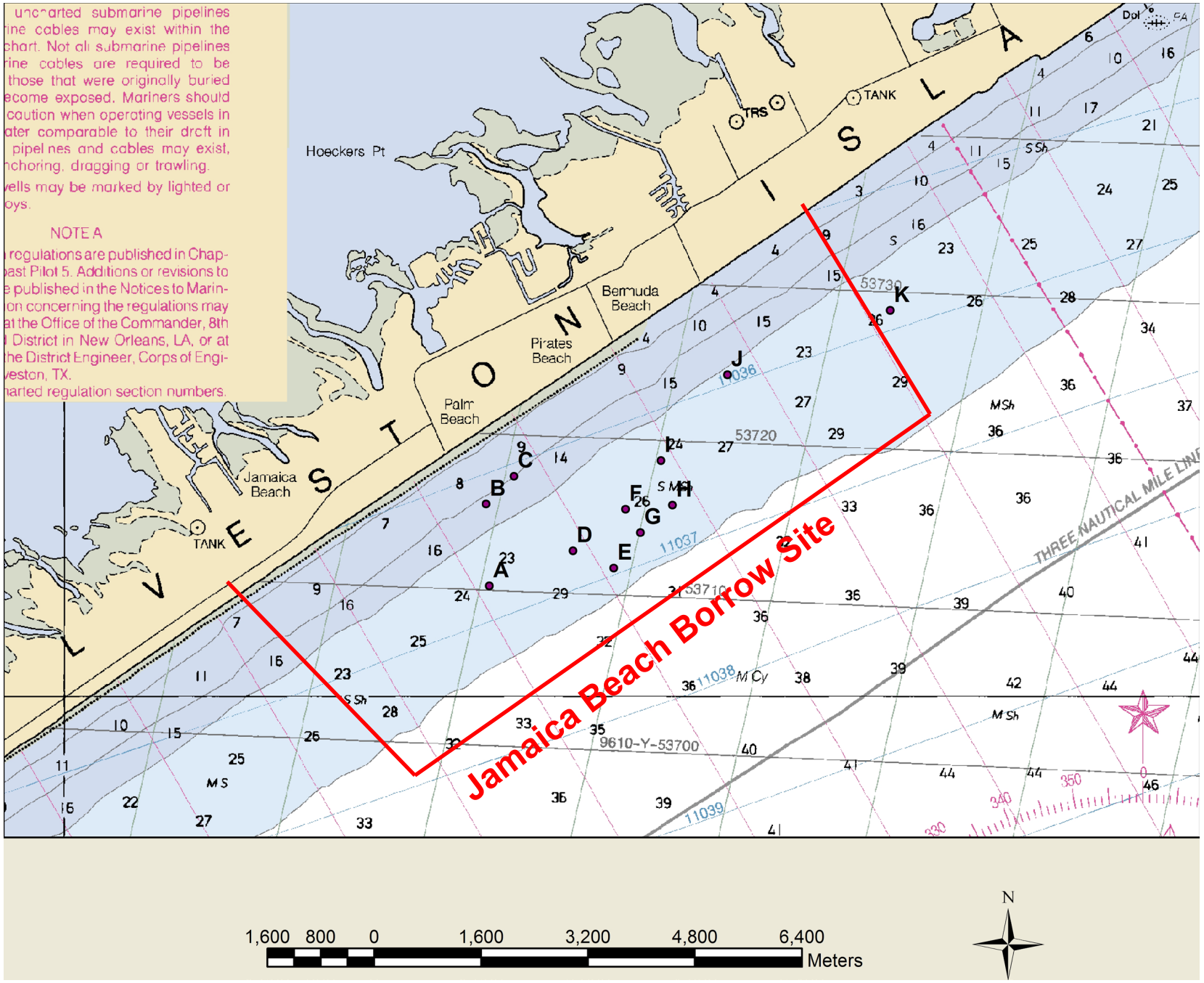
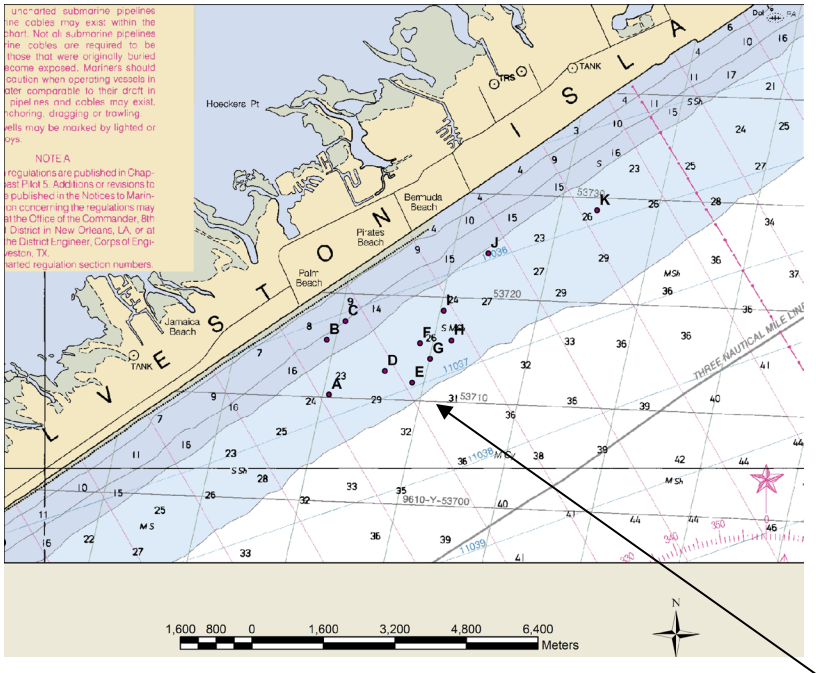


Table 3- Summary of Average Thickness of Sand Deposits along each 5 foot (1.5 m) Isobath

	A-B	B-C	C-D	Total Volume
Average Distance between cores	275 m	400 m	400 m	
Ave. Thickness	3.6 m	1.75 m	1.35 m	
Cubic meters/km	963k m^3/km	271.25k m^3/km	91.13 m^3/km	1,325.4k m^3/km


uncharted submarine pipelines
fine cables may exist within the
chart. Not all submarine pipelines
fine cables are required to be
those that were originally buried
become exposed. Mariners should
caution when operating vessels in
ater comparable to their draft in
pipelines and cables may exist,
nchoring, dragging or trawling.
vells may be marked by lighted or
oys.
NOTE A
regulations are published in Chap-
ast Pilot 5. Additions or revisions to
e published in the Notices to Marin-
on concerning the regulations may
at the Office of the Commander, 8th
District in New Orleans, LA, or at
he District Engineer, Corps of Engi-
veston, TX.
harted regulation section numbers.
Hoeckers Pt
TRS
TANK
Bermuda Beach
Pirates Beach
Palm Beach
Jamaica Beach
TANK
HOUSTON
GALVESTON ISLAND
Jamaica Beach Borrow Site
THREE NAUTICAL MILE LINE
53730
53720
53716
11036
11037
11038
11039
9610-Y-53700
A
B
C
D
E
F
G
H
J
K
1,600 800 0 1,600 3,200 4,800 6,400
Meters
N


uncharted submarine pipelines
line cables may exist within the
chart. Not all submarine pipelines
line cables are required to be
those that were originally buried
become exposed. Mariners should
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ater comparable to their draft in
pipelines and cables may exist.
nchoring, dragging or trawling.
ells may be marked by lighted or
oys.
NOTE A
regulations are published in Chap-
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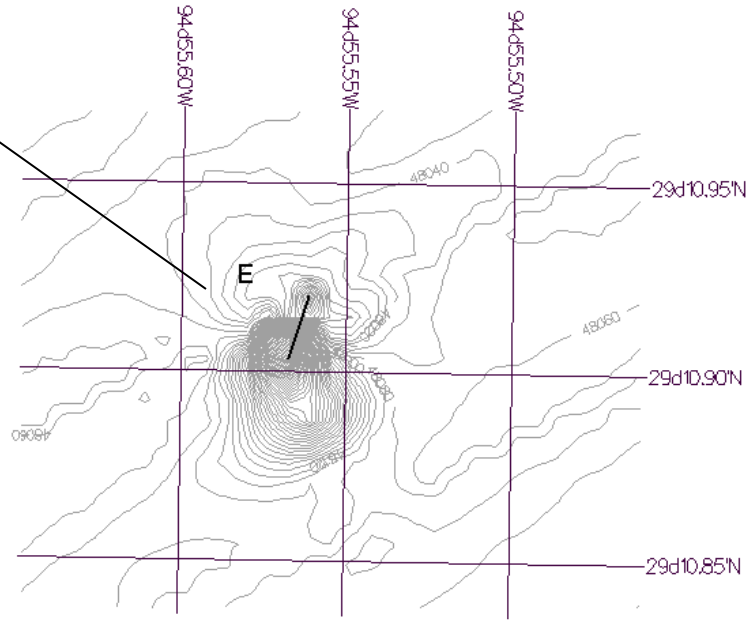
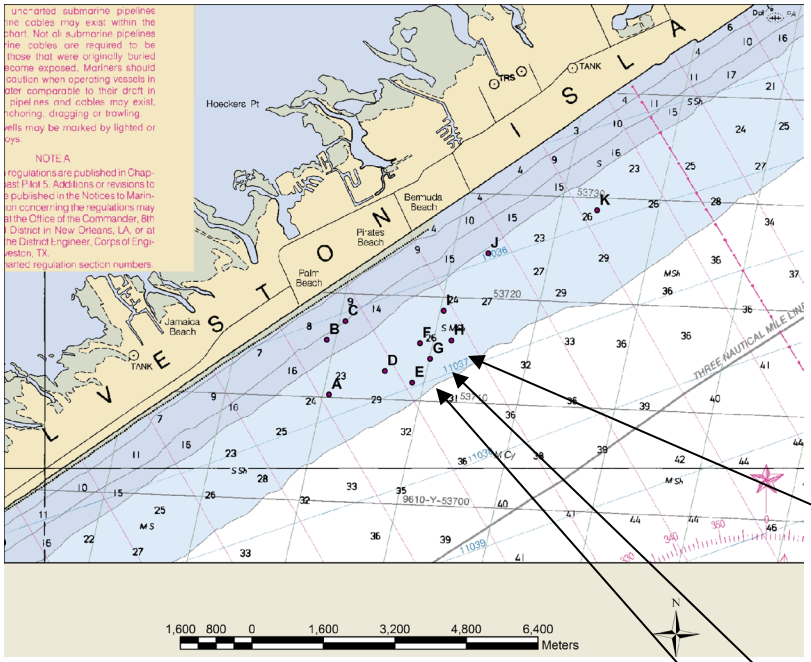
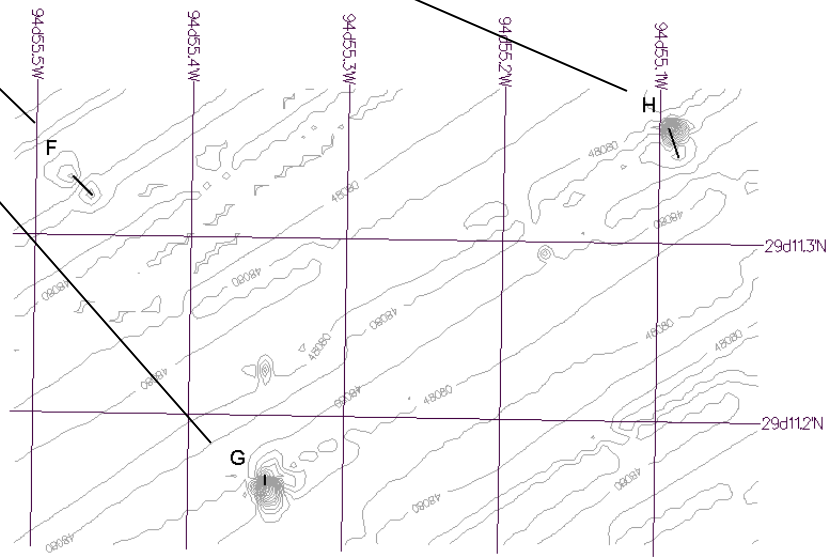
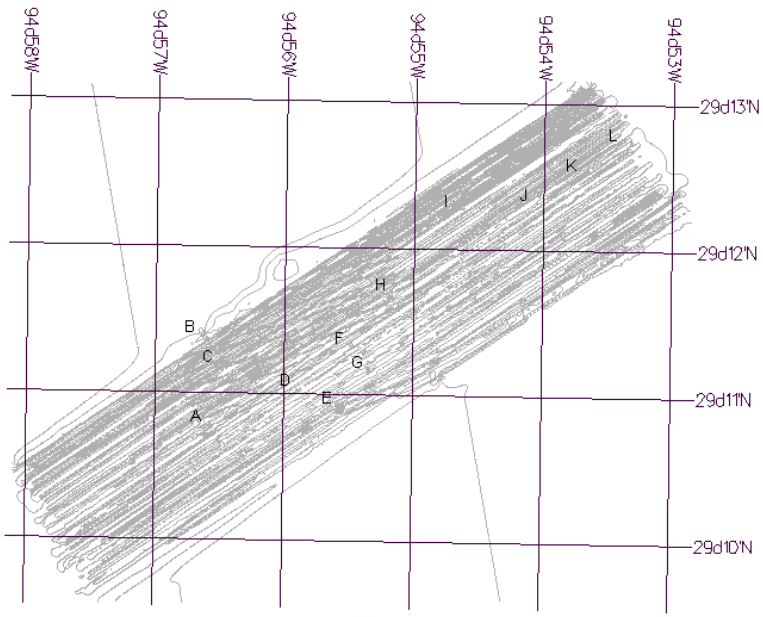
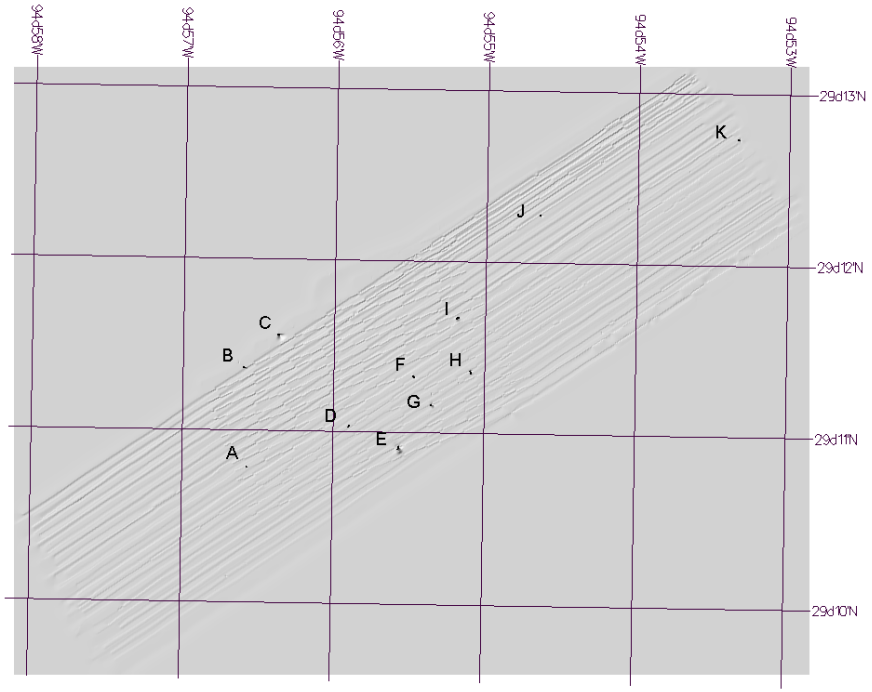
e published in the Notices to Marin-
on concerning the regulations may
at the Office of the Commander, 8th
District in New Orleans, LA, or at
he District Engineer, Corps of Engi-
eston, TX.
varied regulation section numbers.
Hoeckers Pt
TRS
TANK
Bermuda Beach
Pirates Beach
Palm Beach
Jamaica Beach
TANK
A
B
C
D
E
F
G
H
J
K
53730
53720
53710
11097
11039
9610-Y-53700
THREE NAUTICAL MILE LINE
1,600 800 0 1,600 3,200 4,800 6,400
Meters
N

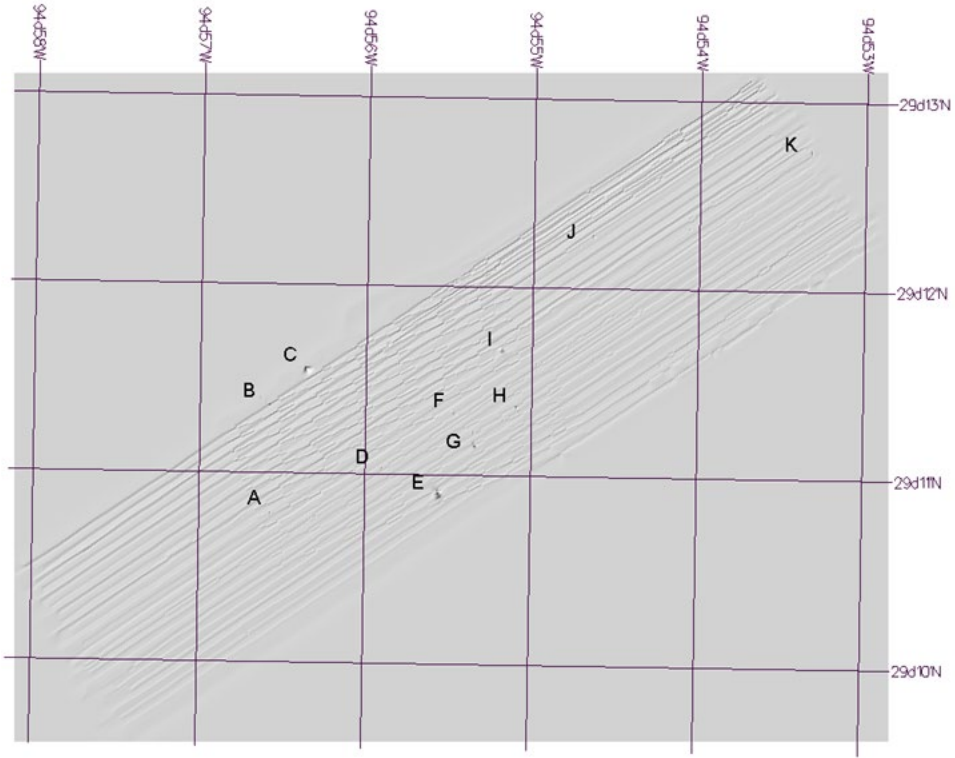

94d55.60'W
94d55.55'W
94d55.50'W
29d10.95'N
29d10.90'N
29d10.85'N
E


uncharted submarine pipelines
line cables may exist within the
chart. Not all submarine pipelines
line cables are required to be
those that were originally buried
become exposed. Mariners should
caution when operating vessels in
ater comparable to their draft in
pipelines and cables may exist.
chioring, dragging or trawling.
ells may be marked by lighted or
oys.
NOTE A
regulations are published in Chap-
ast Pilot 5. Additions or revisions to
e published in the Notices to Marin-
on concerning the regulations may
at the Office of the Commander, 8th
District in New Orleans, LA, or at
he District Engineer, Corps of Engi-
eston, TX.
arried regulation section numbers.
Hoeckers Pt
TRS
TANK
Bermuda Beach
Pirates Beach
Palm Beach
Jamaica Beach
TANK
ISLAND
WEST
LEVEL
THREE NAUTICAL MILE LINE
9610-Y-53700
53720
53730
A
B
C
D
E
F
G
H
J
K
1,600 800 0 1,600 3,200 4,800 6,400
Meters
N


94d55.5'W
94d55.4'W
94d55.3'W
94d55.2'W
94d55.1'W
F
H
G
I
29d11.3'N
29d11.2'N


94d58'W
94d57'W
94d56'W
94d55'W
94d54'W
94d53'W
29d13'N
29d12'N
29d11'N
29d10'N
A
B
C
D
E
F
G
H
I
J
K
L


94d58'W
94d57'W
94d56'W
94d55'W
94d54'W
94d53'W
29d13'N
29d12'N
29d11'N
29d10'N
A
B
C
D
E
F
G
H
I
J
K


94d58'W
94d57'W
94d56'W
94d55'W
94d54'W
94d53'W
29d13'N
29d12'N
29d11'N
29d10'N
A
B
C
D
E
F
G
H
I
J
K

Conclusion

The Offshore Sand Deposits:

- **Sediment layers exist as nearly horizontal layers which are truncated by the shore face profile.**

- **Correlation of these units across CHIRP lines and between cores allow for estimations of total sand thickness and quality beyond core depths in specific locations**

- **Gross interval of sand thin offshore**

- **Sand gets progressively finer with depth both within stratigraphic units and between stratigraphic units**

- **Within stratigraphic units, sand gets progressively finer with distance offshore**

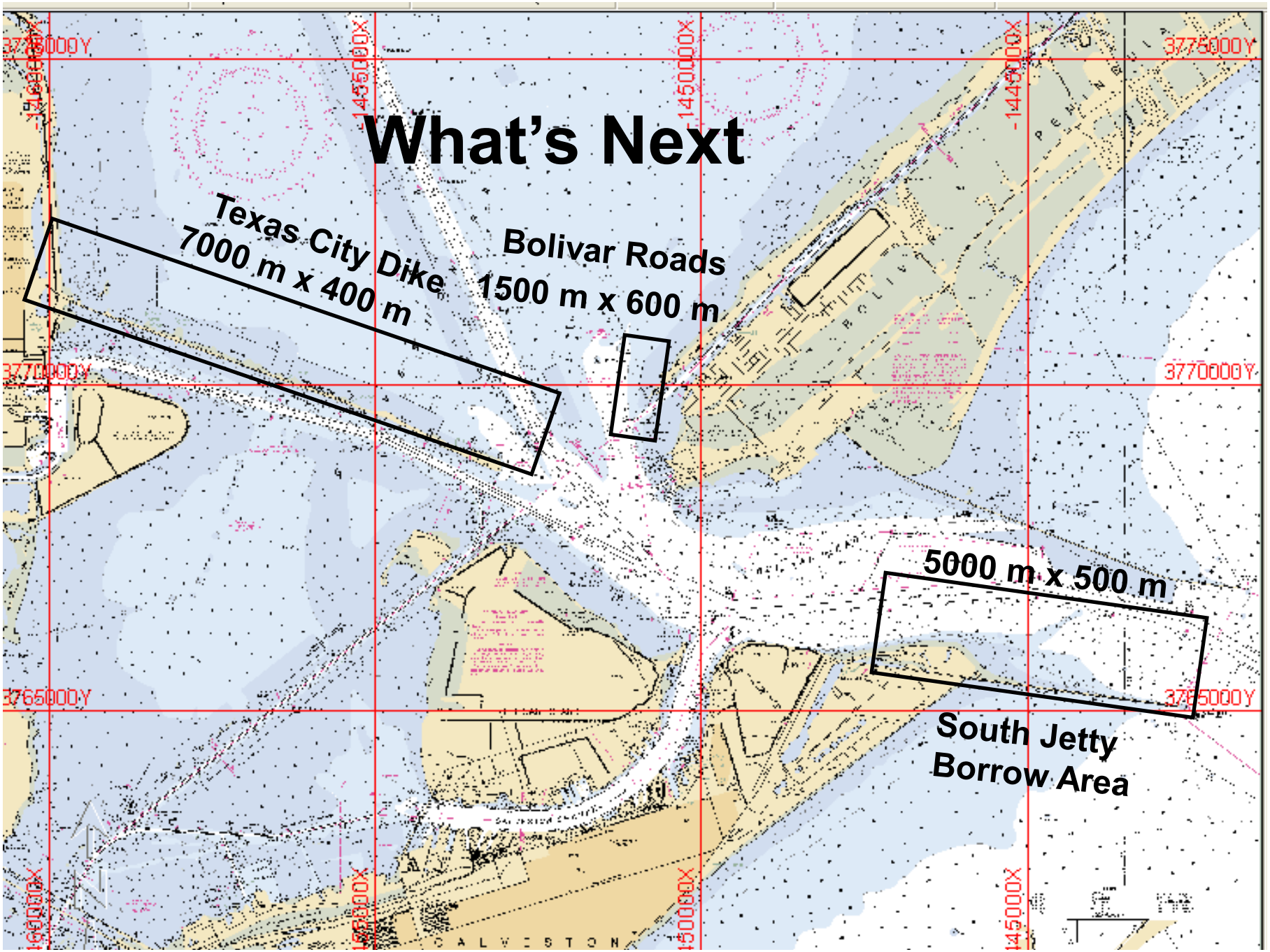
Conclusion-continued

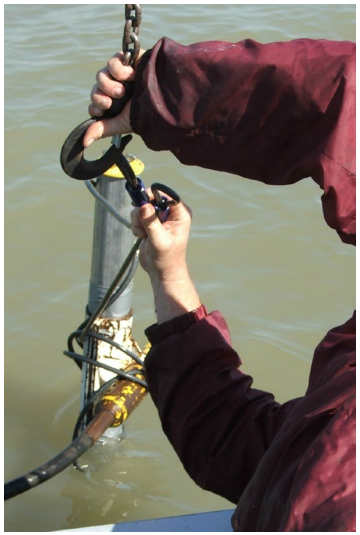
The Offshore Sand Deposits:

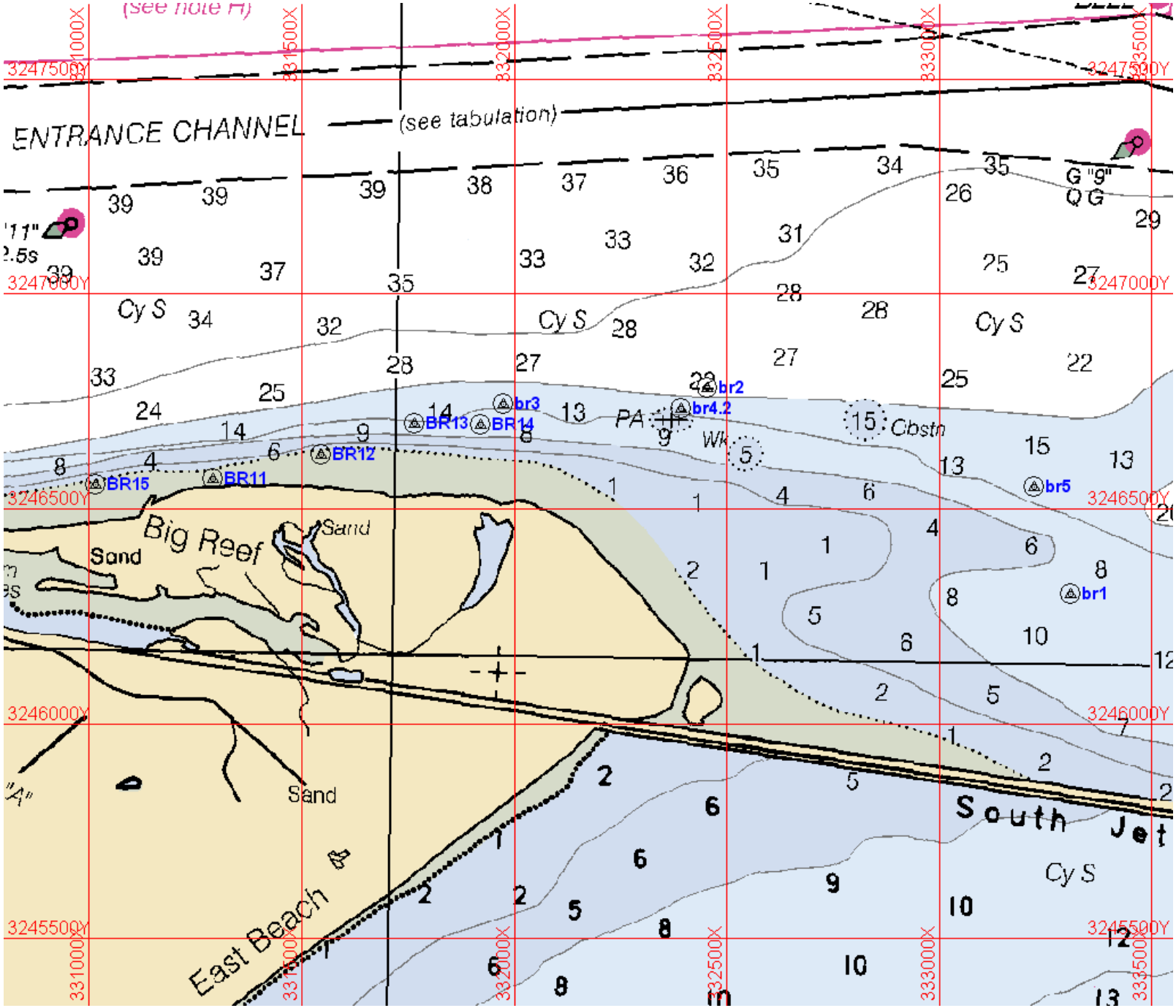
•Over 1.3 million cubic meters of sand/km

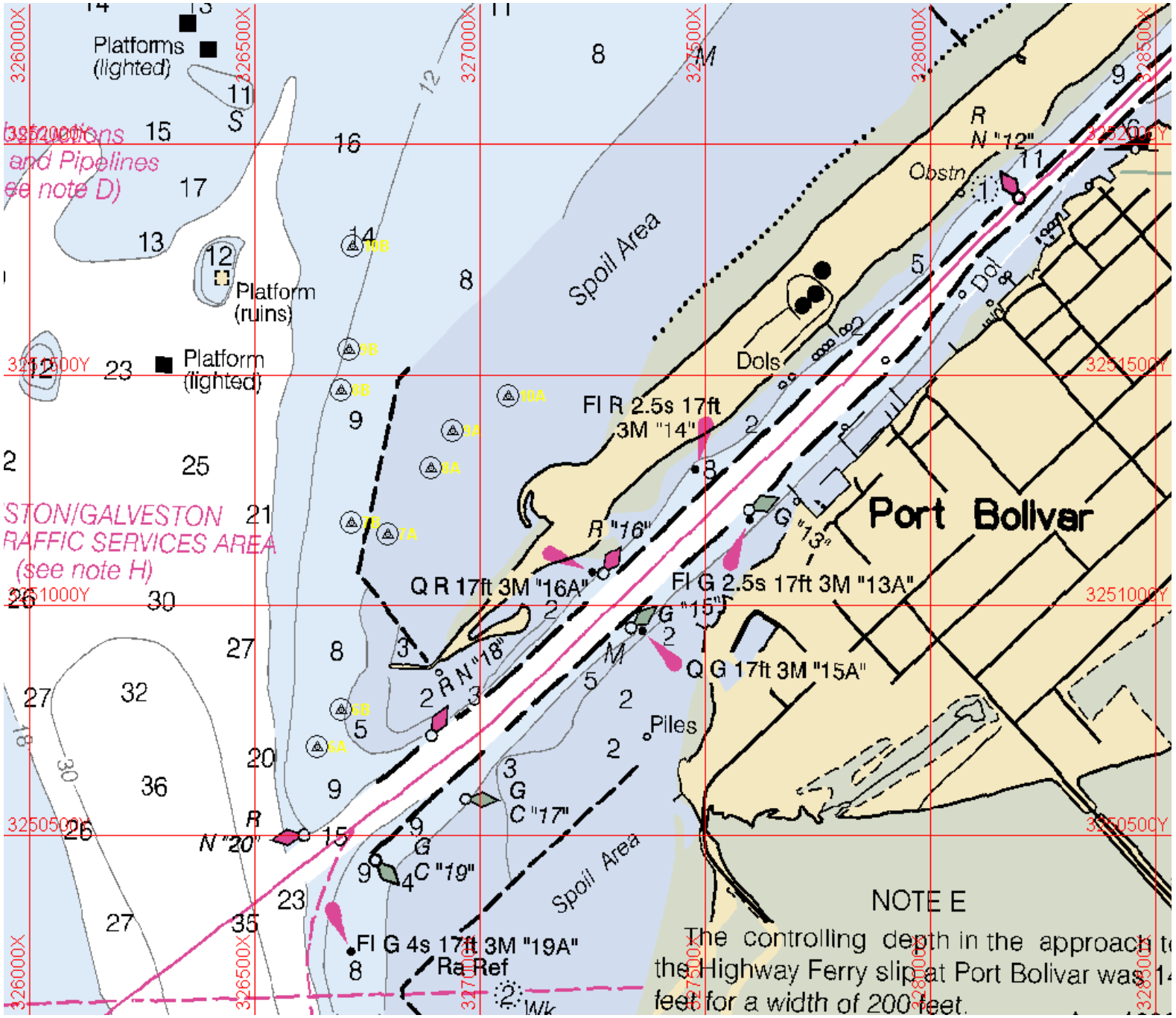
•However, it is 25-50% finer than what is on the beach

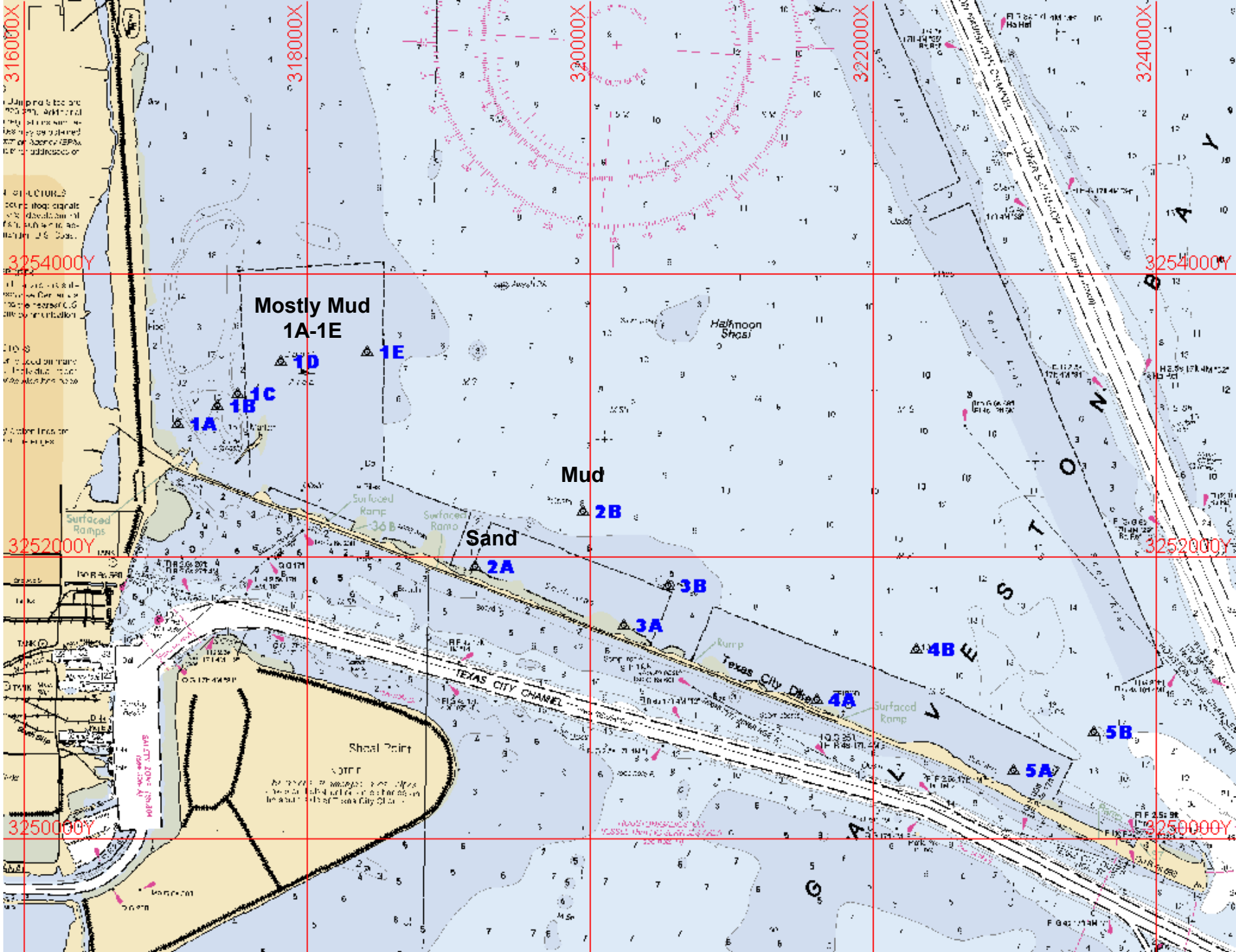
•Stratigraphic correlations from this study and core results from Anderson's work Suggest that sediment gets progressively finer and muddier with depth until the Beaumont Clay is reached throughout the inner shelf off of Galveston Island


What's Next
Texas City Dike
7000 m x 400 m
Bolivar Roads
1500 m x 600 m
5000 m x 500 m
South Jetty
Borrow Area




(see note H)
ENTRANCE CHANNEL
(see tabulation)
"11"
2.5s
G "9"
Q G
Cy S
Cy S
Cy S
PA
Wk
15 Cbstn
br1
br2
br3
br4.2
br5
BR11
BR12
BR13
BR14
BR15
Big Reef
Sand
Sand
Sand
East Beach
South Jet
Cy S
"A"
3247500Y
3247000Y
3246500Y
3246000Y
3245500Y
331000X
331500X
332000X
332500X
333000X
333500X


Platforms (lighted)
Platform (ruins)
Platform (lighted)
and Pipelines
see note D)
STON/GALVESTON
RAFFIC SERVICES AREA
(see note H)
Spoil Area
Spoil Area
Dols
Dol
Obstn
Fl R 2.5s 17ft 3M "14"
R "16"
Q R 17ft 3M "16A"
R N "18"
Fl G 2.5s 17ft 3M "13A"
G "13"
G "15"
Q G 17ft 3M "15A"
Piles
G C "17"
R N "20"
G C "19"
Fl G 4s 17ft 3M "19A"
Ra Ref
Port Bolivar
R N "12"
NOTE E
The controlling depth in the approach t
the Highway Ferry slip at Port Bolivar was 1
feet for a width of 200 feet.


Mostly Mud
1A-1E
1D
1E
1C
1B
1A
Mud
2B
Sand
2A
3B
3A
4B
4A
5B
5A
Halfmoon Shoal
Shoal Point
TEXAS CITY CHANNEL
Texas City Dike
Surfaced Ramps
Surfaced Ramp
Ramp
GALVESTON BAY
316000X
318000X
320000X
322000X
324000X
3254000Y
3252000Y
3250000Y