Atchafalaya Basin Floodway System

MR&T Project Flood Flow Line Study

Background

- From 1861 to 1927, the design flood for the lower Mississippi River progressively increased and, in general was based on the maximum flood of record.
- The flood of 1927 so far surpassed these prior floods that it necessitated a review of the flood control plans and a reconsideration of all levee grades.
- In 1927 the MRC adopted a design peak flood discharge at Cairo of 2,250,000 cfs. This flow was about 25 percent greater than that of the 1927 flood.
- Other studies were made between 1927 and 1950 which resulted in revisions to the original project flood flows.

Background

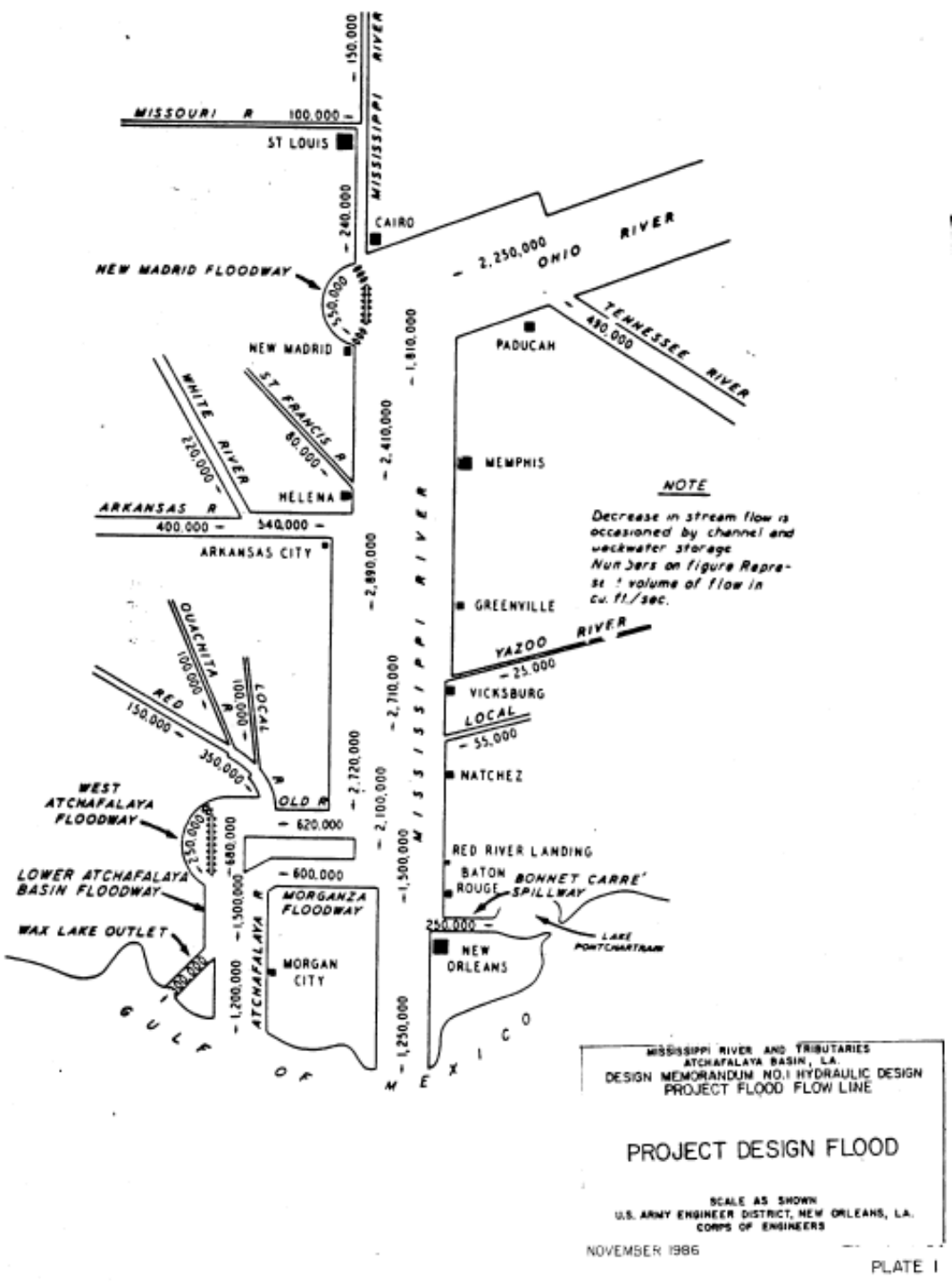
1955 Study

"During the project flood review made in the 1950's, some 35 different hypothetical combinations of historical storms were sequentially arranged to conform with frontal movements and synoptic situations consistent with those in nature to determine the meteorologically feasible pattern that would produce the greatest runoff in the lower Mississippi River."

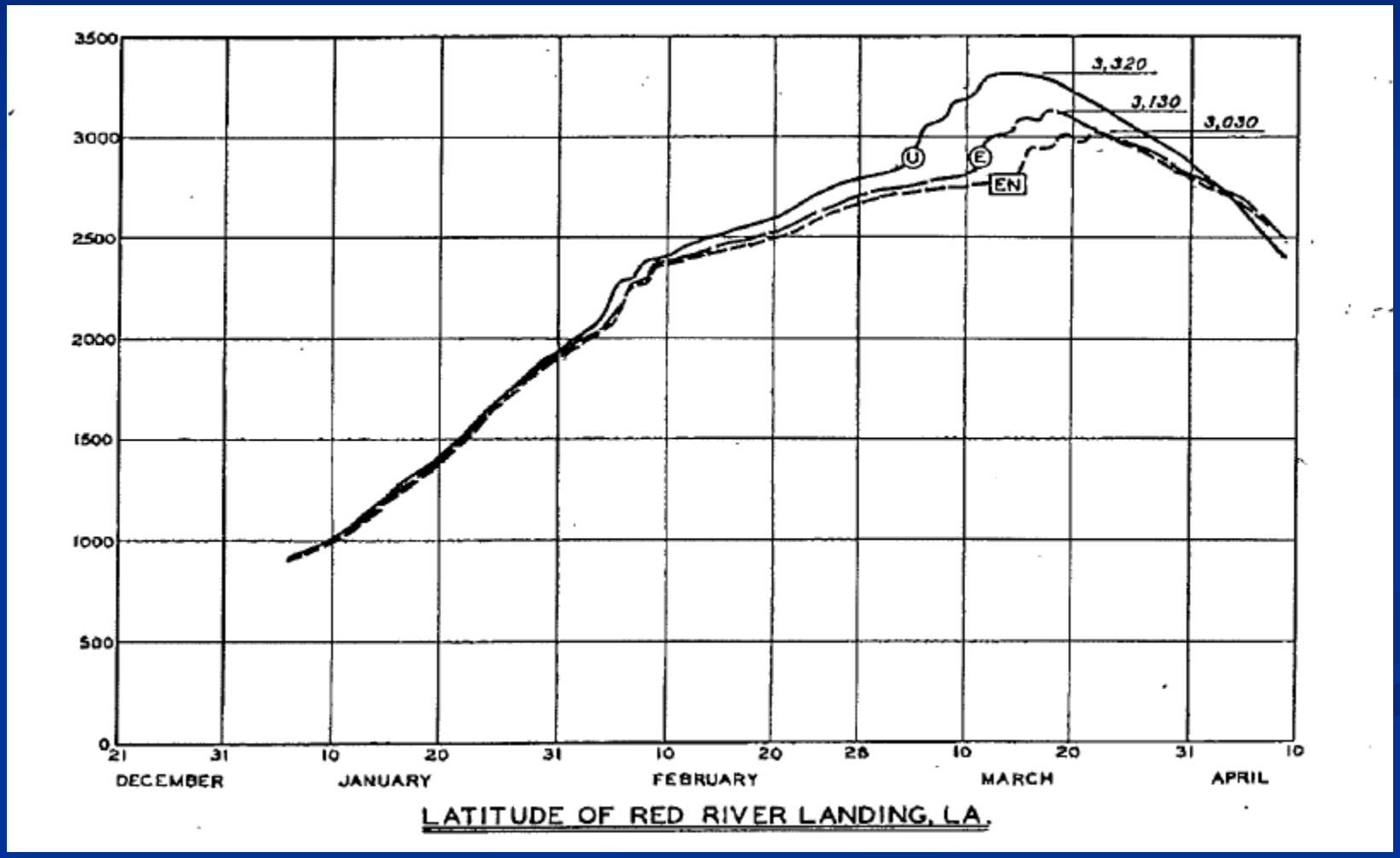
Source: Report on Refined 1973 MR&T Project Flood Flowline, April 1978

Mississippi River and Tributaries (MR&T) Project Design Flood.

Hypo-Flood 58A with "EN" reservoirs, or those existing reservoirs plus those to be constructed by 1970, was selected as the basis for the project flood flows and is referred to as the 58A-EN Project Design Flood.

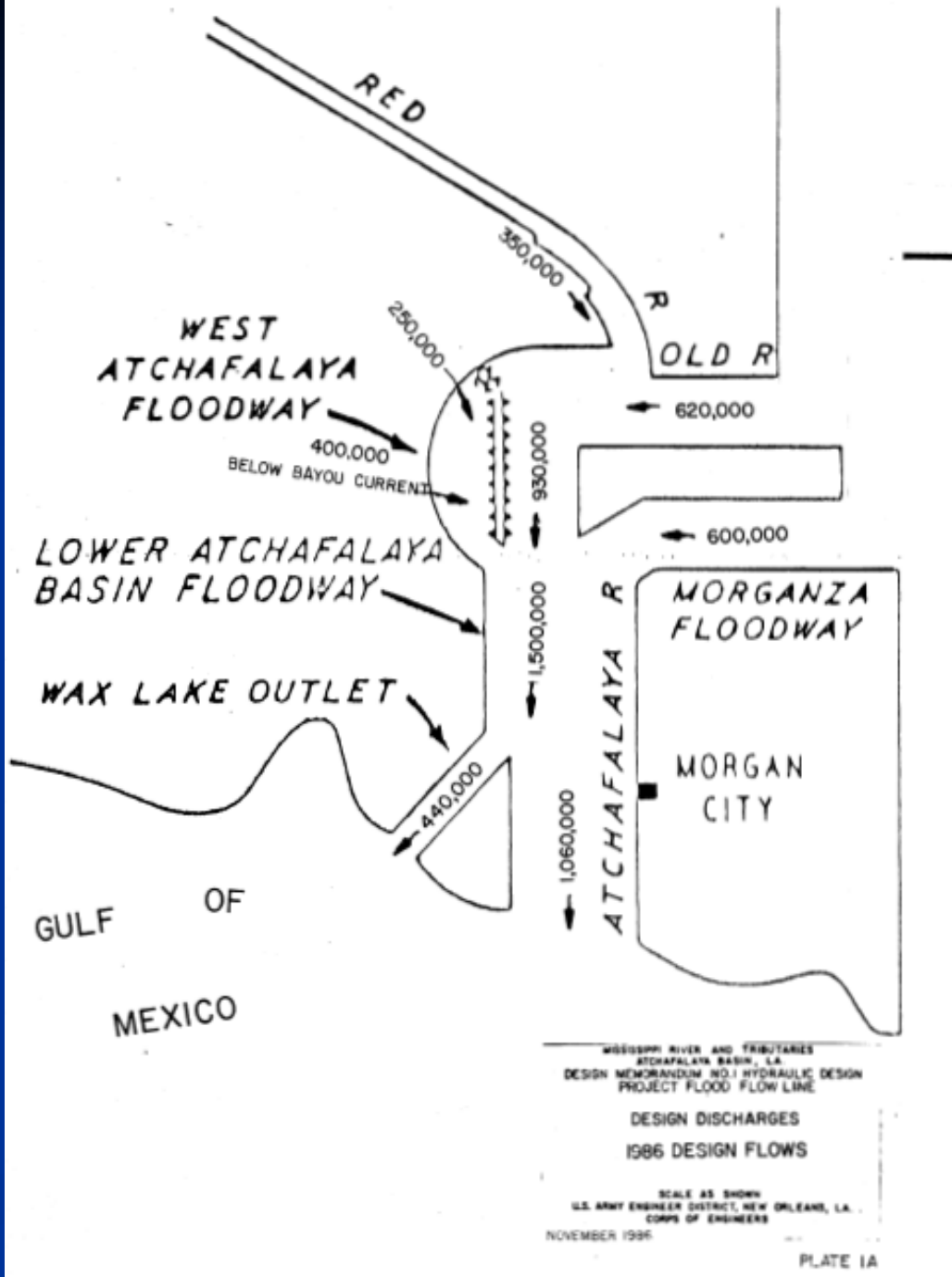


Hypo-flood 58A



Atchafalaya Basin Floodway System

"The principal role of the Atchafalaya Basin Floodway system in the MR&T flood control project is to safely convey one-half of the project design flood of 3,000,000 cfs, or 1,500,000 cfs, to the Gulf of Mexico."

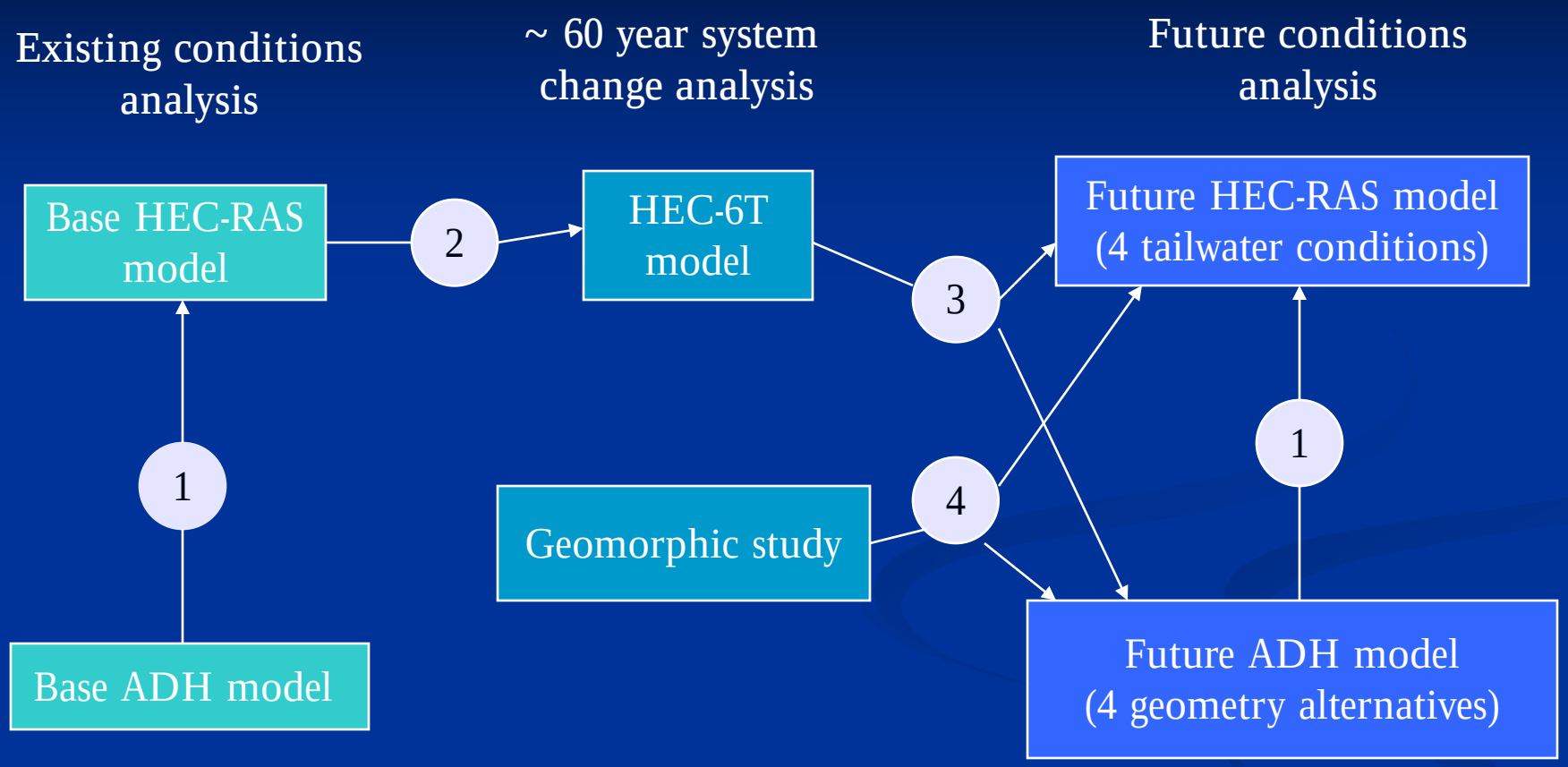


Source: Atchafalaya Basin, LA., Project Flood Flow Line, January 1987

Flow Line Study approach

- ADH for coastal areas and to analyze the Lower Atchafalaya River and Wax Lake Outlet flow split
- HEC-RAS from GIWW to Red River and Black River confluence at Acme, LA
- HEC-6T from Gulf of Mexico to Red River and Black River confluence at Acme, LA
- Geomorphic study of subsidence and sedimentation not covered by numerical models

Flow Line Study process



1. ADH model provides tailwater conditions to HEC-RAS model
2. HEC-RAS model provides cross section geometry to HEC-6T model
3. HEC-6T model provides future channel data to HEC-RAS and ADH models
4. Geomorphic study provides future sedimentation and subsidence information for overbank areas for both HEC-RAS and ADH models

HEC-RAS model layout

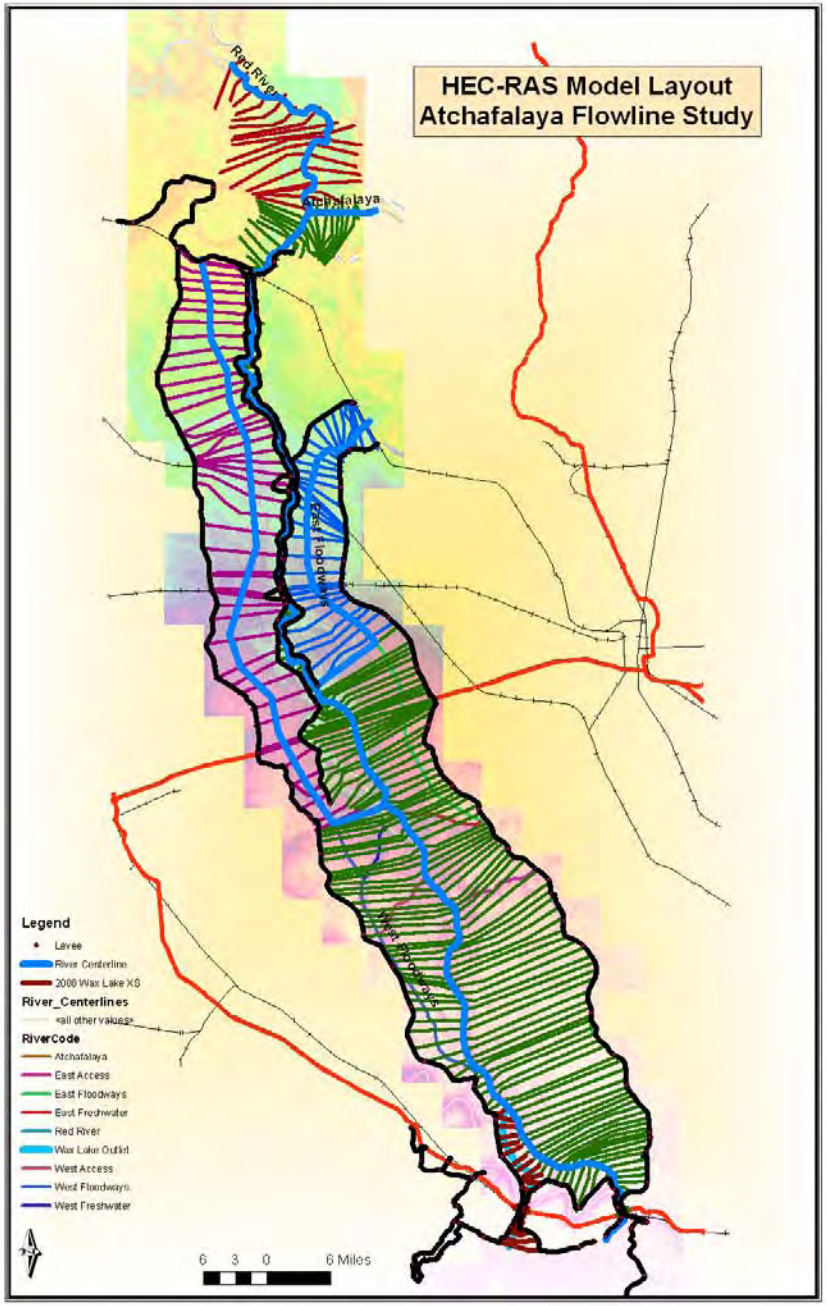


Figure from Scott Goodfellow, MVP

HEC-RAS model layout

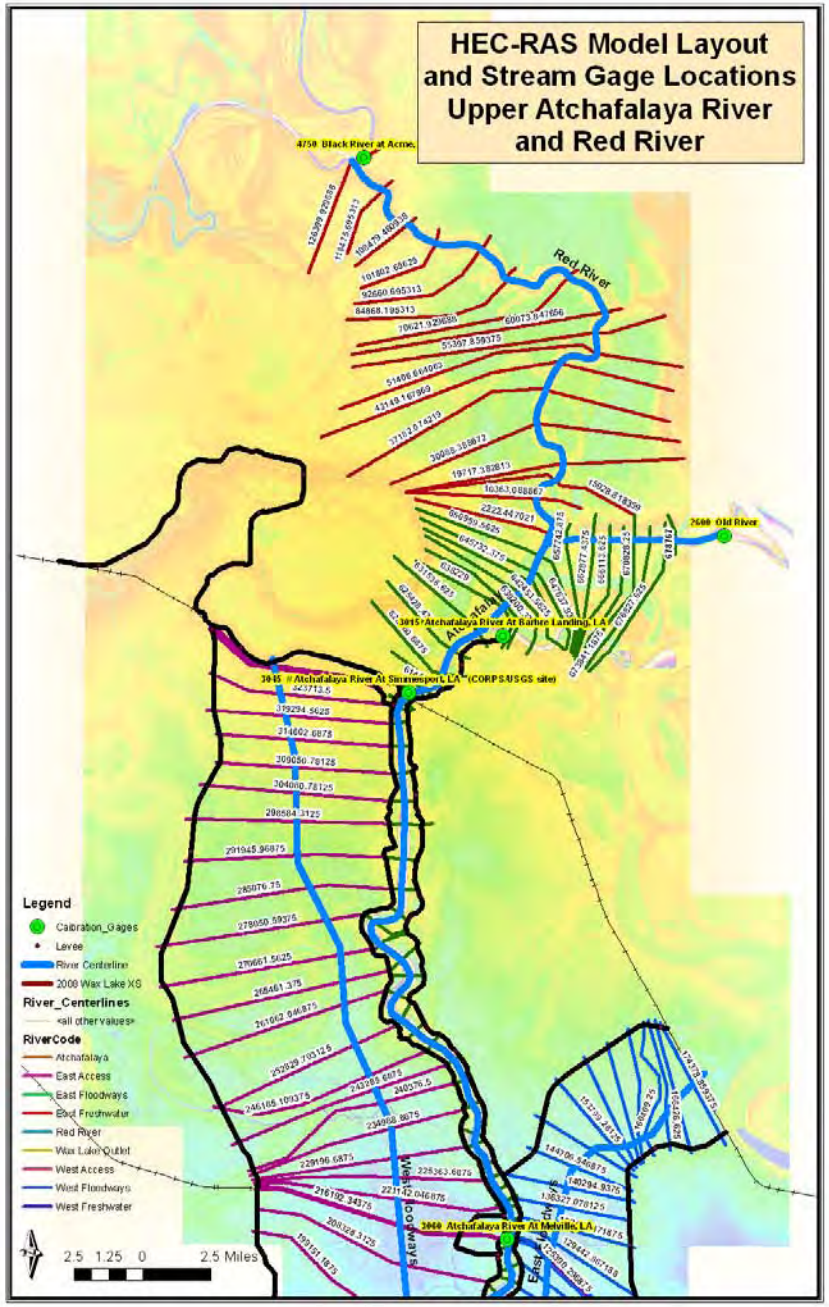


Figure from Scott Goodfellow, MVP

HEC-RAS model layout

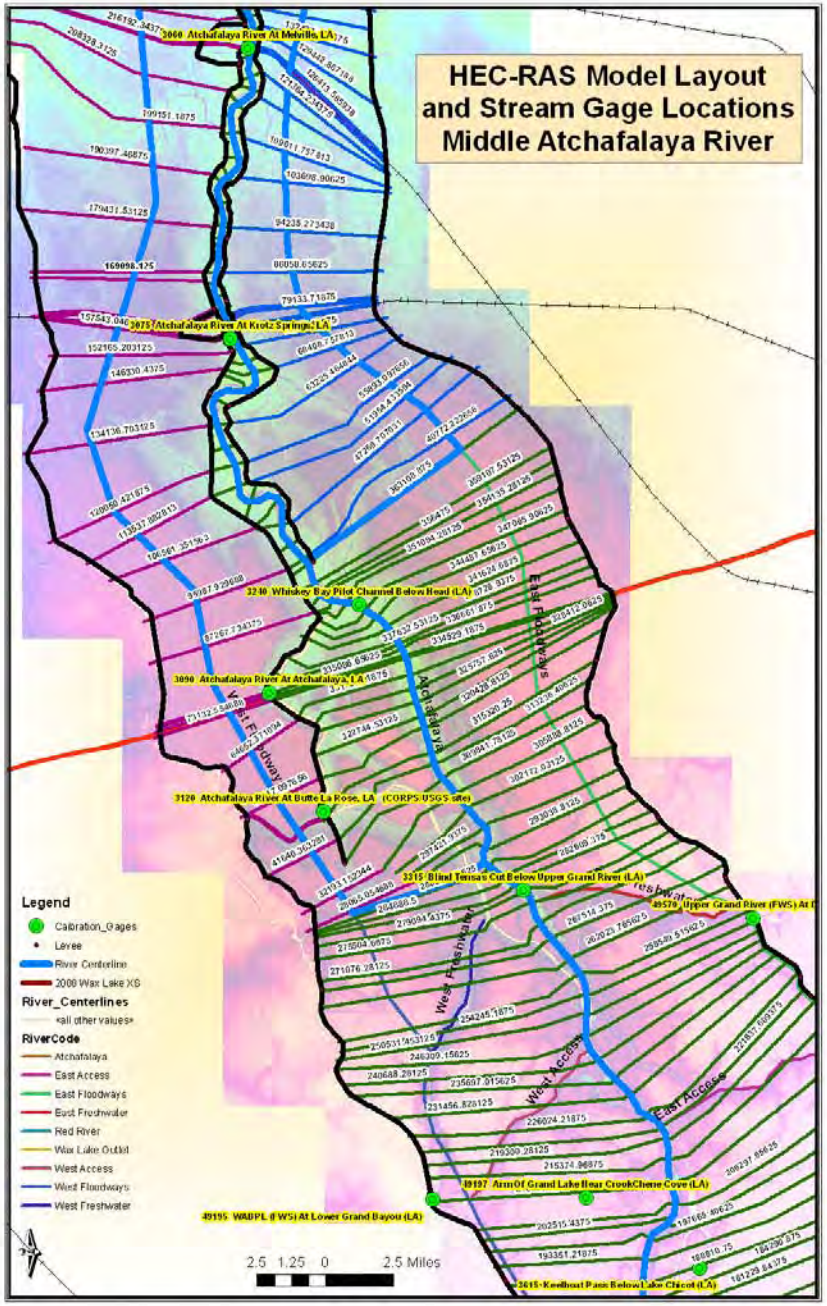


Figure from Scott Goodfellow, MVP

HEC-RAS model layout

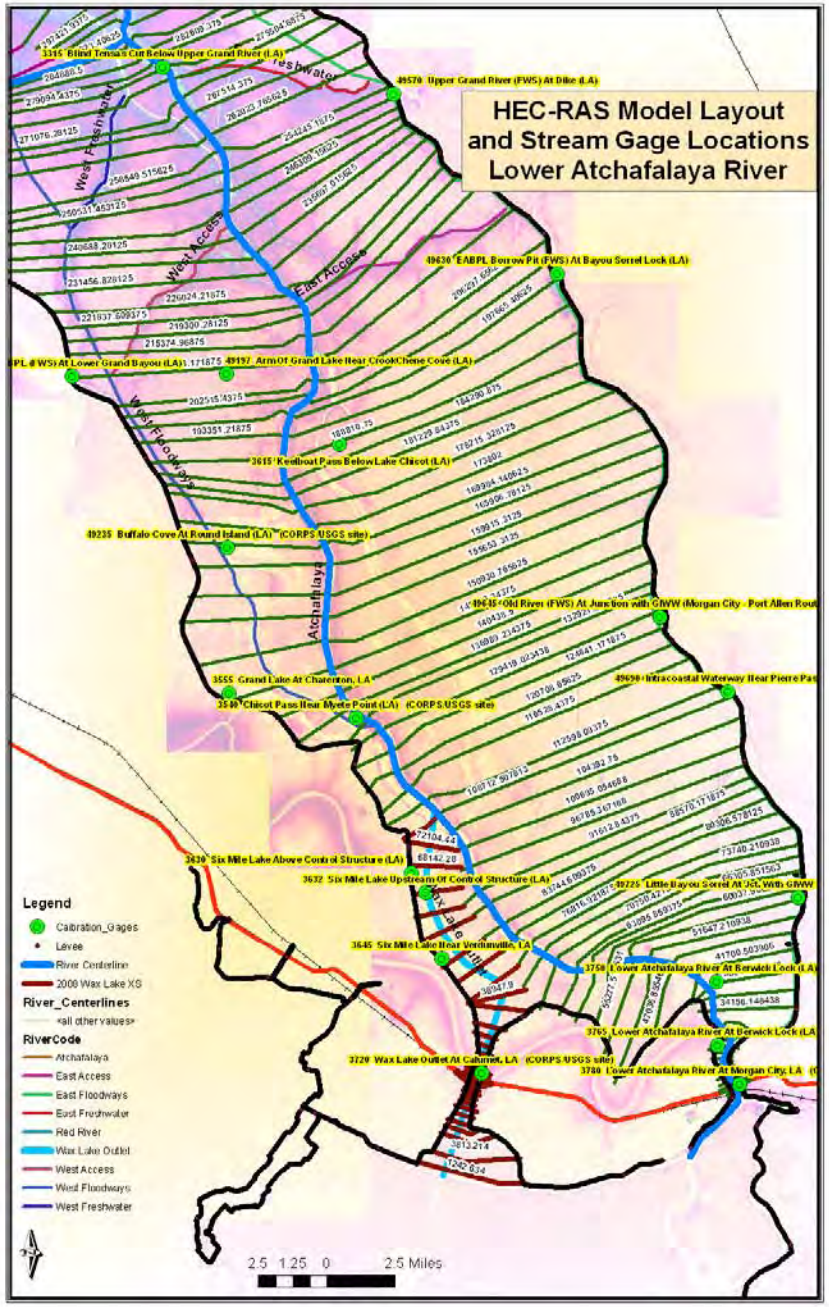


Figure from Scott Goodfellow, MVP

HEC-6T cross section layout

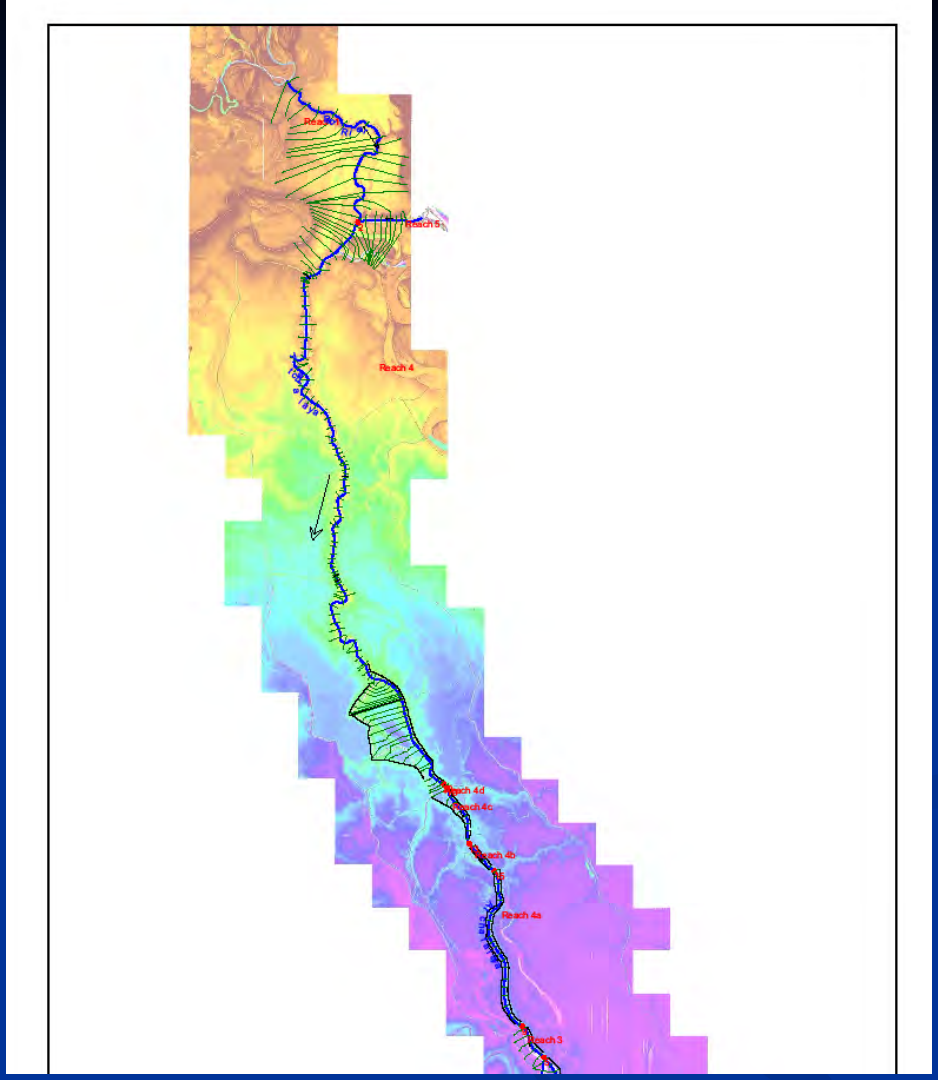


Figure from Tom Kirkeeng, MVR

HEC-6T segment schematic

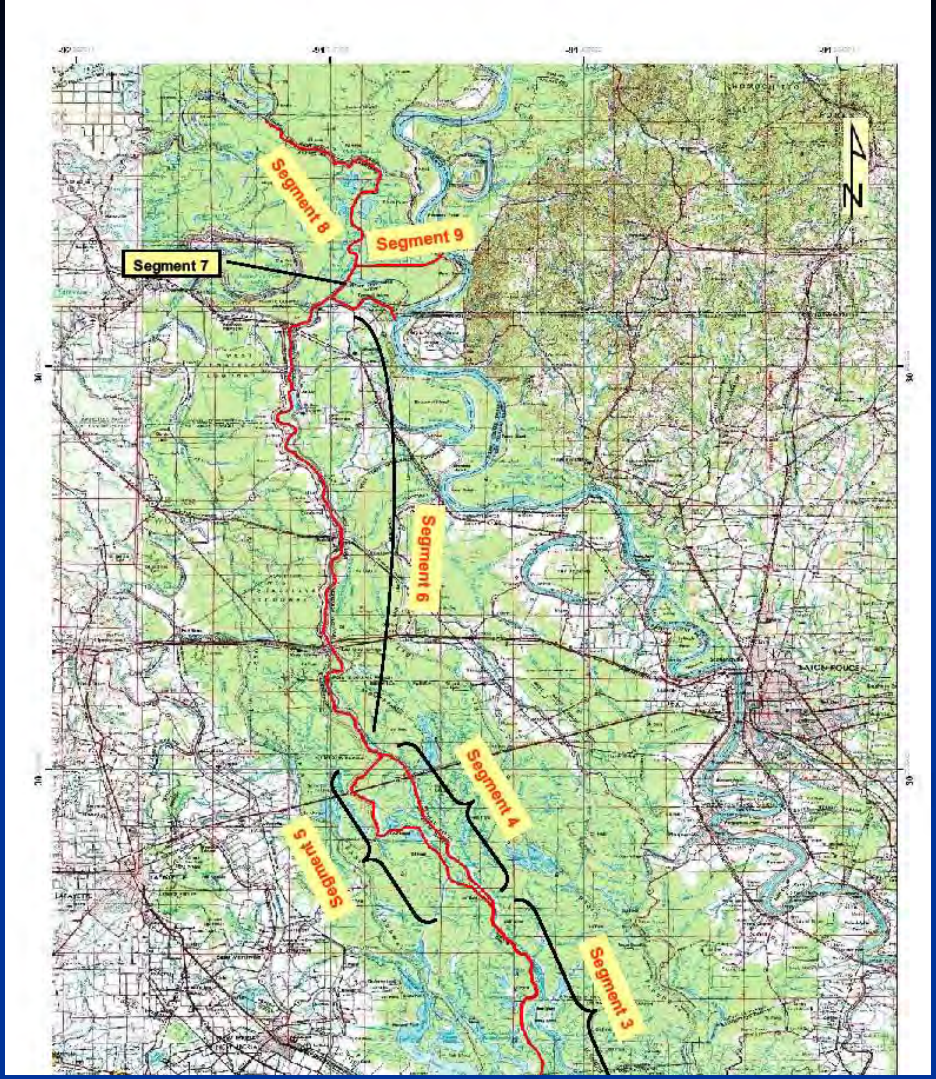
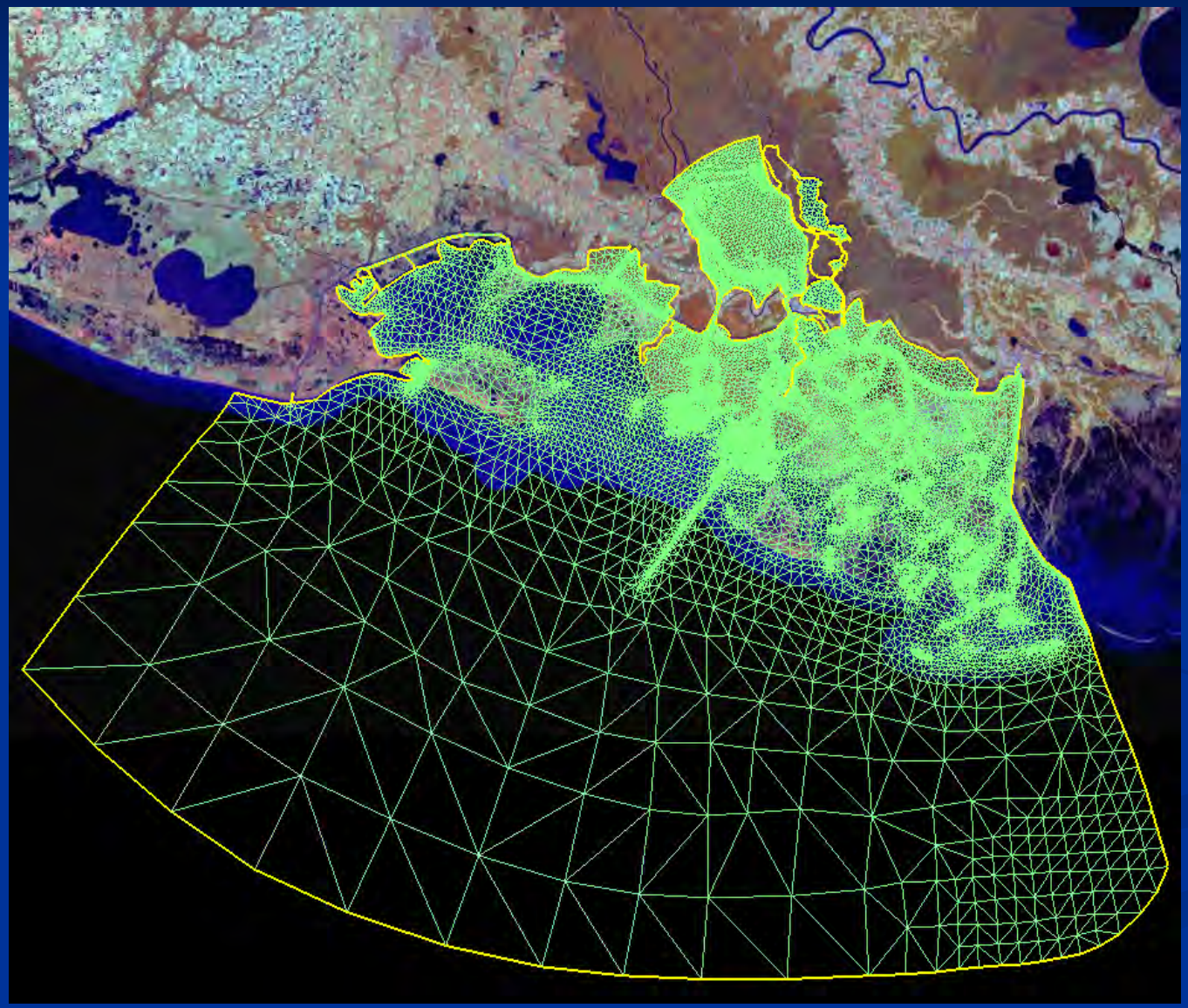
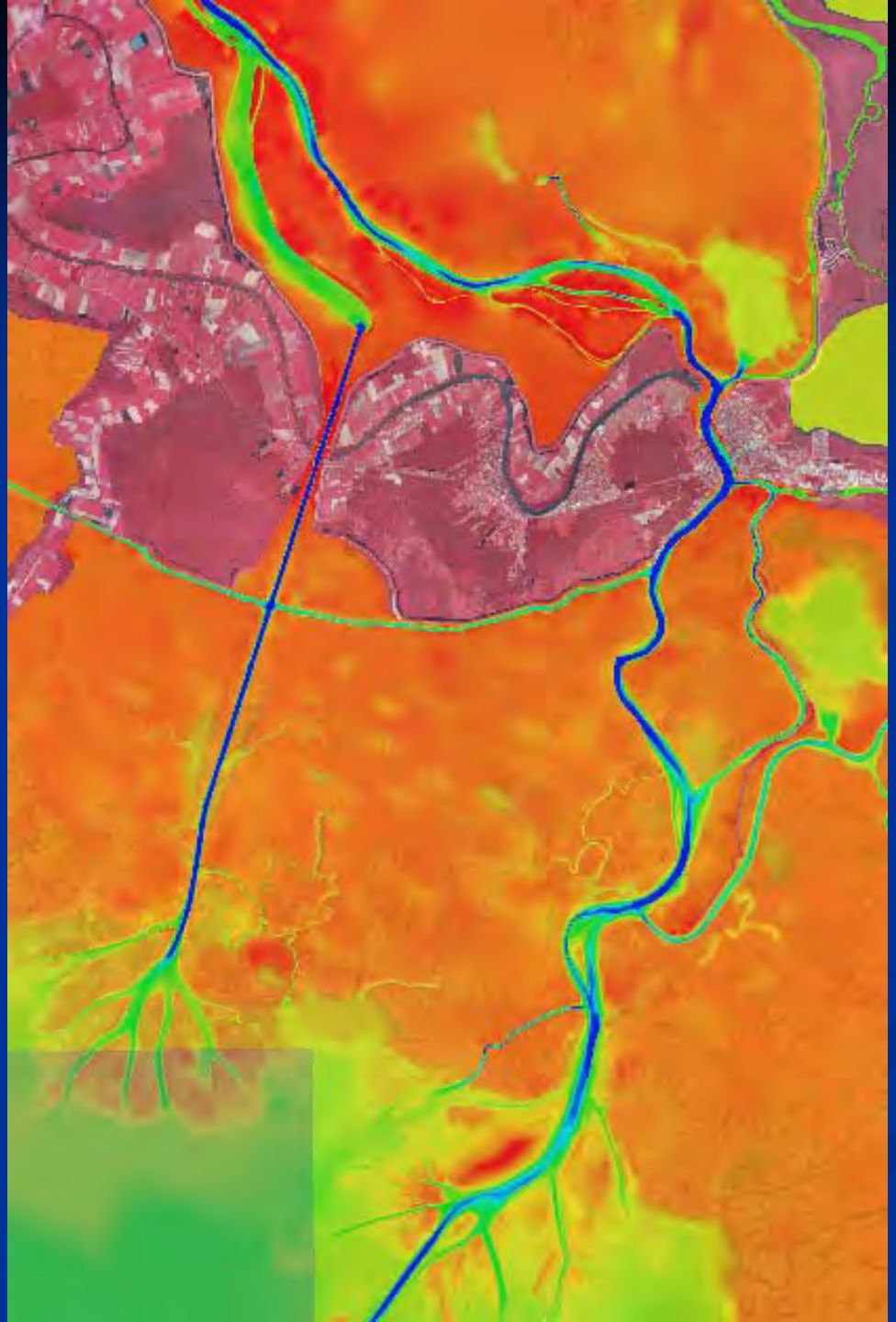


Figure from Tom Kirkeeng, MVR

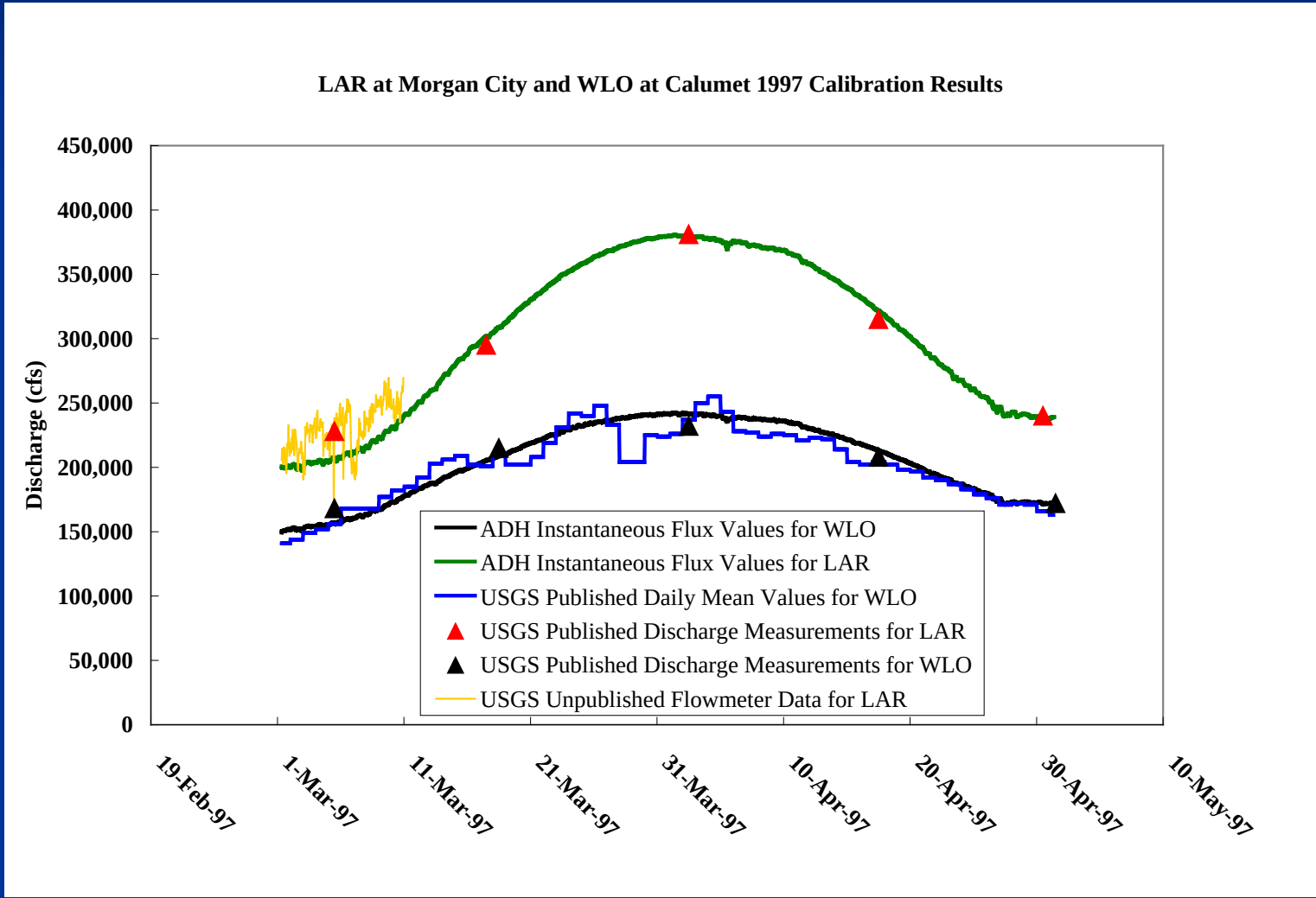
ADH model mesh

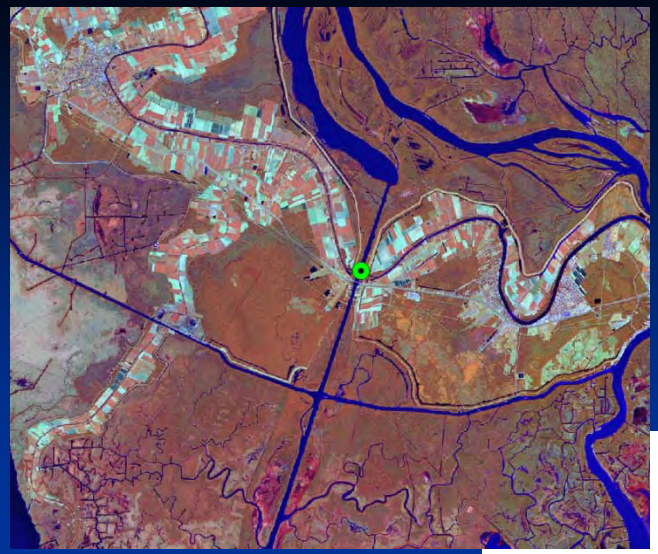


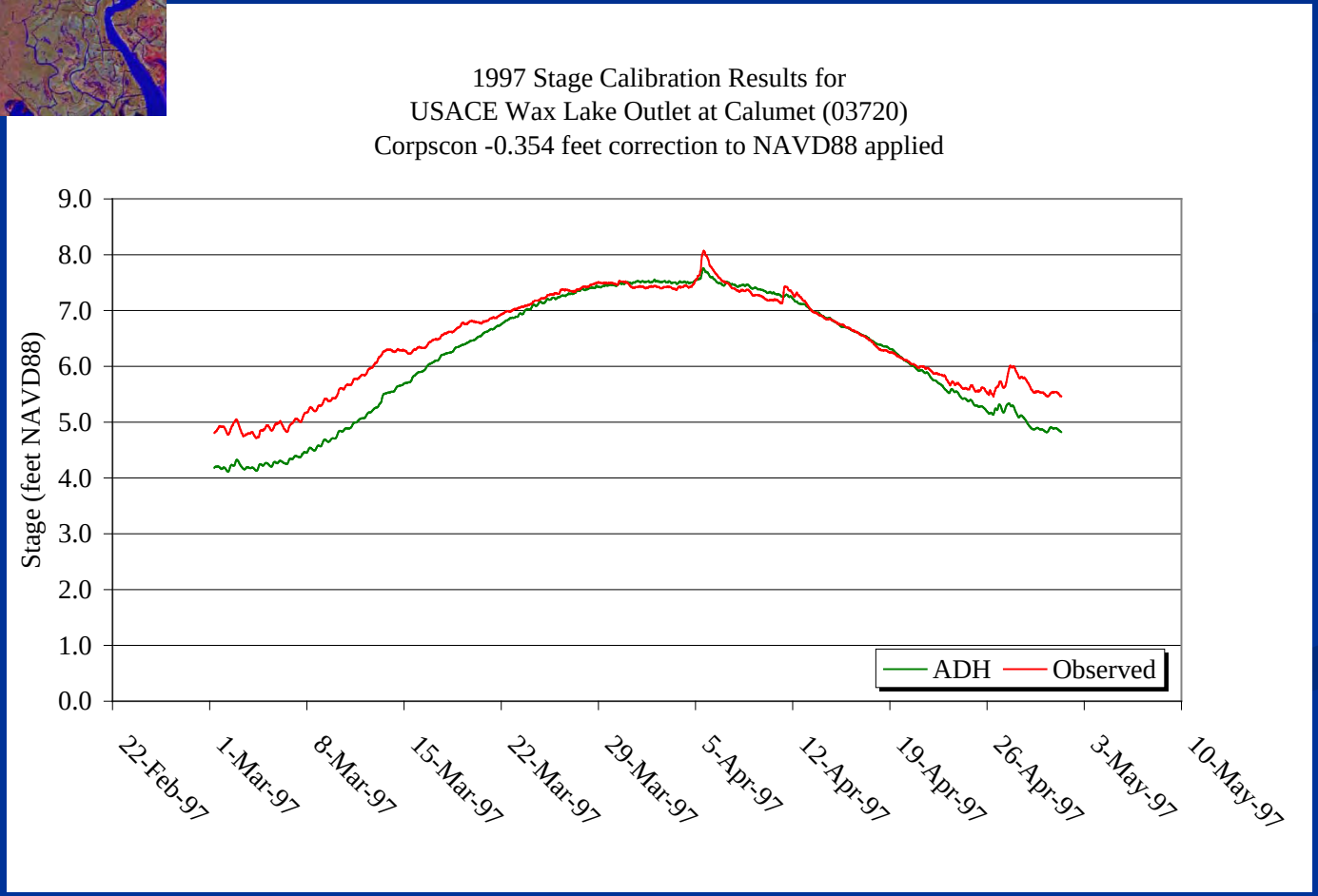
Latest mesh has 66,559 nodes and 127,325 elements.

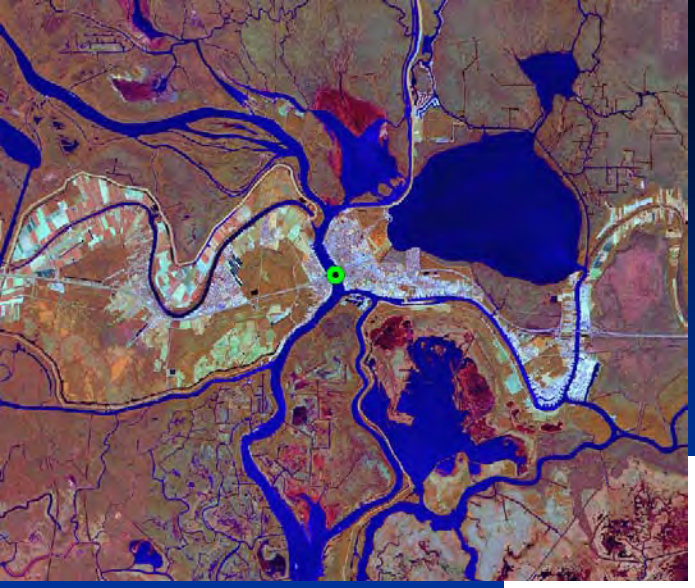


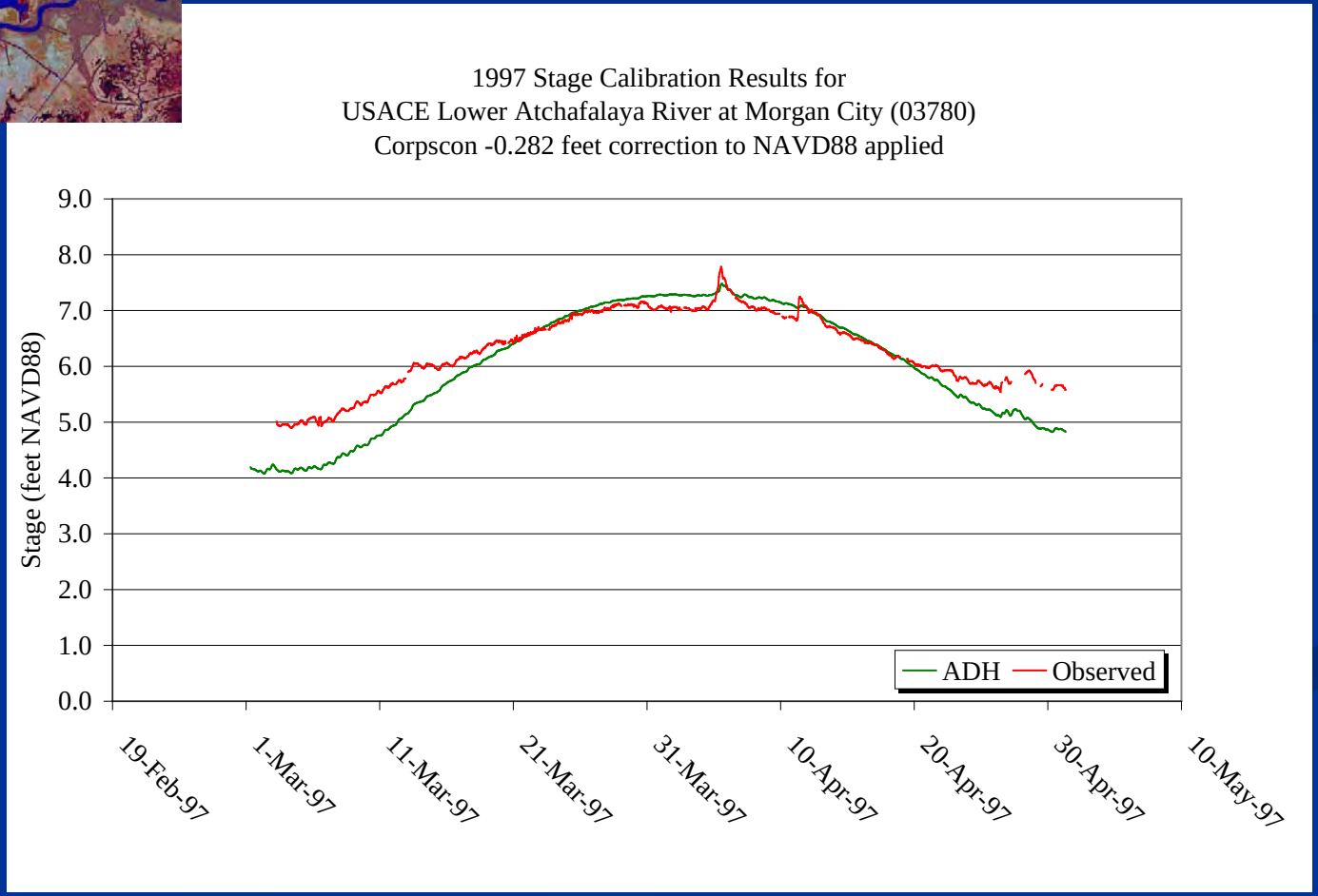
Model discharge verification

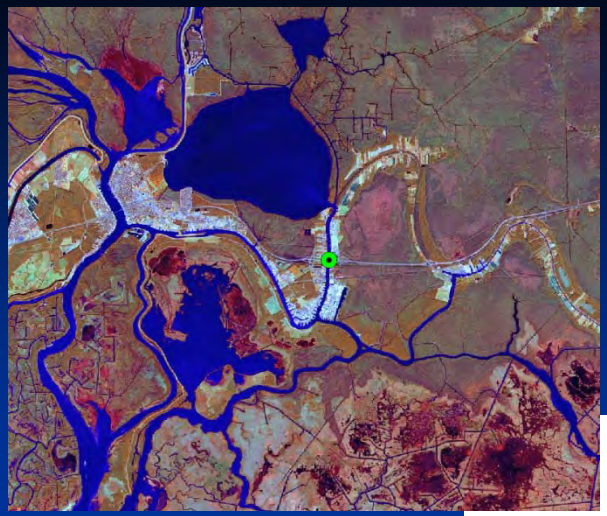


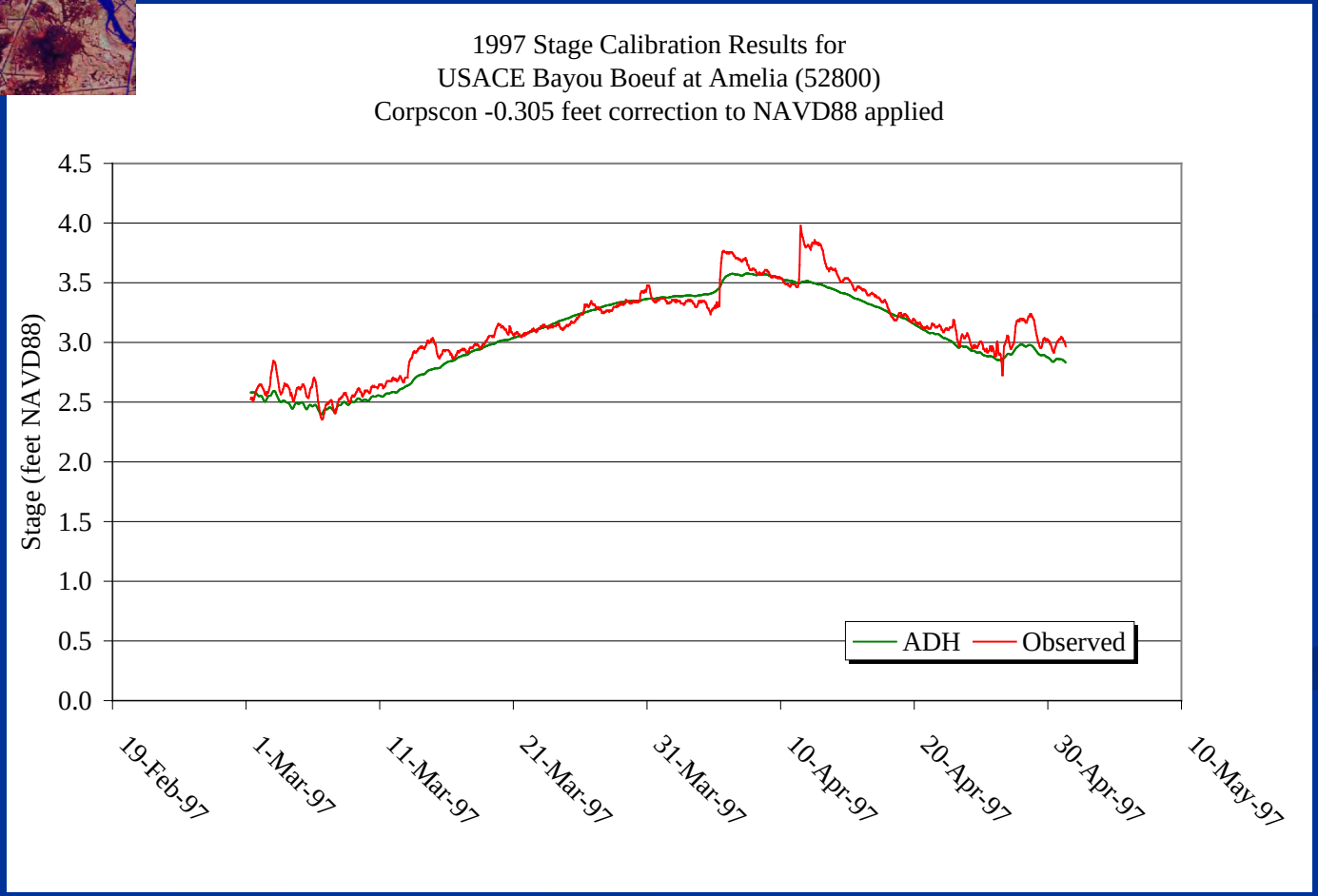


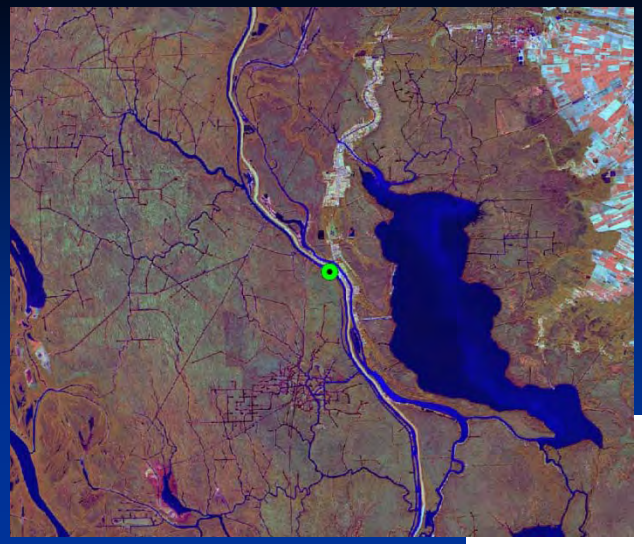

1997 Stage Calibration Results for
USACE Wax Lake Outlet at Calumet (03720)
Corpscon -0.354 feet correction to NAVD88 applied
Stage (feet NAVD88)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
ADH
Observed
22-Feb-97
1-Mar-97
8-Mar-97
15-Mar-97
22-Mar-97
29-Mar-97
5-Apr-97
12-Apr-97
19-Apr-97
26-Apr-97
3-May-97
10-May-97

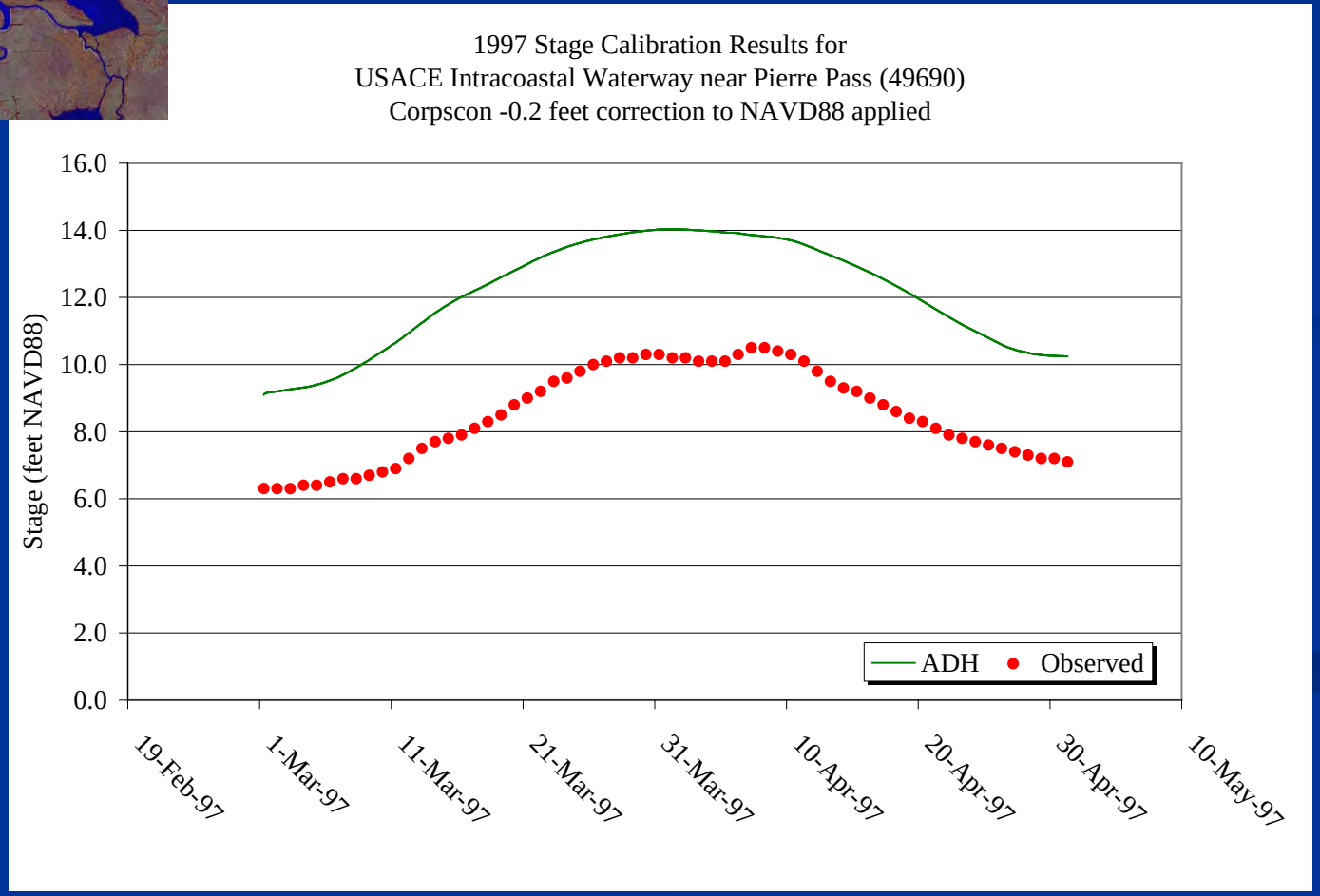


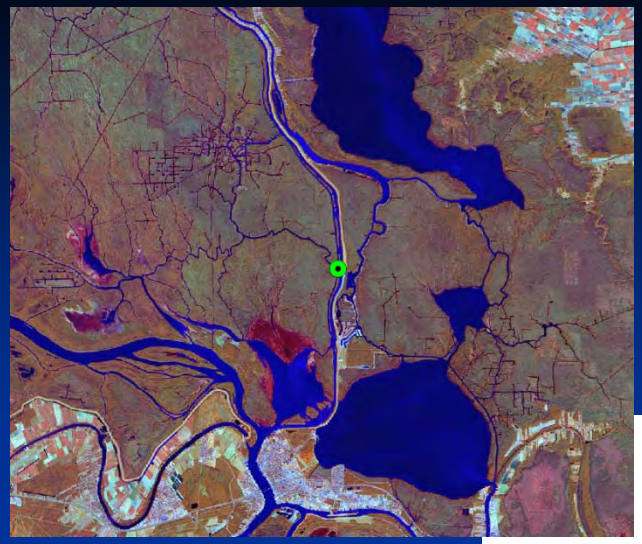

1997 Stage Calibration Results for
USACE Lower Atchafalaya River at Morgan City (03780)
Corpscon -0.282 feet correction to NAVD88 applied
Stage (feet NAVD88)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
19-Feb-97
1-Mar-97
11-Mar-97
21-Mar-97
31-Mar-97
10-Apr-97
20-Apr-97
30-Apr-97
10-May-97
ADH
Observed

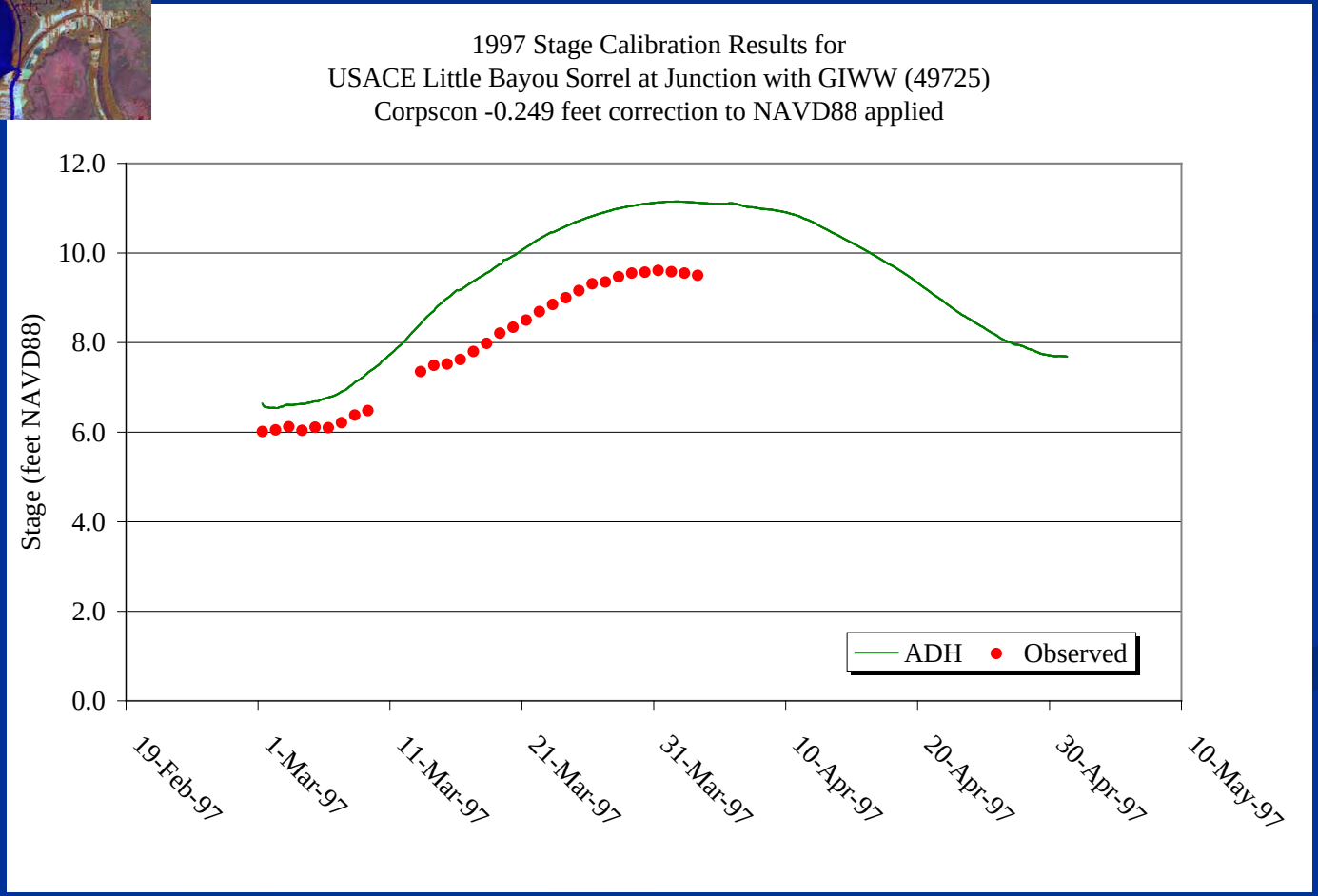



1997 Stage Calibration Results for
USACE Bayou Boeuf at Amelia (52800)
Corpscon -0.305 feet correction to NAVD88 applied
Stage (feet NAVD88)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
19-Feb-97
1-Mar-97
11-Mar-97
21-Mar-97
31-Mar-97
10-Apr-97
20-Apr-97
30-Apr-97
10-May-97
ADH
Observed

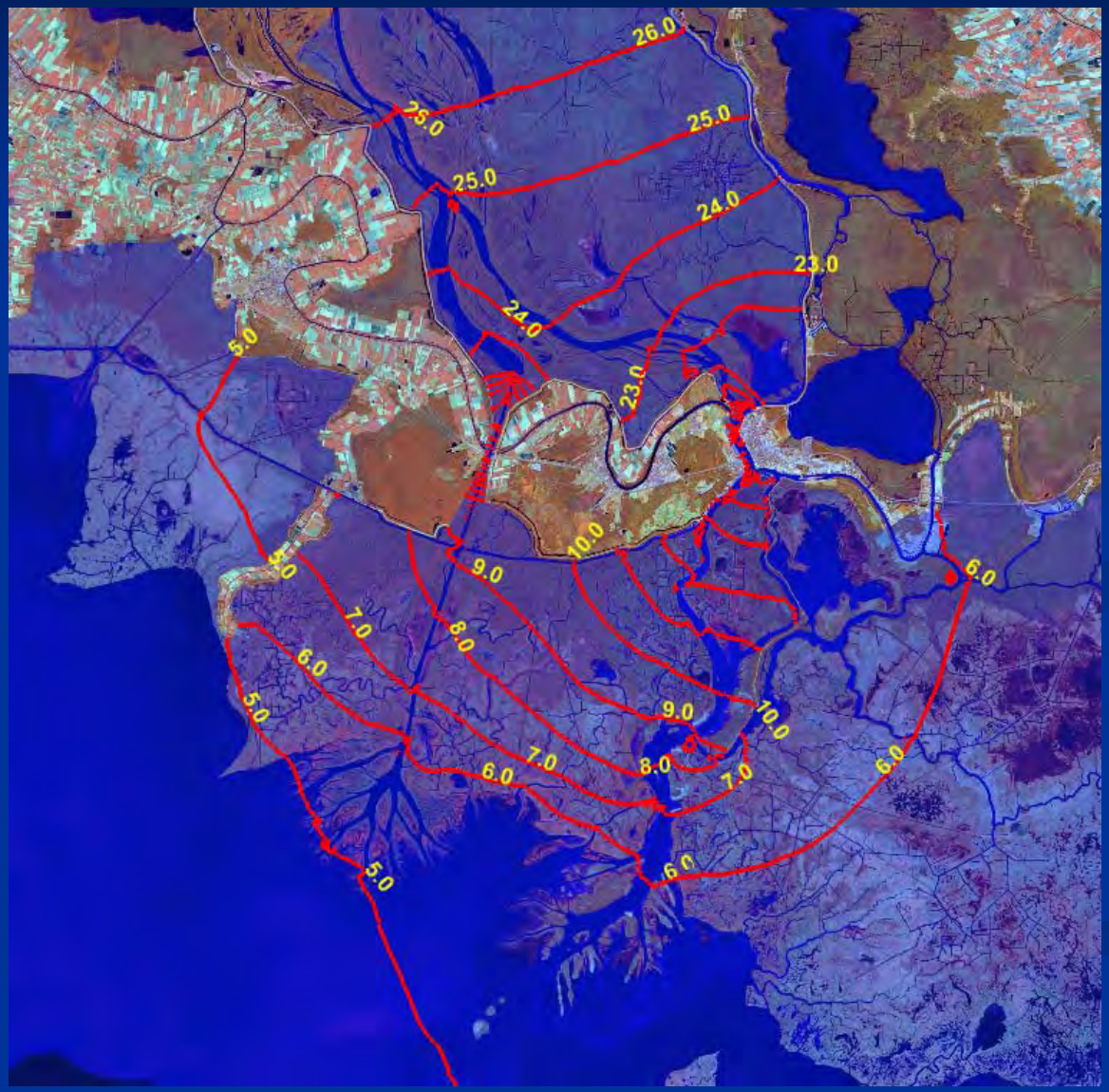



1997 Stage Calibration Results for
USACE Intracoastal Waterway near Pierre Pass (49690)
Corpscon -0.2 feet correction to NAVD88 applied
Stage (feet NAVD88)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
19-Feb-97
1-Mar-97
11-Mar-97
21-Mar-97
31-Mar-97
10-Apr-97
20-Apr-97
30-Apr-97
10-May-97
ADH
Observed

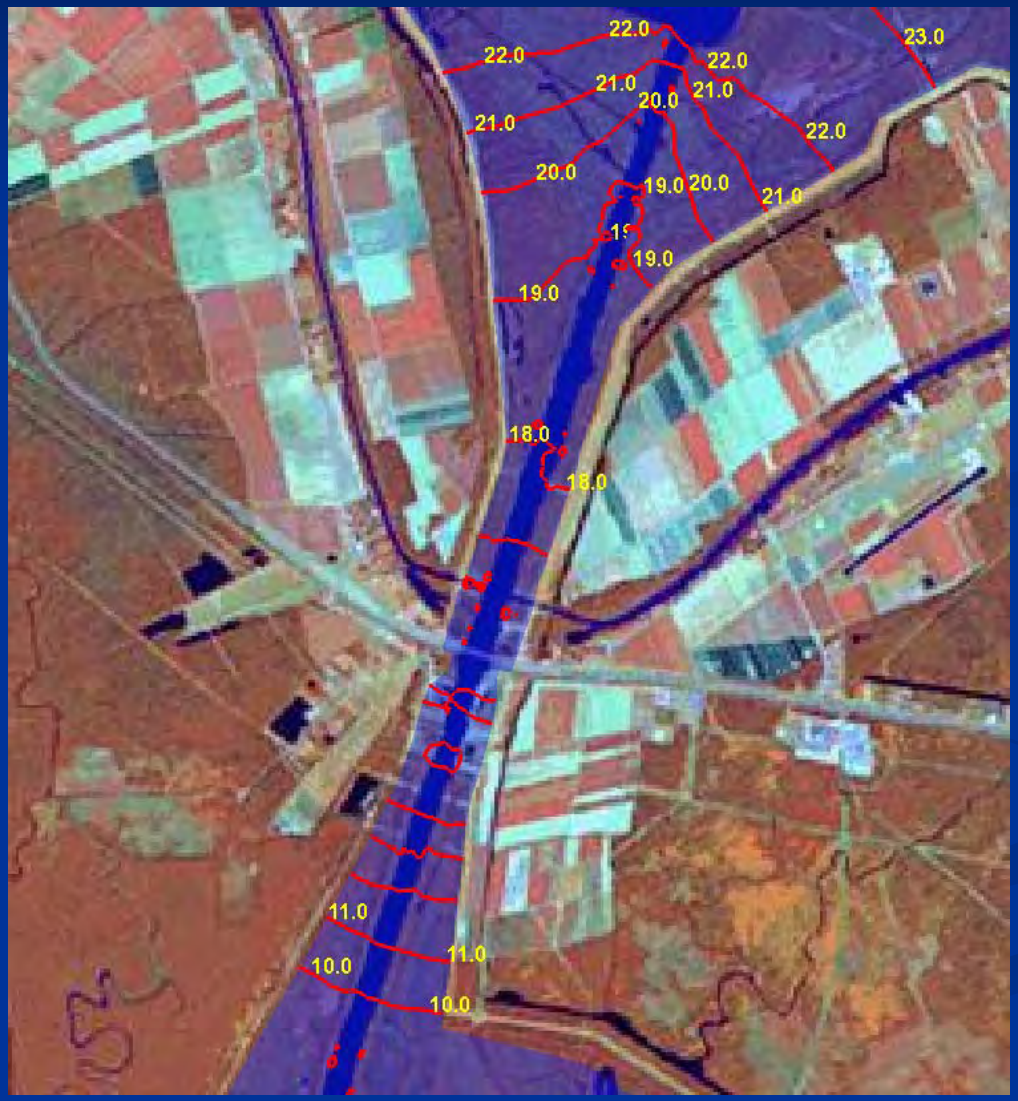



1997 Stage Calibration Results for
USACE Little Bayou Sorrel at Junction with GIWW (49725)
Corpscon -0.249 feet correction to NAVD88 applied
Stage (feet NAVD88)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
19-Feb-97
1-Mar-97
11-Mar-97
21-Mar-97
31-Mar-97
10-Apr-97
20-Apr-97
30-Apr-97
10-May-97
ADH
Observed

Existing conditions PDF contours

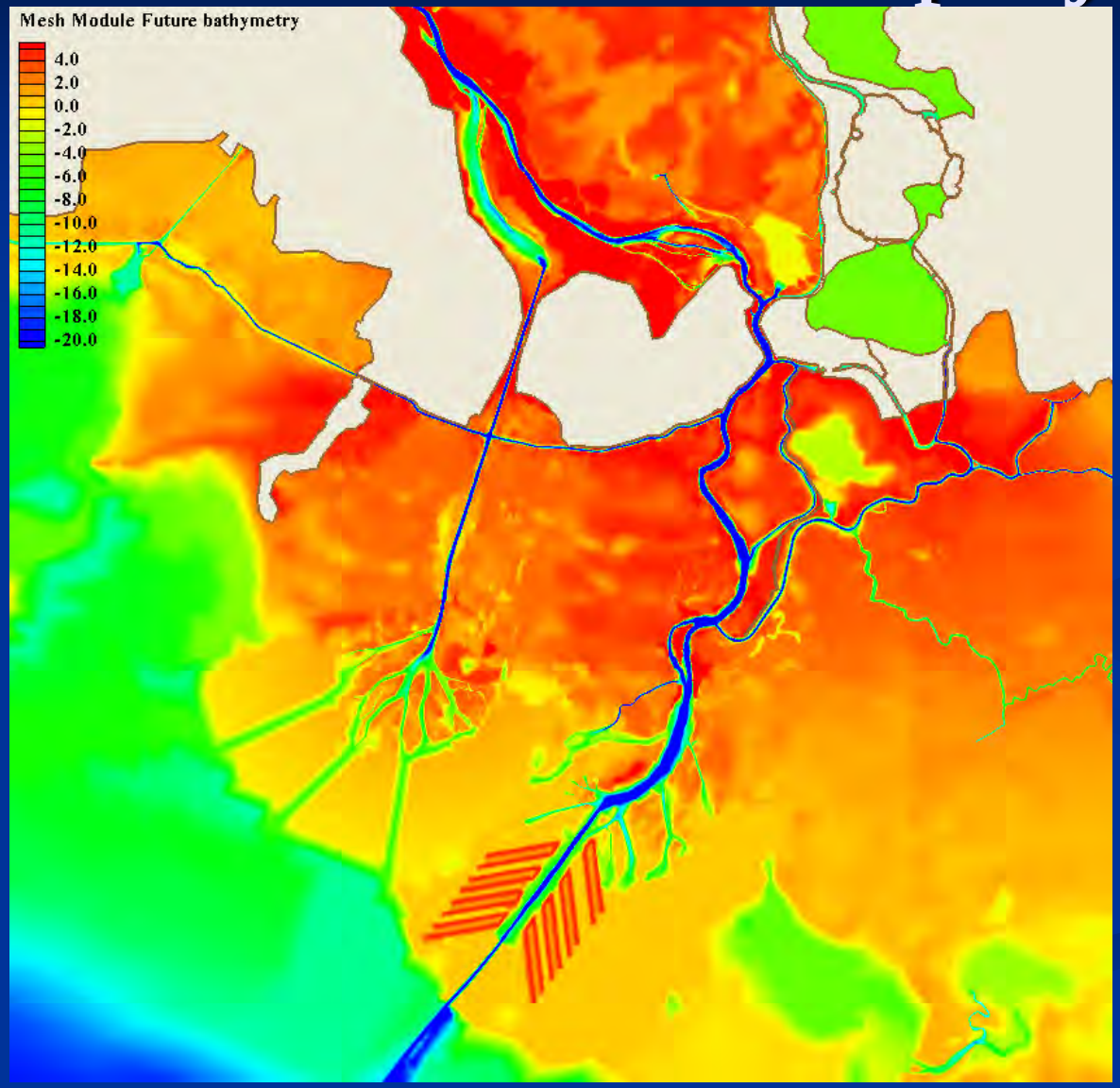


Existing conditions Wax Lake Outlet contours

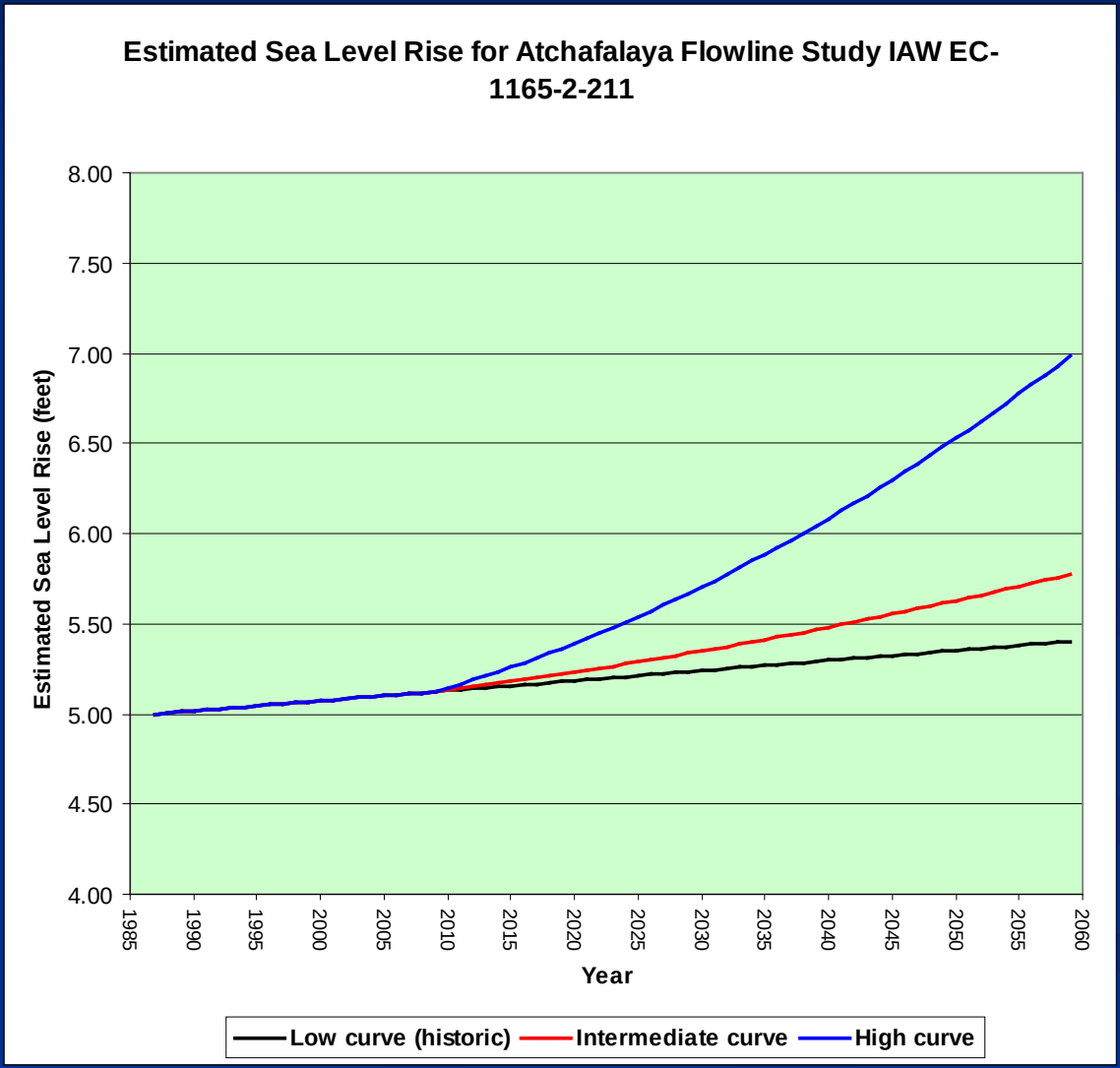


Existing conditions Lower Atchafalaya River contours

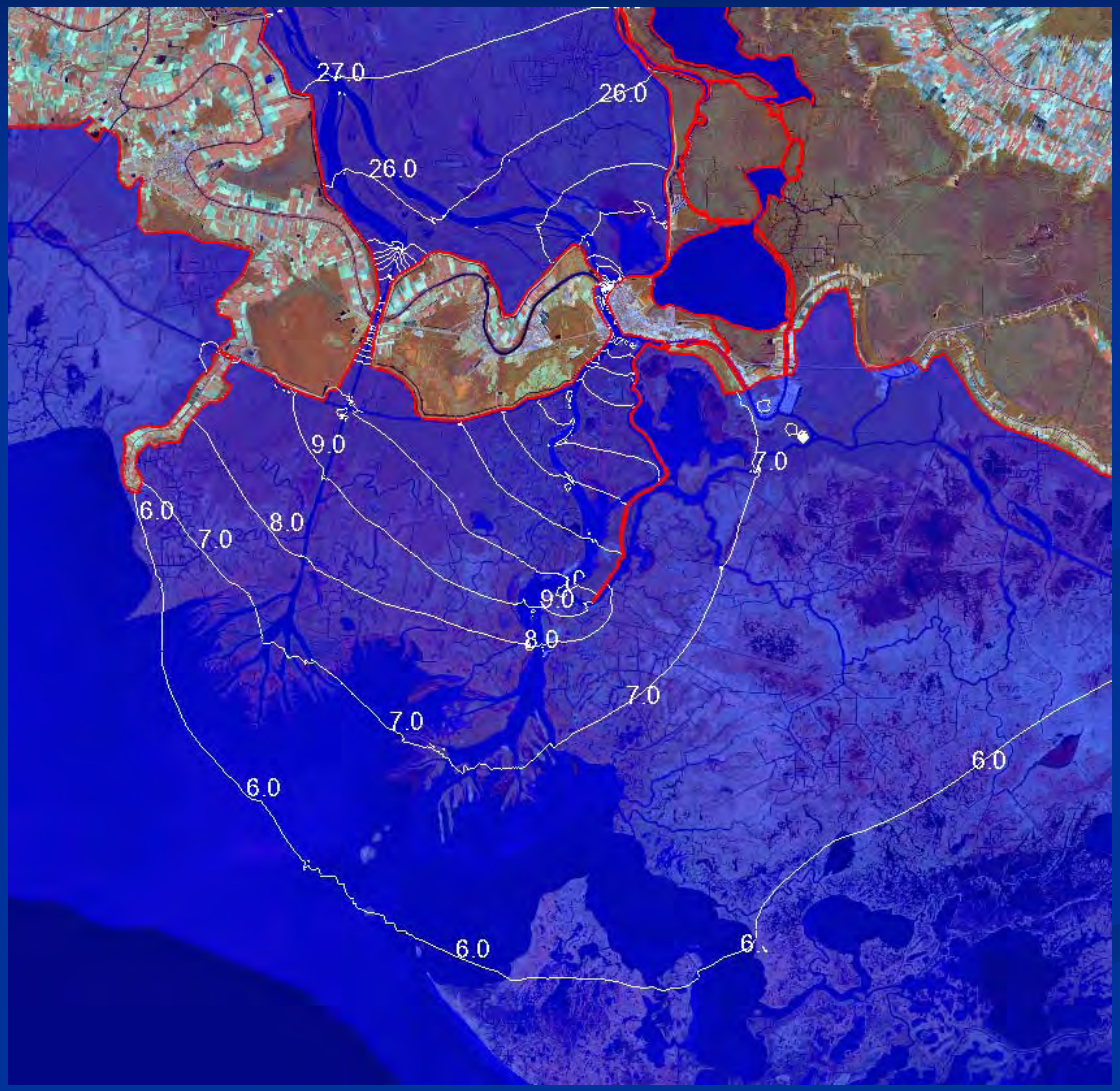
Future mesh without project



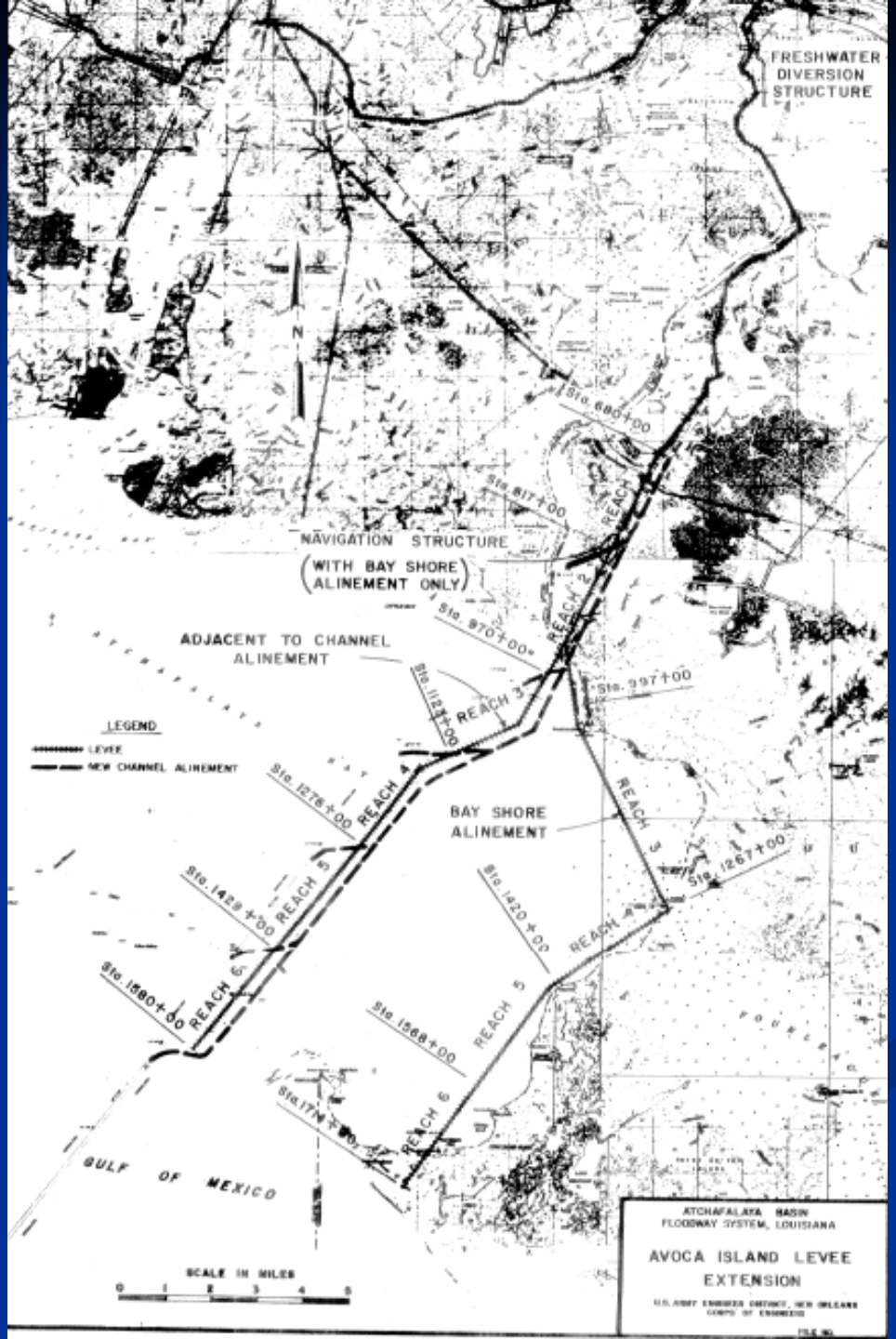
Future Sea Level Rise Projections



Future PDF contours without project and intermediate sea level rise

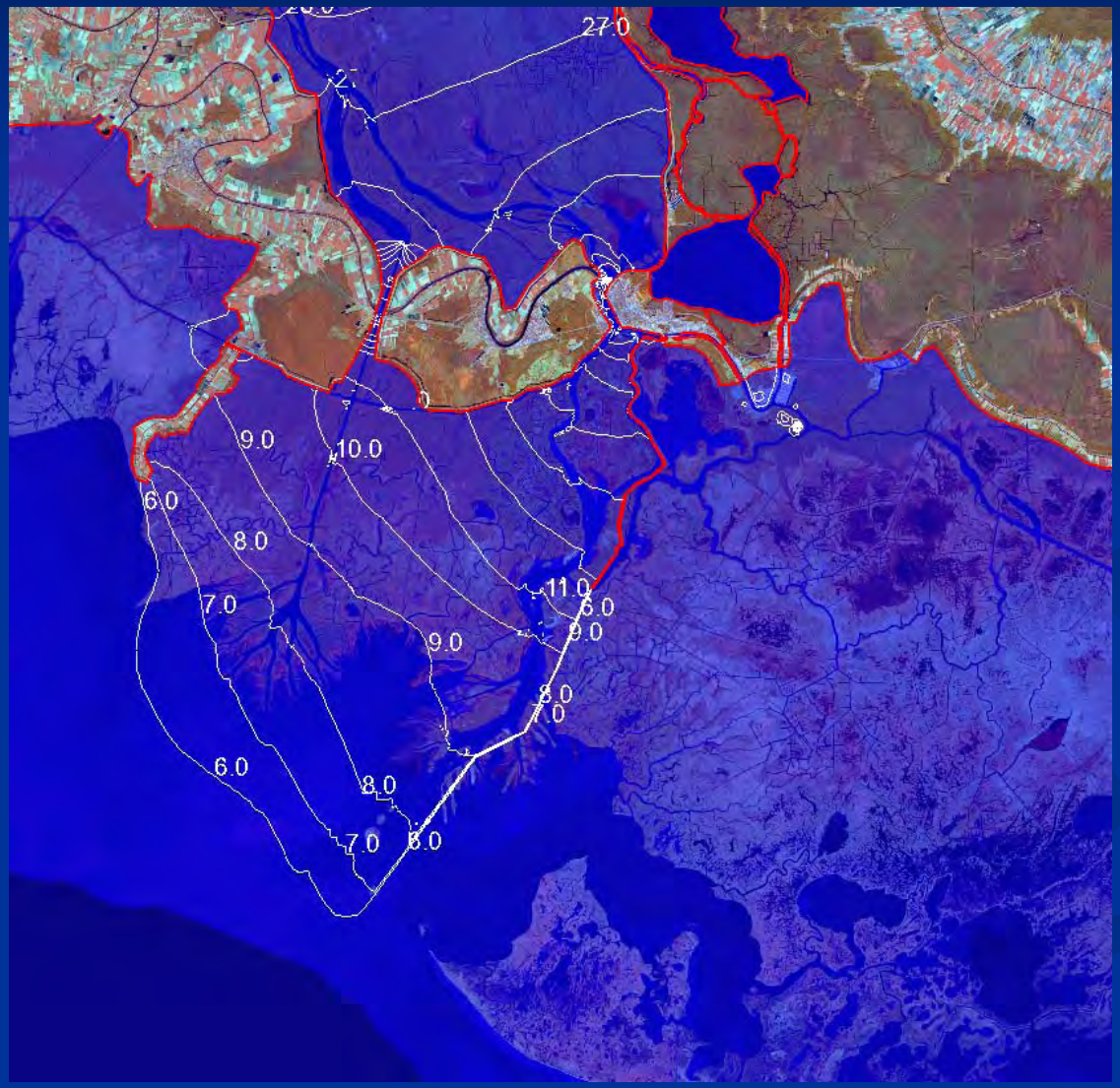


Avoca Island levee extension

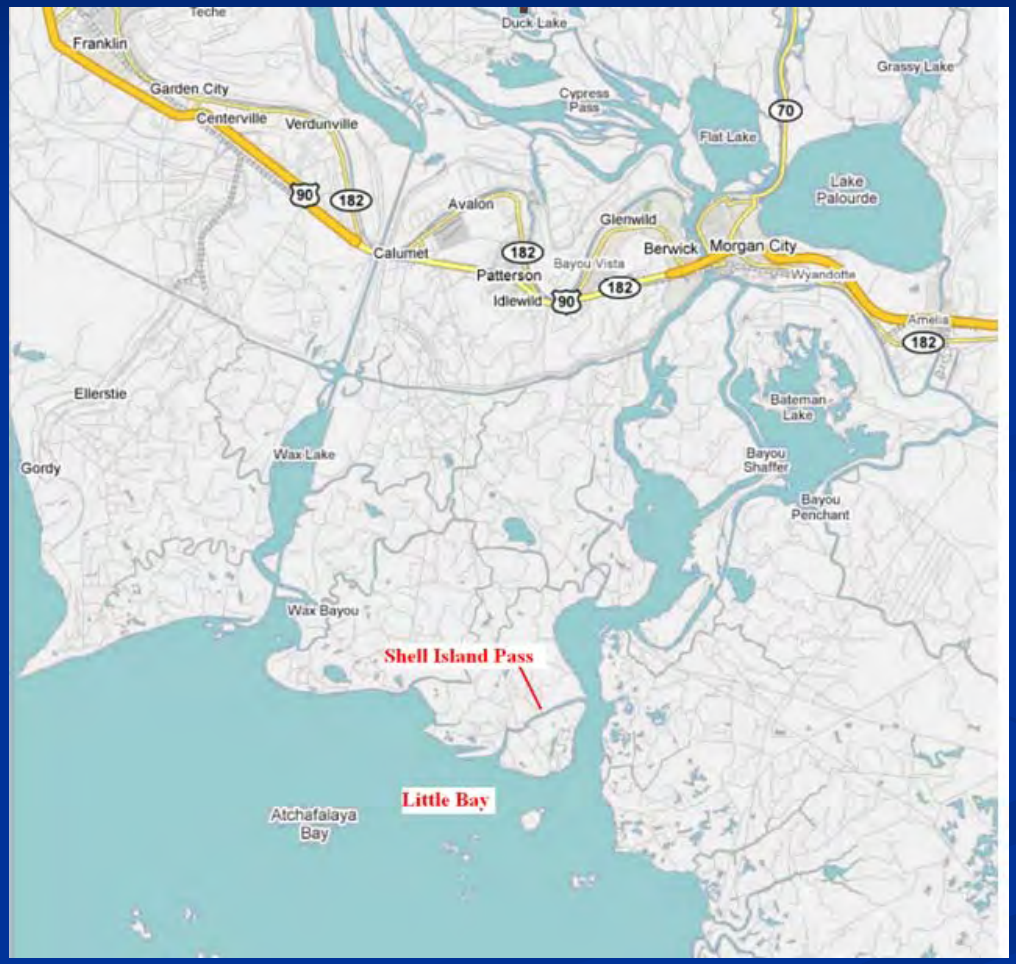


Source: Atchafalaya Basin Floodway System, Louisiana Feasibility Report, January 1982

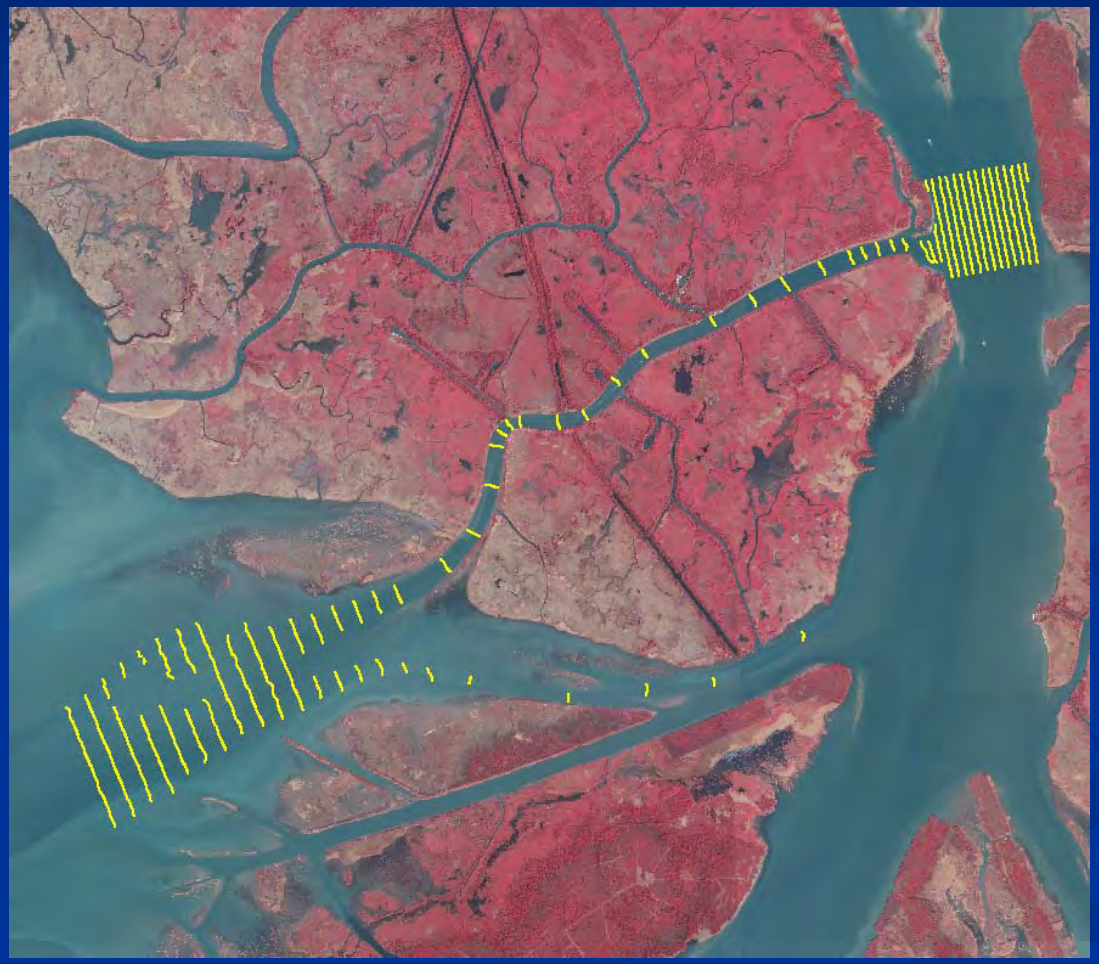
Future PDF contours with AILE and intermediate sea level rise



Shell Island Pass Sedimentation Analysis

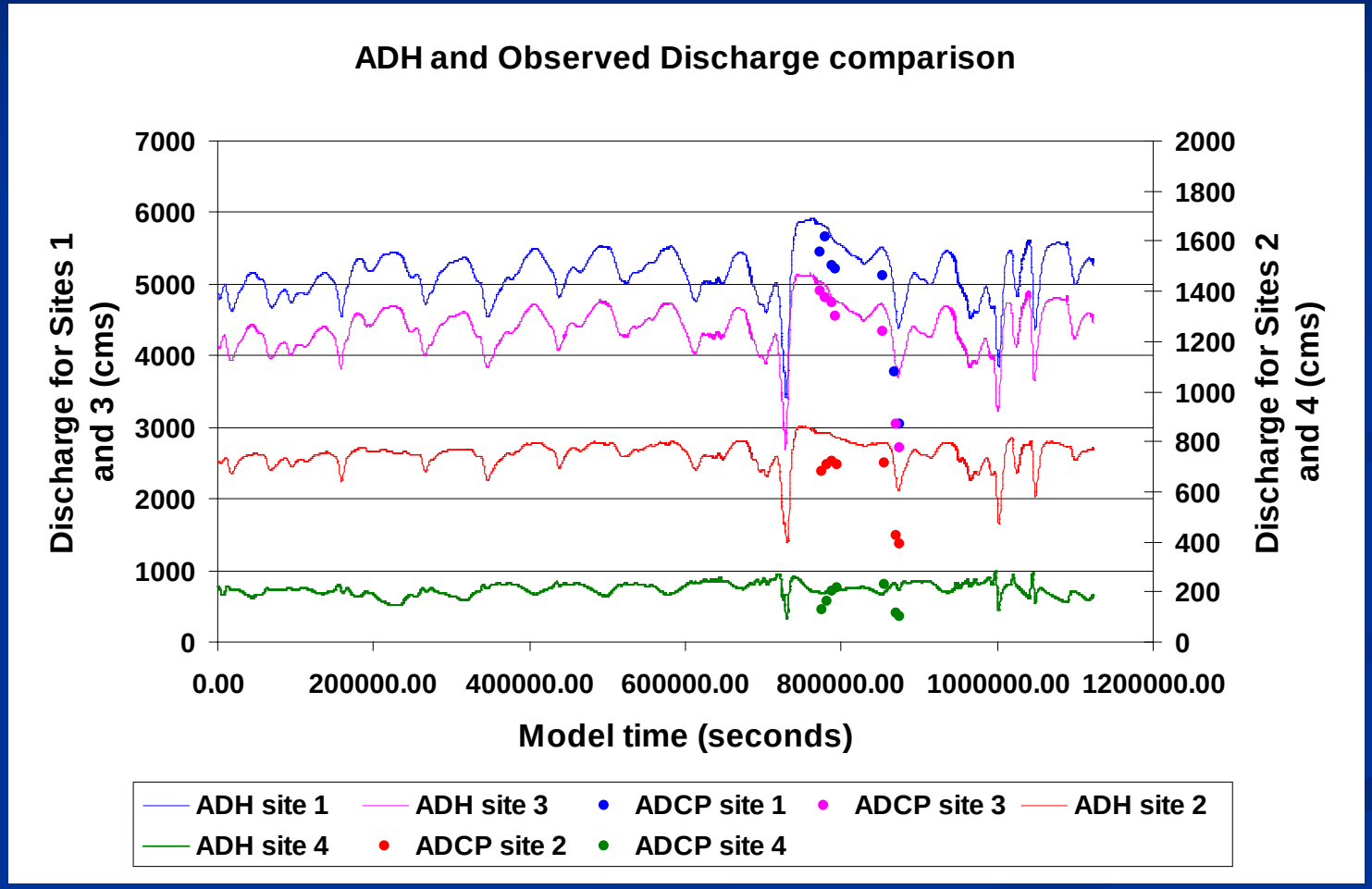


Sounding data collected

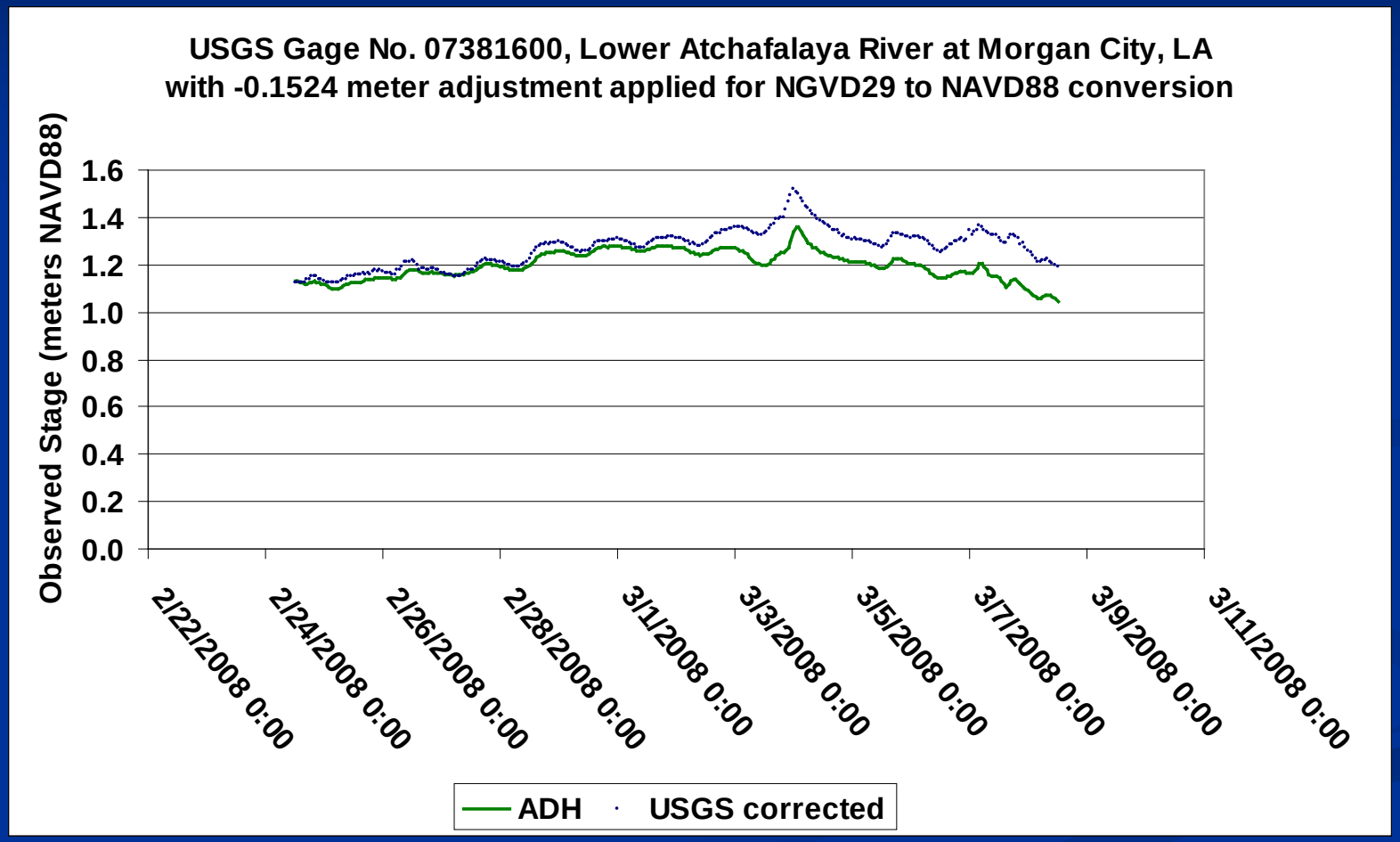


ADCP data collection sites

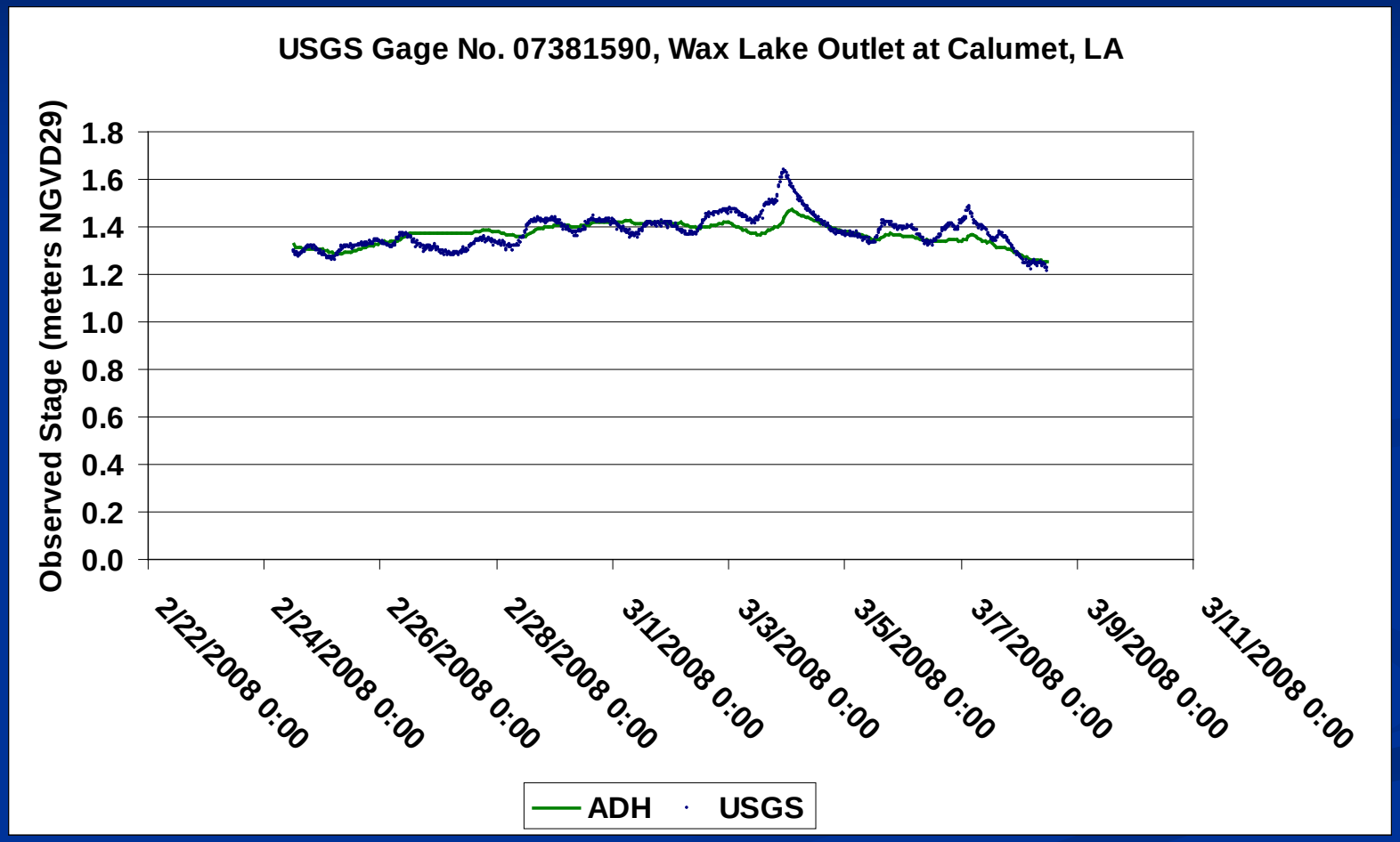
ADH/ADCP comparison



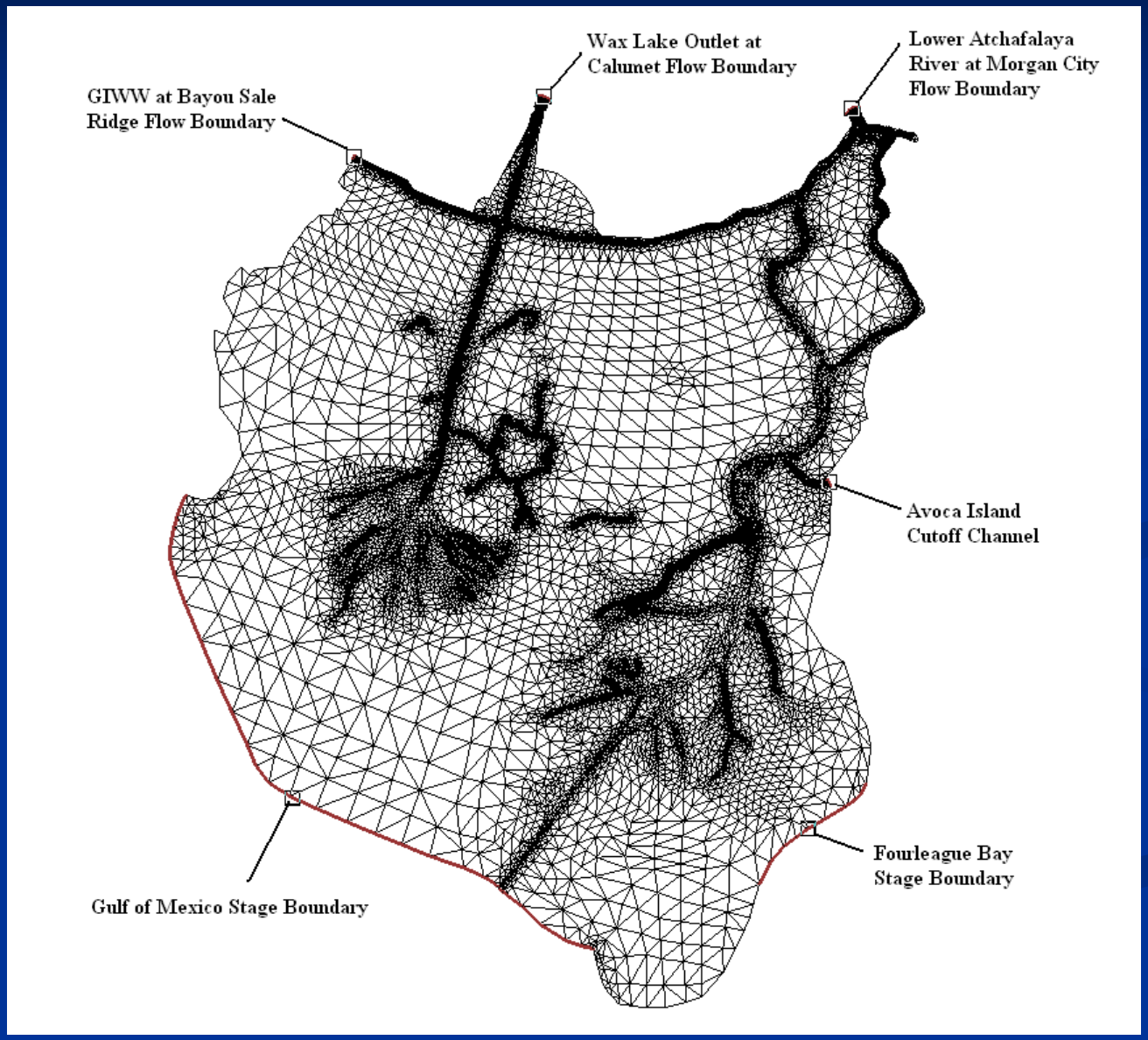
LAR at Morgan City stage validation



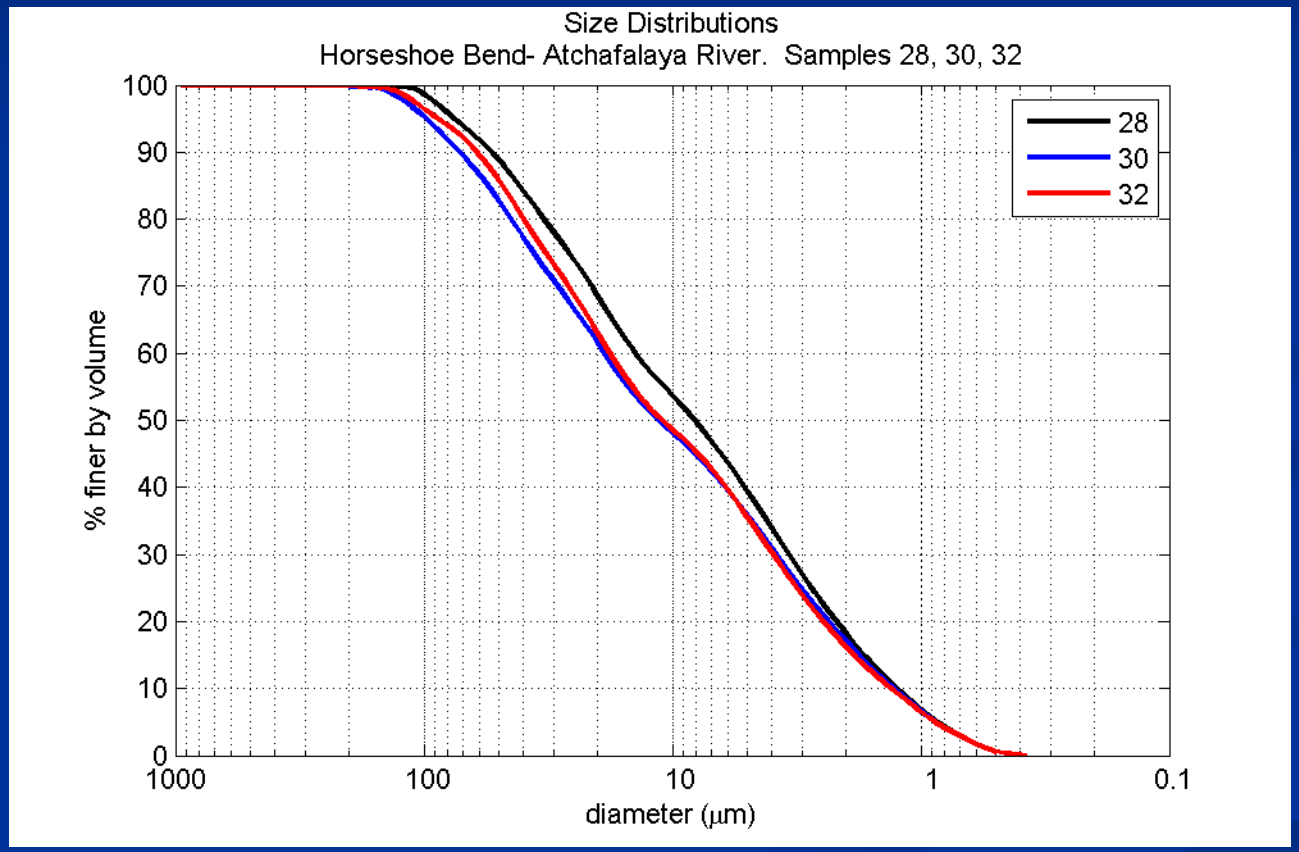
WLO at Calumet stage validation



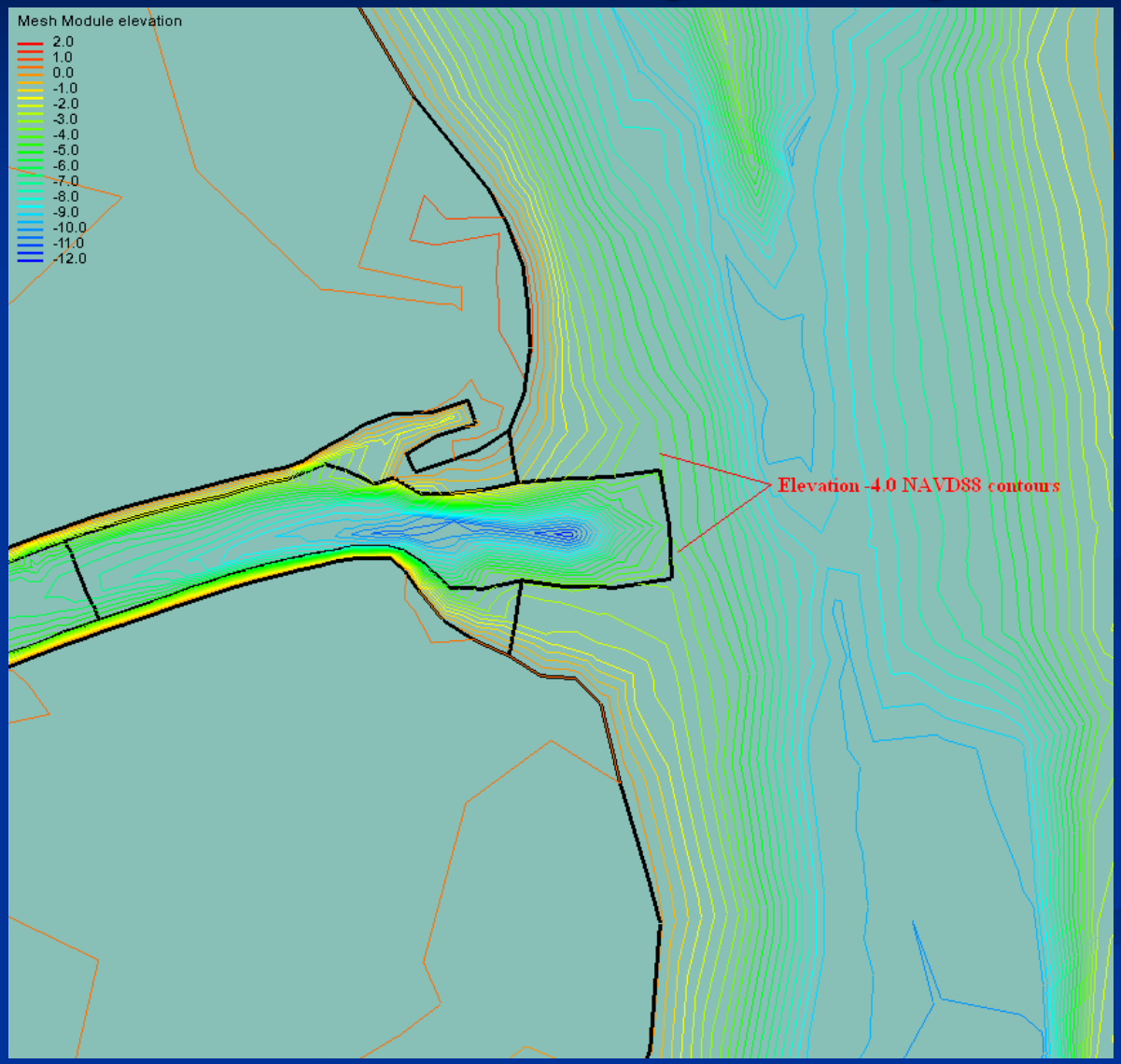
Shell Island Pass ADH mesh



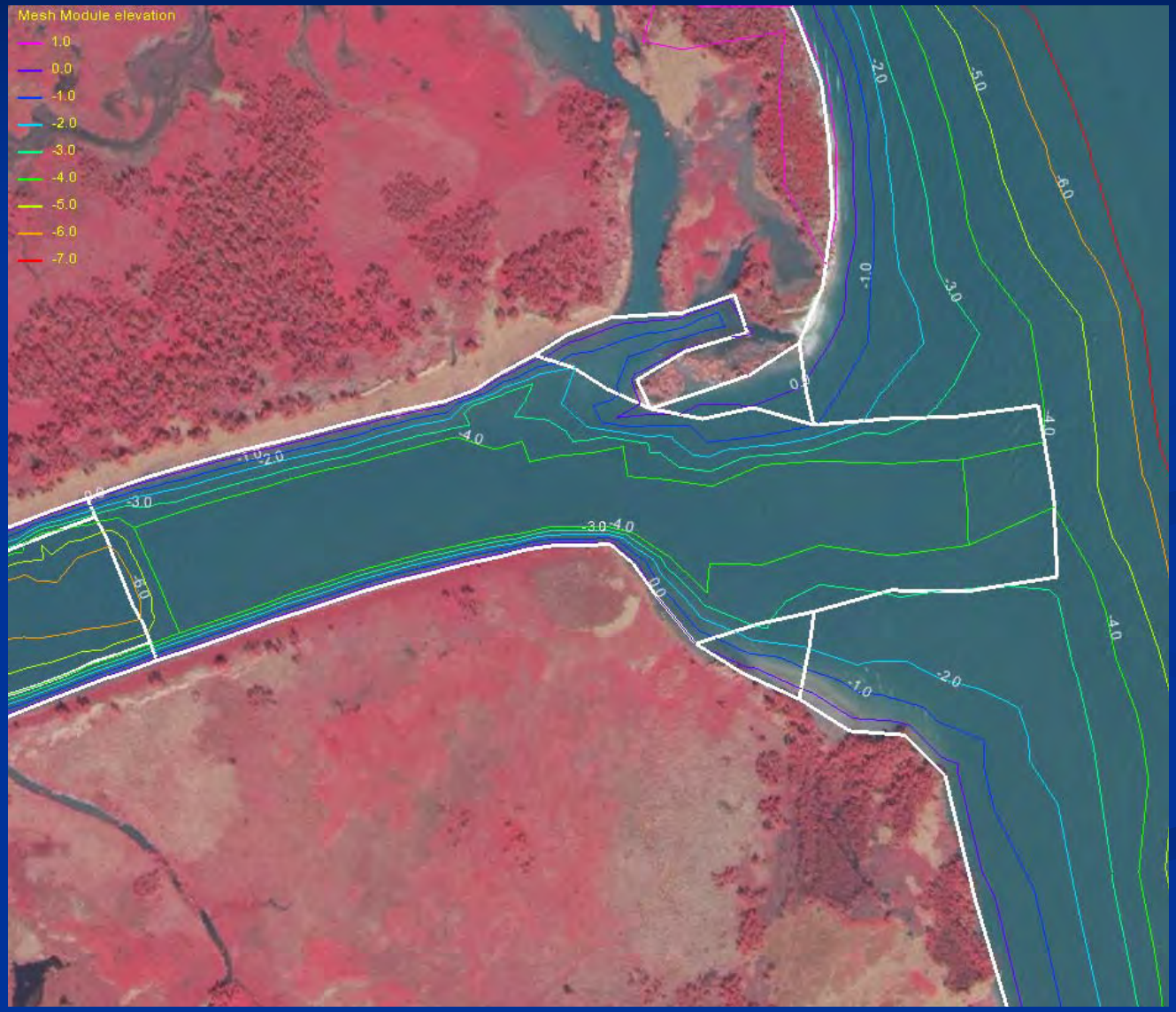
Horseshoe Bend bed material gradation



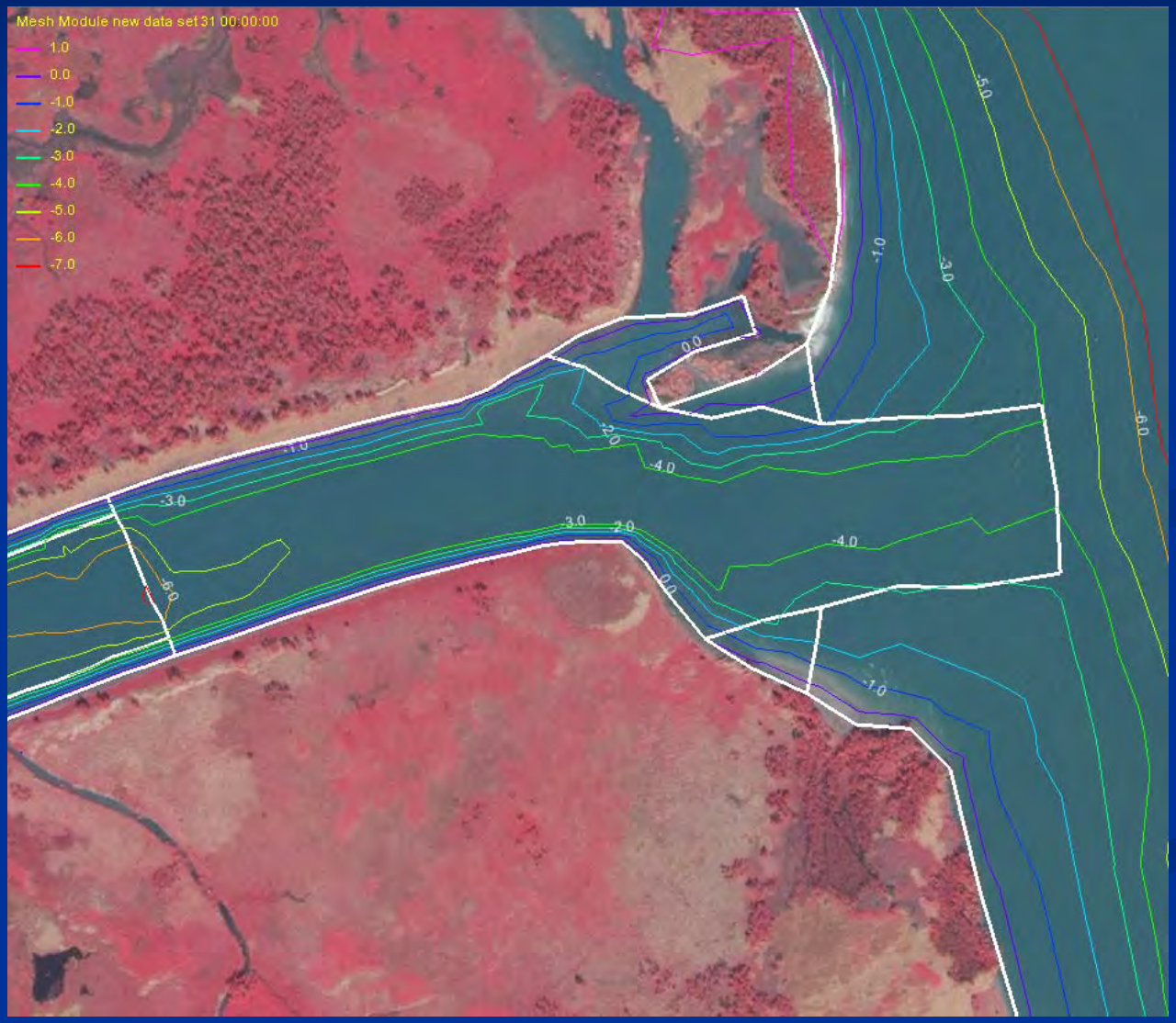
ADH bathymetry



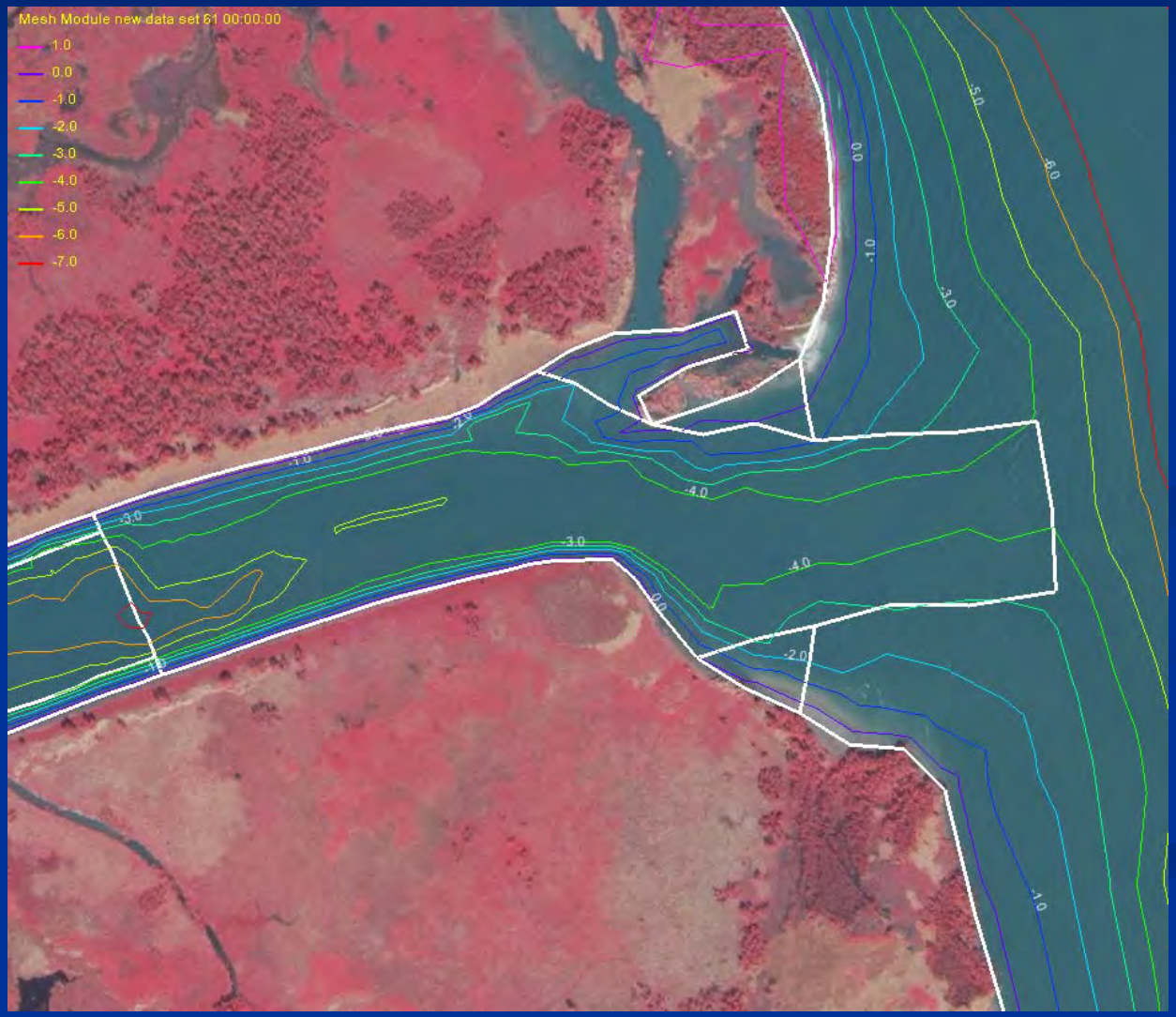
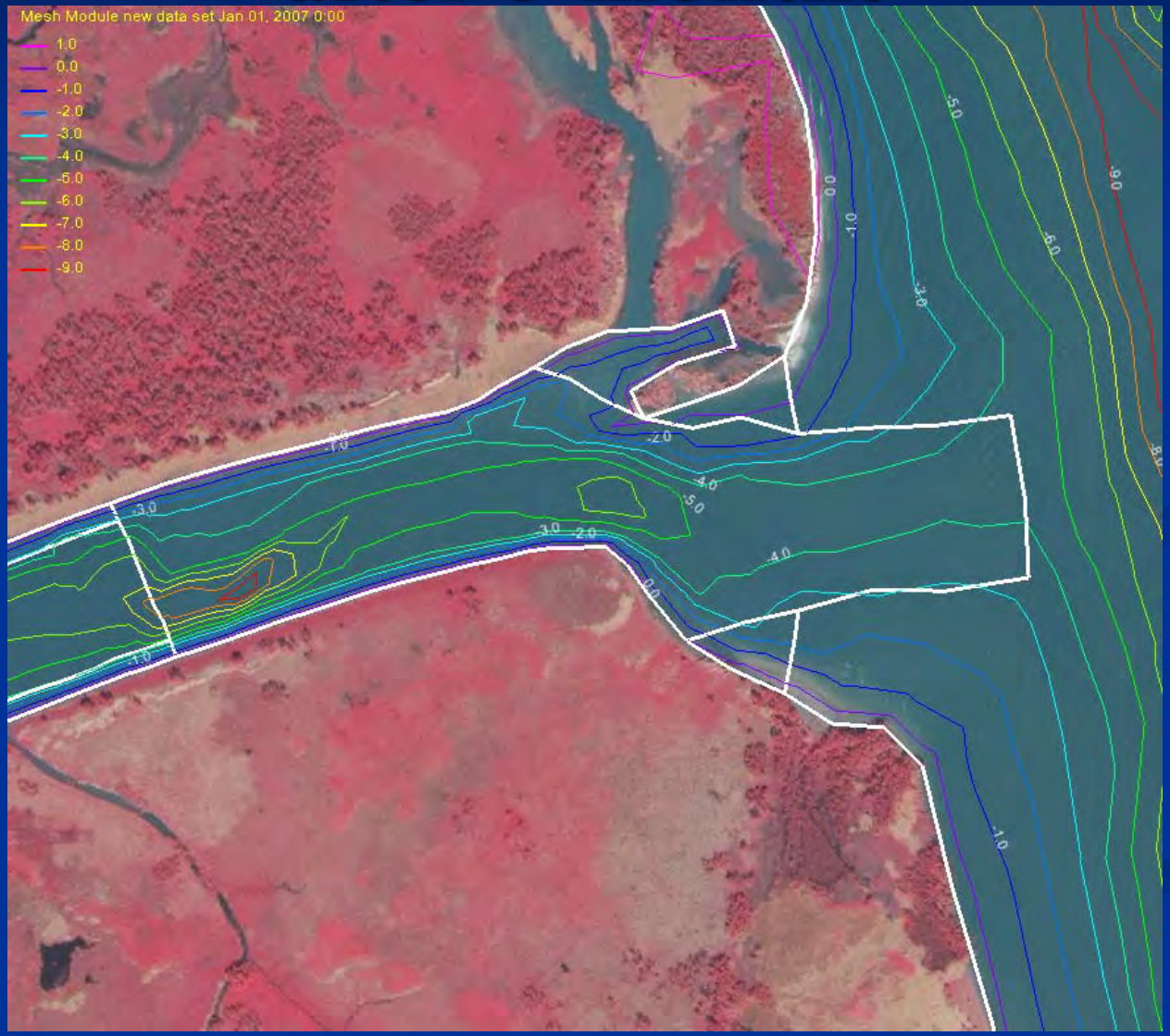
Initial dredge material placement



Dredge material placement erosion after 1 month



Dredge material placement erosion after 2 months



Dredge material placement erosion after 3 months