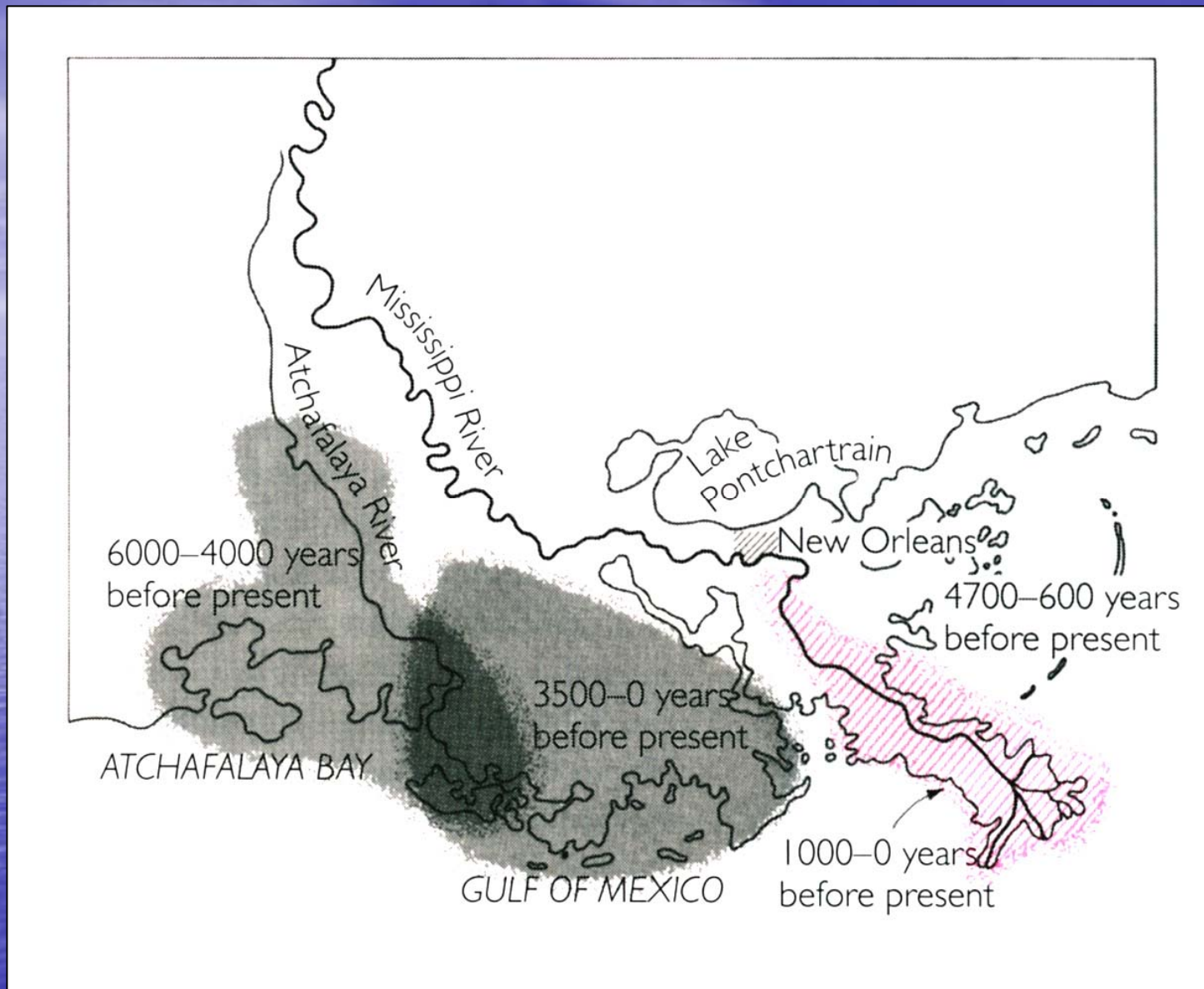
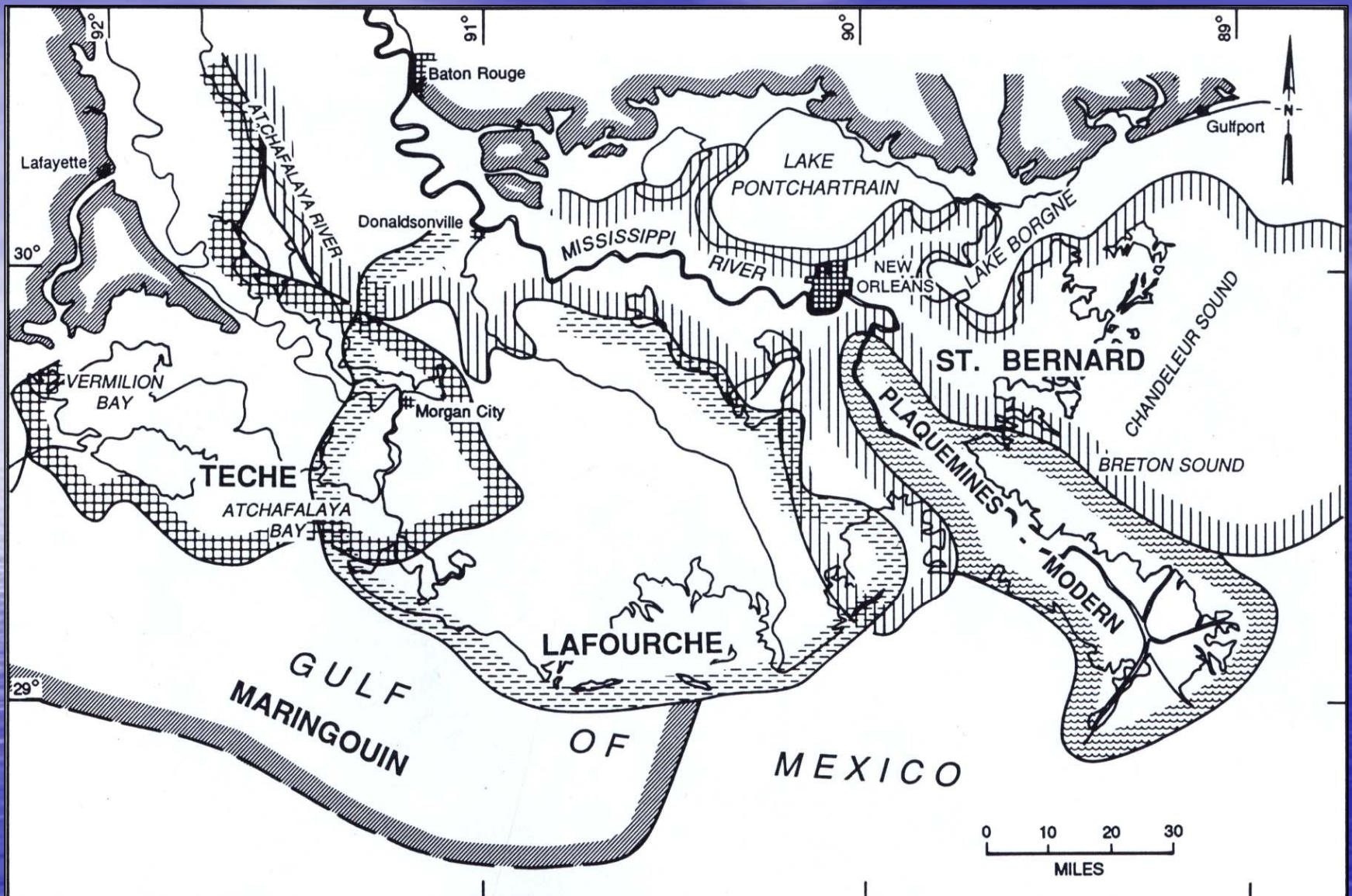


PART 4

GEOLOGIC SETTING AND FOUNDATION CONDITIONS IN NEW ORLEANS

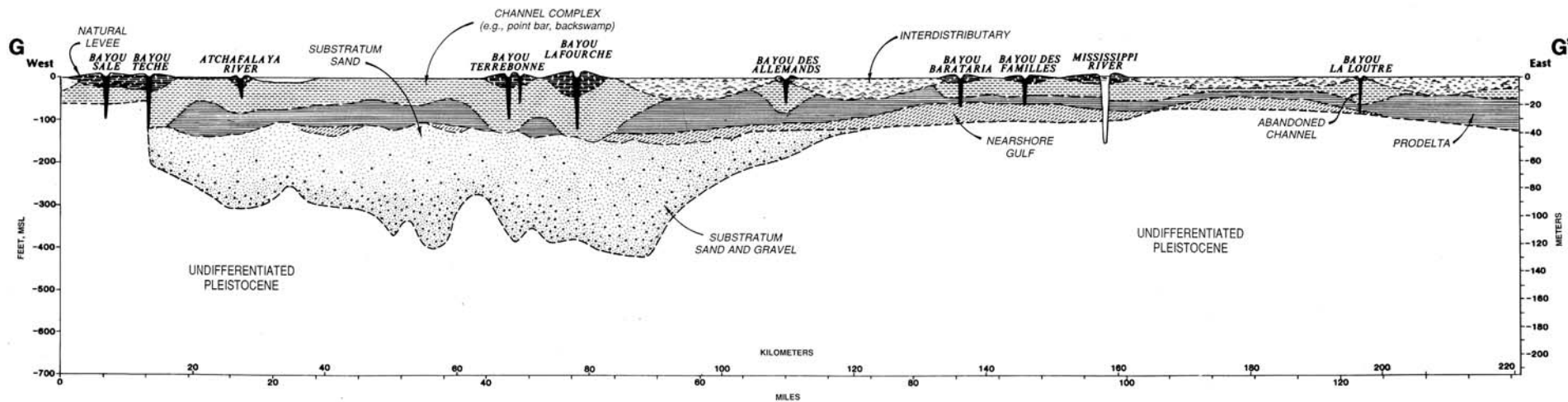


- **The modern Mississippi Delta has been deposited during the past 6000 years, in four major areas.**

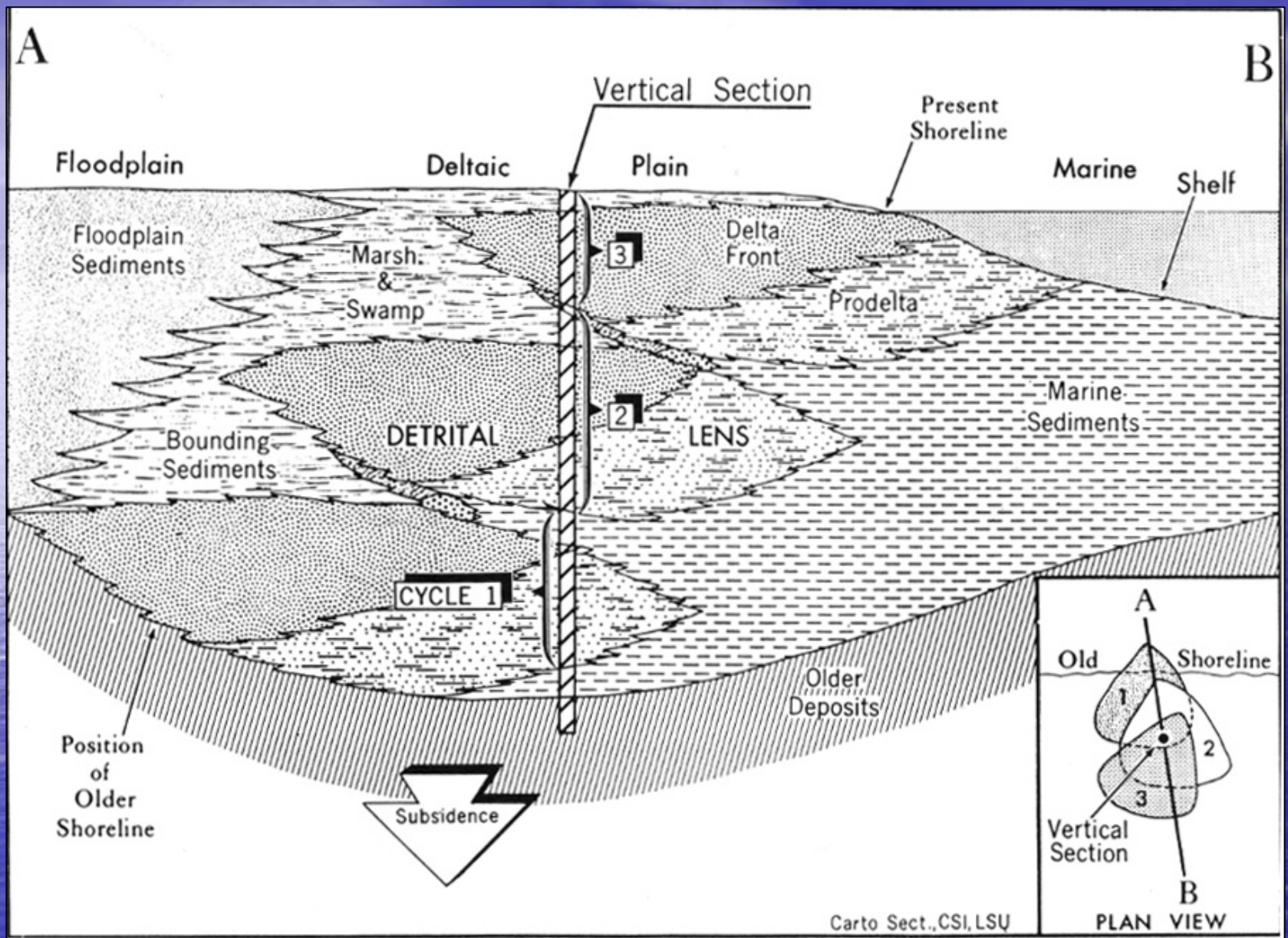


Current interpretation of the modern delta. Most of New Orleans lies within a interdistributary zone, with lacustrine, swamp, and marsh deposits.

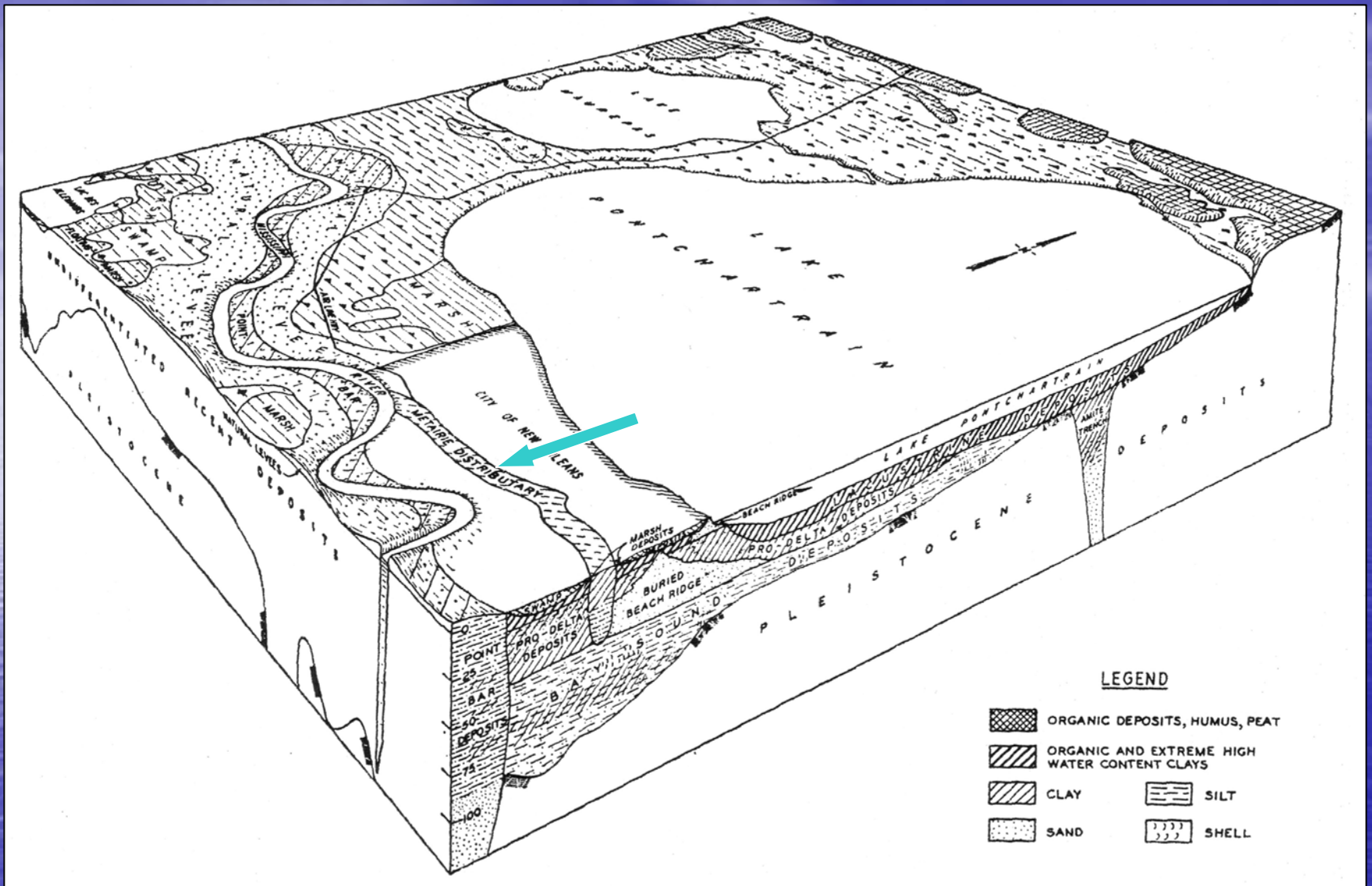
Transverse cross section thru the Mississippi Delta



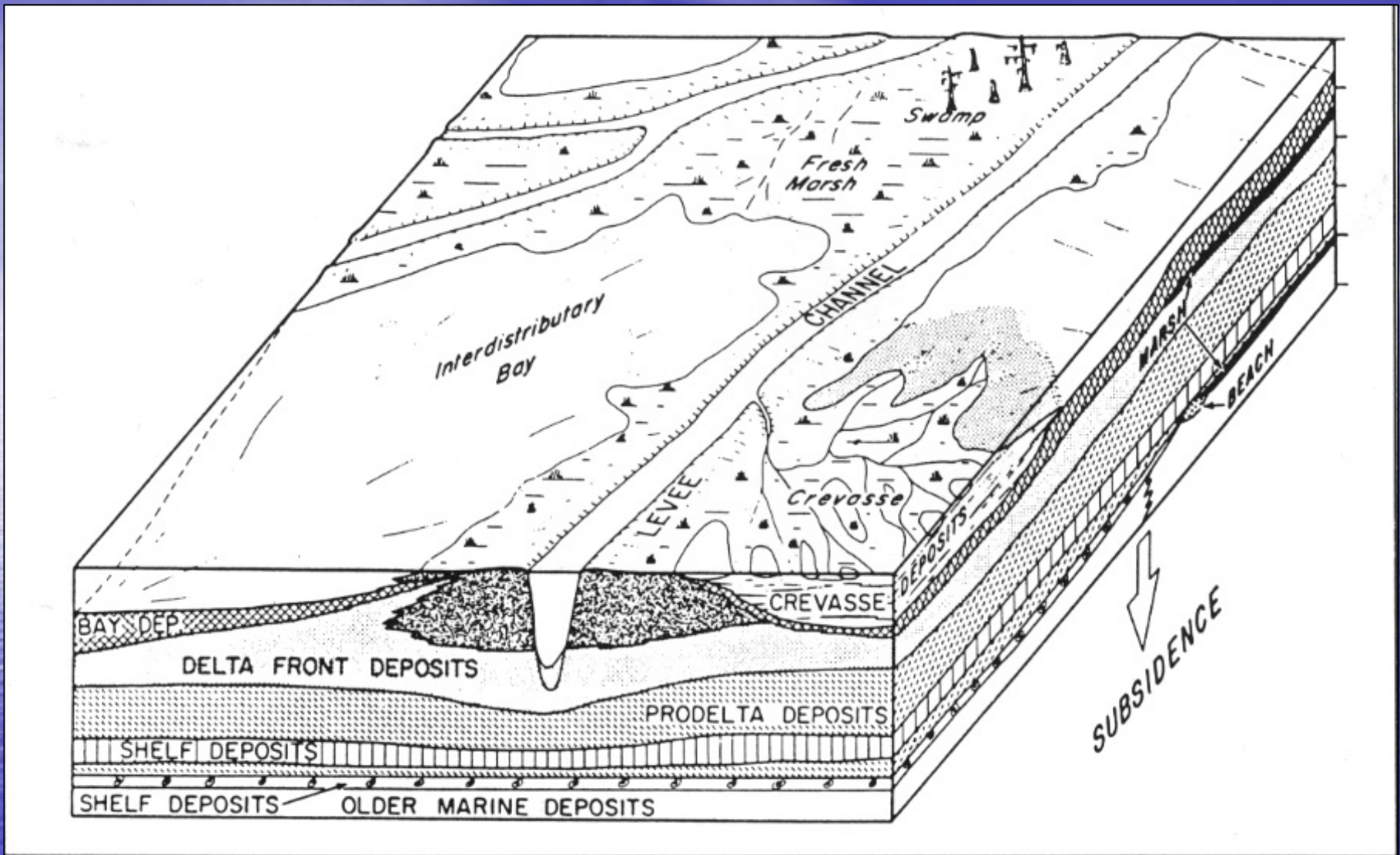
- Sedimentation of the Mississippi Delta during the past 11,000 years has seen a progressive fining of the sediment; dominated by fine-grained overbank silt. Sand is laterally confined along the major distributary channels, shown here in black.



Most of New Orleans lies on a thin deltaic plain, filled with marsh, swamp, and lacustrine sediments.



- New Orleans is split in half by the Metarie Ridge distributary channel, shown here.



The drainage canals lie within interdistributary embayments, which are underlain by fat clays deposited in a quiet water paludal environment.



Cypress wood is indicative of a swamp environment.

Cypress swamps are noted on all the old maps of New Orleans, surrounding the city and bounding Lake Ponchartrain

These thrive in 2 to 6 feet of water, but cannot regenerate unless new influx of sediment is deposited in the swamp, reducing the water depth

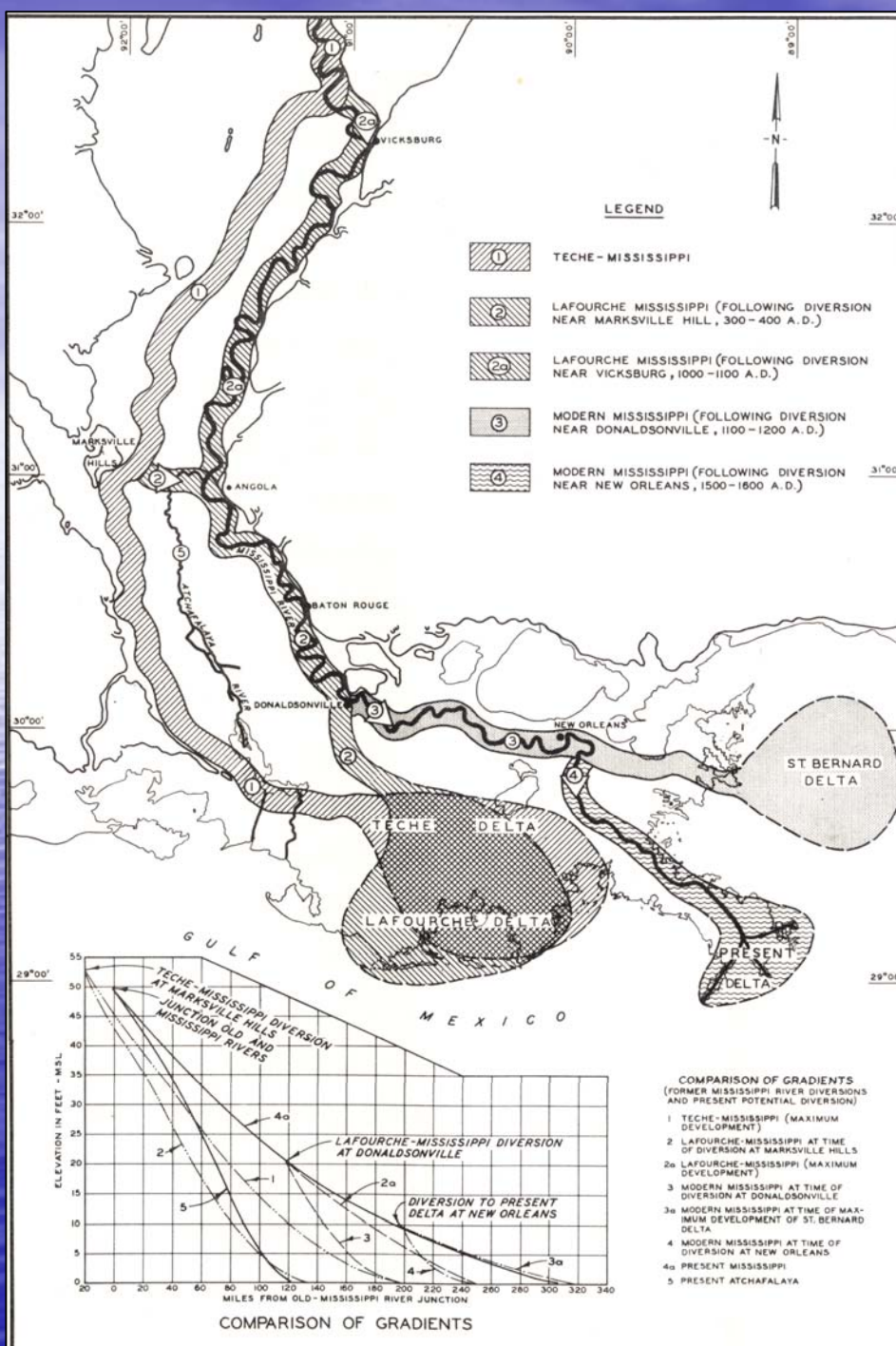
Brackish water intrusion can also cause flocculation of clay and premature die out of the Cypress trees

Main Stem Channel Deltas

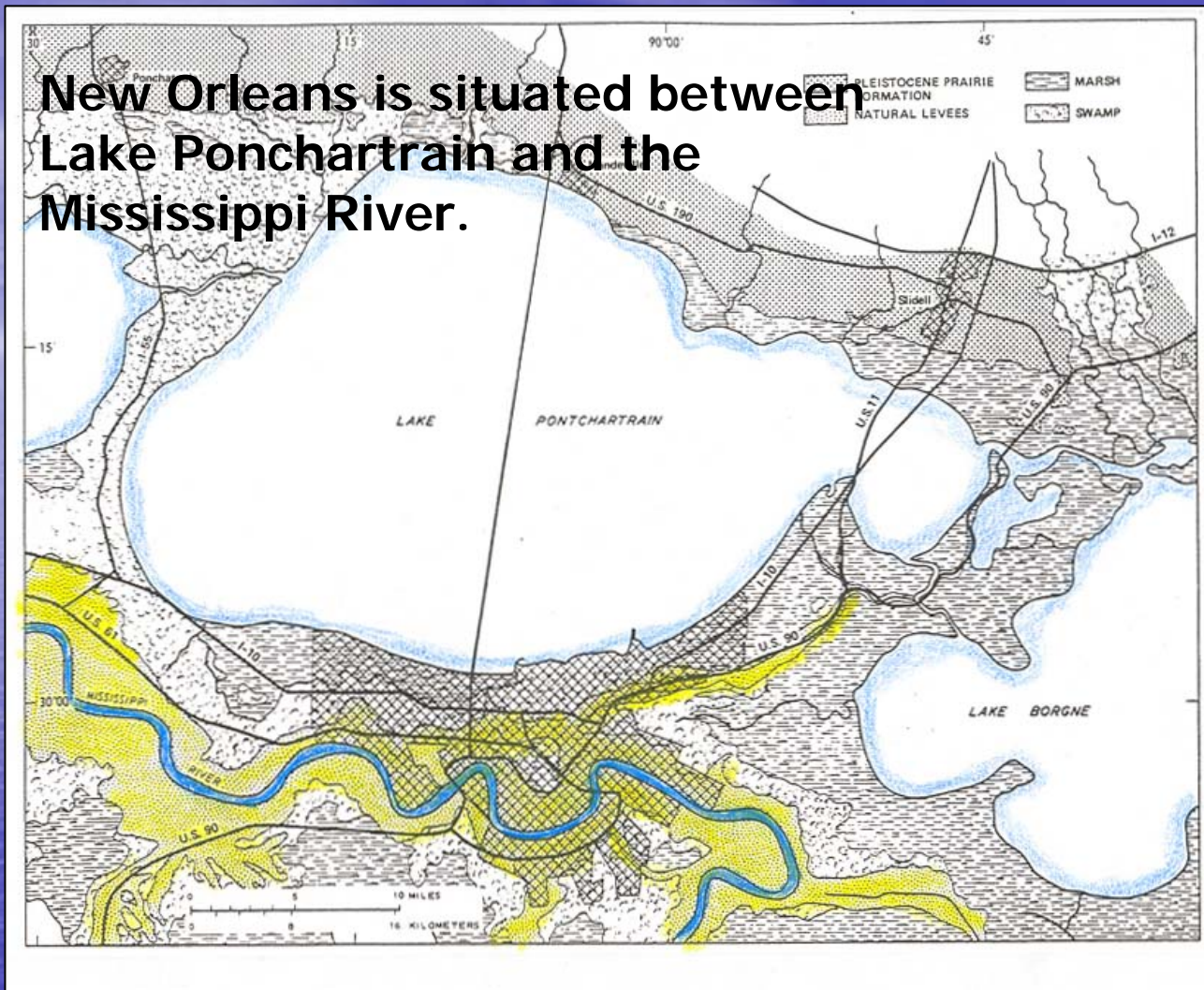
The **St. Bernard** and **Plaquemines Deltas** are the youngest features in the Mississippi Delta.

They deposit nutrient rich silt which promotes growth of fresh water swamps

Most of the St. Bernard Delta has subsided below sea level.



New Orleans is situated between Lake Ponchartrain and the Mississippi River.



The **Pine Island Beach Trend** is a linear deposit of beach sand emanating from the Pearl River in Mississippi. The deposition of this barrier created the Lake Pontchartrain basin.

Cypress Swamp die-off



The entire delta is slowly subsiding. If new sources of sediment do not replenish the swamp, the young cypress shoots cannot germinate in water > 2 feet deep; and Cypress forests die off all at once, becoming a treeless, grassy marsh, with a forest of dead tree trunks.

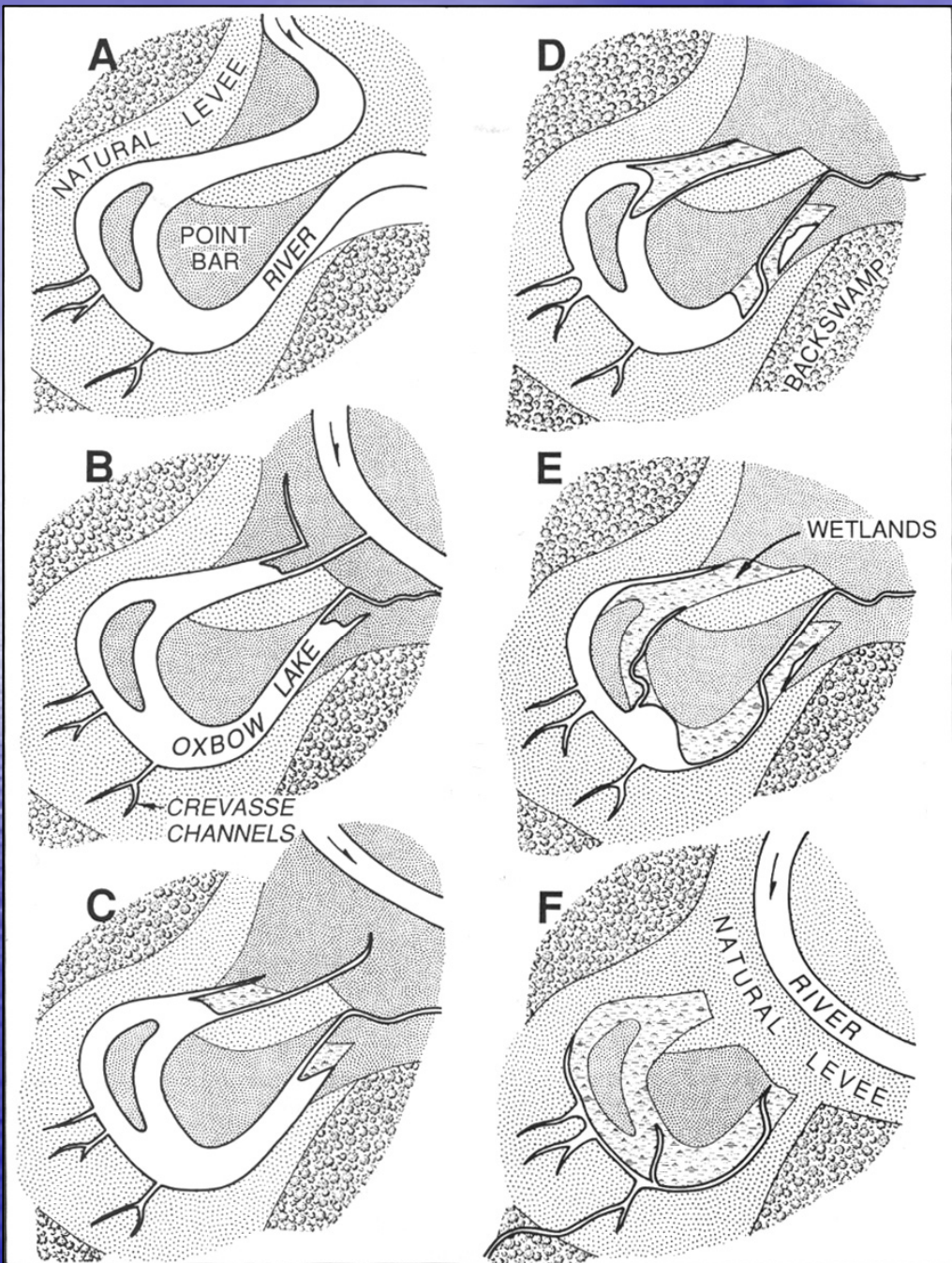
MARSH DEPOSITS OVERLIE CYPRESS SWAMPS



Marsh deposits are typified by fibrous peats; from three principal environments: **Fresh water marshes**; 2) **floating marsh** – roots and grass sitting on an ooze of fresh water (shown above); and 3) **saltwater marshes** along the coast. The New Orleans marsh tends to be grassy marsh on a flat area that is “building down”, underlain by soft organic clays. Note: **smectite clays flocculate during brackish water intrusions.**

Depositional Environment Keys

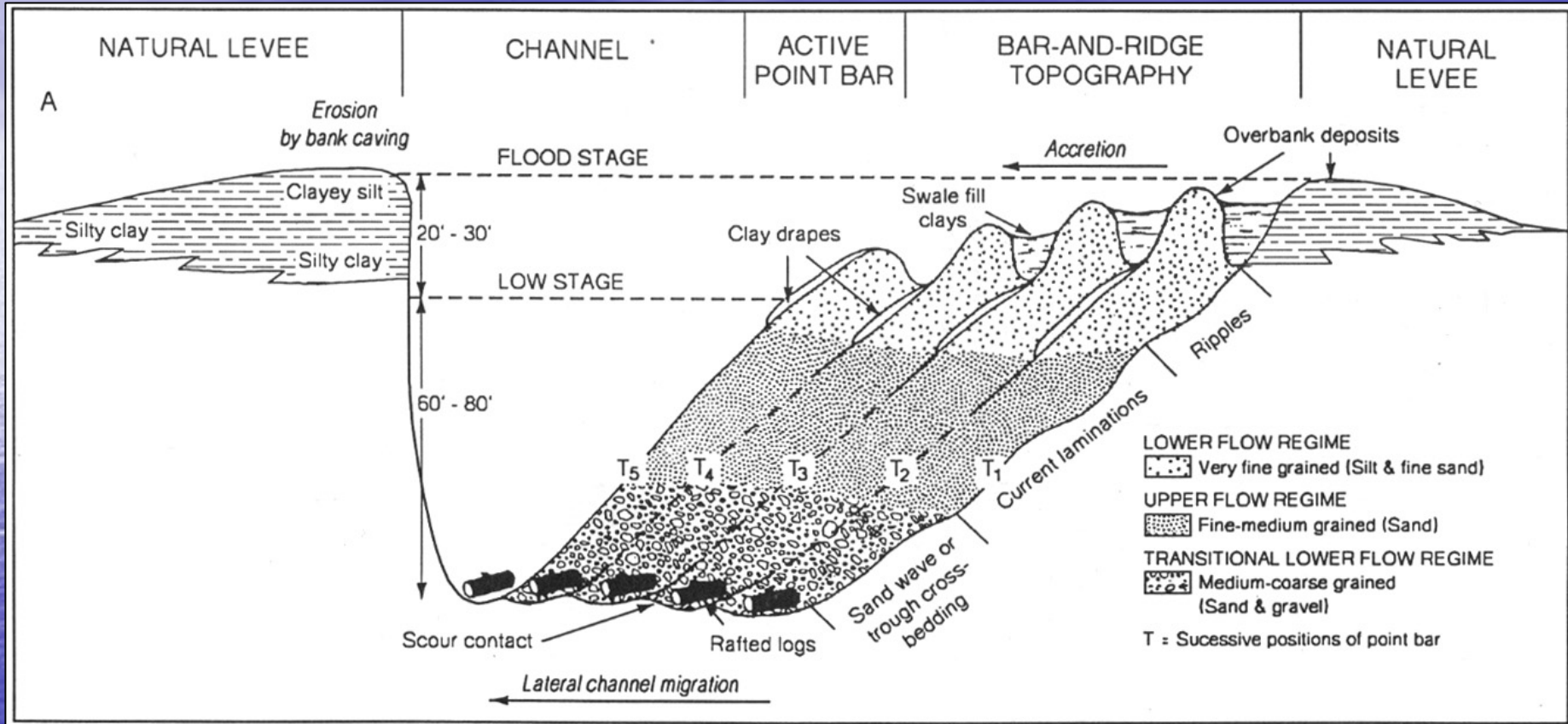
- Cypress wood = fresh water swamp
- Fibrous peaty materials = marshes
- Fat Clays with organics; usually lacustrine. A pure fat clay has high w/c and consistency of peanut butter
- Interdistributary clays; paludual environments; lakes Silt lenses when water shallow and wind swept waves
- Lean clays CL $LL < 50$, silty and w/c $< 60\%$
- Fat clays CH $LL > 50$ no silt and w/c $> 70\%$



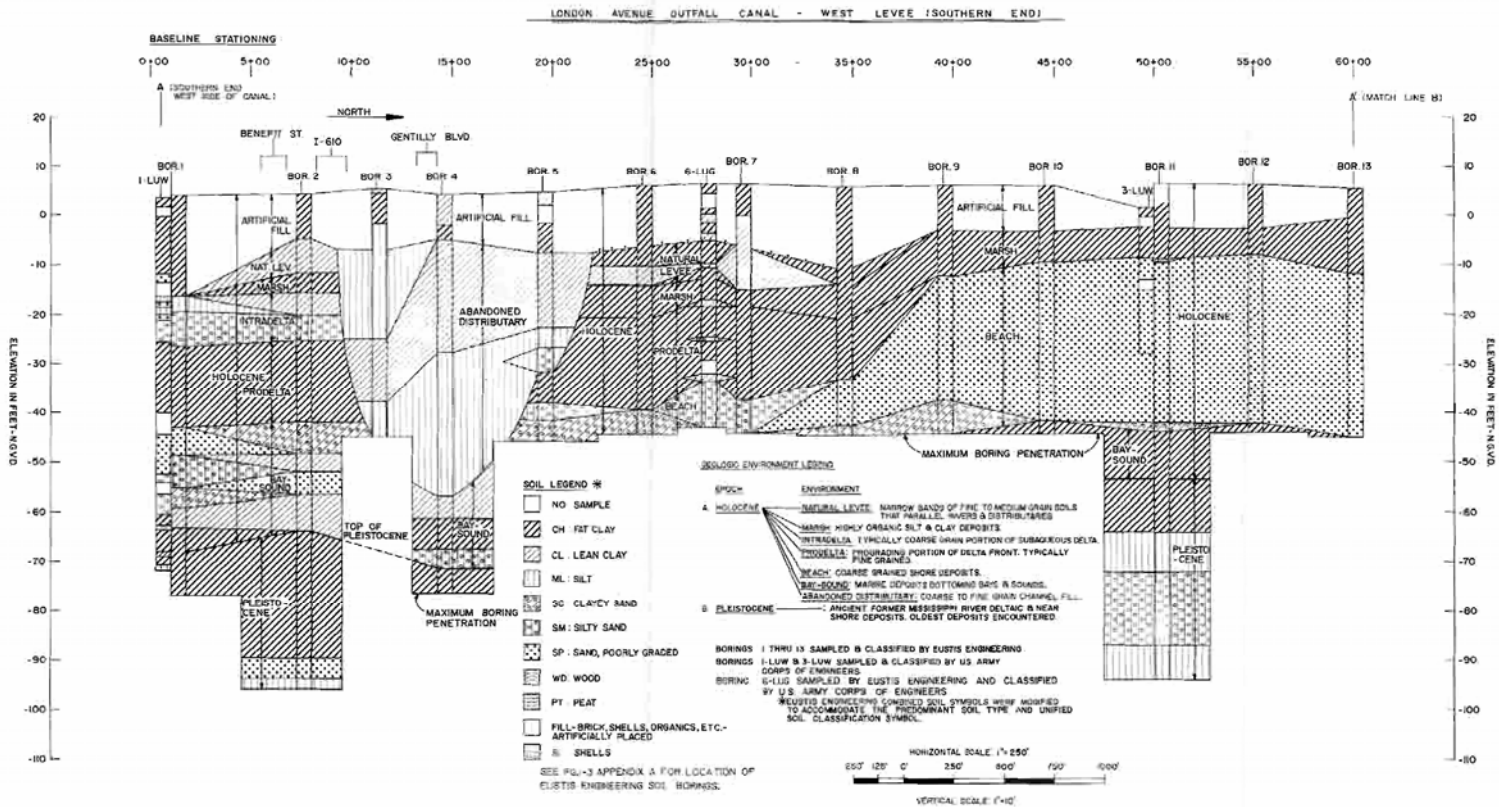
Abandoned meanders result in complex mixtures of channel sands, fat clay, lean clay, fibrous peat, and cypress swamp muck, which can be nearly impossible to correlate linearly between boreholes.

The New Orleans District uses **5-inch diameter piston samples** for their **undisturbed samples**. These are useful for characterizing the depositional environment of the soils.

Clay drapes and pockets



Example from Saucier (1994) showing complex depositional relationships between units in a distributary meander belt. Note discontinuous nature.



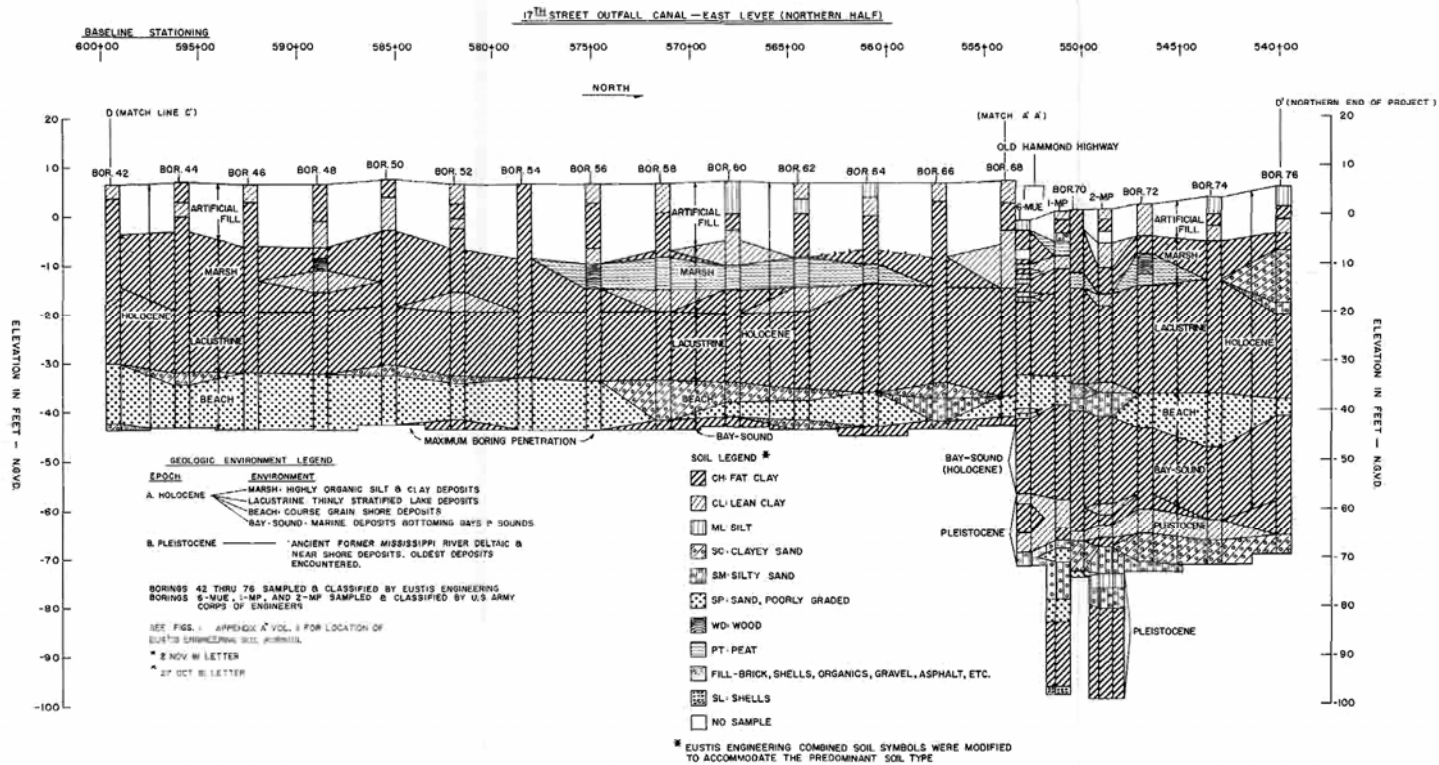
Note infilled meander channel

LAKE PONTCHARTRAIN, LA. AND VICINITY
-18- 13 CL PLAN
DESIGN MEMORANDUM NO. 15A - GENERAL DESIGN
LONDON AVE. OUTFALL CANAL
ORLEANS PARISH

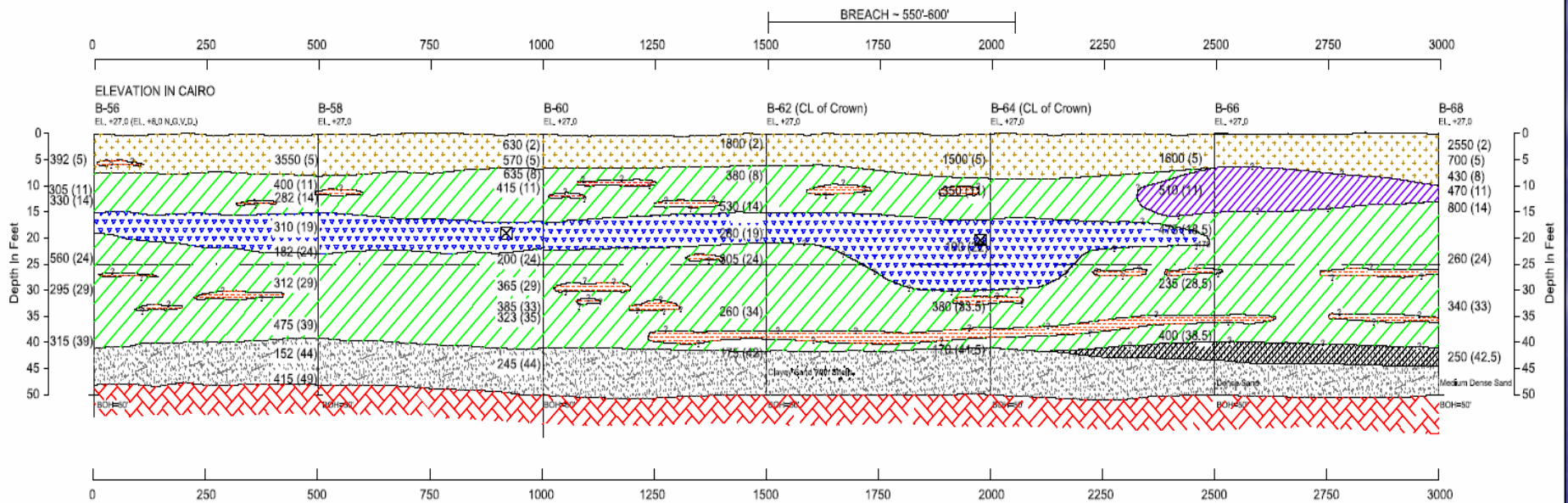
SOIL AND GEOLOGIC PROFILE

U.S. ARMY PROVEEN DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE: SEPT. 1966 FILE NO. W 3-2228

Geologic section along middle reach of the 17th St. Canal. Note filled meander channel over 50 feet deep.



The geologic sections prepared for the flood wall project along the 17th Street Canal were prepared by the engineering geology section of the Corps' New Orleans District office.



17th Street Canal East Levee- Draft Soil Profile
New Orleans, Louisiana

- FILL
- MARSH
- WOOD
- CL, OM, WD
CLAY WITH ORGANIC MATERIAL AND WOOD
- CL, LEAN CLAY
- CH, FAT CLAY
- MEDIUM DENSE SAND
- BAY SAND
- SILT LENS
- BOTTOM OF SHEET PILE
- ### (##) Surq:2 IN PSF, (DEPTH IN FEET)
- (S) (##) N, BLOW COUNT

- Alternative interpretation of the Eustis 1982 borings for the 17th Street Canal East Levee, near the 2005 break. In this case the swamp deposits would extend beneath the sheetpile tips over a zone 300 feet long, where the break occurred.

SOME DATA IN REGARD TO FOUNDATIONS
in
NEW ORLEANS AND VICINITY

COLLECTED AND COMPILED
BY THE
SOIL AND FOUNDATION SURVEY
AS REQUESTED BY
LOUISIANA ENGINEERING SOCIETY

A PROJECT OF THE
WORKS PROGRESS ADMINISTRATION OF LOUISIANA

Harry L. Hopkins, Federal Administrator
James H. Crutcher, State Administrator

ADVISORY COMMITTEE

Donald Derickson, M. Am. Soc. C.E., Chairman, Representing
THE TULANE UNIVERSITY OF LOUISIANA

Edw. S. Bres, Member Am. Soc. C.E. Representing The
LOUISIANA ENGINEERING SOCIETY

A. J. Negrotto, M. Am. Soc. C.E., State Director of Operations
WORKS PROGRESS ADMINISTRATION OF LOUISIANA

John H. O'Neill, Assoc. M. Am. Soc. C.E. Representing The
LOUISIANA SECTION, AMERICAN SOCIETY OF CIVIL ENGINEERS

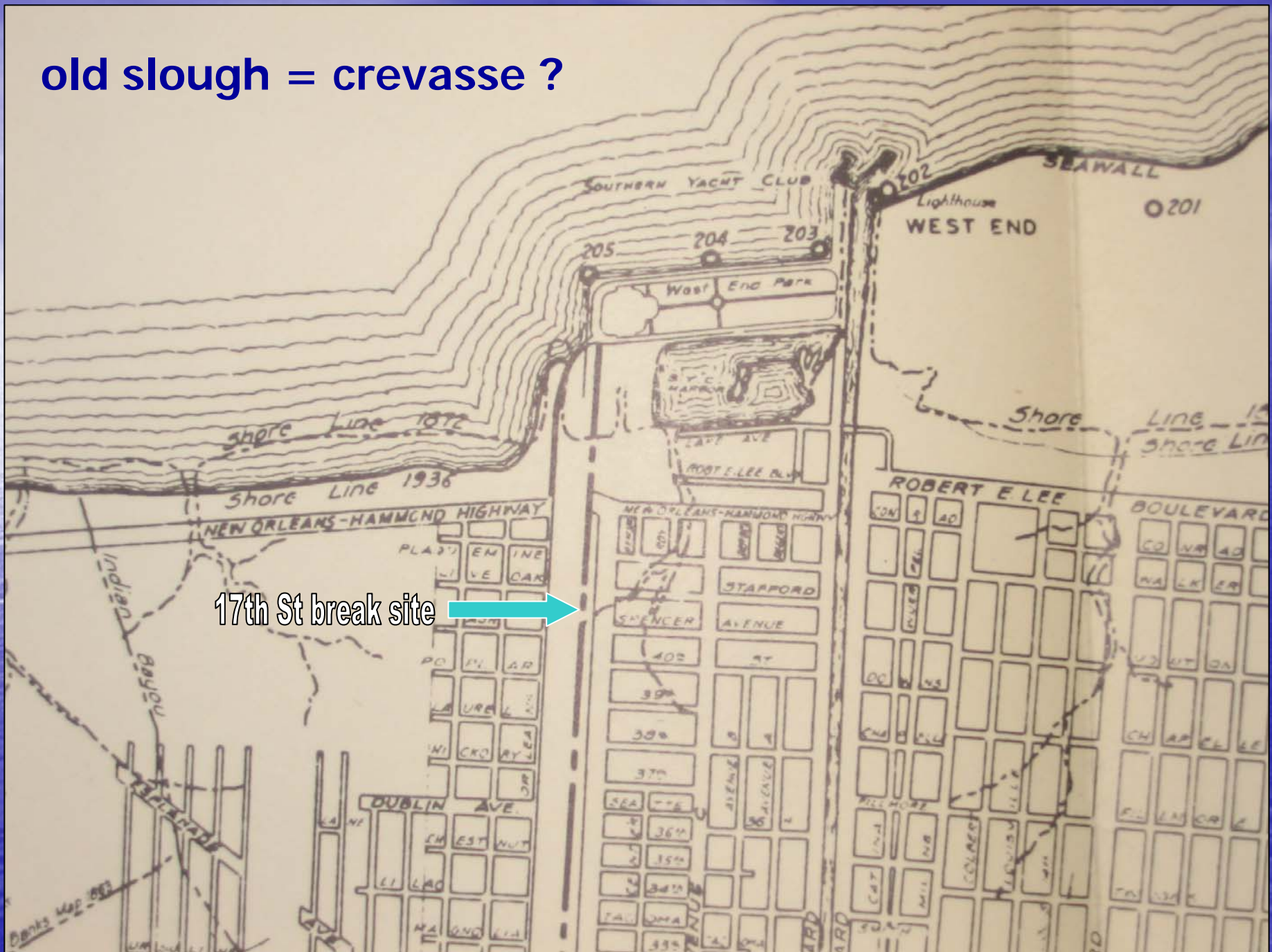
PROJECT SUPERVISOR
F. P. Hamilton, Assoc. M. Am. Soc. C.E.

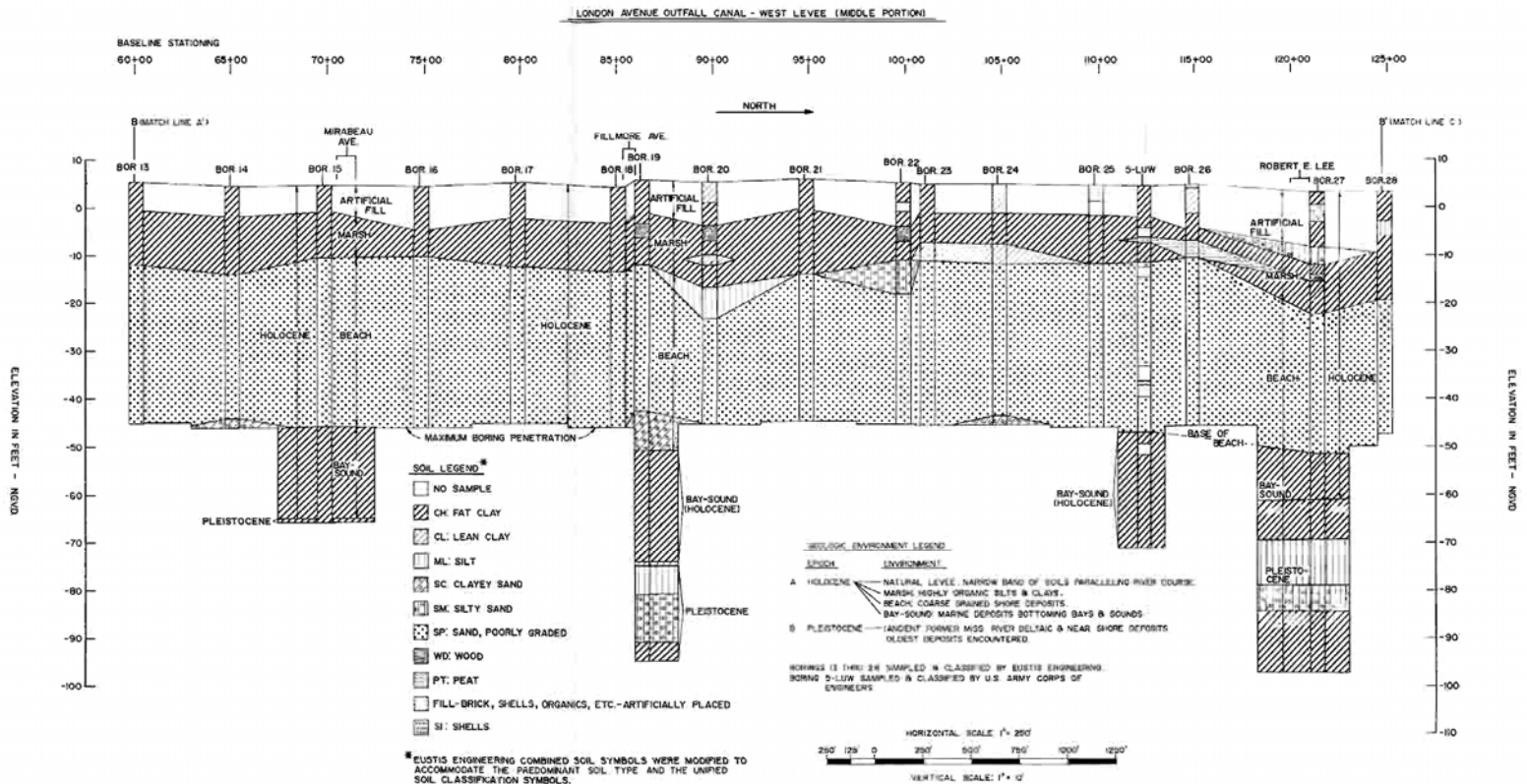
SPONSOR
BOARD OF STATE ENGINEERS OF LOUISIANA

1937

VOL. I.

old slough = crevasse ?





DATE: 2007-08-28

FILE NO: 4-2-10289

SCALE: 1" = 10'

DESIGN MEMORANDUM NO. 24 - GENERAL DESIGN
LONDON AVE. OUTFALL CANAL
ORLEANS PARISH

SOIL AND GEOLOGICAL PROFILE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

PLATE 38

The London Avenue Canal is underlain by a much thicker sequence of the Pine Island Beach Trend sands. These are overlain by the cypress swamp and marshy peats mashed within a fat clay matrix, recently deposited in the intertributary zone.