

# Loading Patterns in Varved Pleistocene Sediment in the NYC Area

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Consulting Engineers



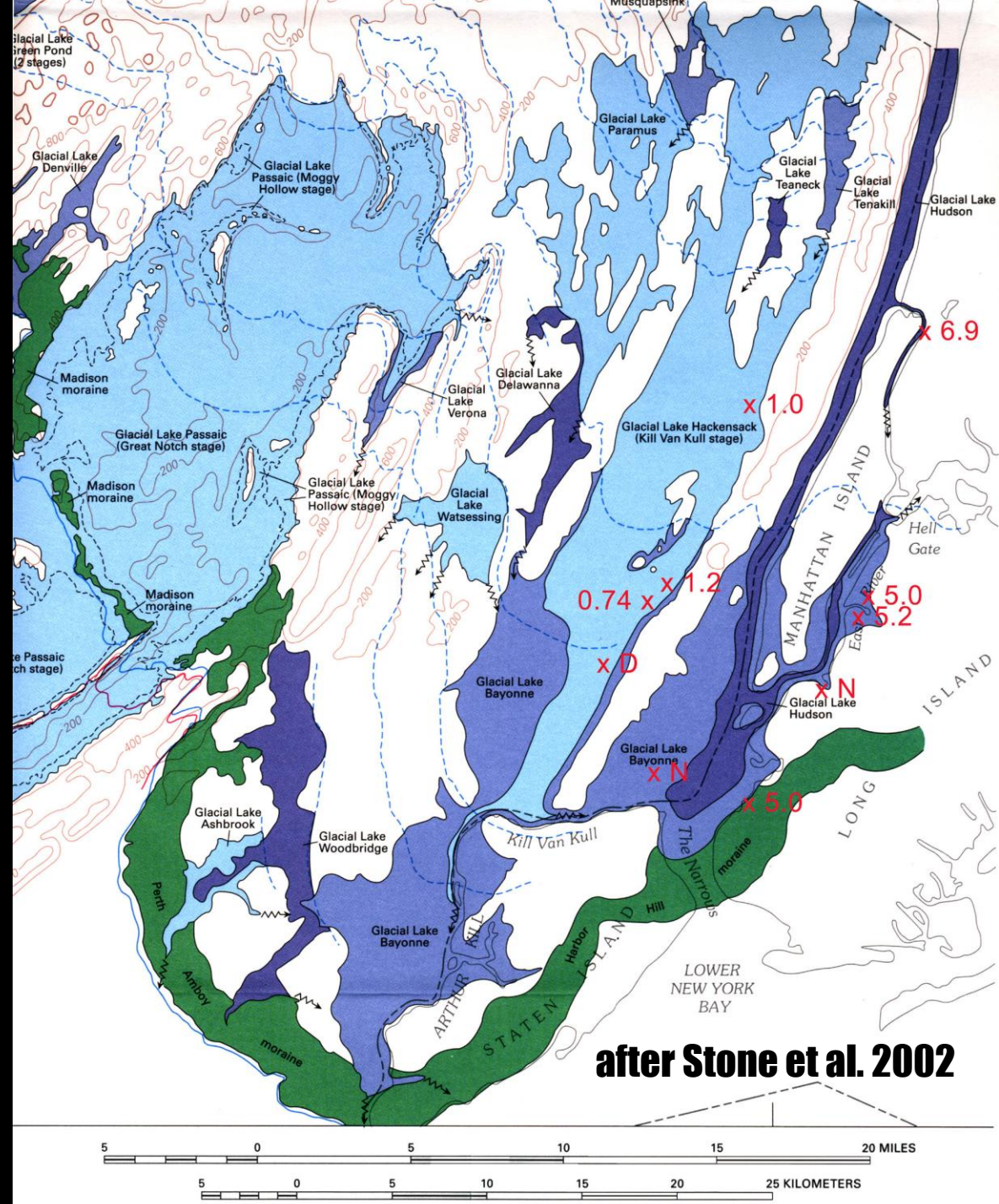
**Charles Merguerian**

Hofstra Geology

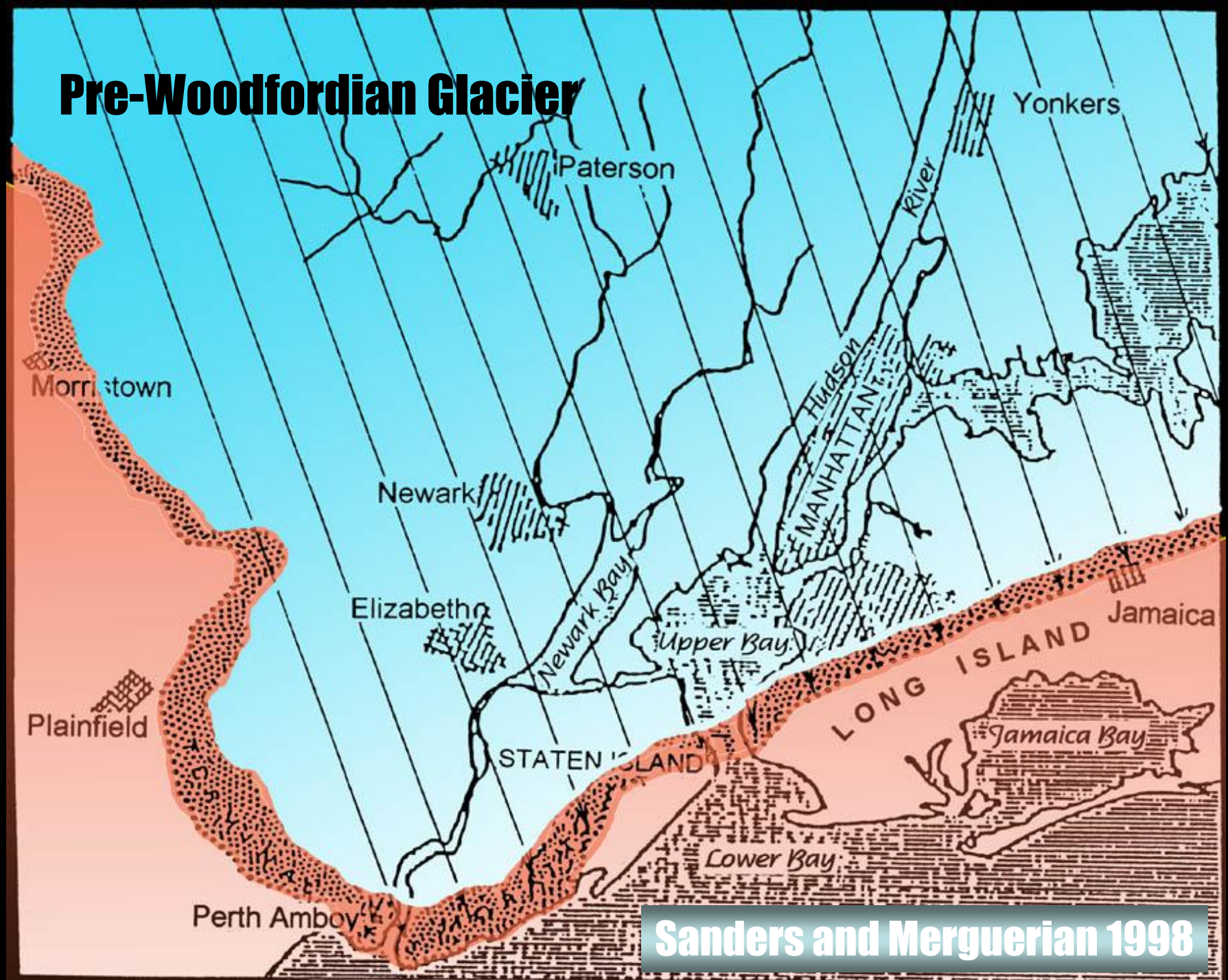


**NYC's Varved Soils  
Experienced Loads  
5-10 tsf > Existing  
Overburden**

**Concluded That  
A Younger Glacier  
Must Have Caused  
Excess Loading!**

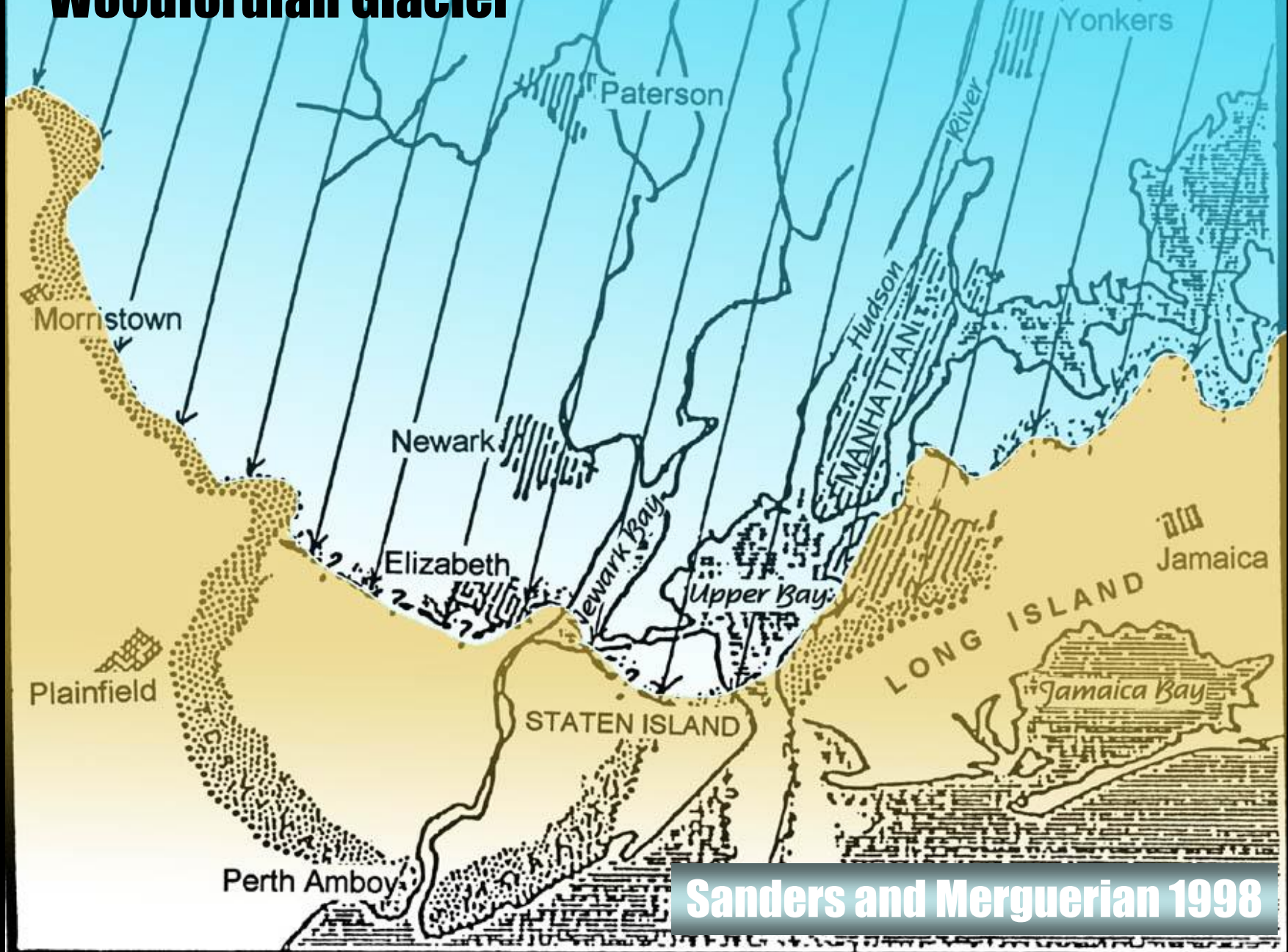


# Pre-Woodfordian Glacier



Sanders and Merguerian 1998

# Woodfordian Glacier



Sanders and Merguerian 1998

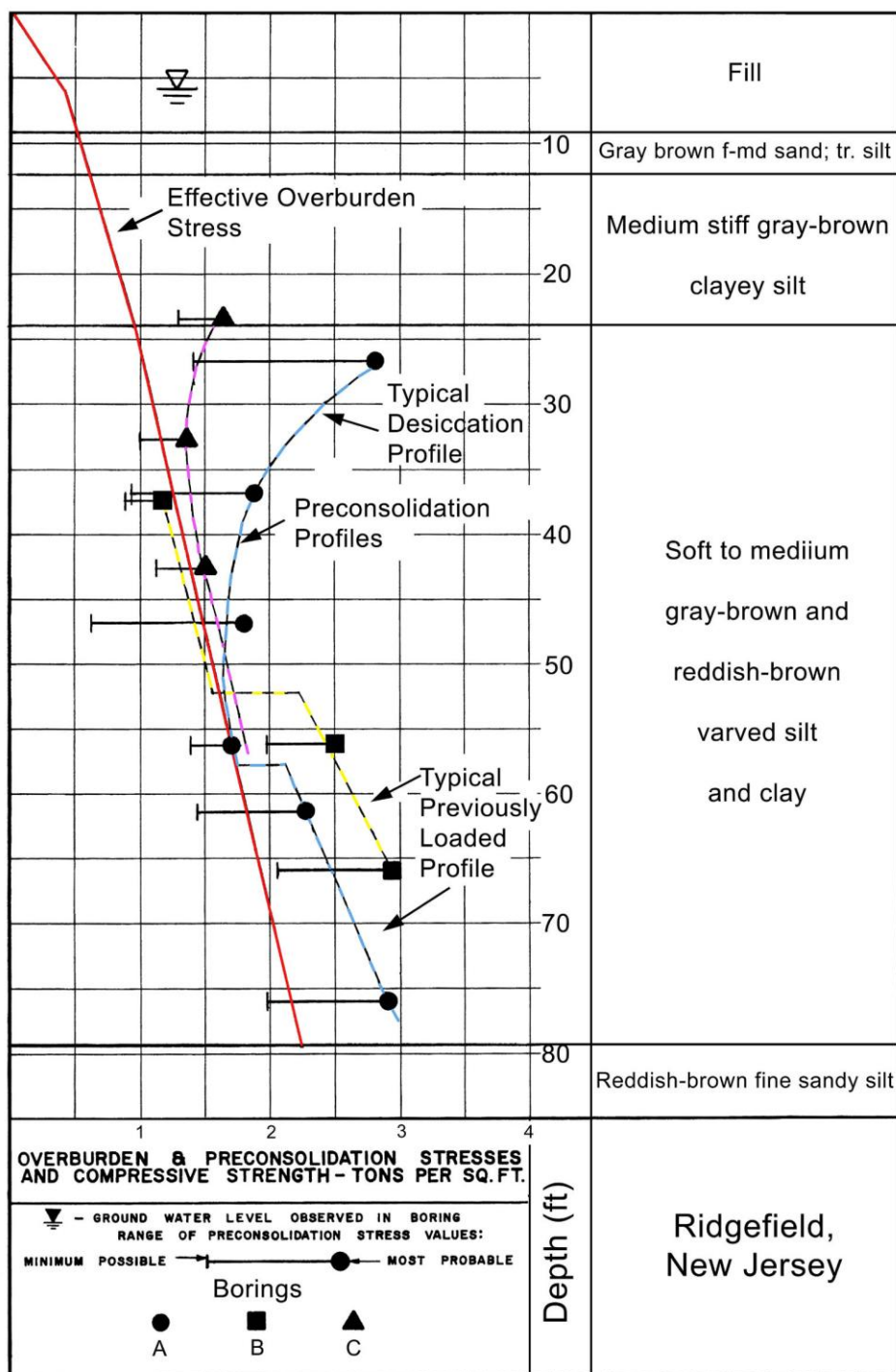
# Loading Mechanisms

1. Loading By Deposition Of Sediments Or Loading By Glacial Ice

2. Lowering Water Table

3. Soil Desiccation

4. Extreme Long-Term Settlement

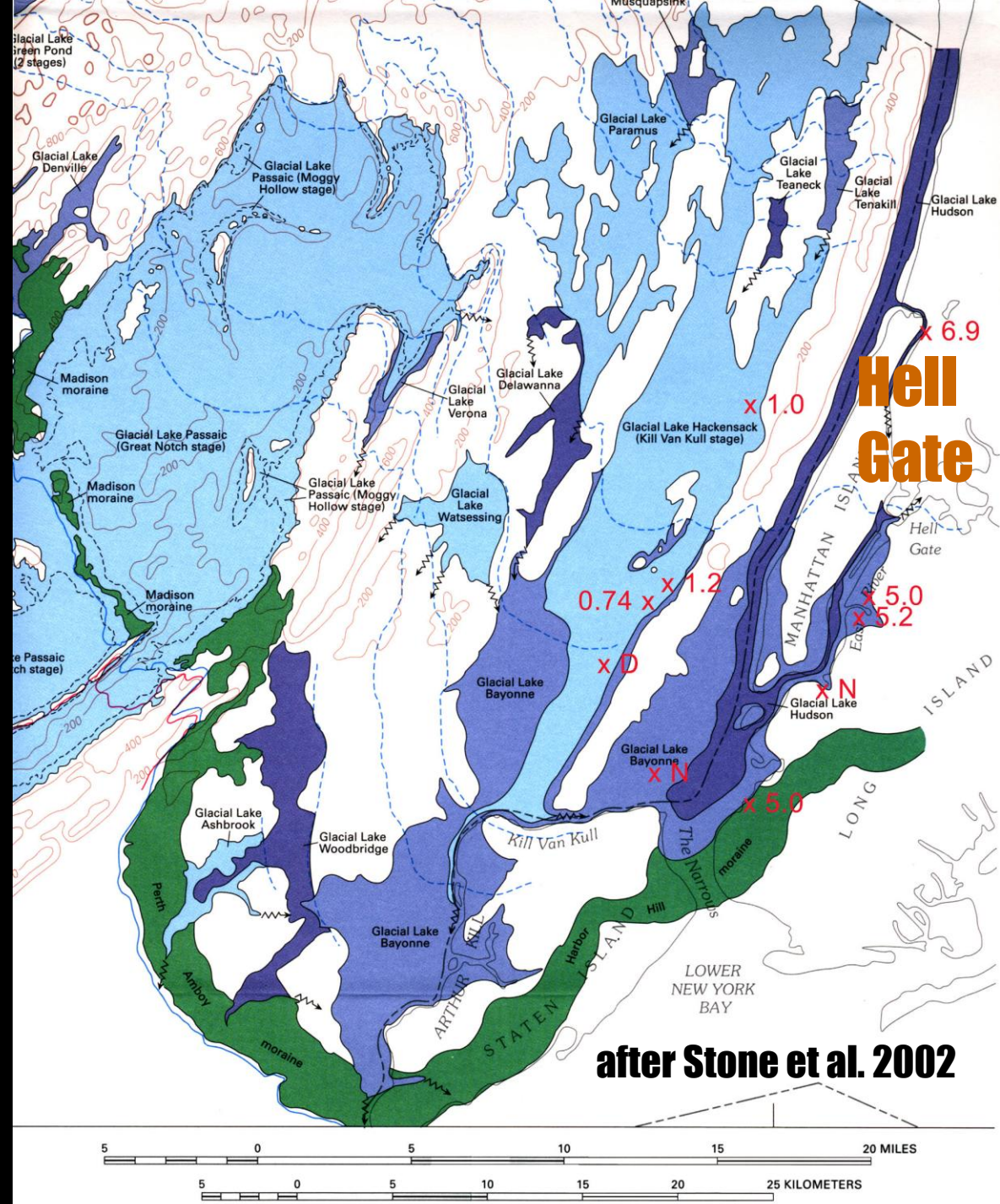


Lake Bayonne

Hell Gate Spillway

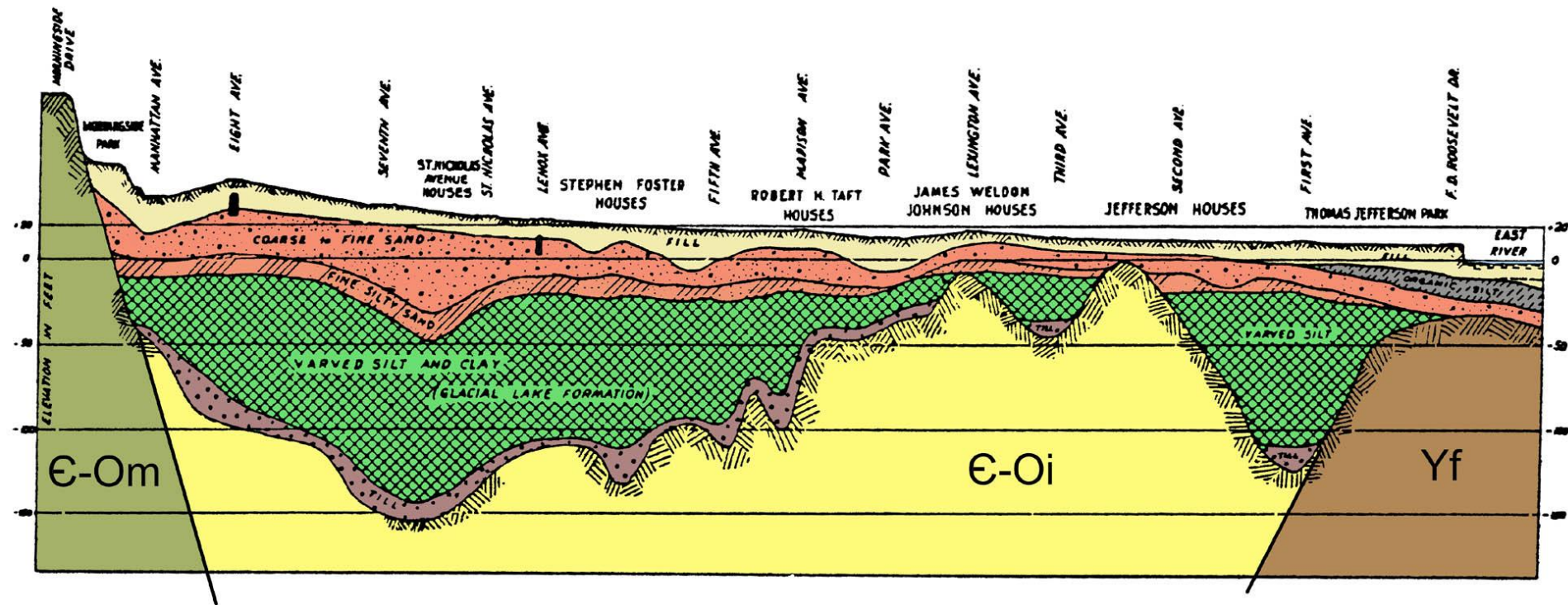
Lake Hackensack  
(West)

Lake Hudson  
(East)



# Typical NYC Soil Profile

## Fining Downward Sequence

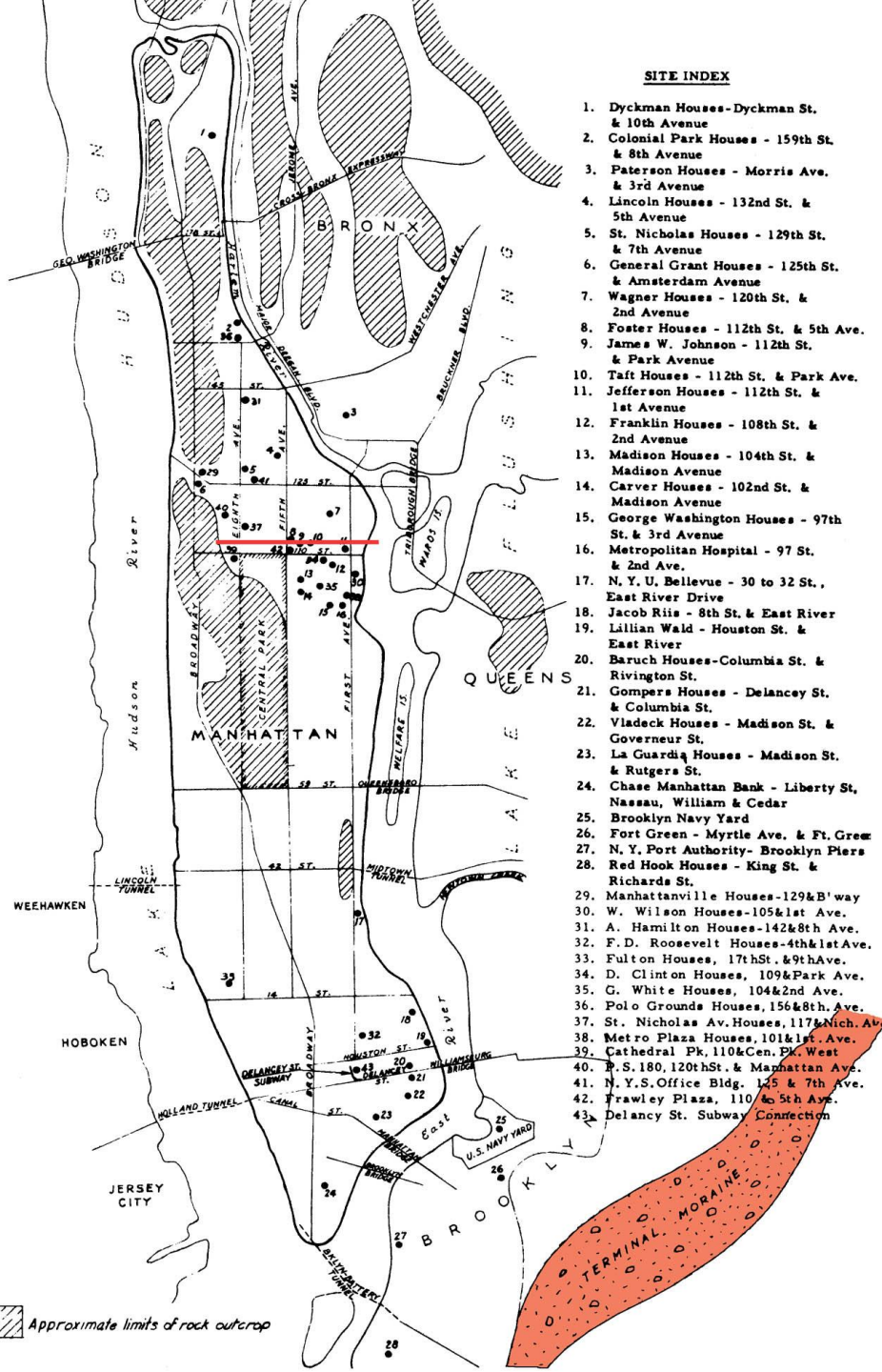


**W-E Section Across 113<sup>th</sup> Street (Parsons 1976)**

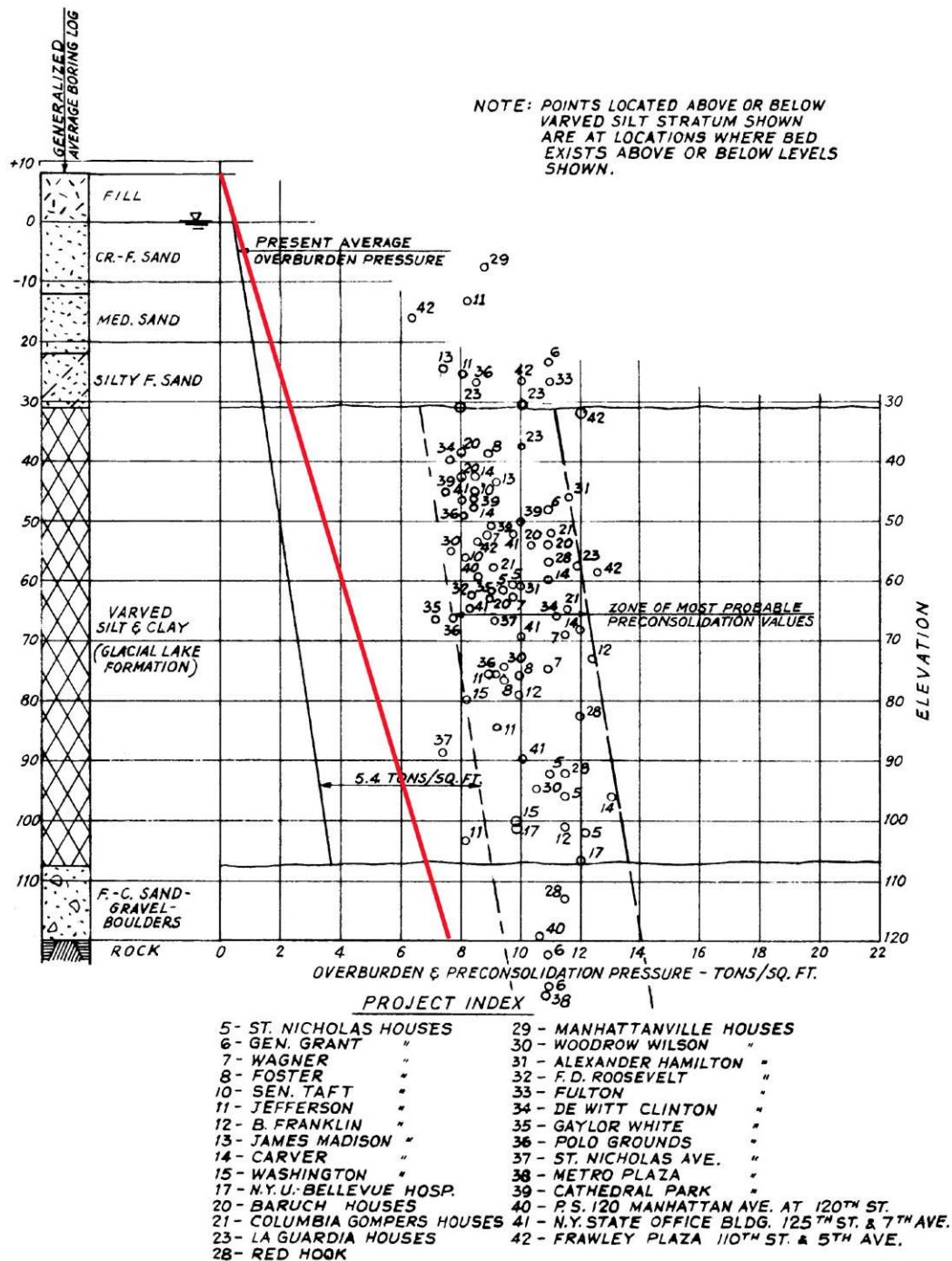
# SITE INDEX

1. Dyckman Houses-Dyckman St. & 10th Avenue
2. Colonial Park Houses - 159th St. & 8th Avenue
3. Paterson Houses - Morris Ave. & 3rd Avenue
4. Lincoln Houses - 132nd St. & 5th Avenue
5. St. Nicholas Houses - 129th St. & 7th Avenue
6. General Grant Houses - 125th St. & Amsterdam Avenue
7. Wagner Houses - 120th St. & 2nd Avenue
8. Foster Houses - 112th St. & 5th Ave.
9. James W. Johnson - 112th St. & Park Avenue
10. Taft Houses - 112th St. & Park Ave.
11. Jefferson Houses - 112th St. & 1st Avenue
12. Franklin Houses - 108th St. & 2nd Avenue
13. Madison Houses - 104th St. & Madison Avenue
14. Carver Houses - 102nd St. & Madison Avenue
15. George Washington Houses - 97th St. & 3rd Avenue
16. Metropolitan Hospital - 97 St. & 2nd Ave.
17. N. Y. U. Bellevue - 30 to 32 St., East River Drive
18. Jacob Riis - 8th St. & East River
19. Lillian Wald - Houston St. & East River
20. Baruch Houses-Columbia St. & Rivington St.
21. Gompers Houses - Delancey St. & Columbia St.
22. Vladeck Houses - Madison St. & Gouverneur St.
23. La Guardia Houses - Madison St. & Rutgers St.
24. Chase Manhattan Bank - Liberty St. Nassau, William & Cedar
25. Brooklyn Navy Yard
26. Fort Green - Myrtle Ave. & Ft. Green
27. N. Y. Port Authority- Brooklyn Piers
28. Red Hook Houses - King St. & Richards St.
29. Manhattanville Houses-129&B'way
30. W. Wilson Houses-105&1st Ave.
31. A. Hamilton Houses-142&8th Ave.
32. F.D. Roosevelt Houses-4th&1st Ave.
33. Fulton Houses, 17th St. & 9th Ave.
34. D. Clinton Houses, 109&Park Ave.
35. G. White Houses, 104&2nd Ave.
36. Polo Grounds Houses, 156&8th Ave.
37. St. Nicholas Av. Houses, 117&Nich. Ave.
38. Metro Plaza Houses, 101&1st Ave.
39. Cathedral Pk, 110&Cen. Pk. West
40. P.S. 180, 120th St. & Manhattan Ave.
41. N. Y. S. Office Bldg. 125 & 7th Ave.
42. Frawley Plaza, 110 & 5th Ave.
43. Delancey St. Subway Connection

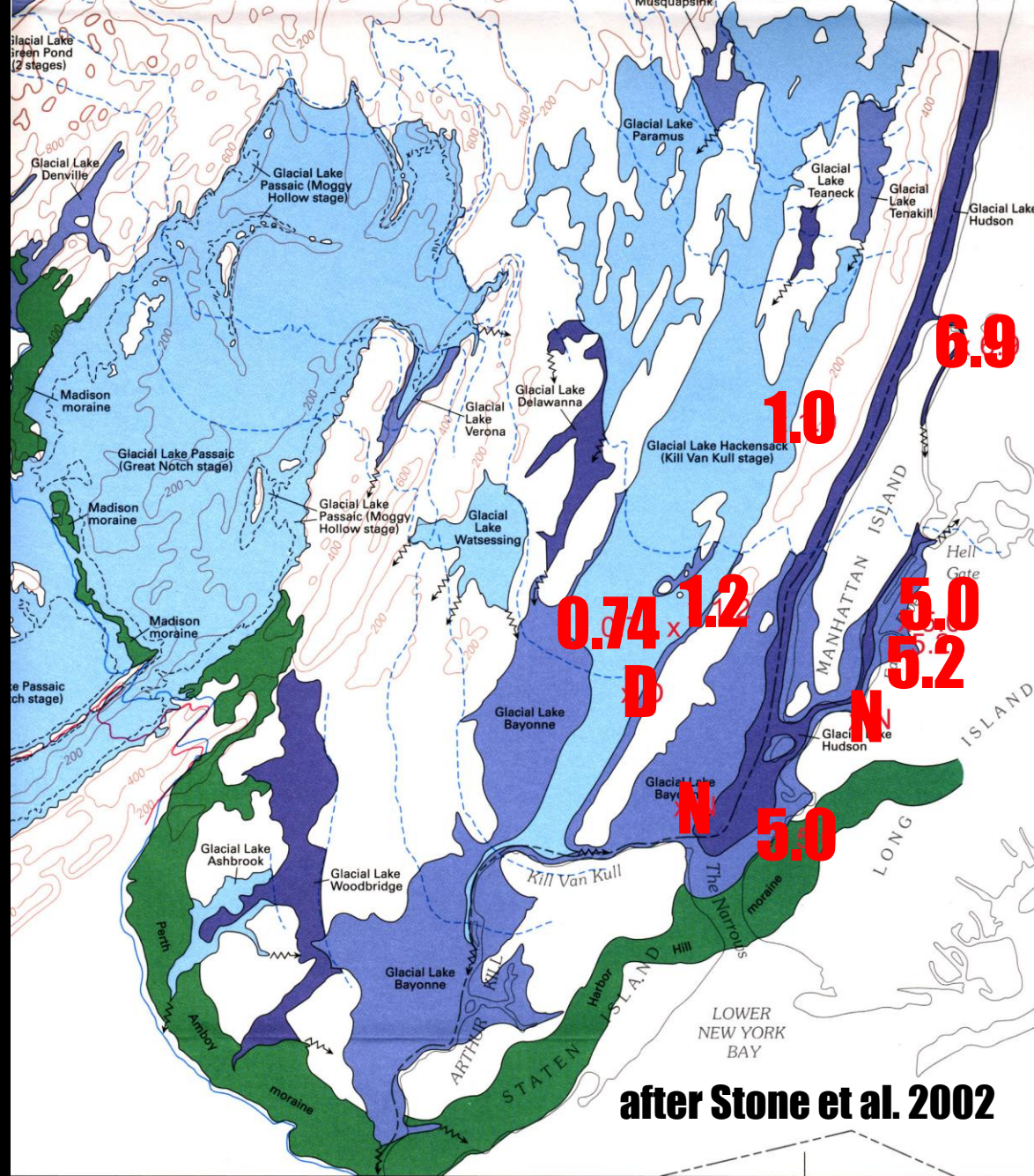
## Parsons Studied NYC Housing Project Data Concentrated In Harlem Valley



# NYC PROFILE



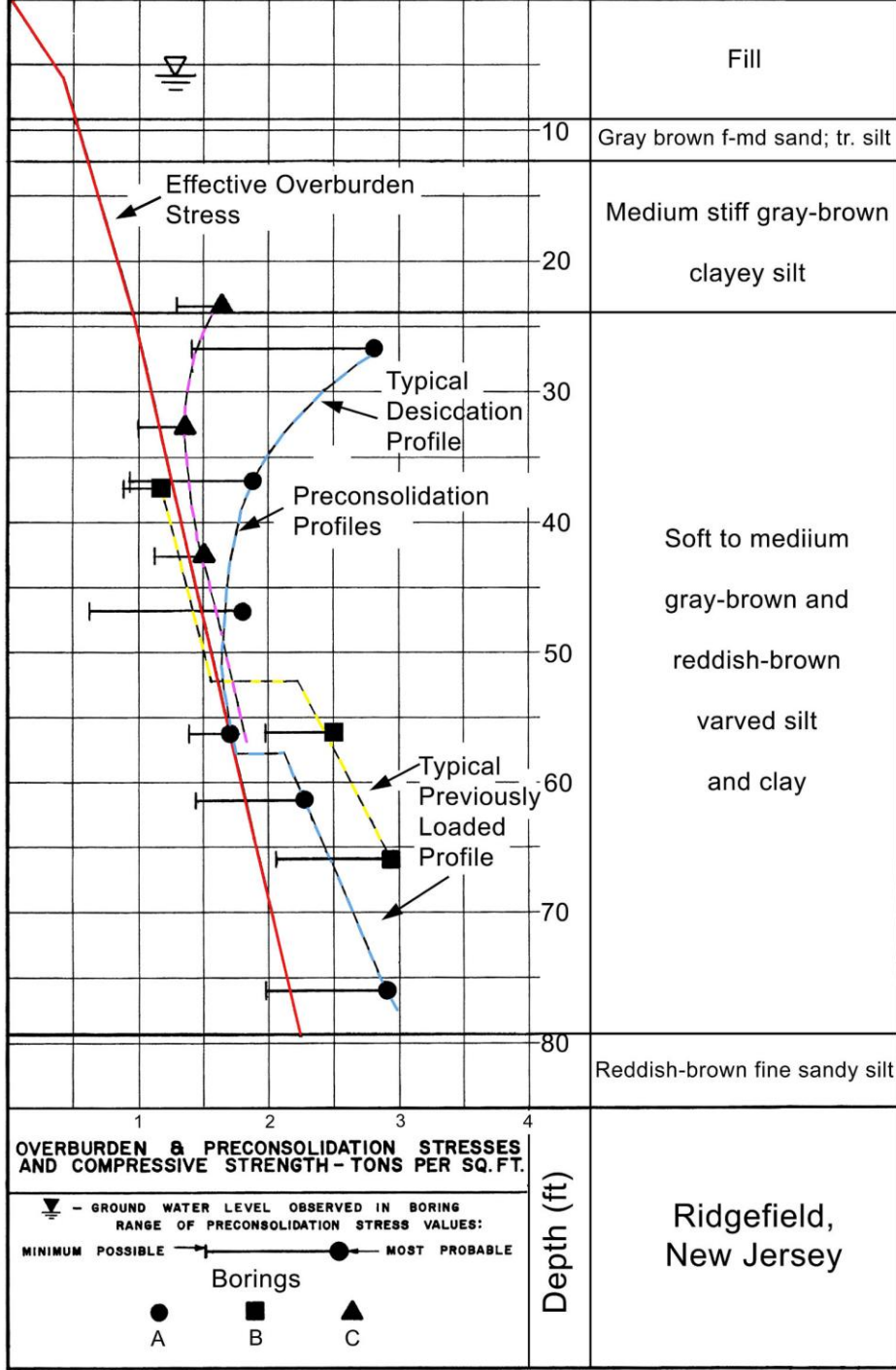
- Overconsolidated by 5-10 tsf
- Equivalent to 80' - 350' of Eroded Soil
- Dropping Water Level To Bedrock Increases Load by **Only 3.5 tsf!**
- Points Do Not Follow Curves For Desiccation or Long-Term Settlement



after Stone et al. 2002

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 KILOMETERS



**NJ Profile Different From NYC Profile**

**Desiccation Profile At Surface**

**Deeper Soil Previously Loaded By 0.75 - 1.0 tsf**

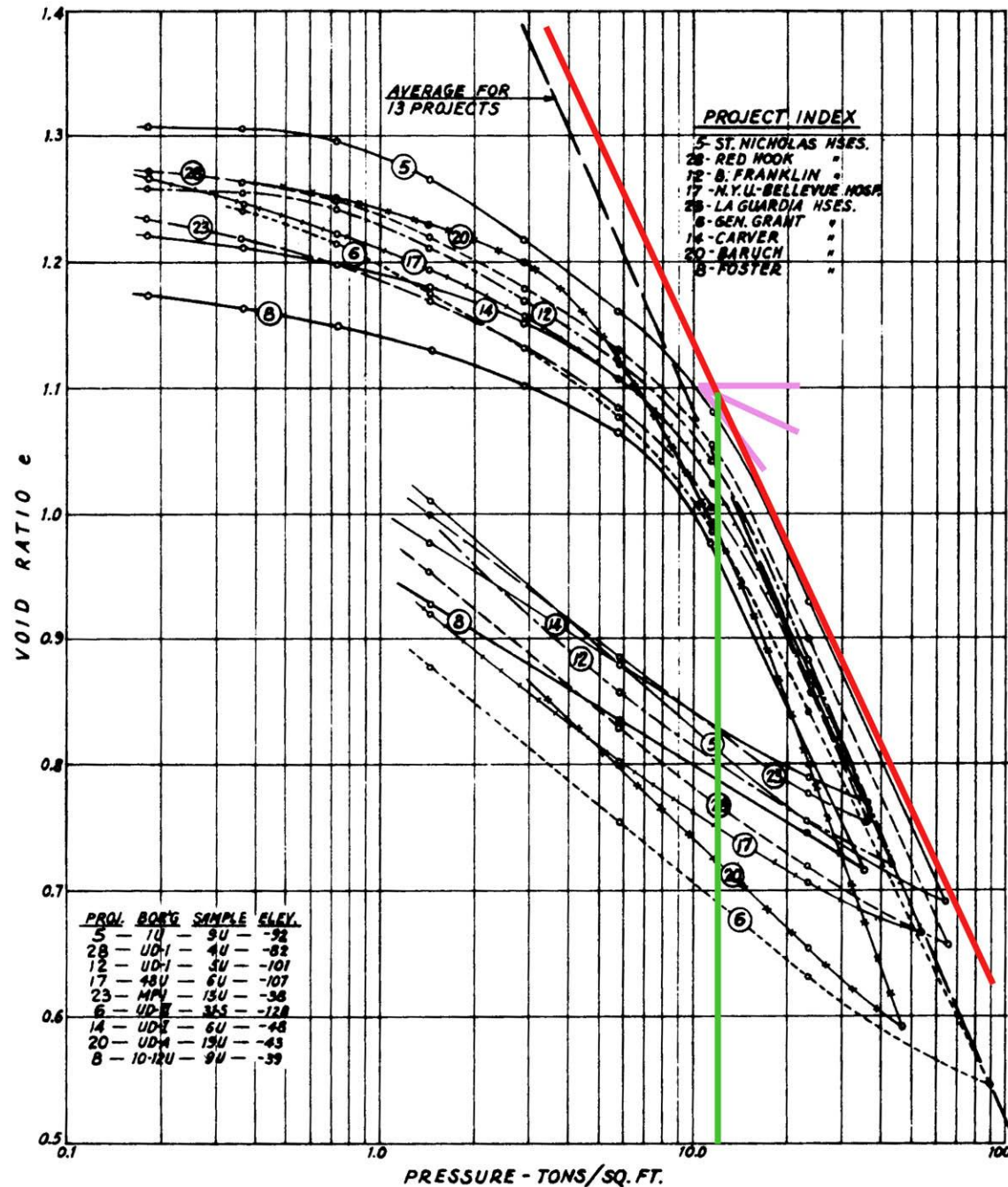
Ridgefield,  
New Jersey

# Future Loading Problems?



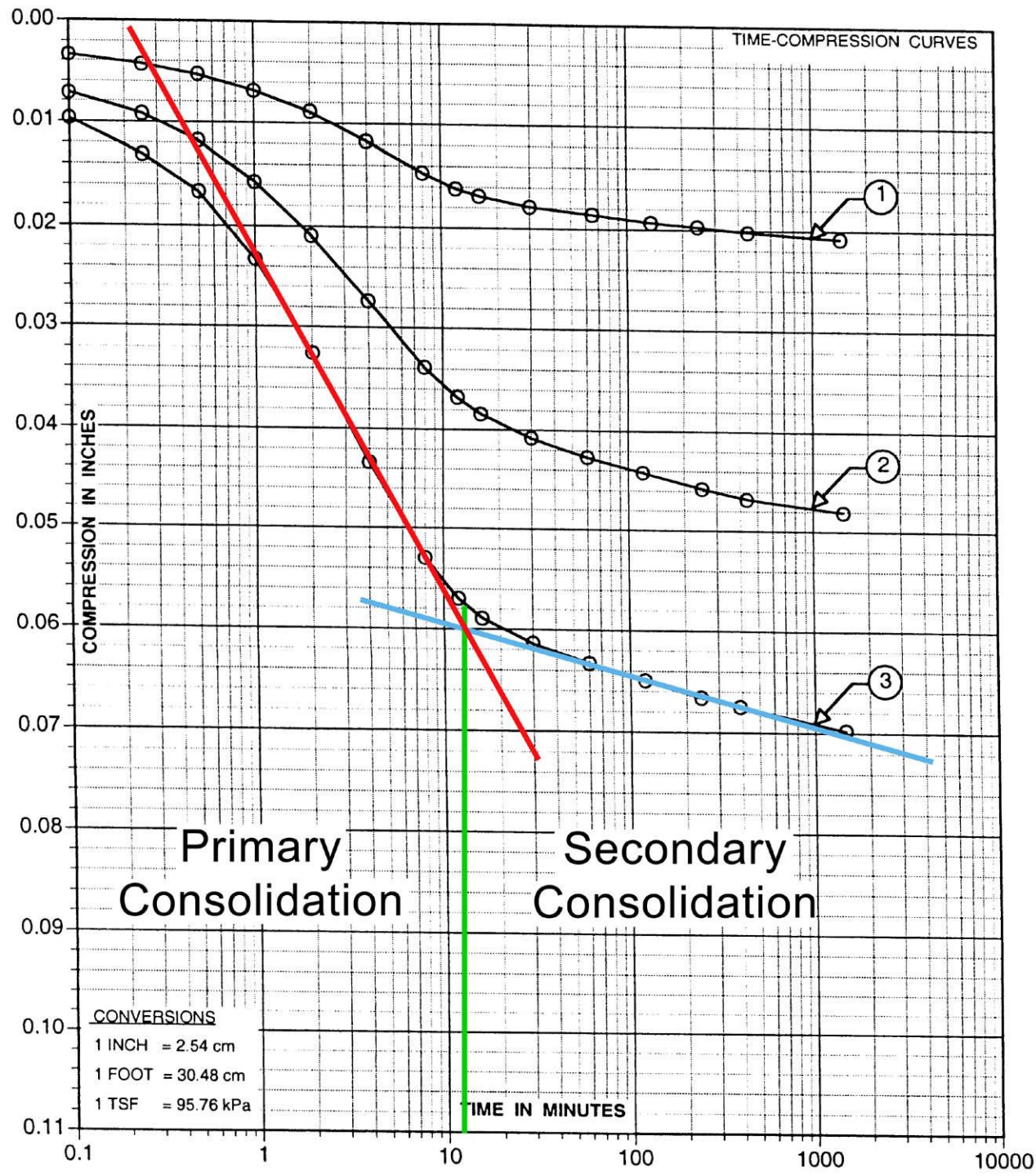


# CLAY FRACTION



## Typical Consolidation Curves for NYC Varved Clays

Used to Determine the Maximum Pressure Soil Was Previously Loaded



# Typical Time-Compression Curves for a Varved Silty Clay

Rapid Initial Compression Followed by Slow Long-Term Compression

