Newly Discovered Ophiolite Scrap in the Hartland Formation of Midtown Manhattan

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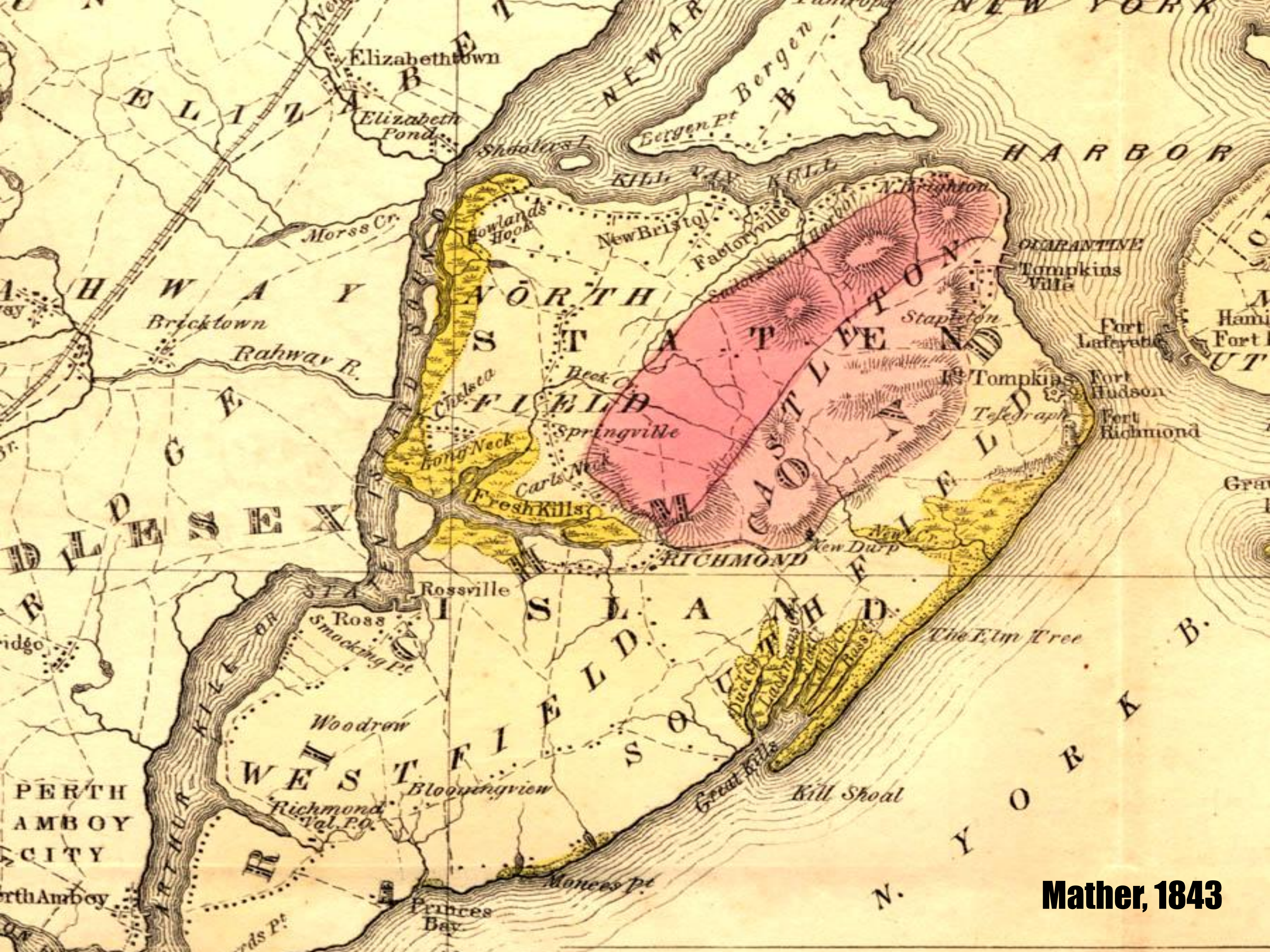
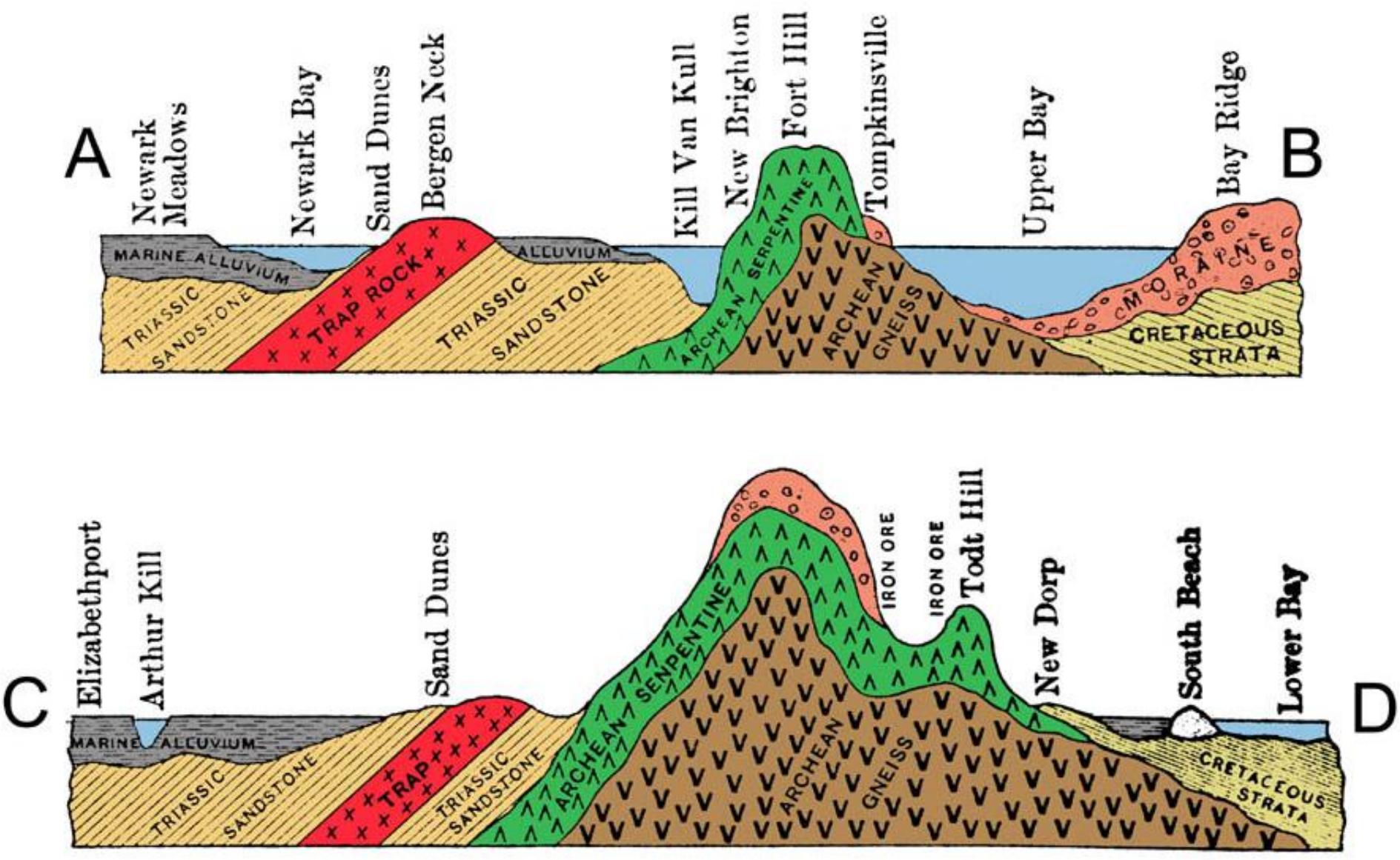
Consulting Engineers


Elizabethtown
Elizabeth Pond
Shooters I.
Bergen Pt
Bergen
NEWARK
HARBOR
NEW YORK
KILL VAN KULL
N. Brighton
New Bristol
Factoryville
Howlands Hook
Morss Cr.
QUARANTINE
Tompkins Ville
Stapleton
Fort Lafayette
Bricktown
Rahway R.
NORTH
FIELD
STATEN
ISLAND
CASTLETON
Chelsea
Springville
Long Neck
Carls Neck
Fresh Kills
Ft. Tompkins
Fort Hudson
Telegraph
Fort Richmond
RICHMOND
New Dorp
New Cr.
Rossville
Ross
Smocking Pt
SOUTH FIELD
Duck Cr.
The Elm Tree
WEST FIELD
Woodrow
Bloomingview
Richmond Val. P.O.
Great Kills
Kill Shoal
N. YORK B.
PERTH AMBOY CITY
Princes Bay
Monees Pt
MIDDLESEX

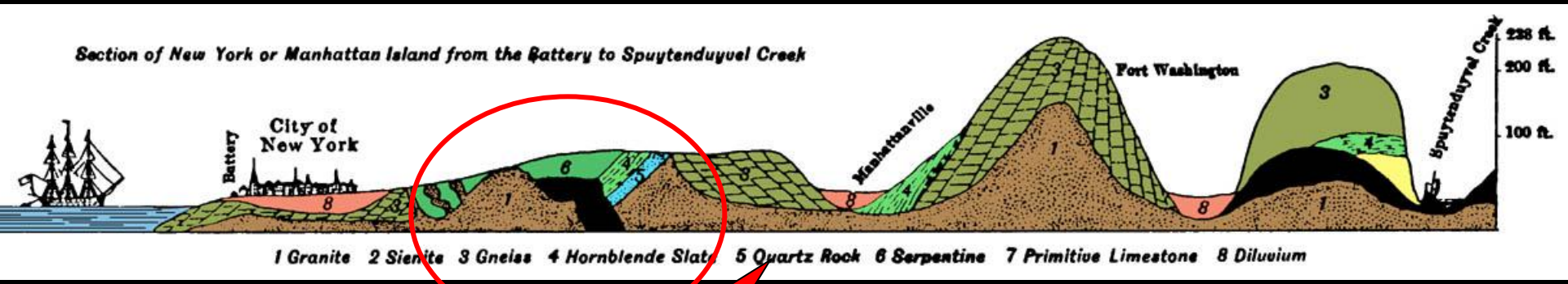
Mather, 1843

Staten Island Serpentinite



after Britton, 1881

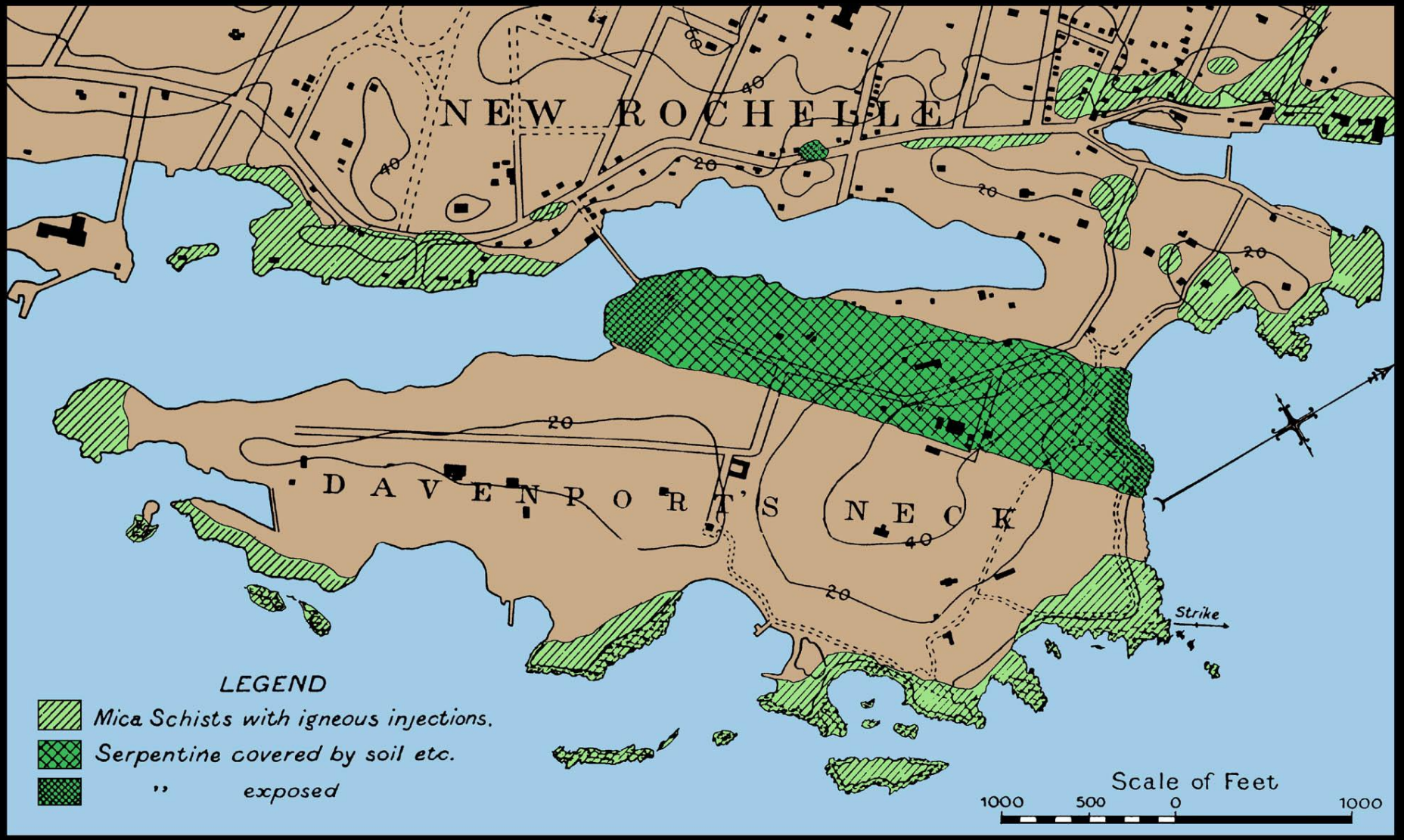
Manhattan Island Serpentinite



Also Discussed by Gratacap (1887) and Merrill et al (1902)

after Cozzens, 1843

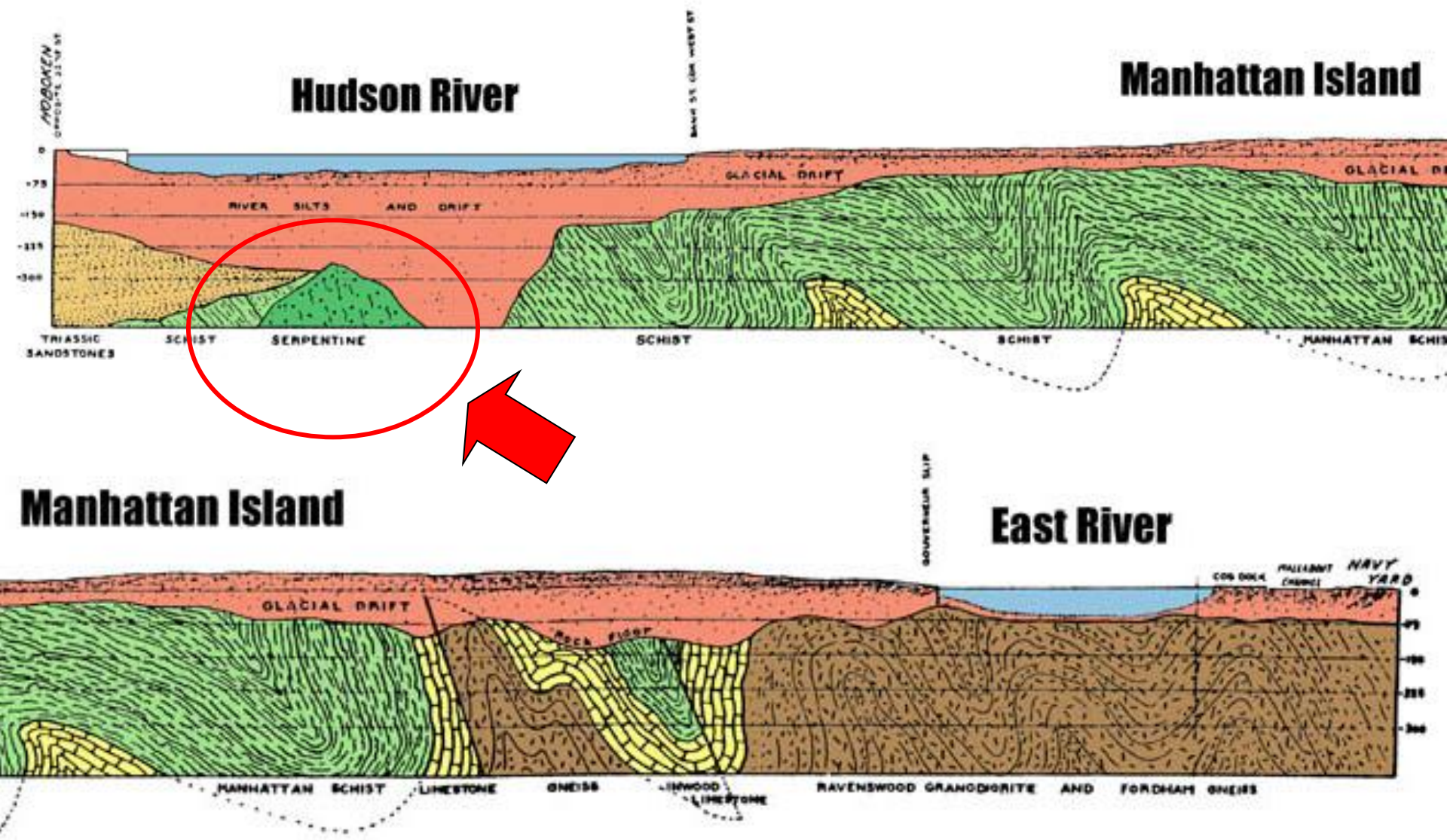
Davenport Neck Serpentinite



Similar in Size and Setting to Rye Body!

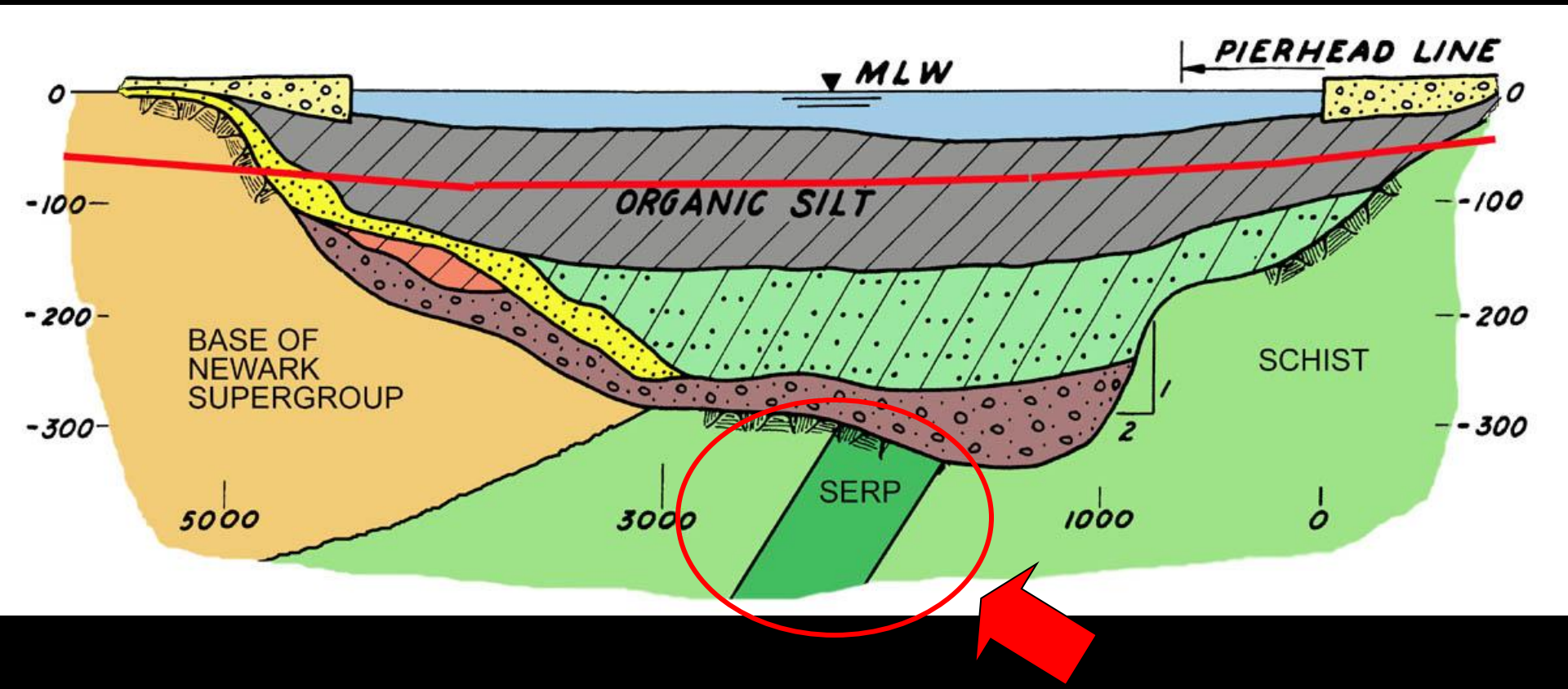
Merrill, 1898

Hudson River - Hoboken NJ Serpentinite



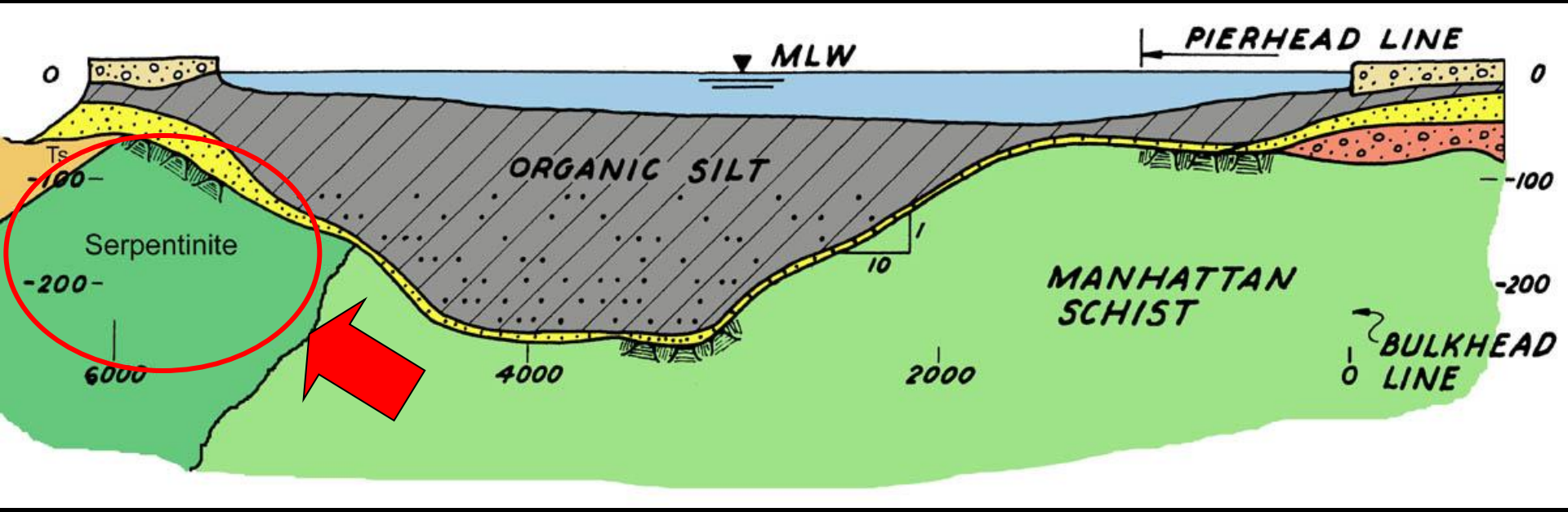
after Berkey, 1910

Pennsylvania Railroad Serpentinite Hudson Crossing at 34th Street

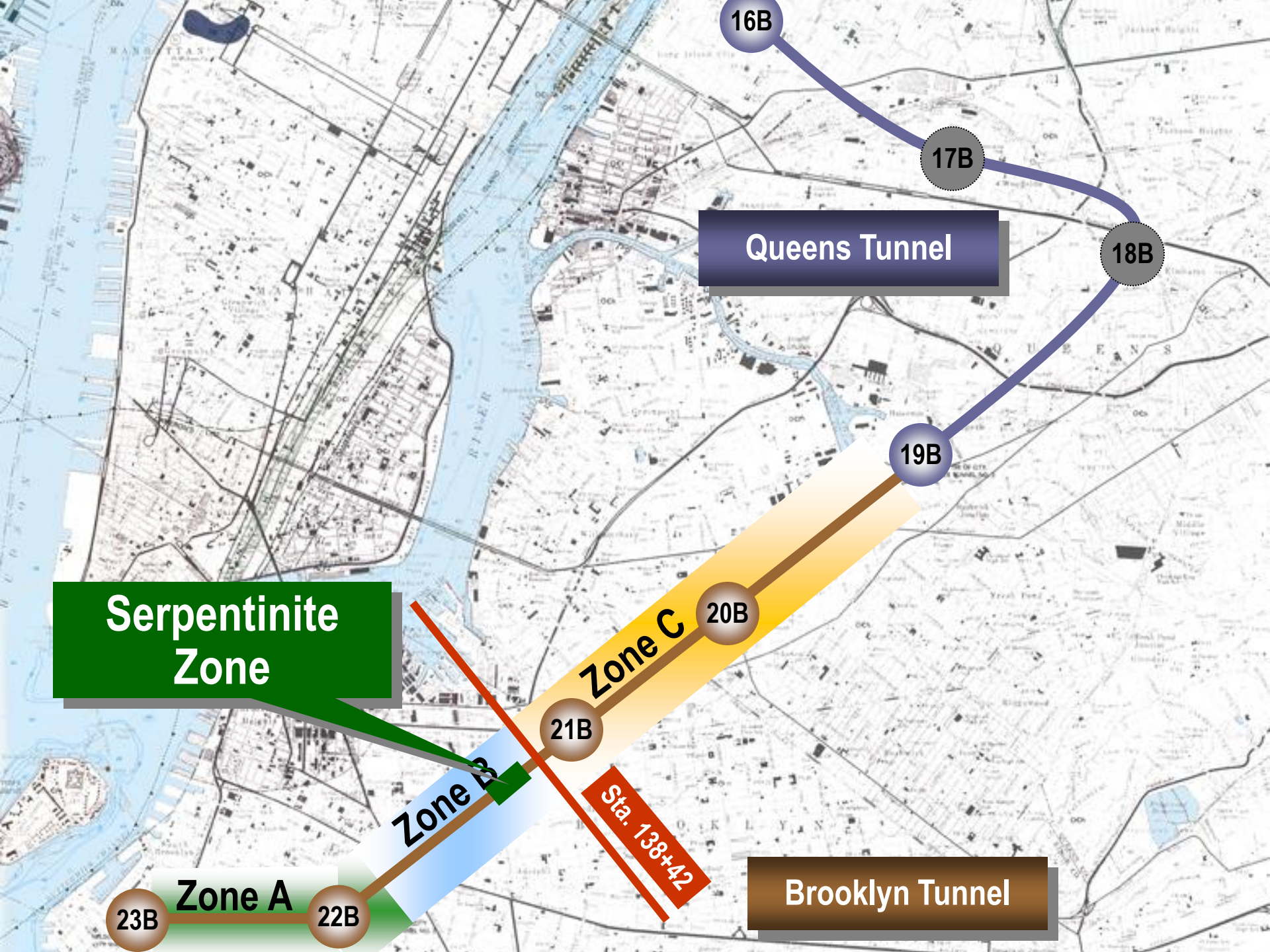


Base diagram after Mueser-Rutledge Consultants after Berkey 1910, 1933

Holland Tunnel Serpentinite

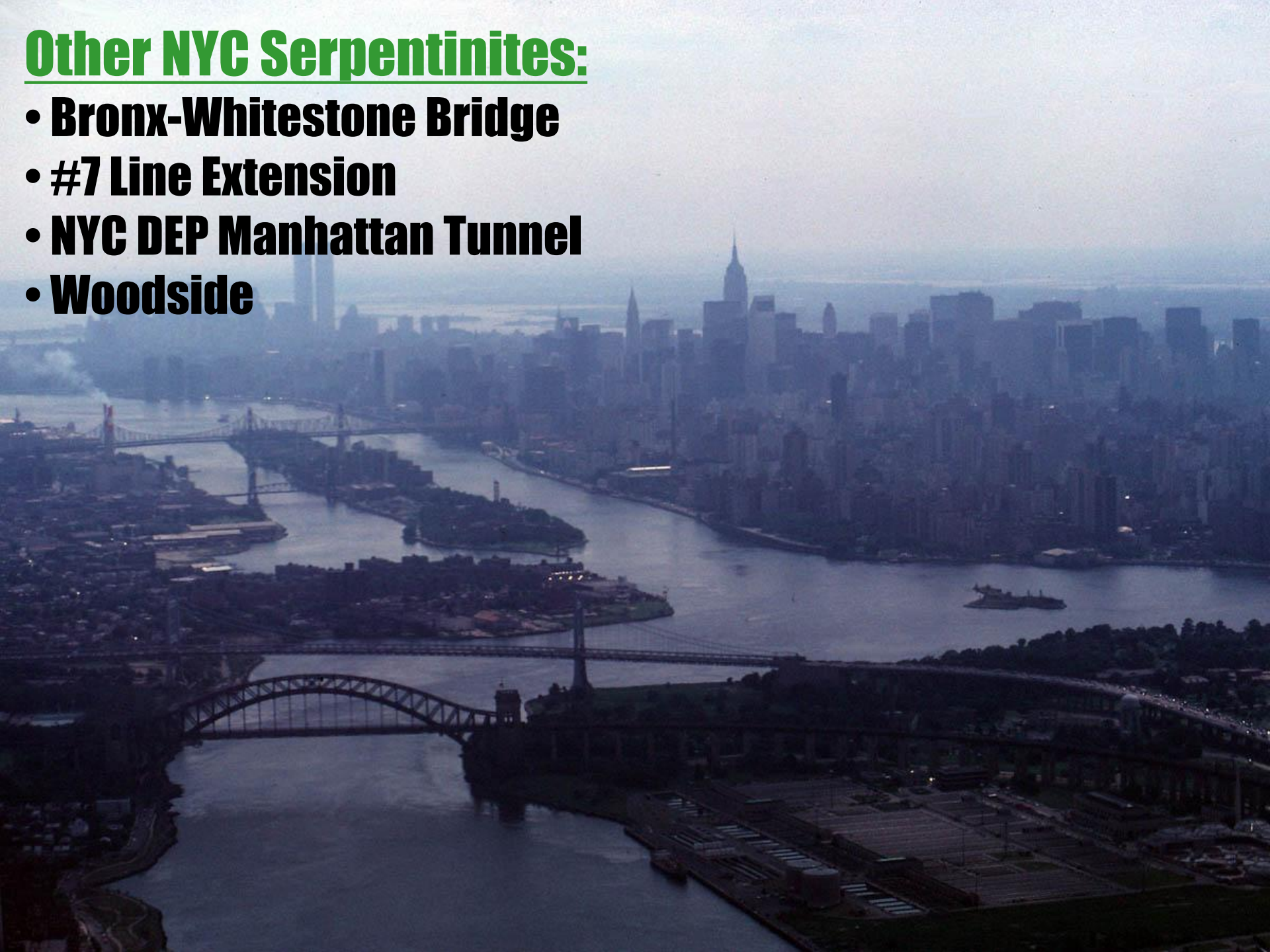


Base diagram after Mueser-Rutledge Consultants
Some data from Worzel and Drake (1959)


16B
17B
Queens Tunnel
18B
19B
Serpentinite Zone
Zone C
20B
21B
Zone B
Sta. 138+42
Zone A
23B
22B
Brooklyn Tunnel

Brooklyn Tunnel Serpentinite Zone

Brooklyn Tunnel – Sta. 128+30



Other NYC Serpentinites:

- Bronx-Whitestone Bridge
- #7 Line Extension
- NYC DEP Manhattan Tunnel
- Woodside


One Bryant
Park Site
December 2004


Our First Look

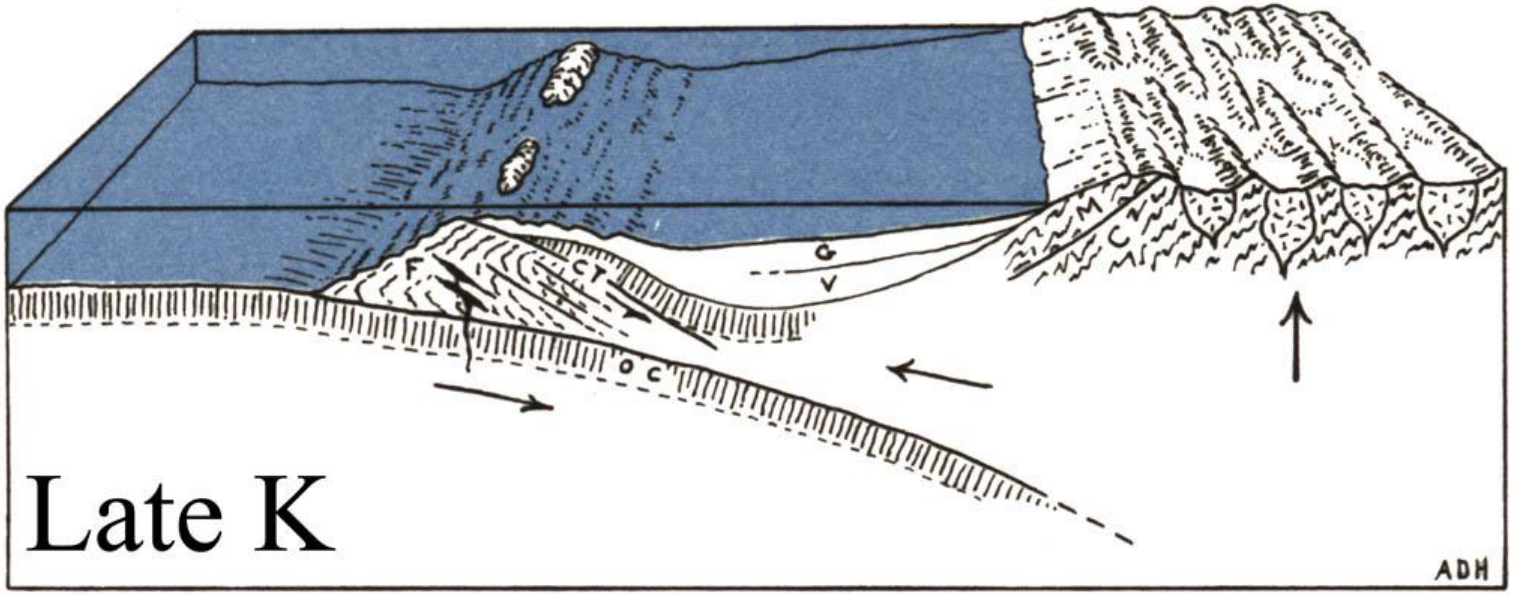
Sheared Western Margin

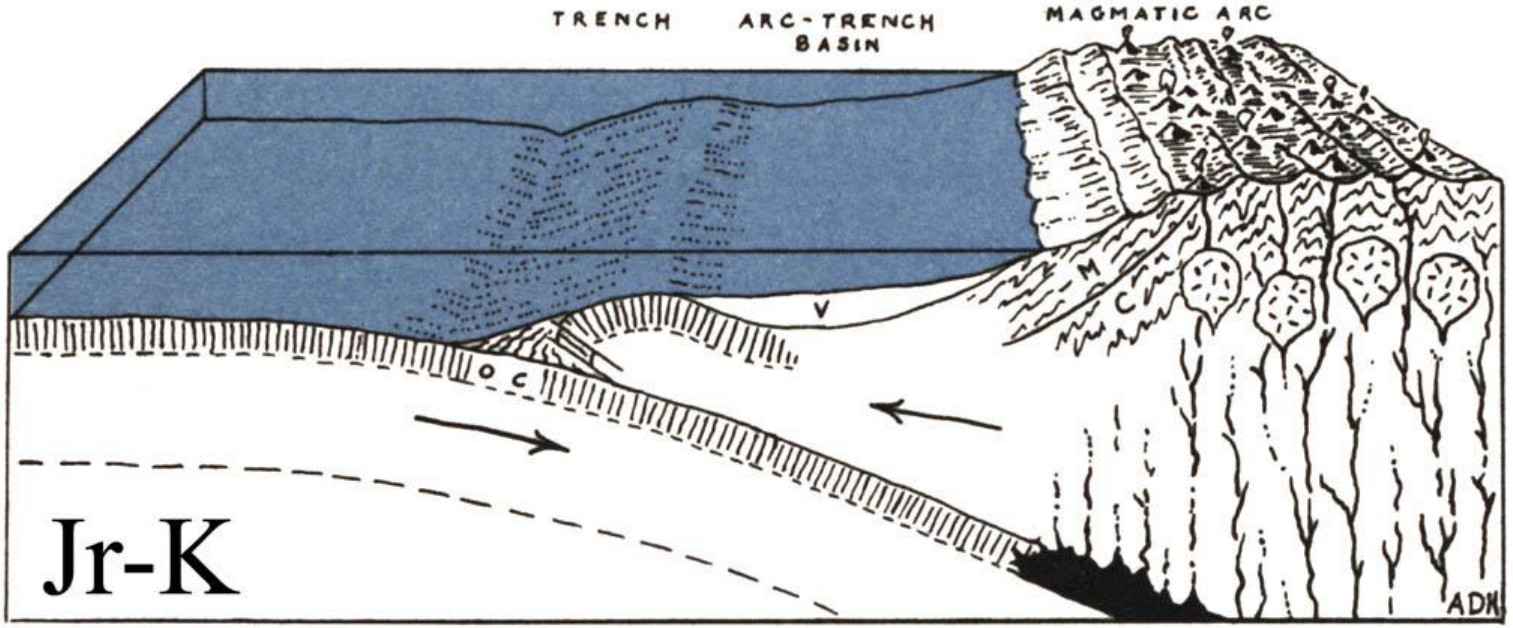

Our Last Look

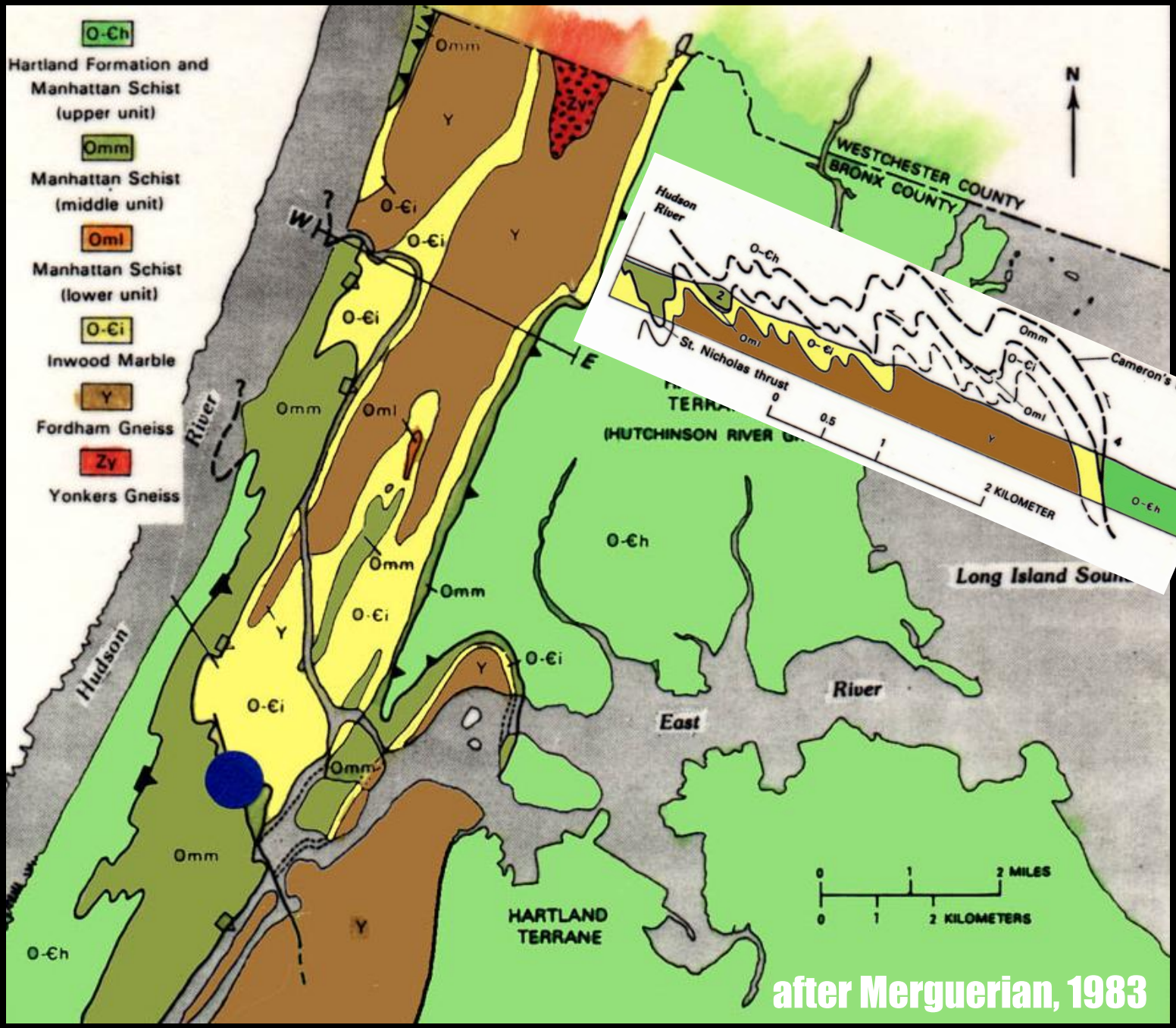
California Coast Ranges

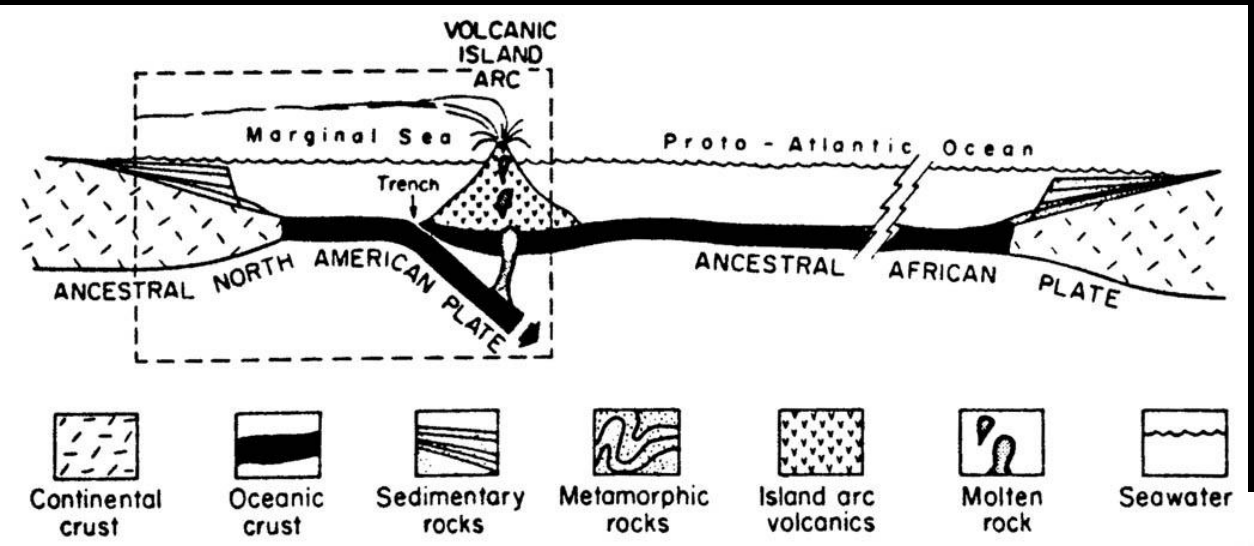

Serpentinite
24 May 2004

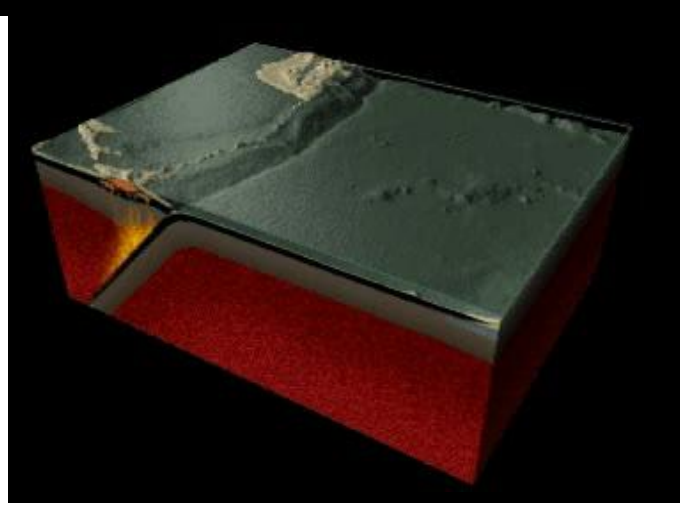

Franciscan Complex

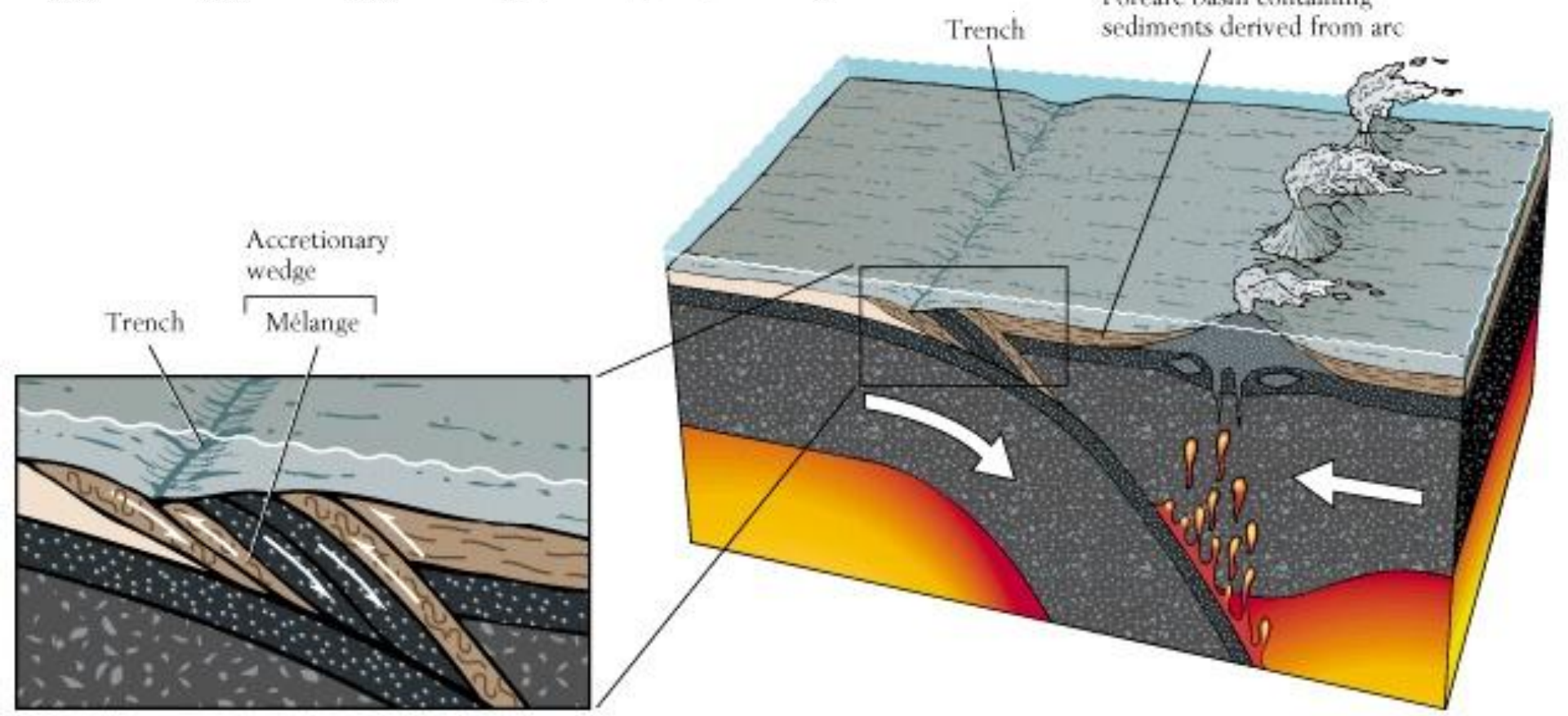

F
CT
Q
V
OC
M
C
Late K
ADH


TRENCH
ARC-TRENCH BASIN
MAGMATIC ARC
V
OC
M
C
Jr-K
ADH

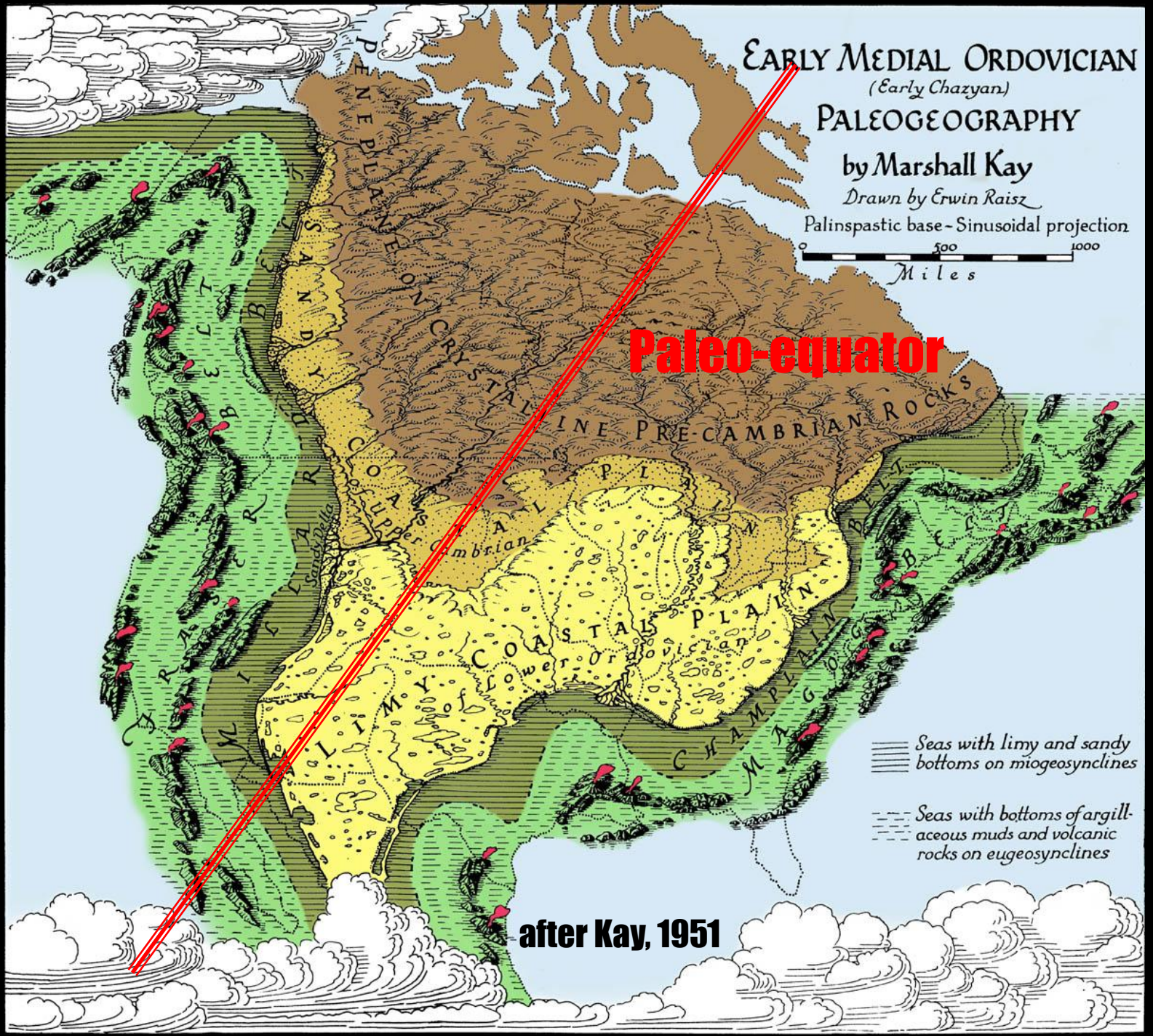

O-Ch
Hartland Formation and Manhattan Schist (upper unit)
Omm
Manhattan Schist (middle unit)
Oml
Manhattan Schist (lower unit)
O-Ci
Inwood Marble
Y
Fordham Gneiss
Zy
Yonkers Gneiss
N
WESTCHESTER COUNTY
BRONX COUNTY
Hudson River
O-Ch
Oml
O-Ci
Omm
Y
St. Nicholas thrust
Cameron's Line
0
0.5
1
2 KILOMETER
O-Ch
TERRANE
(HUTCHINSON RIVER
Long Island Sound
Hudson River
East River
HARTLAND TERRANE
0 1 2 MILES
0 1 2 KILOMETERS
after Merguerian, 1983


VOLCANIC ISLAND ARC
Marginal Sea
Proto - Atlantic Ocean
Trench
ANCESTRAL NORTH AMERICAN PLATE
ANCESTRAL AFRICAN PLATE
Continental crust
Oceanic crust
Sedimentary rocks
Metamorphic rocks
Island arc volcanics
Molten rock
Seawater

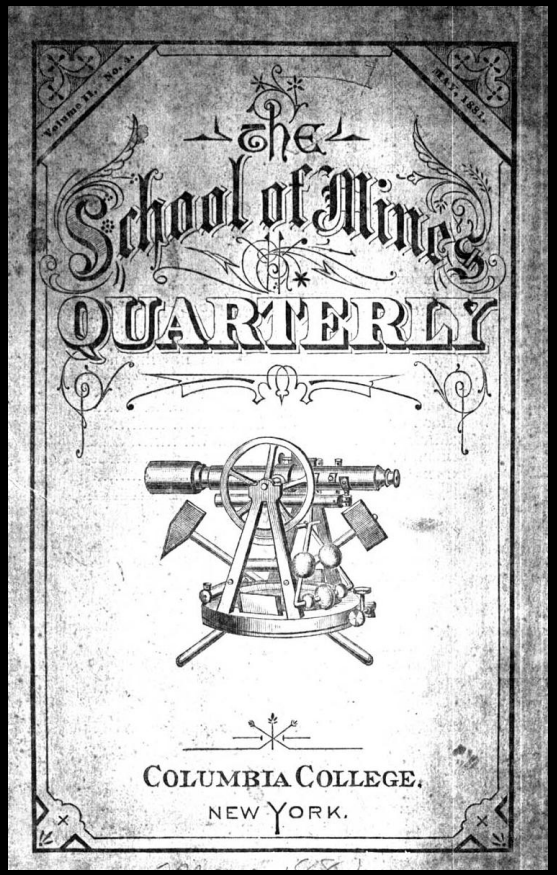



Trench
Forearc basin containing sediments derived from arc
Accretionary wedge
Trench
Mélange

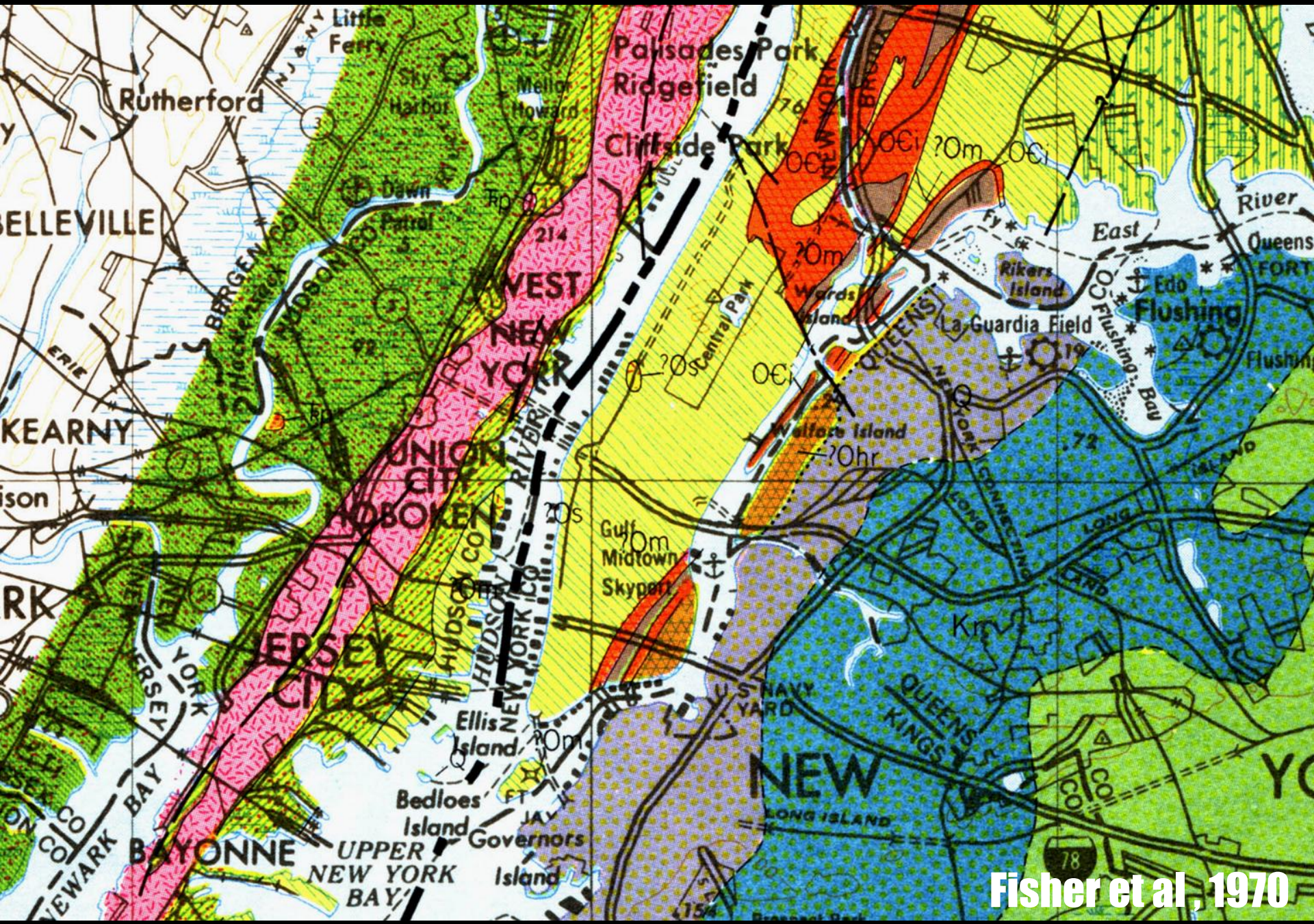
Thanks For Coming To Stonybrook!


EARLY MEDIAL ORDOVICIAN
(Early Chazyan)
PALEOGEOGRAPHY
by Marshall Kay
Drawn by Erwin Raisz
Palinspastic base - Sinusoidal projection
0
500
1000
Miles
Paleo-equator
after Kay, 1951
PENEPLANED CRYSTALLINE PRE-CAMBRIAN ROCKS
SANDY BELT
COASTAL PLAIN of Upper Cambrian
LIMY COASTAL PLAIN of Lower Ordovician
CHAMPLAIN MAGOG BELT
APPALACHIAN GEOSYNCLINE BELT
Seas with limy and sandy bottoms on miogeosynclines
Seas with bottoms of argillaceous muds and volcanic rocks on eugeosynclines

Staten Island



after N. L. Britton, 1881


Rutherford
Little Ferry
Palisades Park
Ridgefield
Cliffside Park
BELLEVILLE
KEARNY
WEST NEW YORK
UNION CITY
HOBOKEN
JERSEY CITY
BAYONNE
Rikers Island
La Guardia Field
Flushing
Central Park
Wards Island
Welfare Island
Gulf Midtown Skyport
Ellis Island
Bedloes Island
Governors Island
UPPER NEW YORK BAY
U.S. NAVY YARD
NEW
LONG ISLAND
QUEENS
KINGS
East River
Flushing Bay
Fisher et al , 1970


Serpentinite


Franciscan Complex