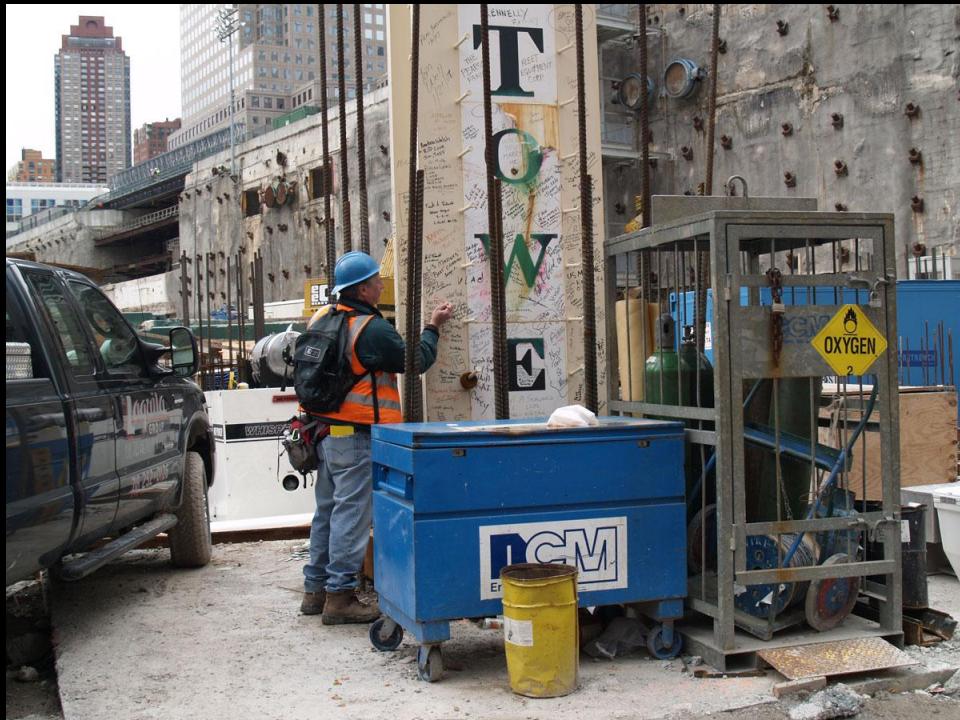


# Structural Geology and Metamorphism of the World Trade Center Site

Charles Merguerian -  
Hofstra University Geology Dept.  
Cheryl Moss – Mueser-Rutledge  
Consultantanting Engineers



**Thanks To:**

**Bob Reina**

**Pablo Lopez**

**Jim Tantalla**

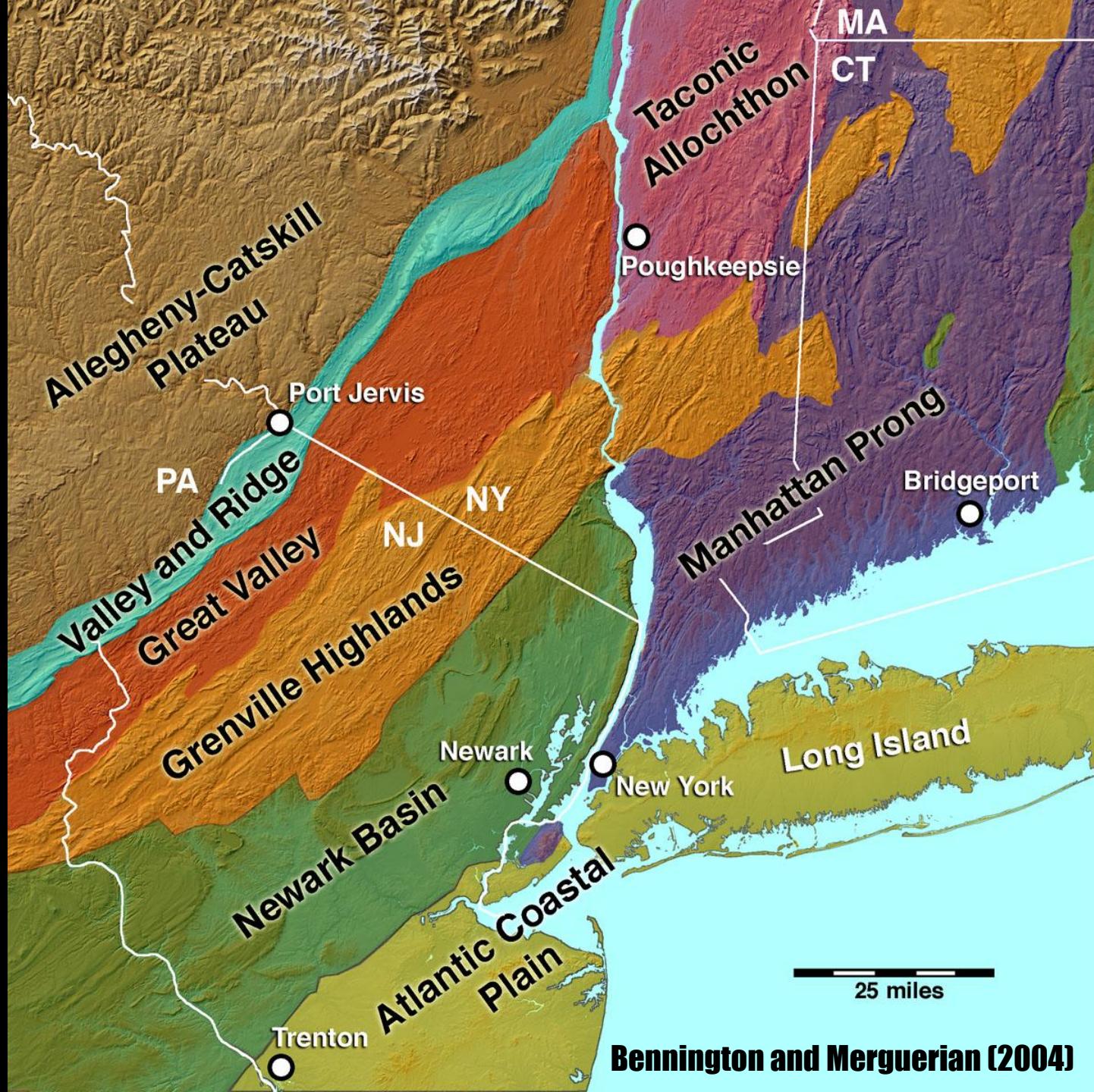
Mueser-Rutledge  
Consulting Engineers



- **Elizabeth Guise and**
- **Mickey Merguerian**
- **HCLAS FRDG Grants**
- **Many Students Over 29 Years at Hofstra**
- Some Still With Us!**

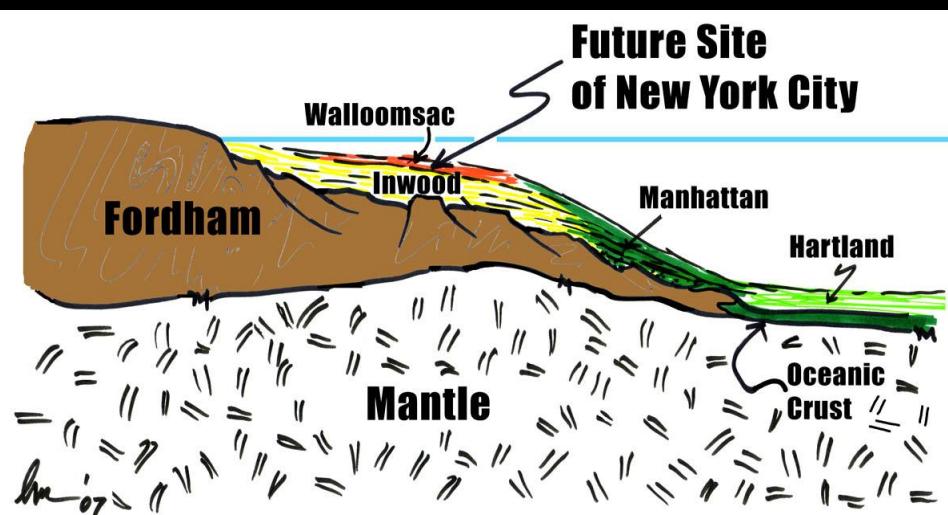


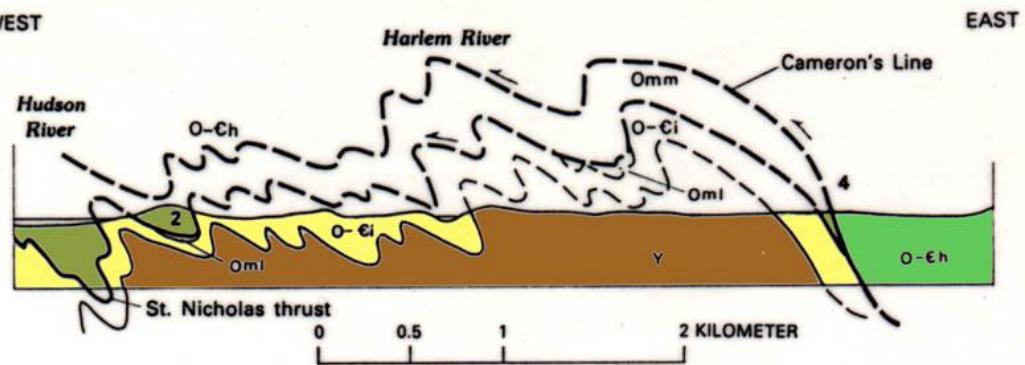
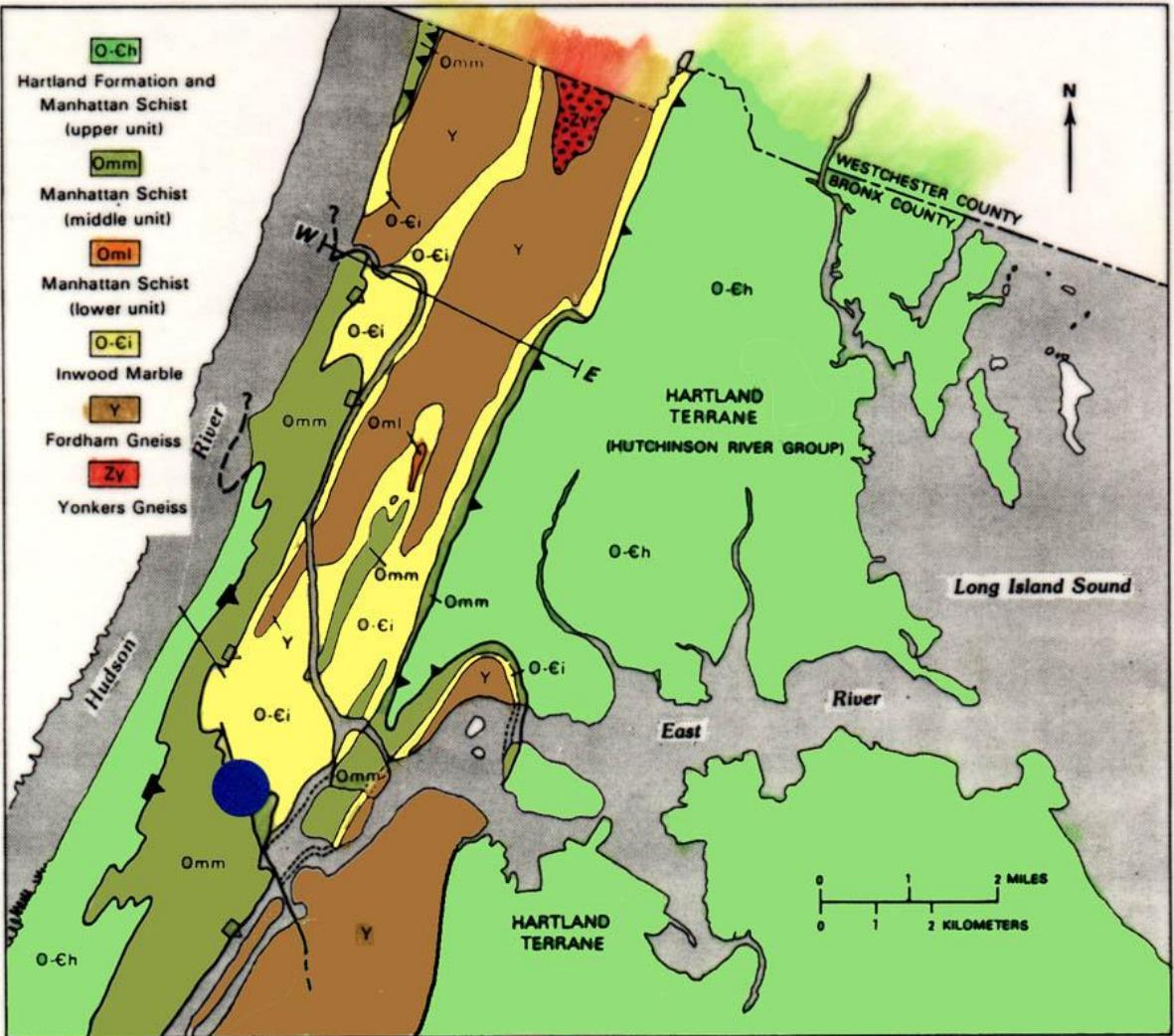
and, the “get-it-done”  
staff at Duke  
Geological Laboratory  
in Stone Ridge, NY



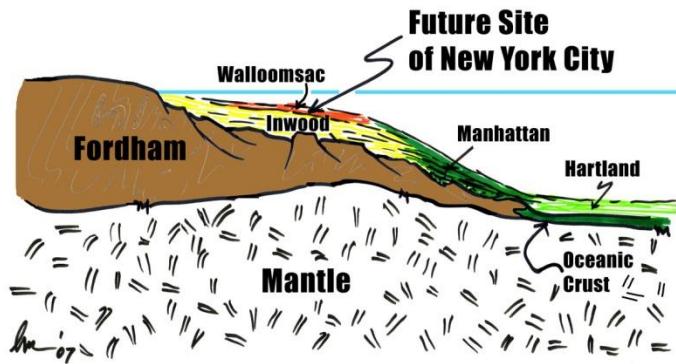
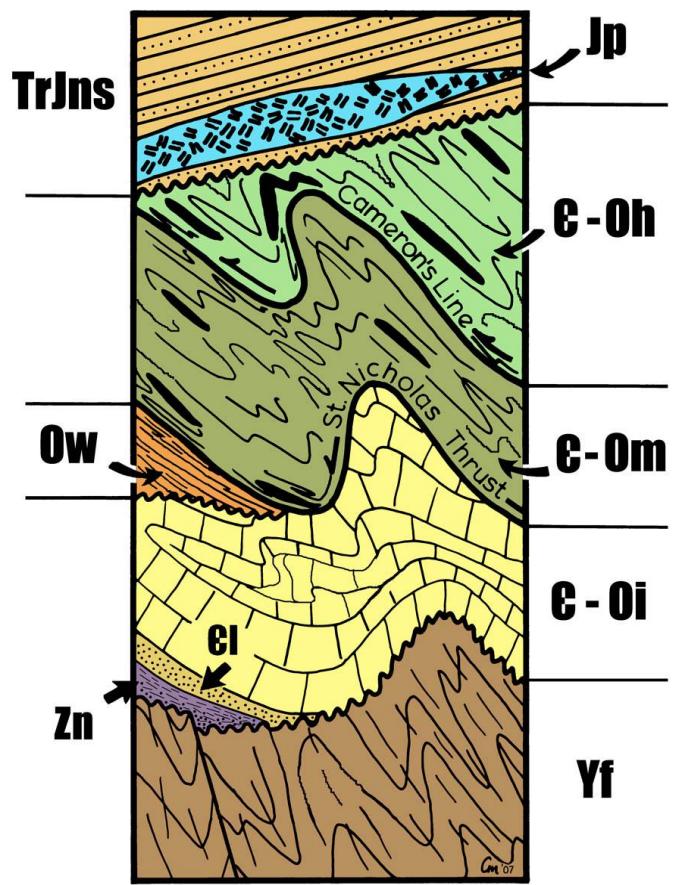
Bennington and Merguerian (2004)

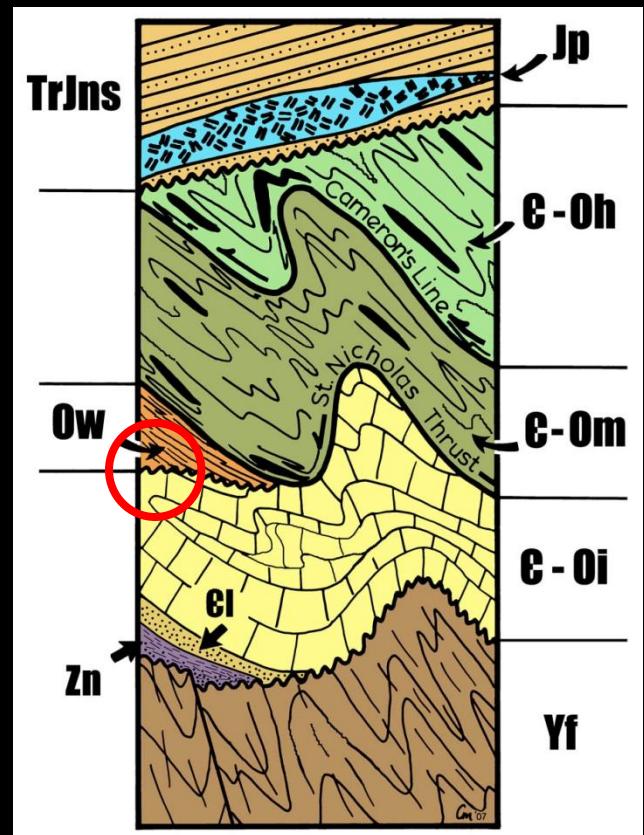
# ~ 480 Ma Taconian Arc – Passive Margin Collision



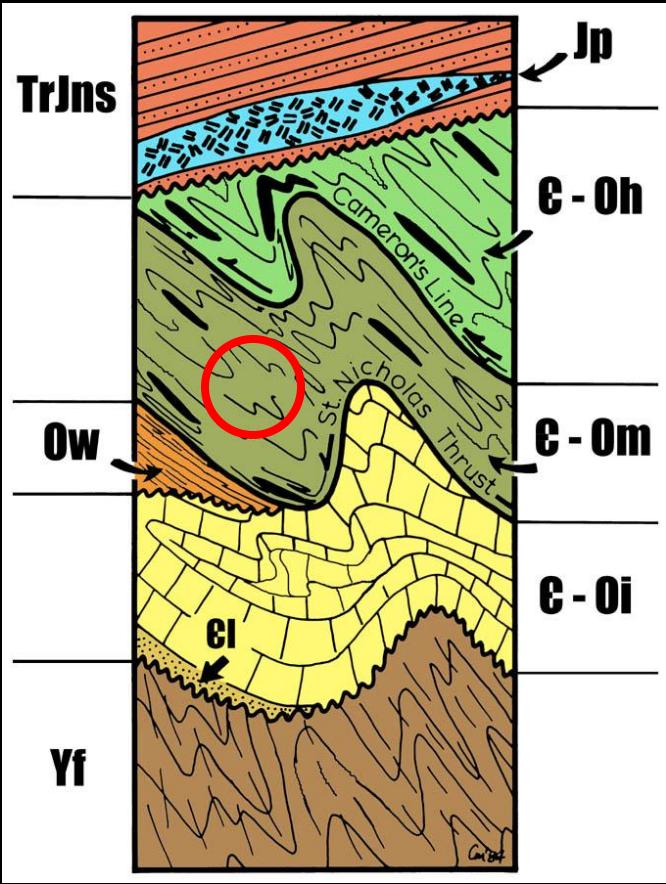


# New York City

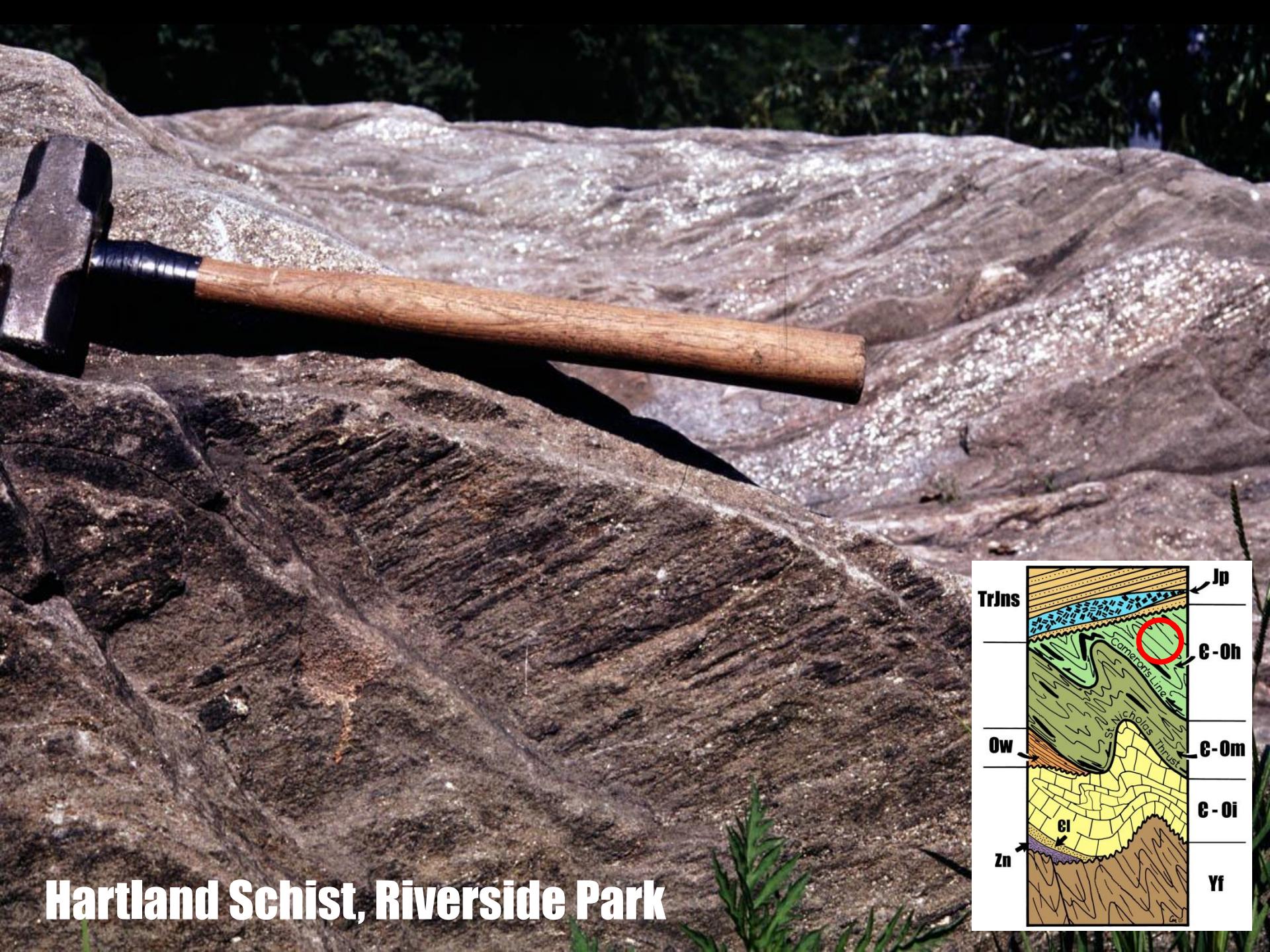




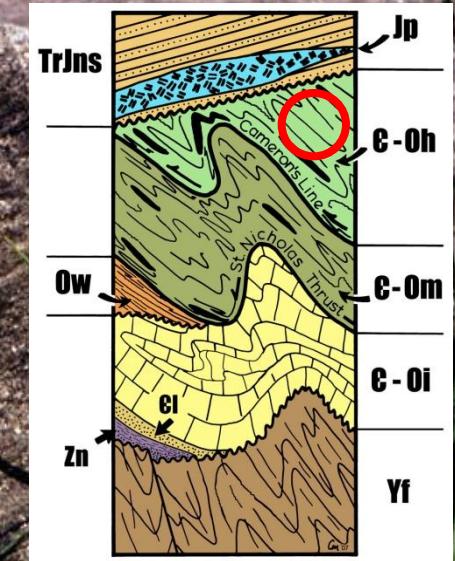
Walloomsac “Balmville” Contact, Grand Concourse, Bronx, NY

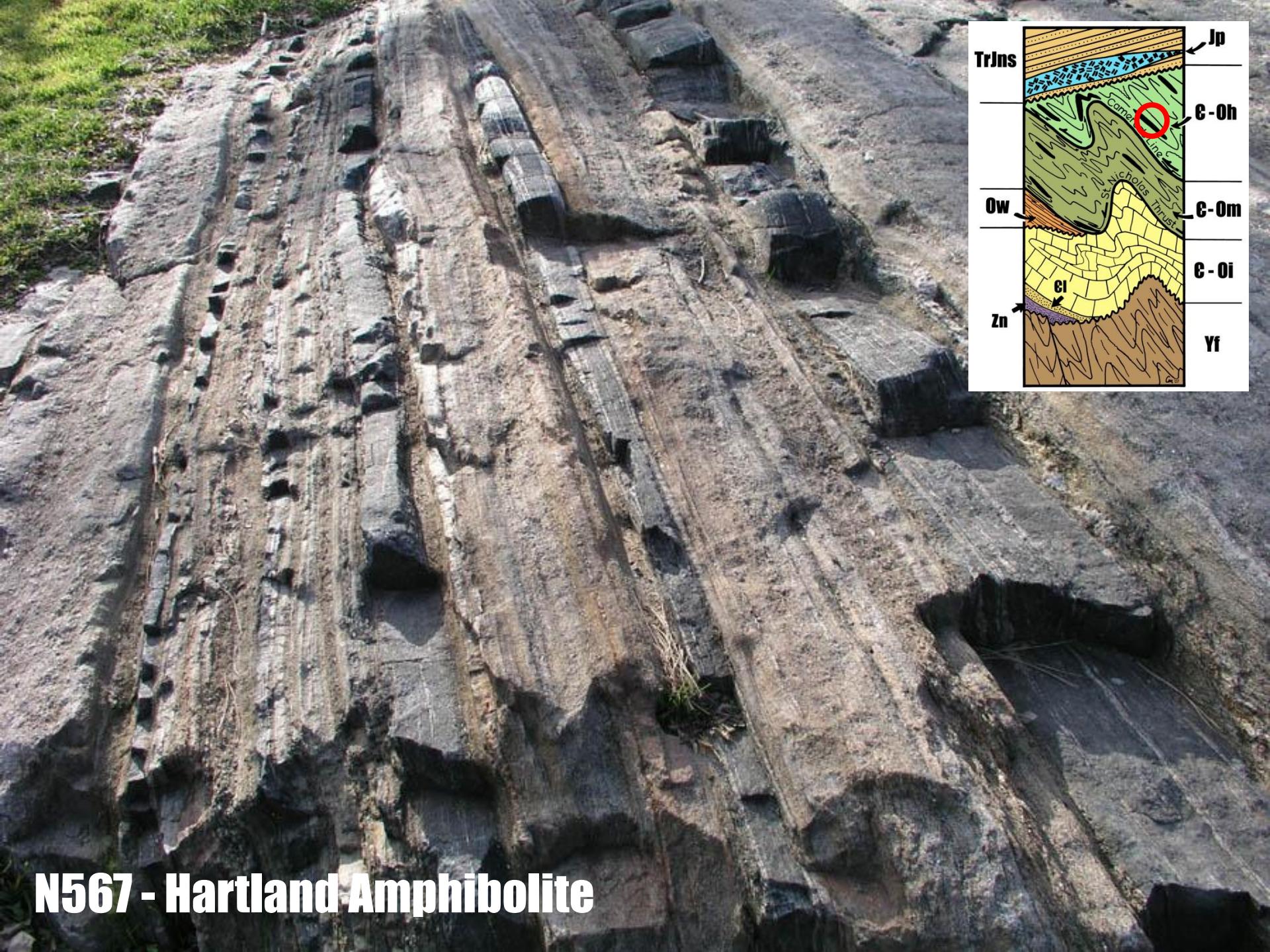


**Manhattan Schist**  
 **$F_3$  Folds of  $S_2$**   
**Central Park, NYC**

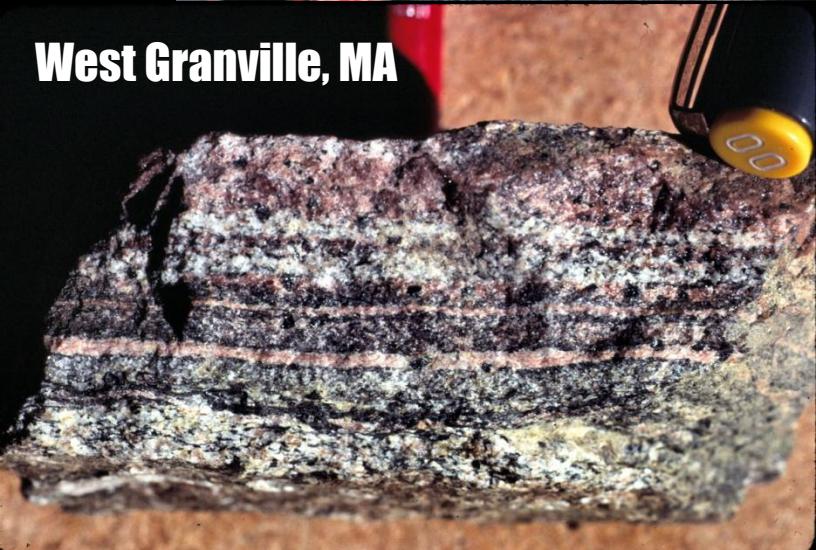
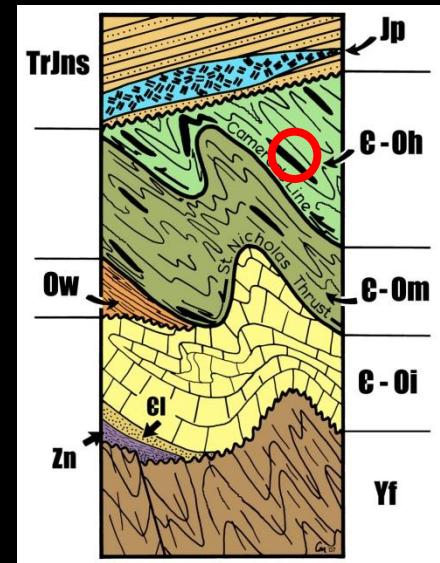


Hartland Schist, Riverside Park





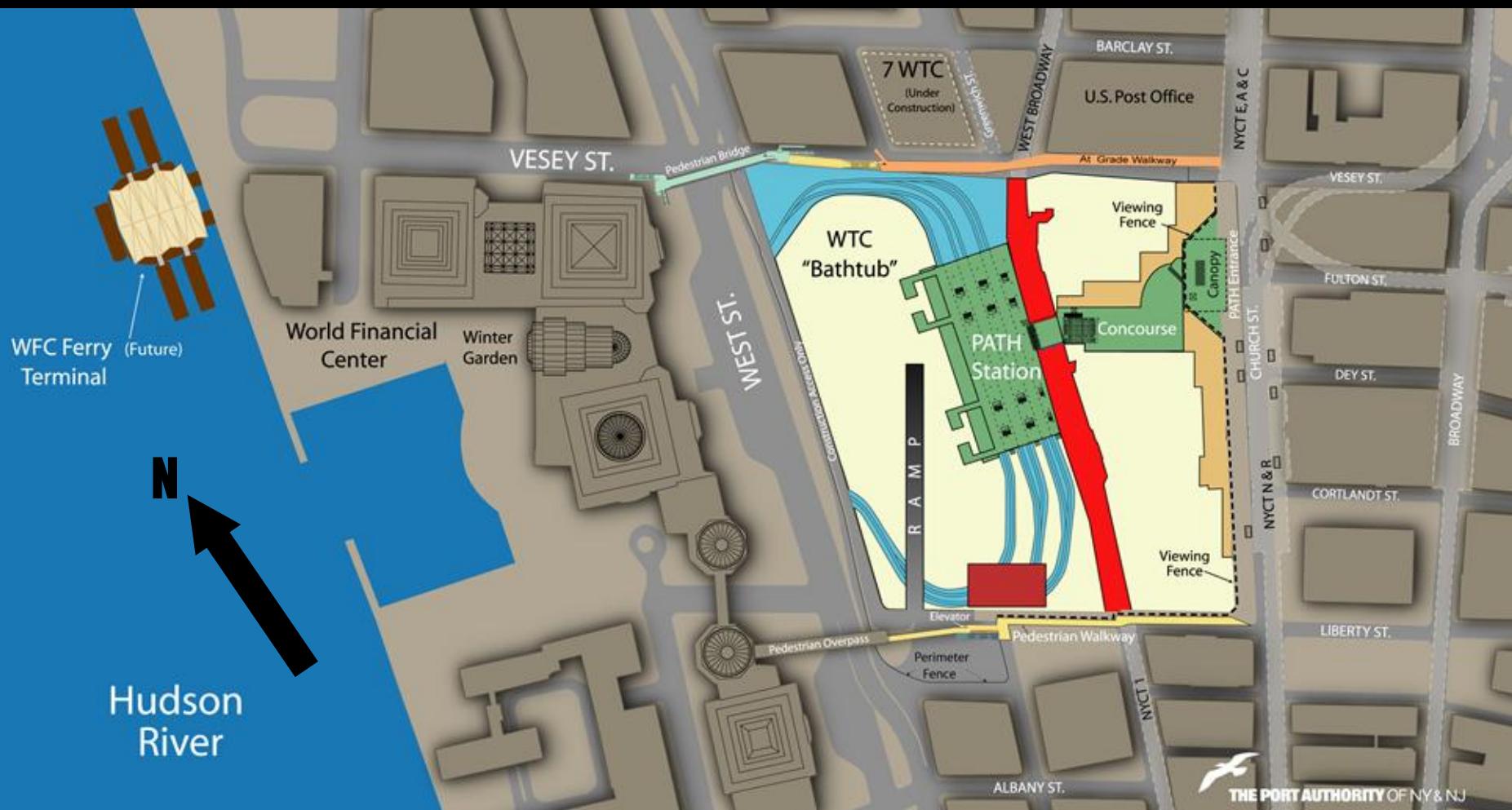
N567 - Hartland Amphibolite



Hartland Coticule



# The World Trade Center Site



**NW WTC**

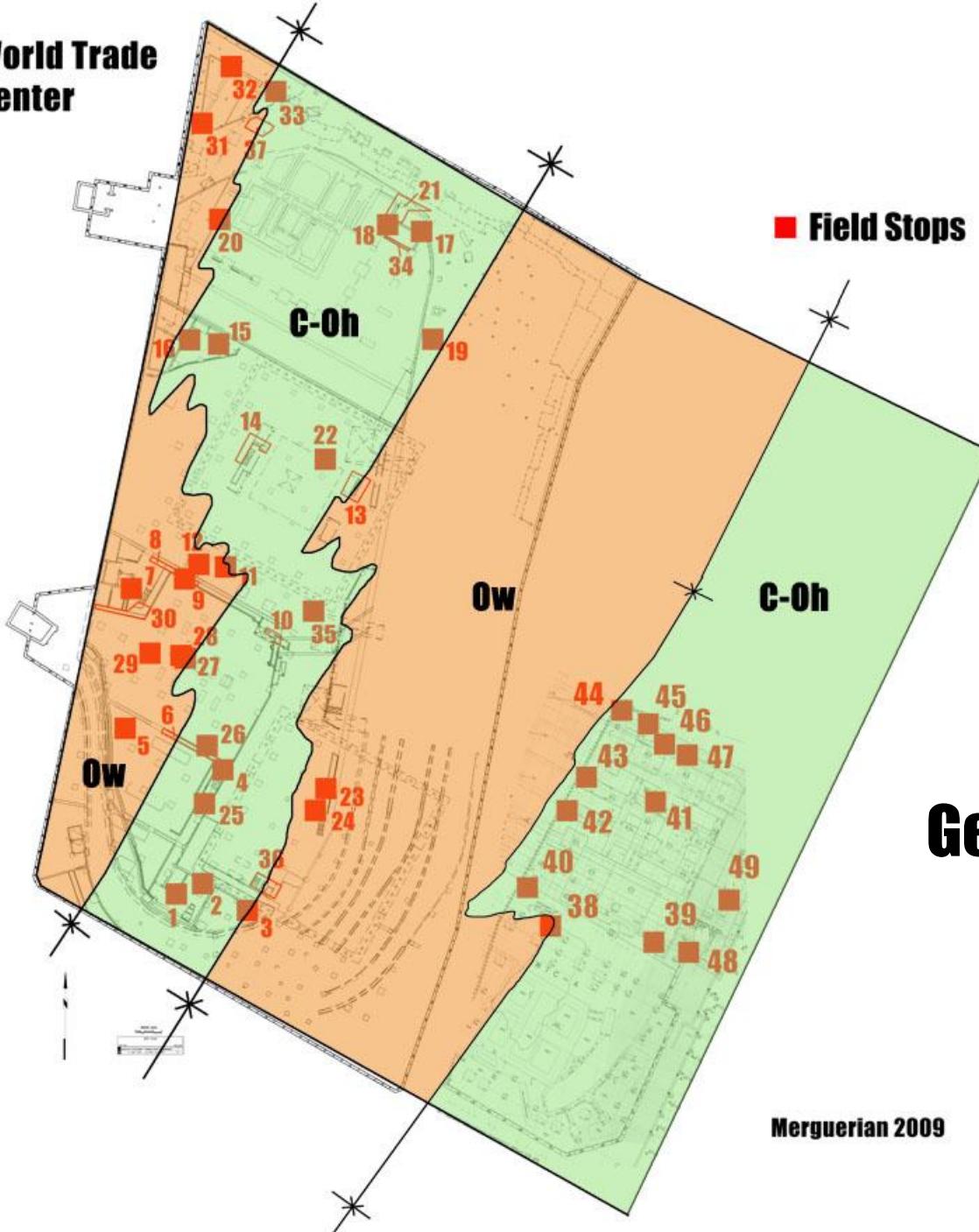


2004

# World Trade Center



**World Trade  
Center**



# Preliminary Geological Map WTC

Merguerian 2009

Stop 6

C-0h

Hartland Schist and Granofels

Stop 6

Q

Mu

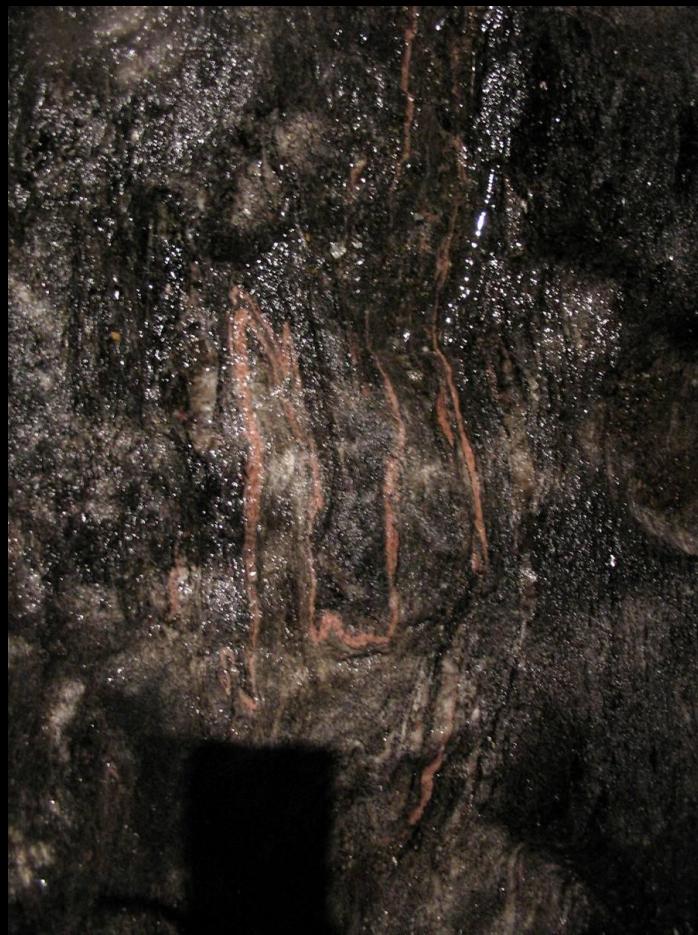
Bi

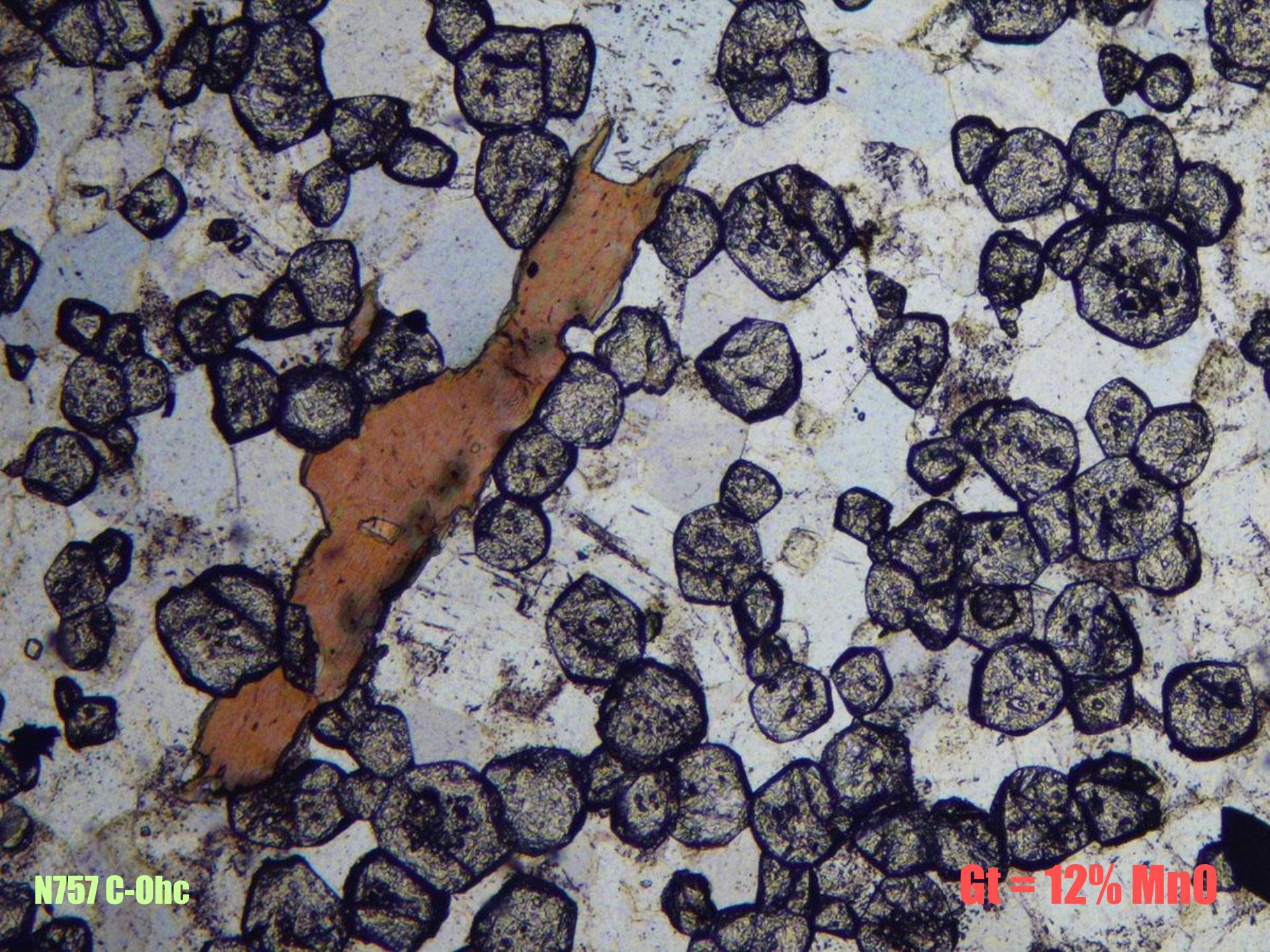
N769A C-Oh

# Hartland Coticule



C-Ohc





N757 C-Ohc

Gt = 12% MnO

Stop 6

Ow

C-Oh

C-Oh+Ow

Stop 6

**High Ti Biotite**

Pg

Pg

Q

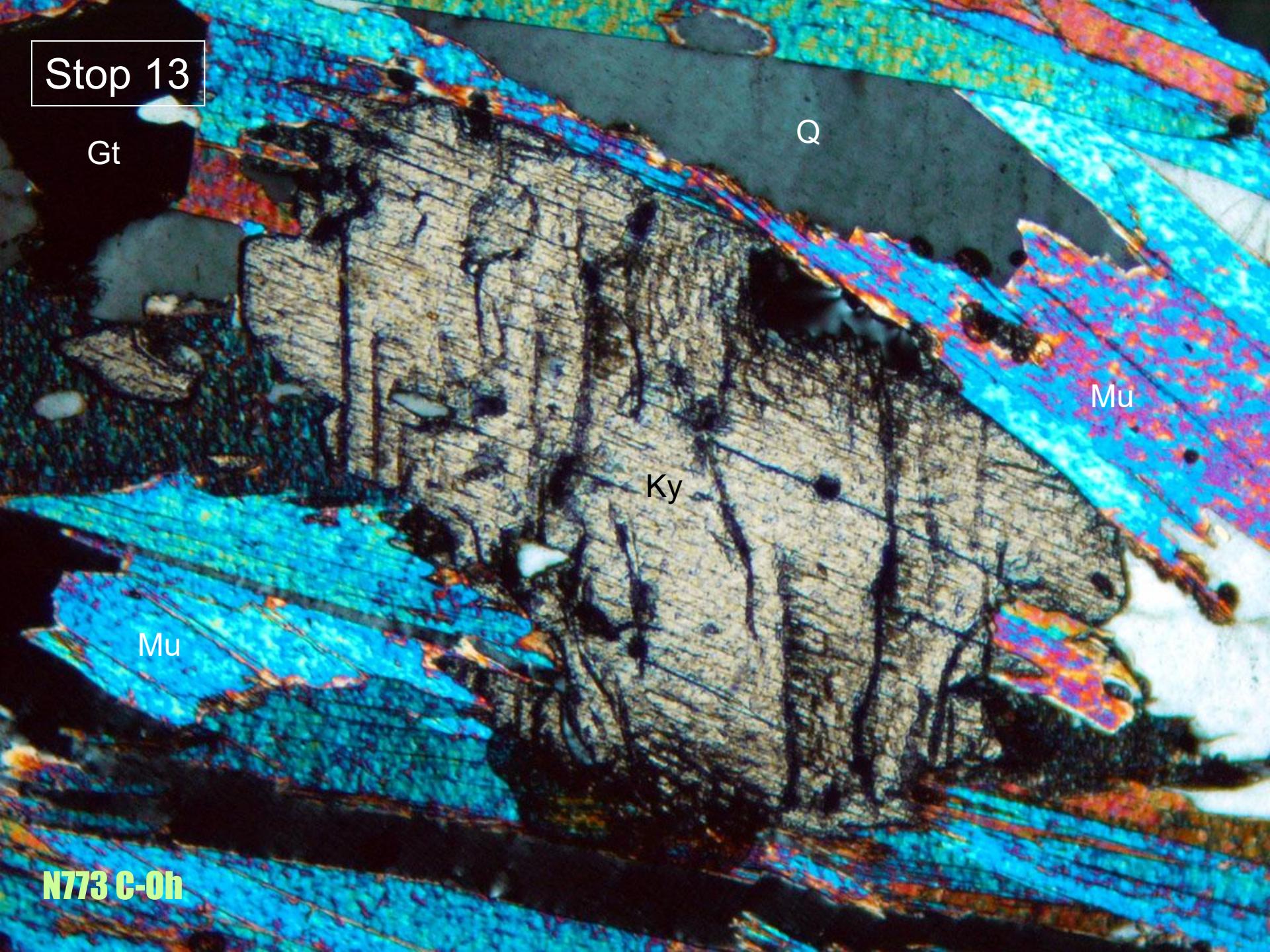
Pg

Bi

Grph

N769B 0w

# Stop 13



MR-4014; Run 1C

Bi

St

Mu

St

Bi

N833 C-0h

Near Stop 13

# Sub-vertical F<sub>3</sub> Folds with Steep, NE-trending Axial Surfaces in Walloomsac Schist and Calc-Silicate Unit



Ow+Owc

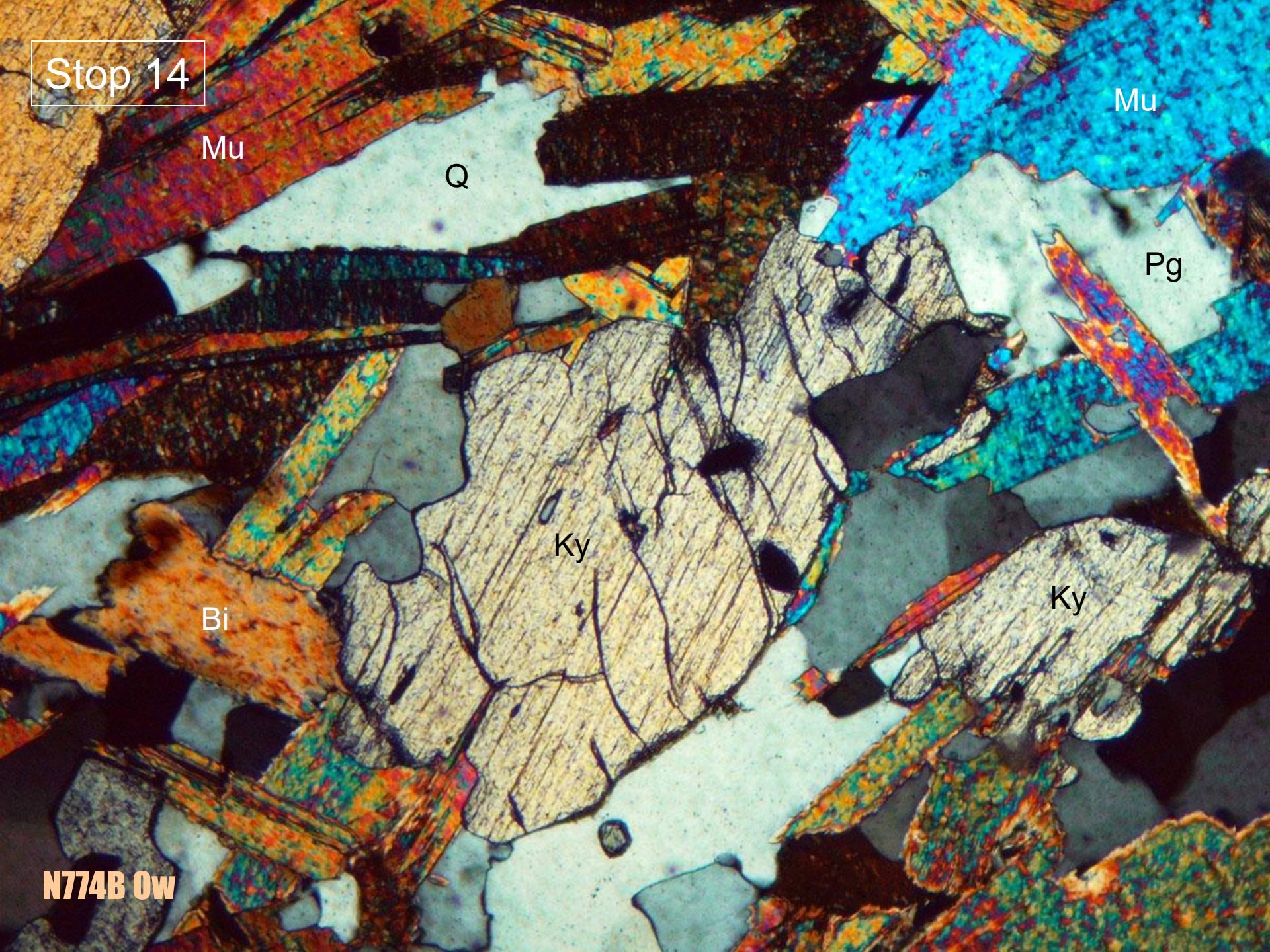


## Stop 14



Ow

# Stop 14



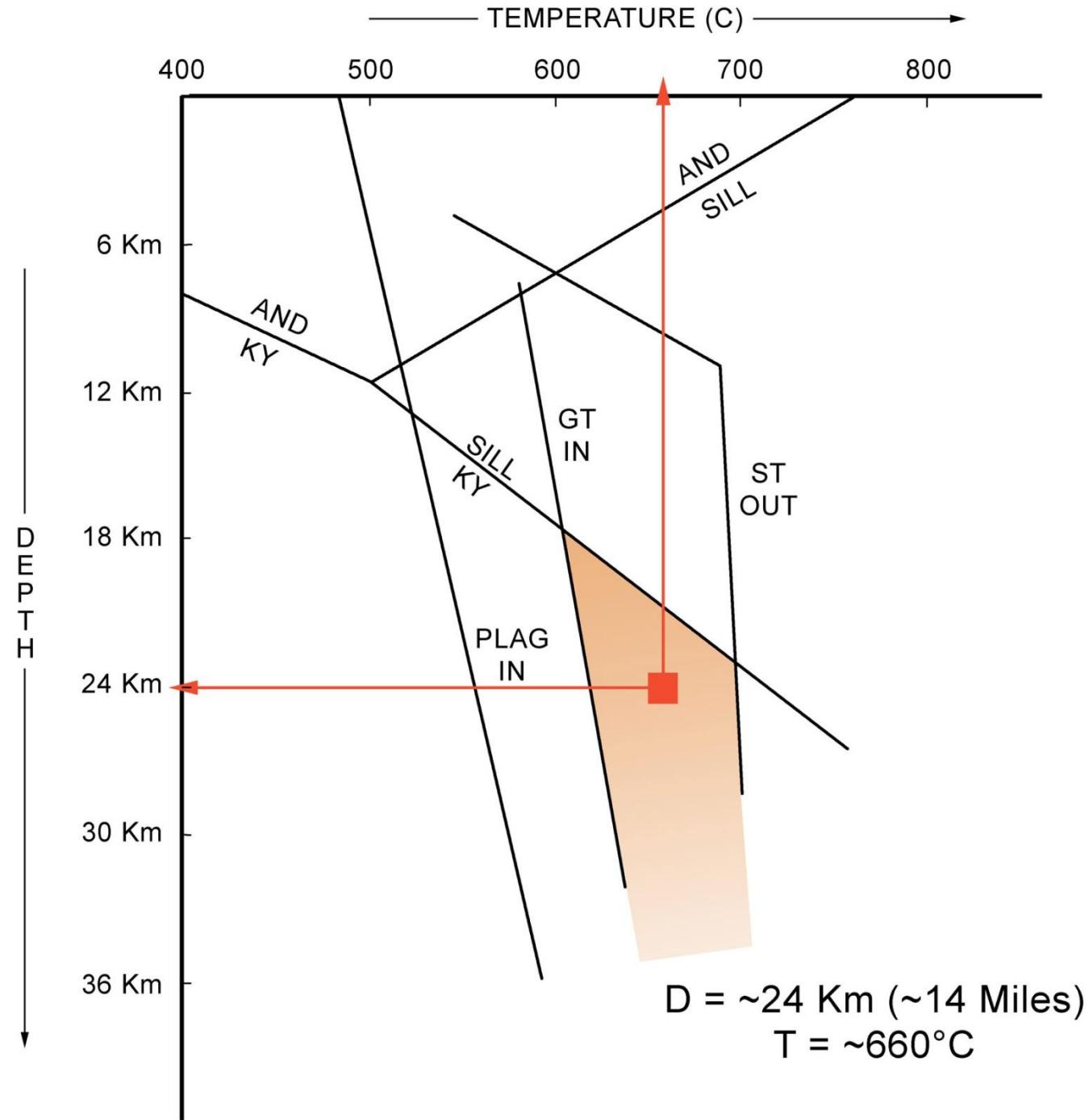
N77°48'0W

Stop 44

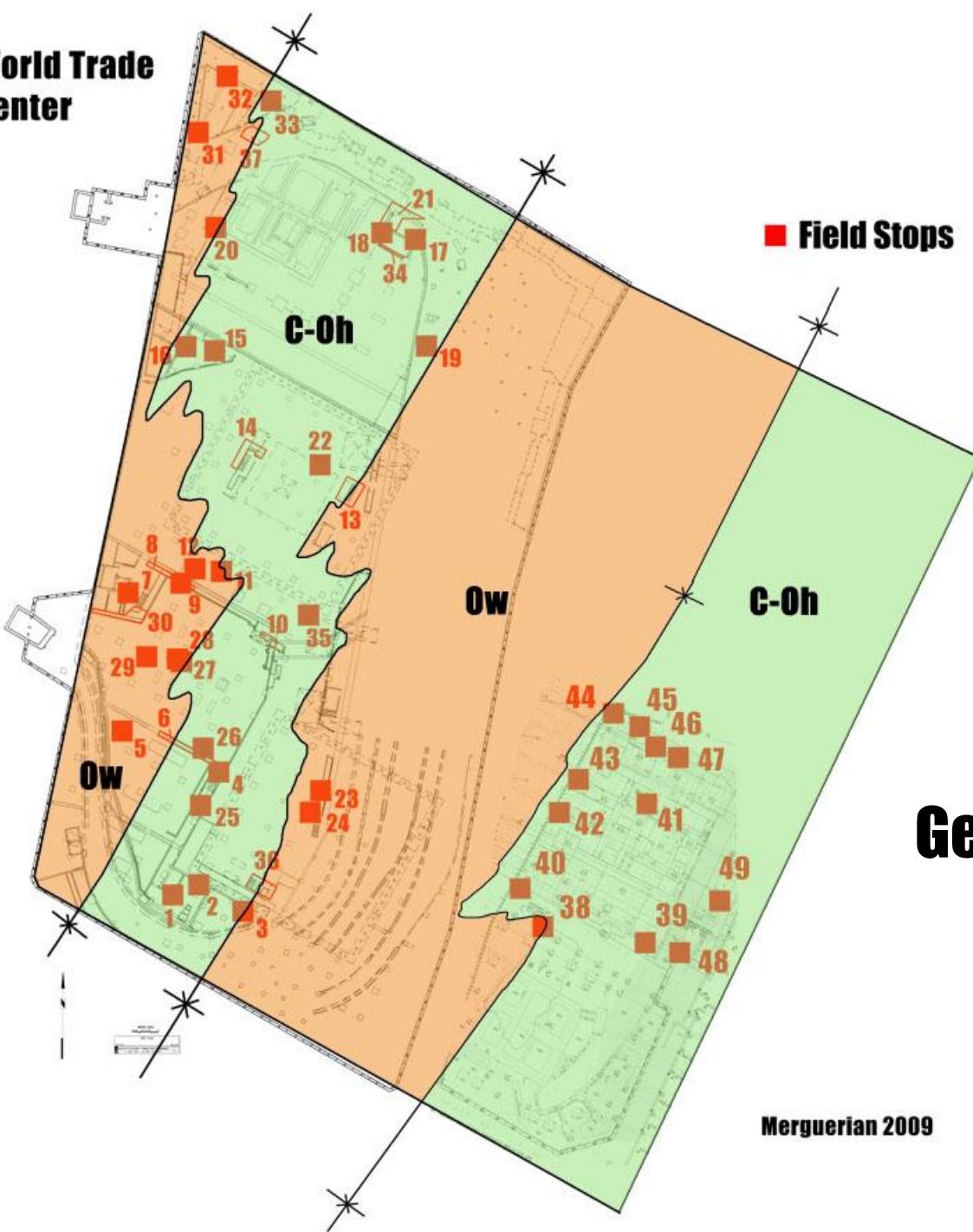


# Re-equilibrated WTC Mineral Assemblage

## Plagioclase Garnet Staurolite Kyanite

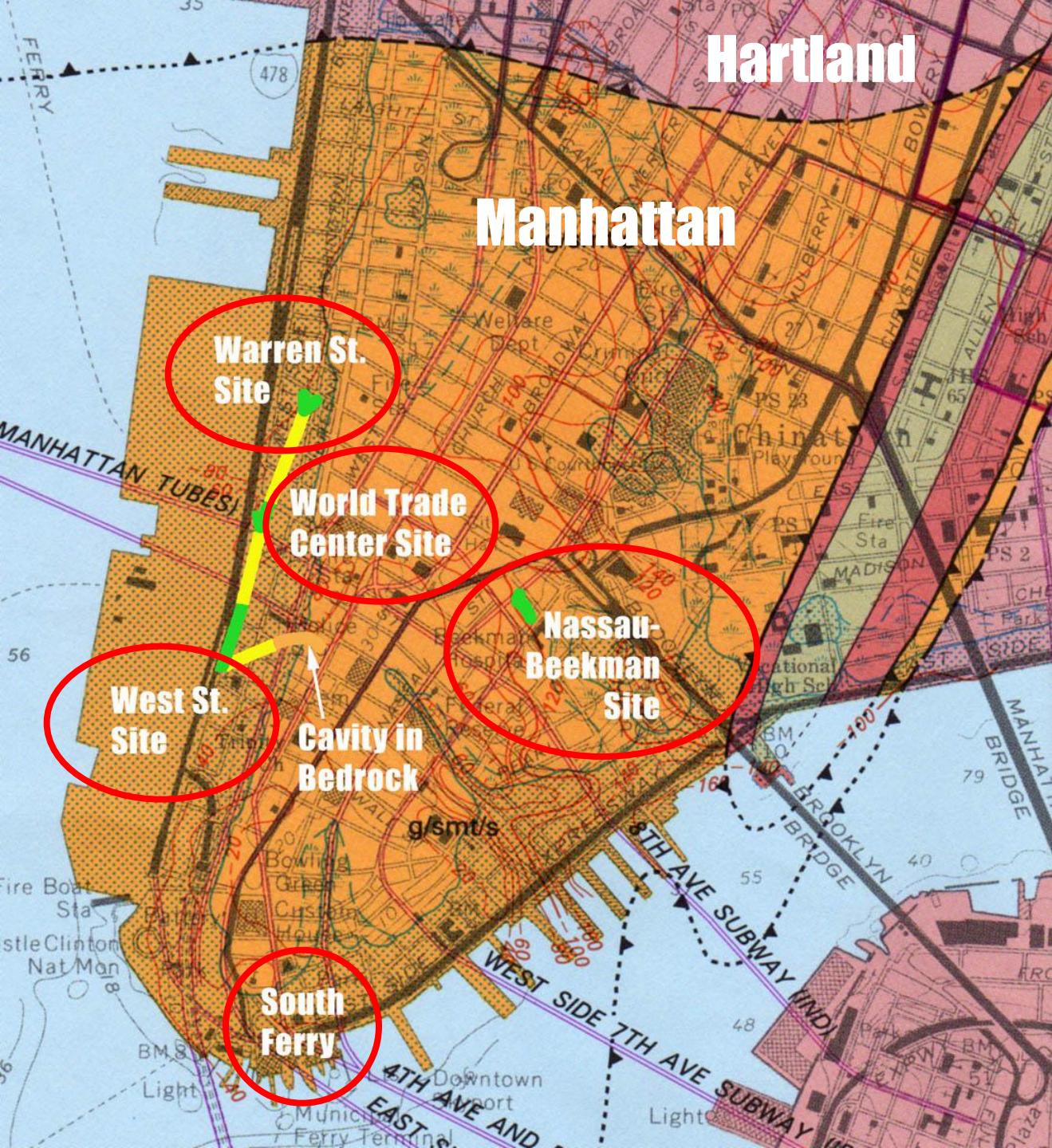


**World Trade  
Center**



# Preliminary Geological Map WTC

Merguerian 2009



Hartland

Manhattan

Warren St.  
Site

World Trade  
Center Site

West St.  
Site

Cavity in  
Bedrock

Nassau-  
Beekman  
Site

South  
Ferry

Five Localities  
South of  
Canal Street  
Display  
Sheared  
Manhattan,  
Hartland, and  
Walloomsac  
Rocks!

Baskerville Map  
Incorrect!

after Baskerville 1994,  
Merguerian and Moss 2007