Orange County Mineral Society

DUKE

Constructing the Second Avenue Subway, NYC, NY

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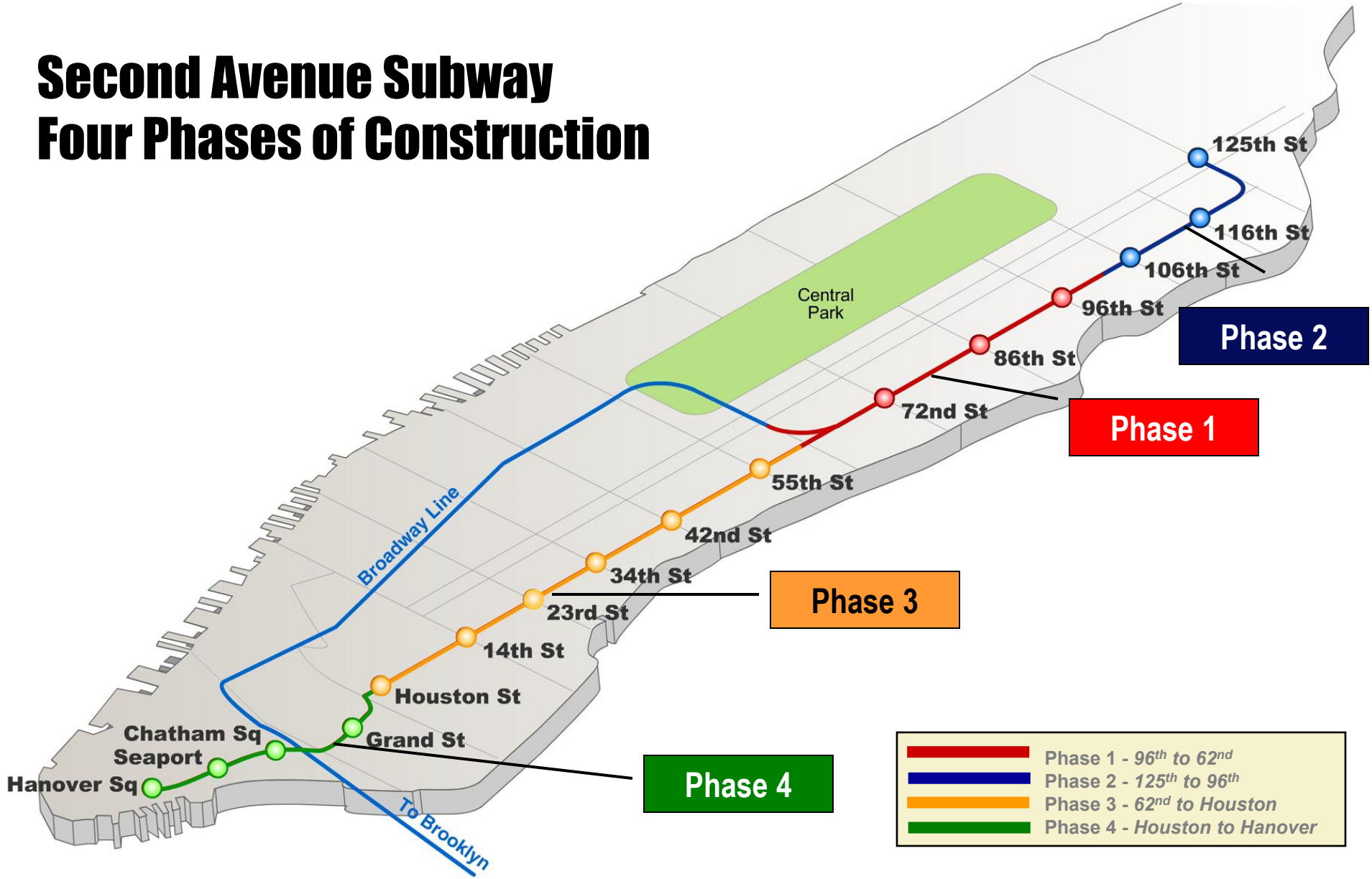
NYC TBM Projects

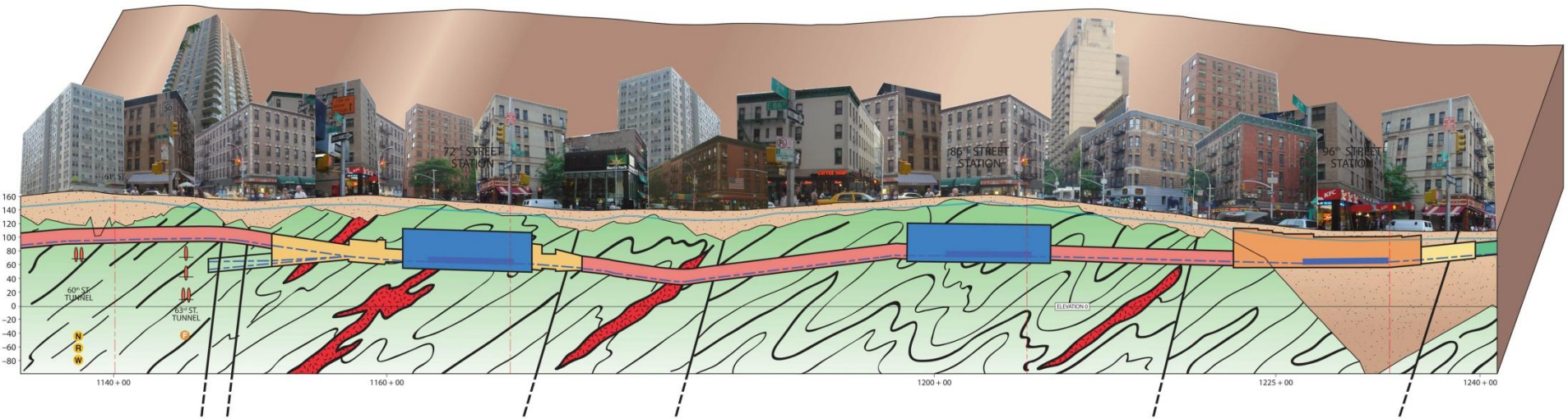
Second Avenue Subway

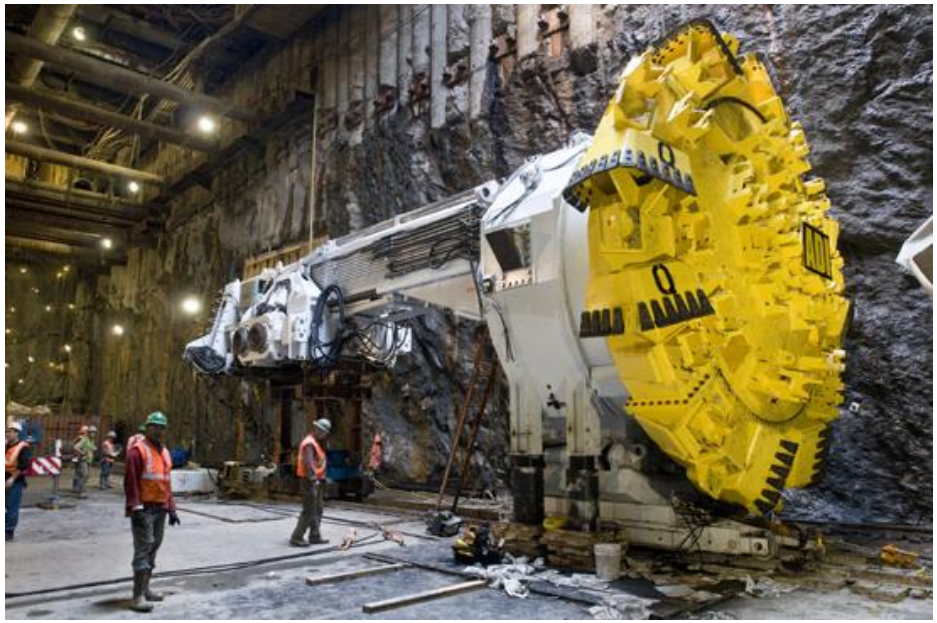
1929 – NYC BOT Proposes Subway
1931 – Plans Postponed for Depression Era ……..
$86M → $249M → $500M
By 1948 – Abandonment
April 2007 – Groundbreaking
June 2010 – TBM Starts @ 96th
2013 – Station Complexes
2017 – Phase 1 Stations Open

Second Avenue Subway
Four Phases of Construction



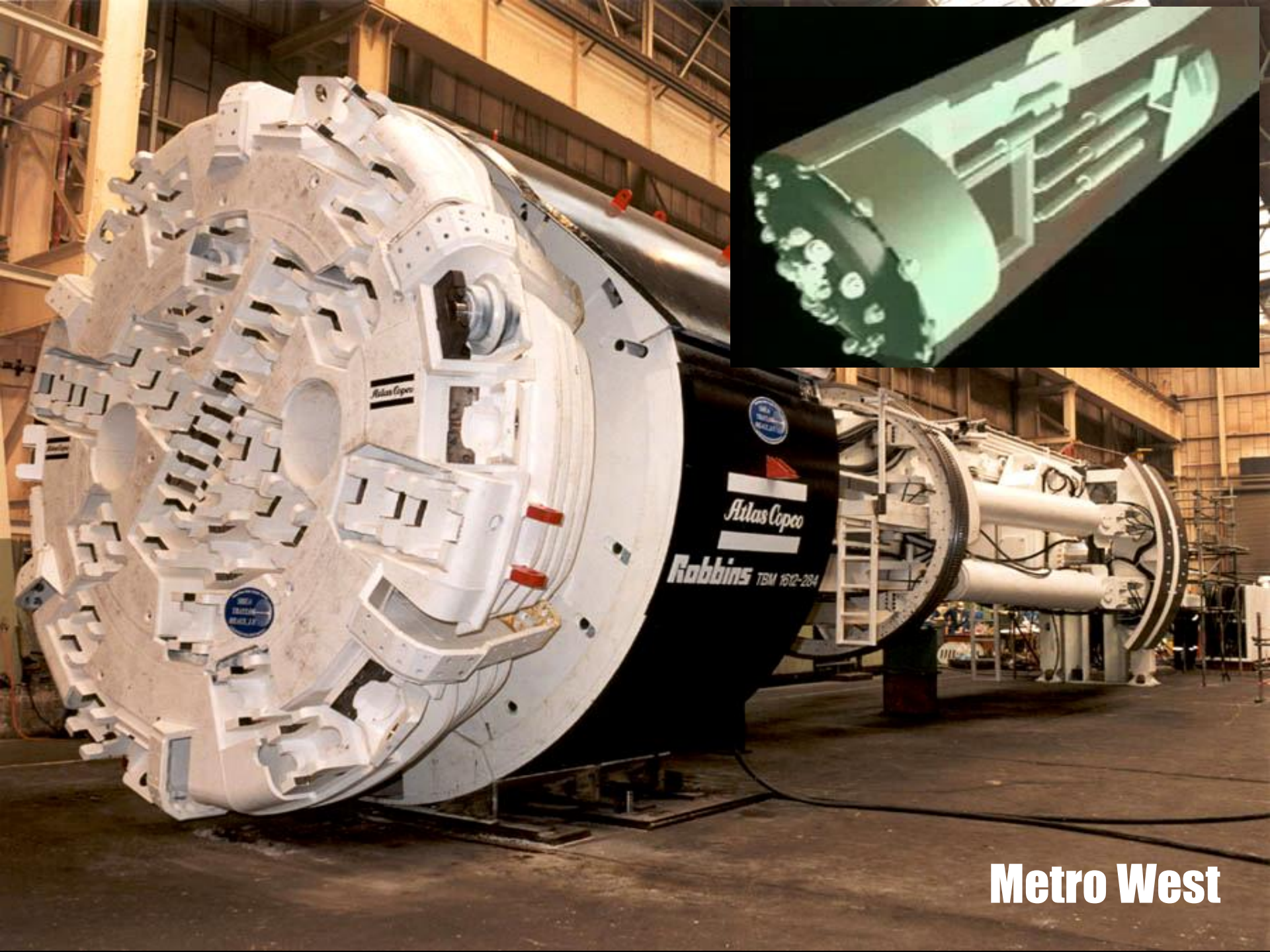
Phase 1 - Threading the Needle south from 96th St.



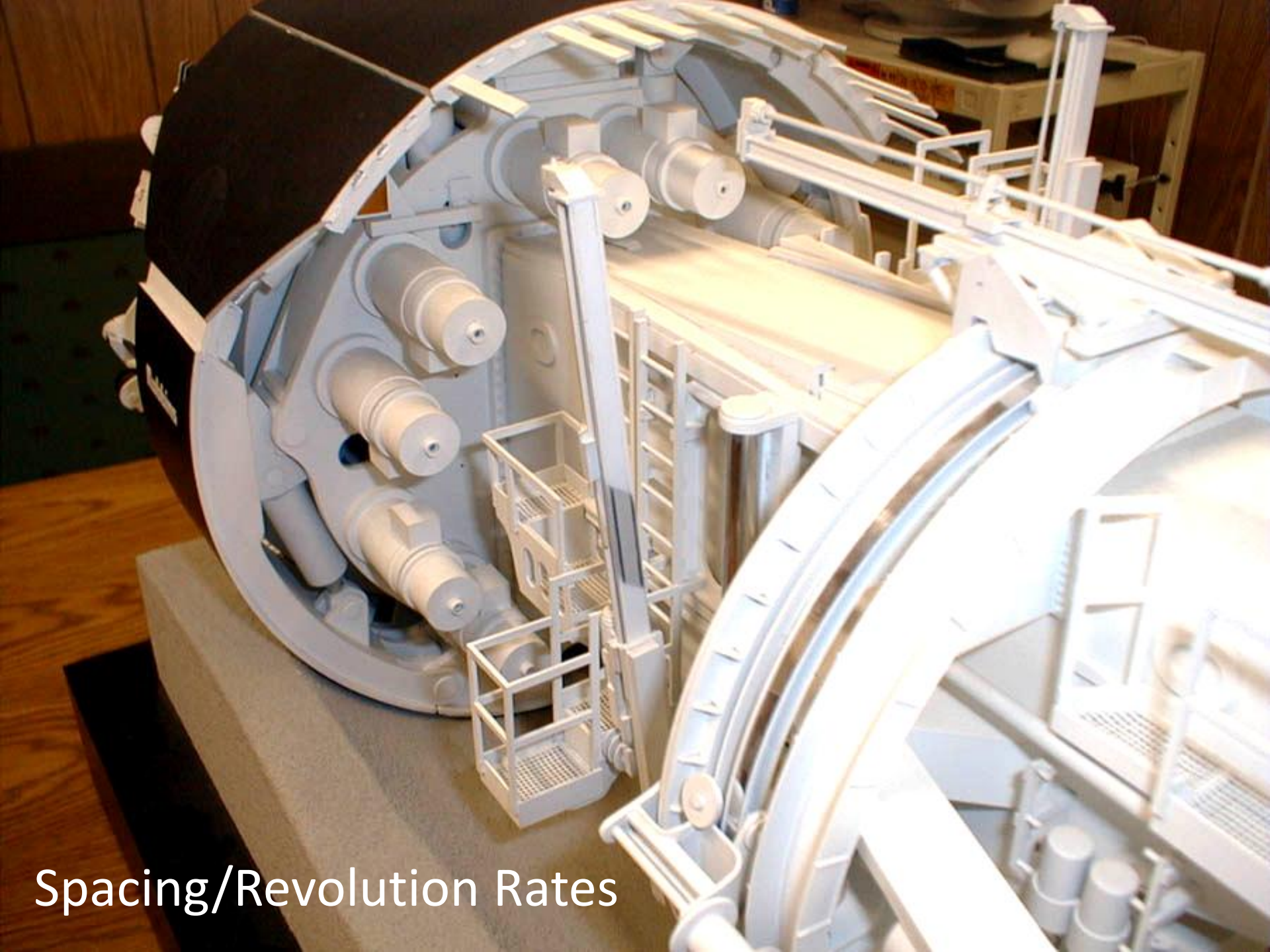


April 2010

May 2010



Metro West

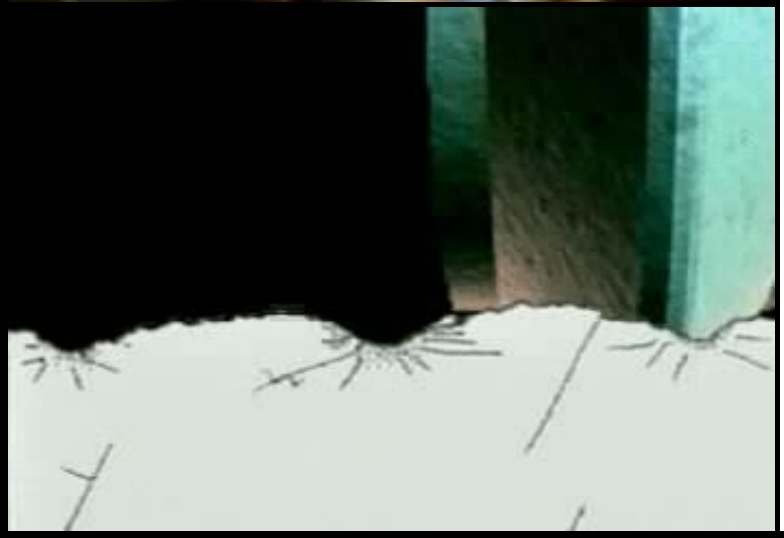


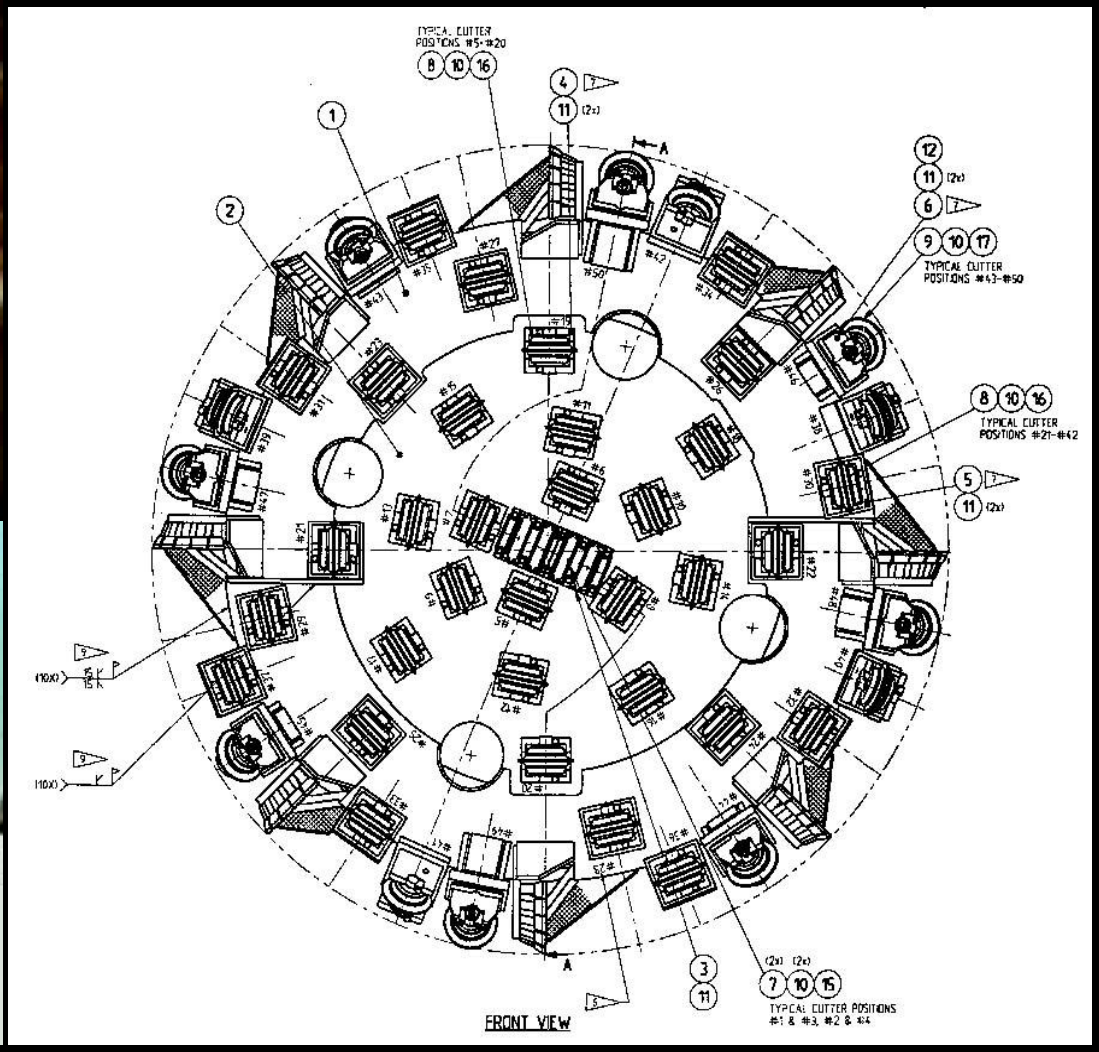
Spacing/Revolution Rates

Queens Tunnel TBM
422 HP Electric
Water Cooled,
Three Phase Motors

10 Motors Total
Usually 8 Online.
At Queens Tunnel
Cutterhead Rotated
at 8.3 Rev/Min

TBM Chip Production



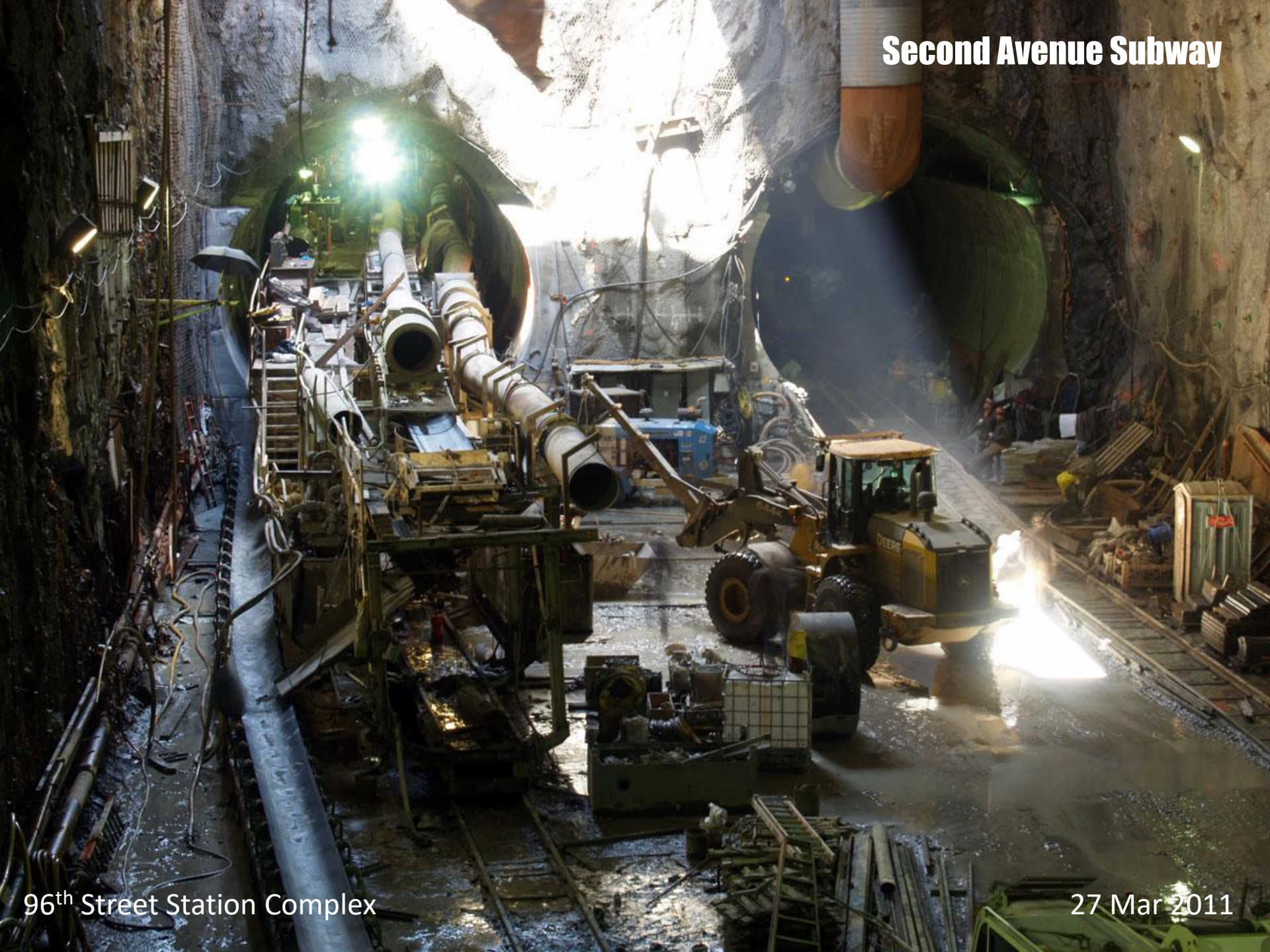


12:32PM
5/15/1998
00:25:04:23
Belly of the Beast

Superb Kerf Pattern in Hard Rock

ROUTE 72A SECTION 13
2ND AVENUE SUBWAY - CONTRACT 0-2091-4
EAST 110TH ST. TO EAST 120TH ST., MAN.
CAYUGA-CRIMMINS
VIEW 2nd AVE @ 115th ST. X-ing

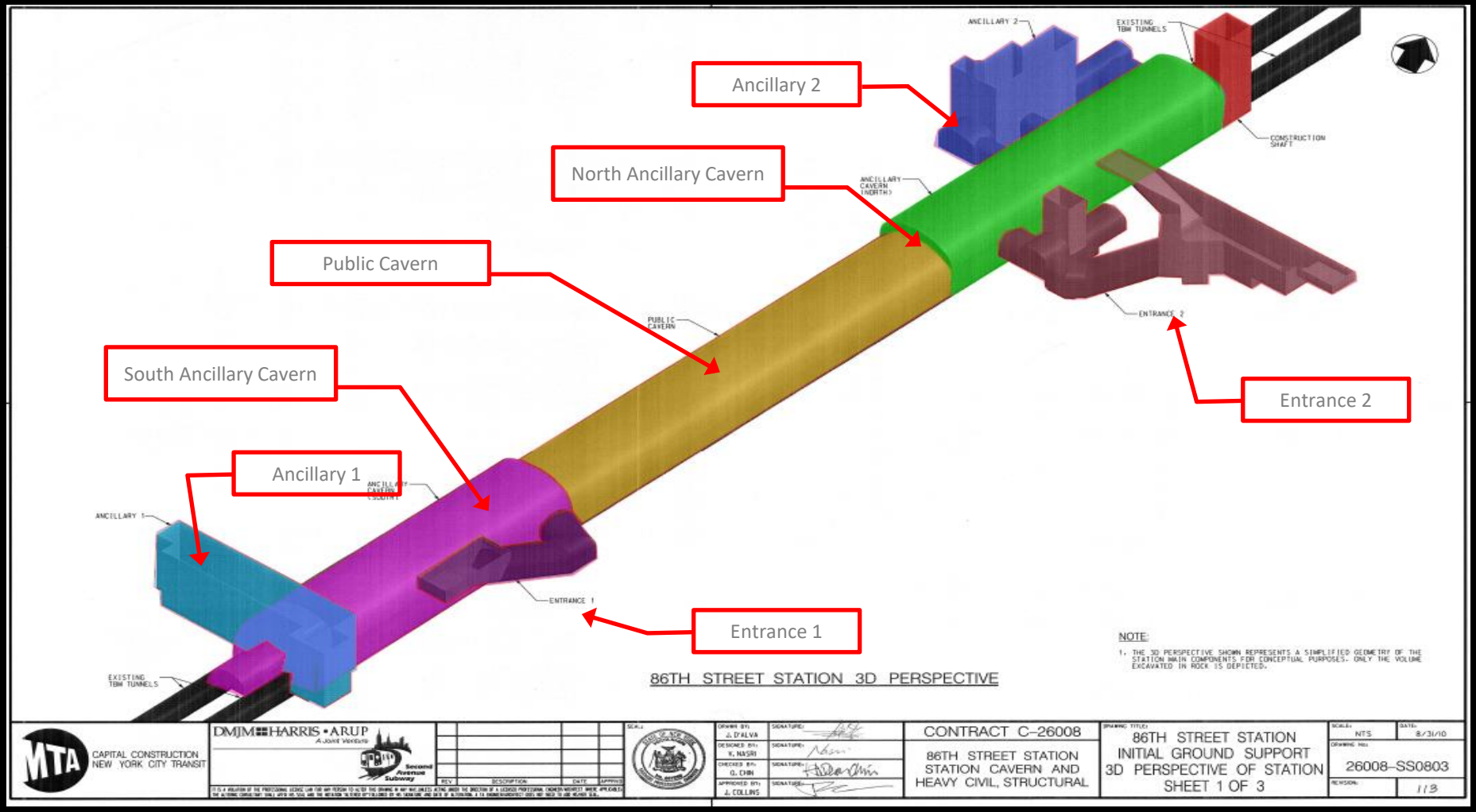
Second Avenue Subway
96th Street Station Complex
27 Mar 2011


Second Avenue Subway
96th Street Station Complex
27 Mar 2011

Second Avenue Subway
South Tube – Sta. 1172+80
27 Mar 2011

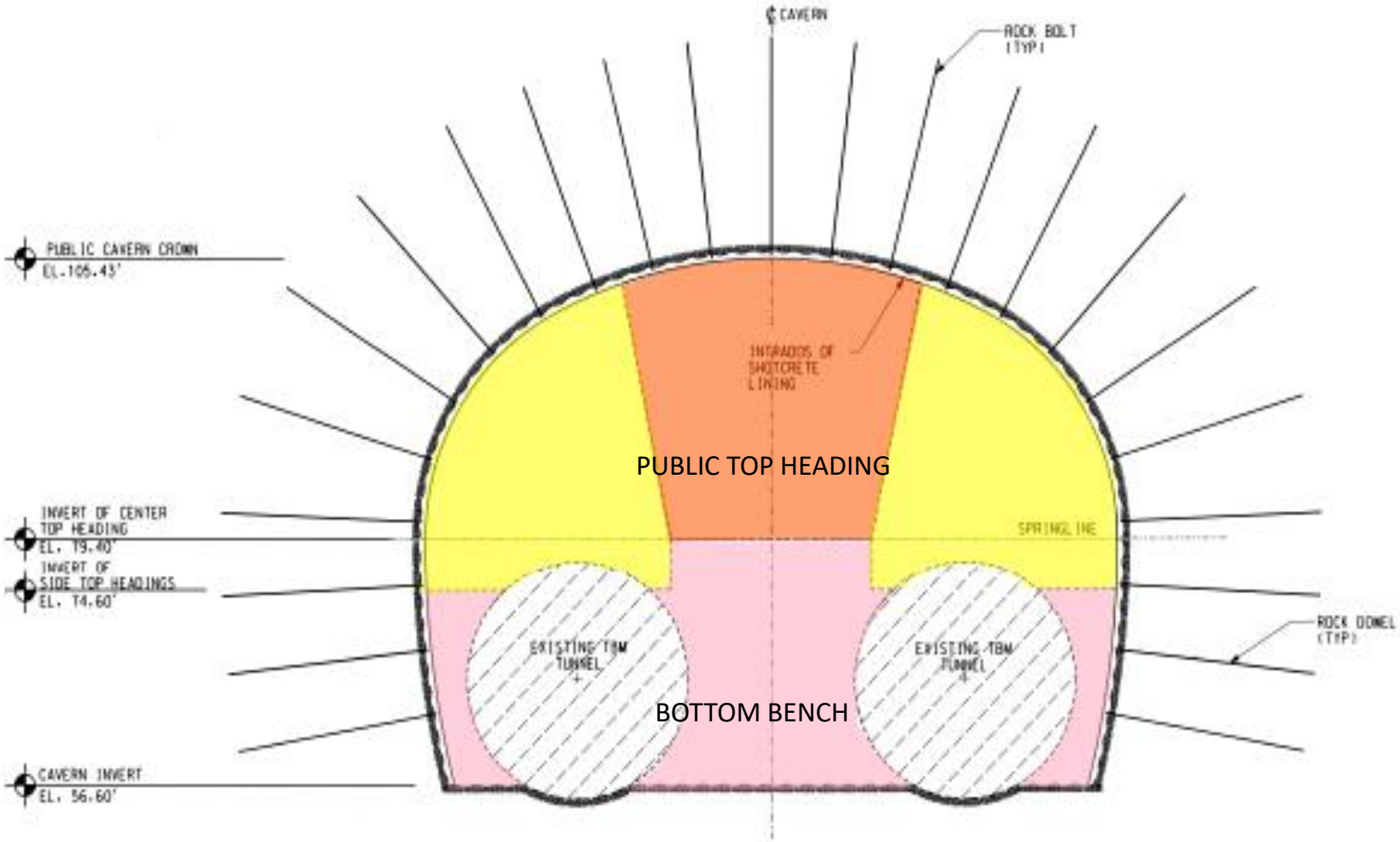
86th Street Station Cavern Excavation Mapping

DUKE



Stations 1198+00 to 1209+00 = ~1,100'

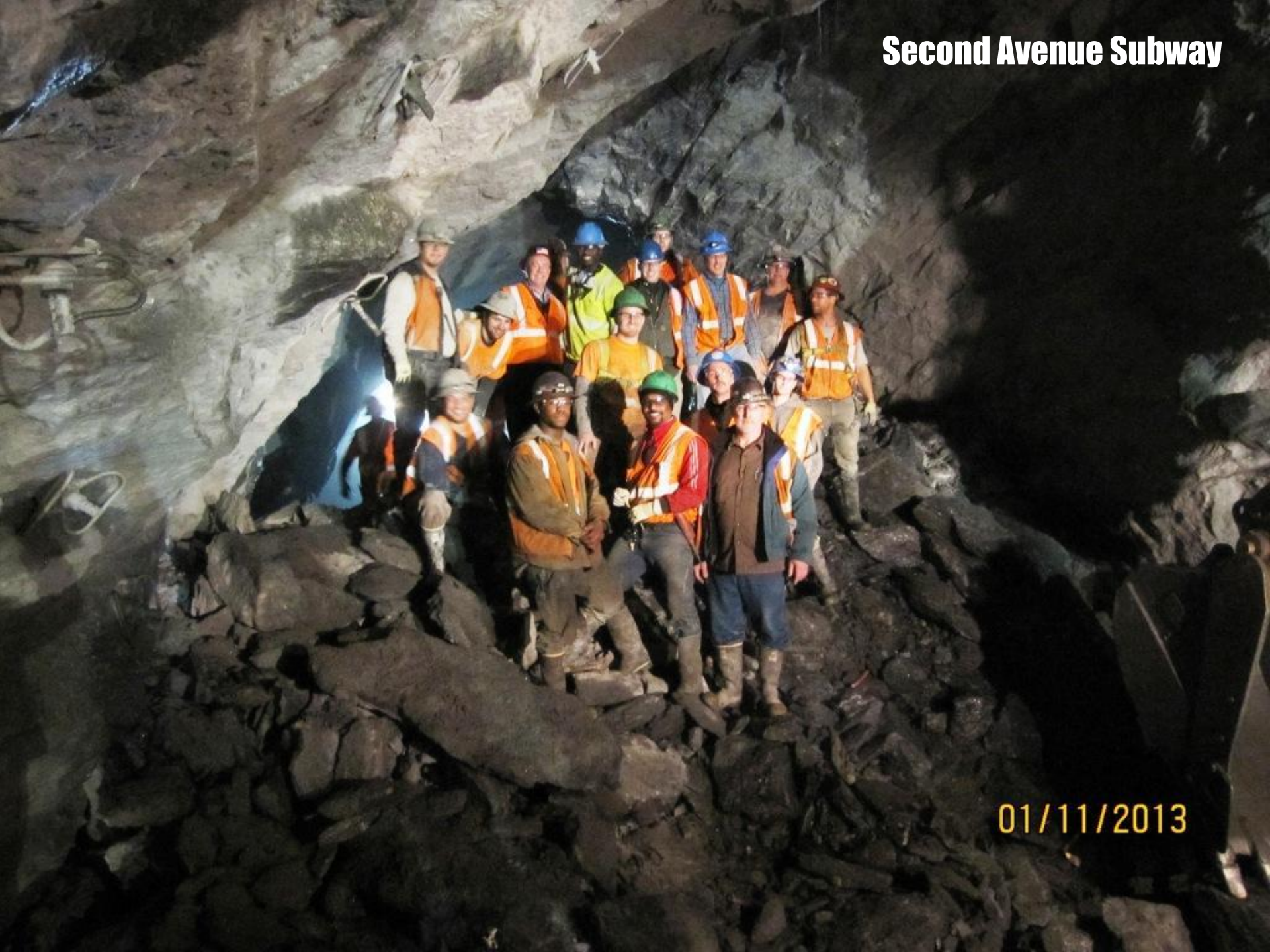
86th Street Station – Public Cavern Excavation (50')



Second Avenue Subway
01/11/2013

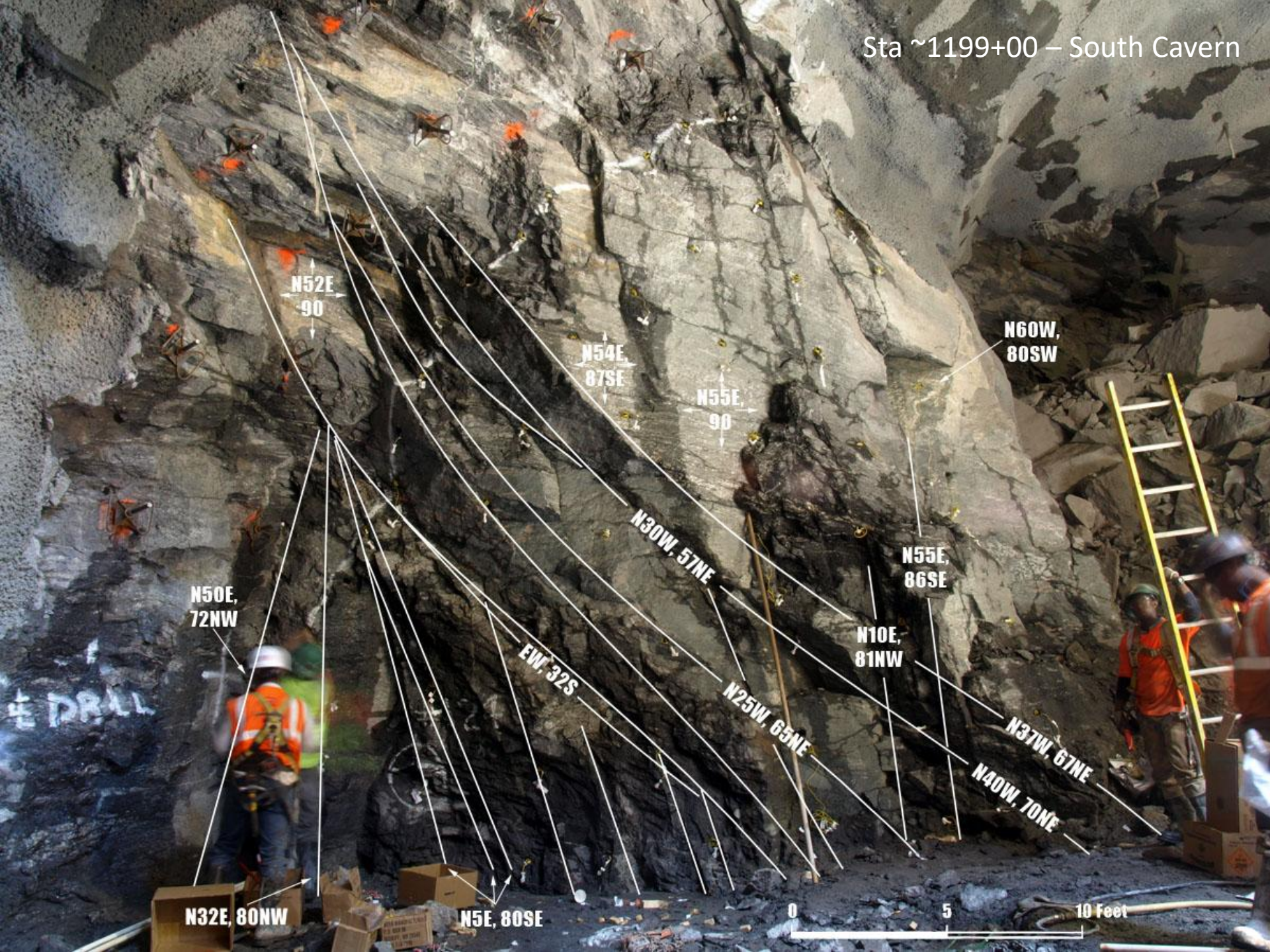
North Cavern

Finished North Ancillary and Public Cavern

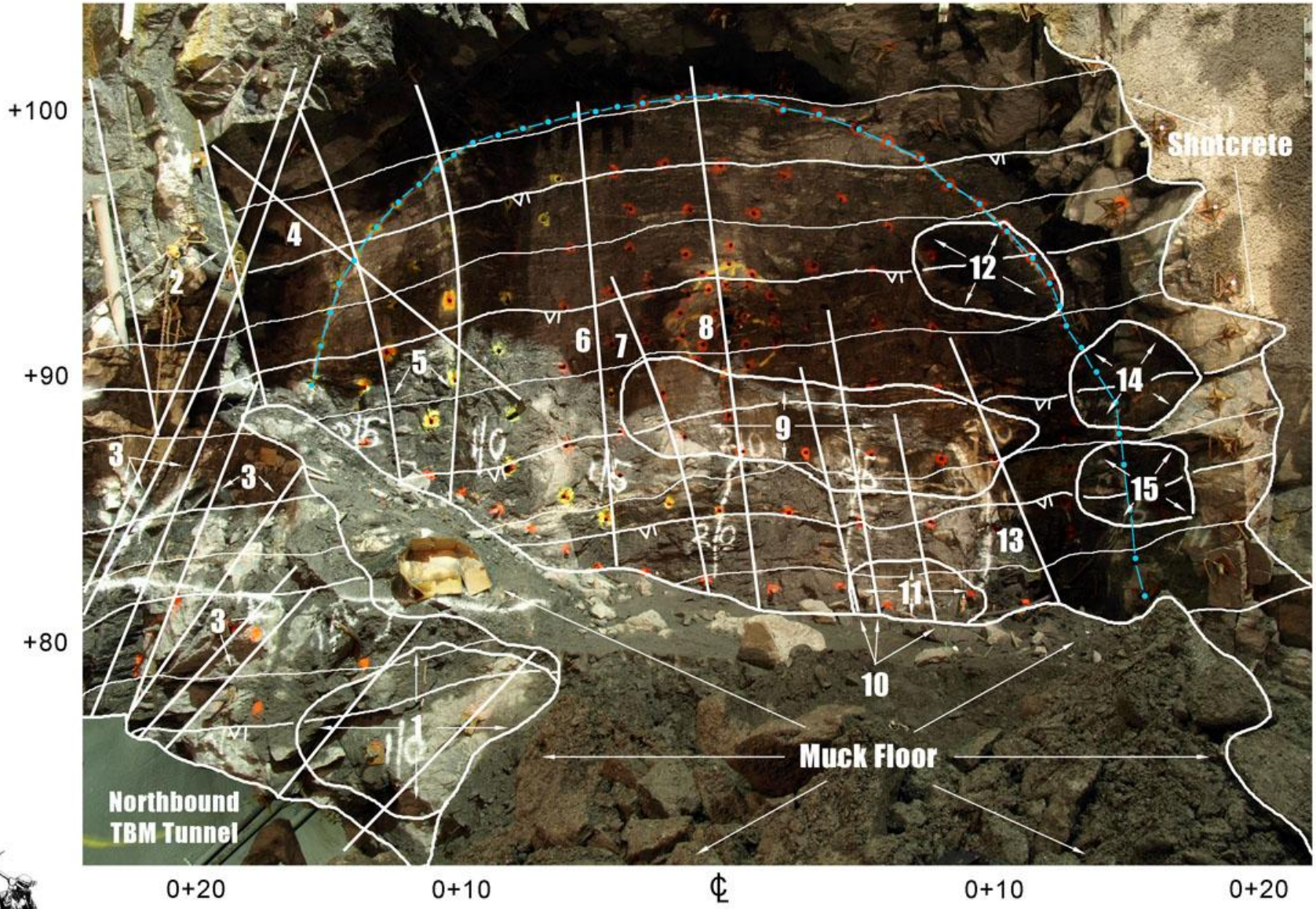

Second Avenue Subway
01/11/2013

Second Avenue Subway
Main Cavern – Sta 1203+95

Sta ~1199+00 – South Cavern


Sta ~1199+00 – South Cavern
N52E
90
N54E,
87SE
N55E,
90
N60W,
80SW
N30W, 57NE
N55E,
86SE
N50E,
72NW
N10E,
81NW
EW, 32S
N25W, 65NE
N37W, 67NE
N40W, 70NE
N32E, 80NW
N5E, 80SE
0
5
10 Feet

Second Avenue Subway
Sta 1198+75 – CIR Room



Duke Geological Lab
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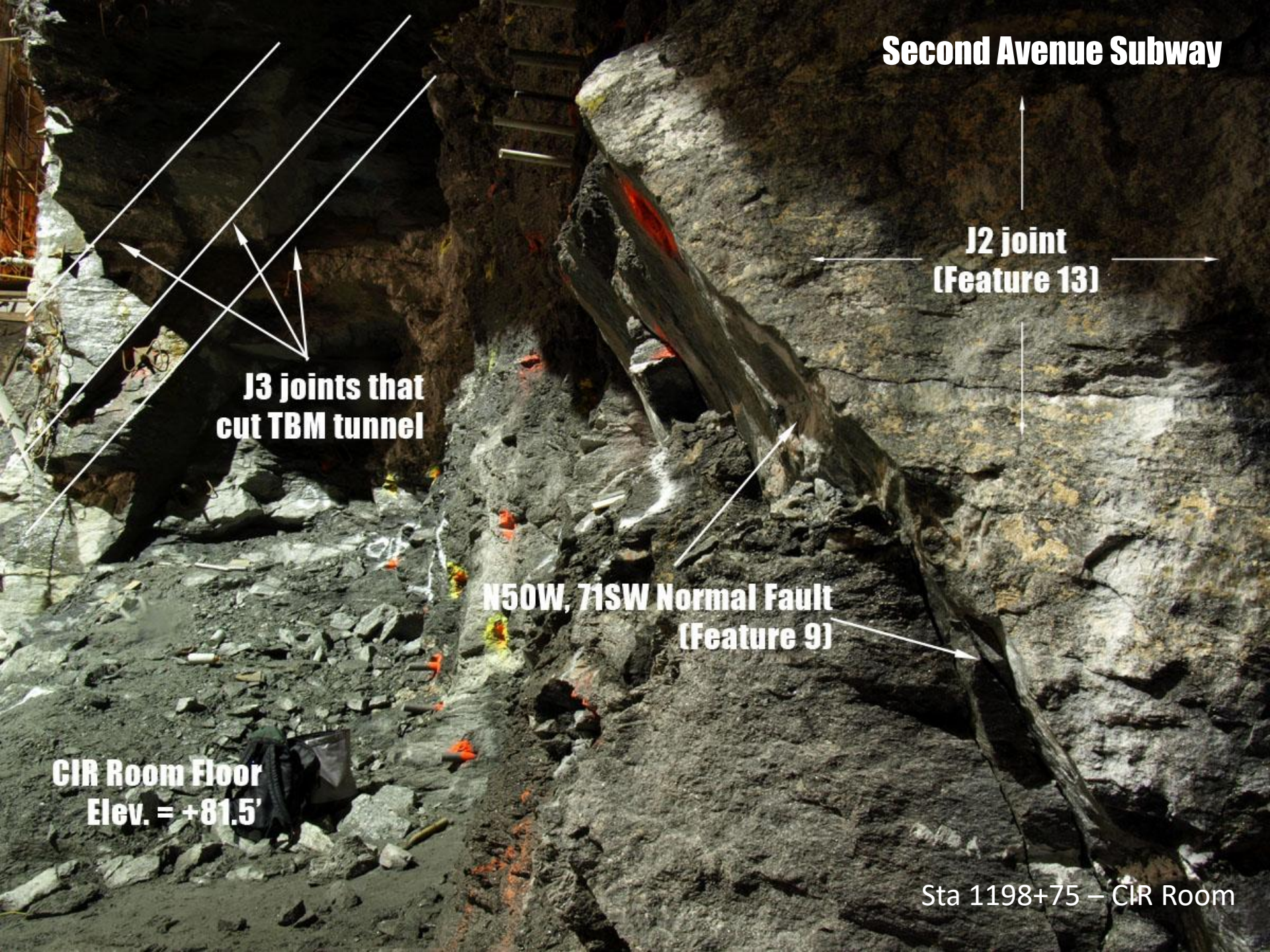
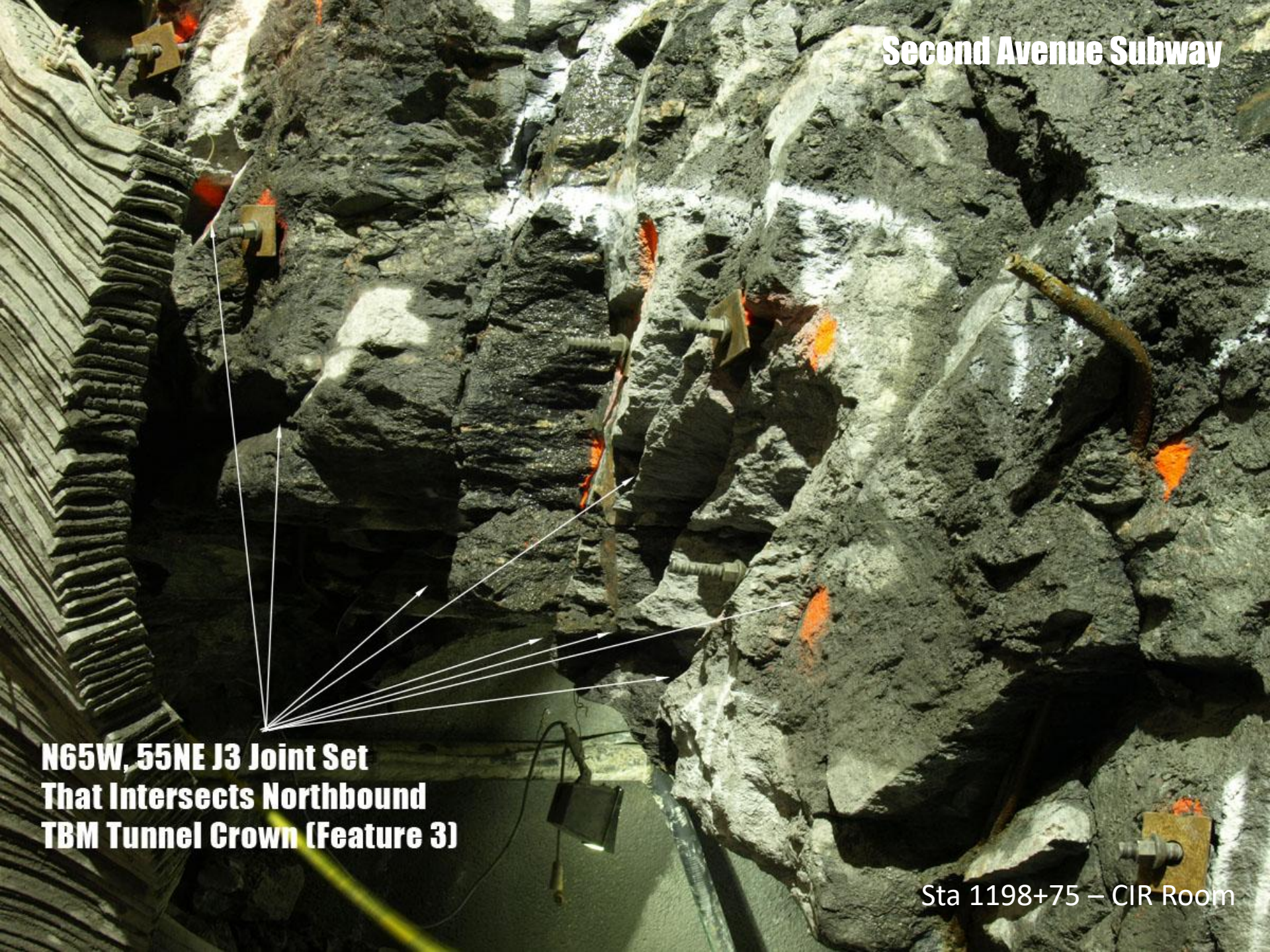
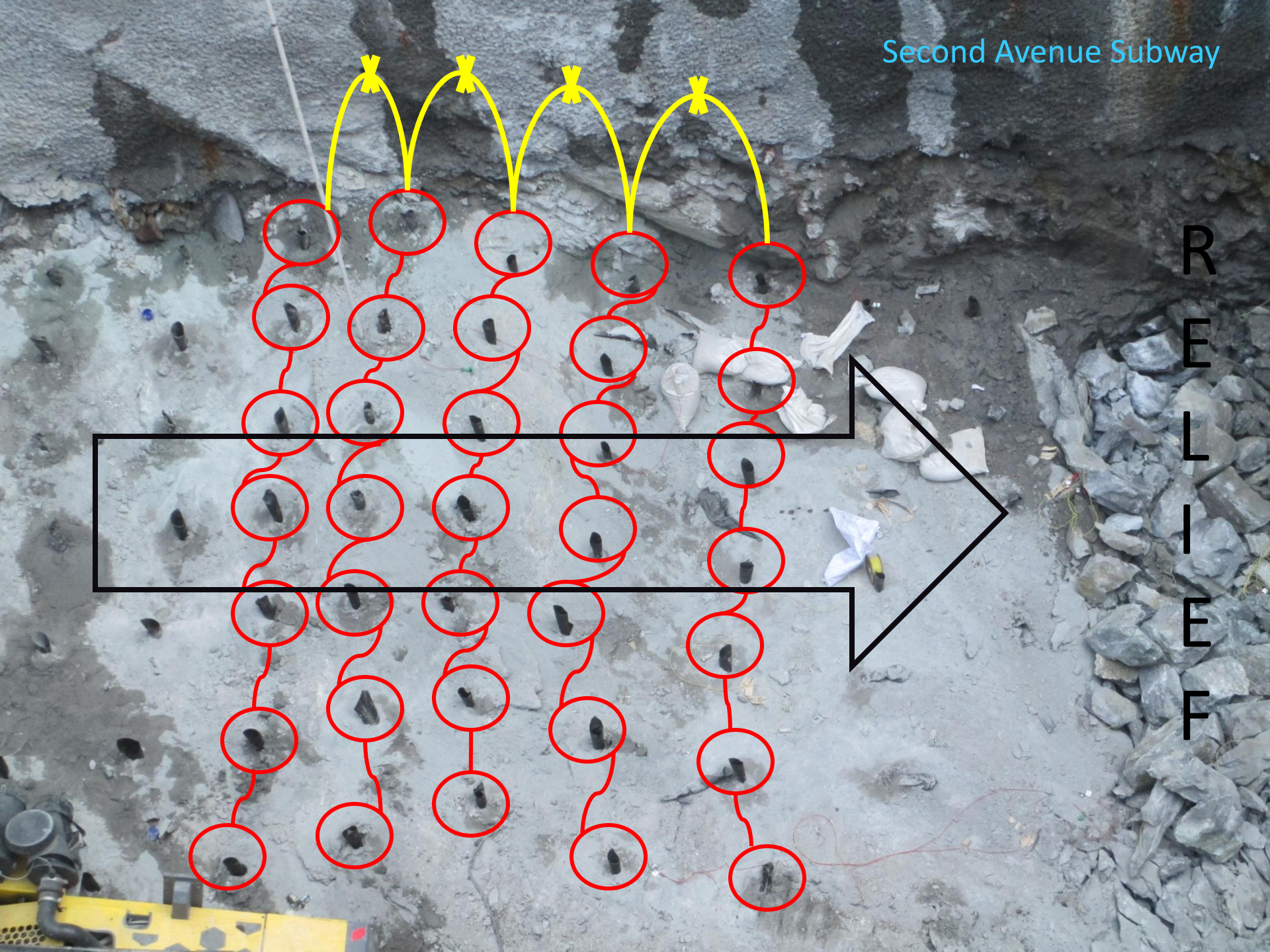
Mapped 28 February 2013

Second Avenue Subway
CIR Room Floor
Elev. = +81.5'
Sta 1198+75 – CIR Room



Sta 1198+75 – CIR Room


Second Avenue Subway
N65W, 55NE J3 Joint Set
That Intersects Northbound
TBM Tunnel Crown (Feature 3)
Sta 1198+75 – CIR Room


Second Avenue Subway
RELIEF

Tilt and Vibration Monitors

Second Avenue Subway
Blast Mats Set

Second Avenue Subway
86th Street Station Complex
Ancillary #2

06 Nov 2012

Second Avenue Subway

Sta 1207+50 – Ancillary #2 West Wall

Second Avenue Subway
86th Street Station Complex
Ancillary #2

Second Avenue Subway
86th Street Ancillary #2
Southward View of South Wall
Elevation +155' to +133'

Plate 2

0 5 10 Feet

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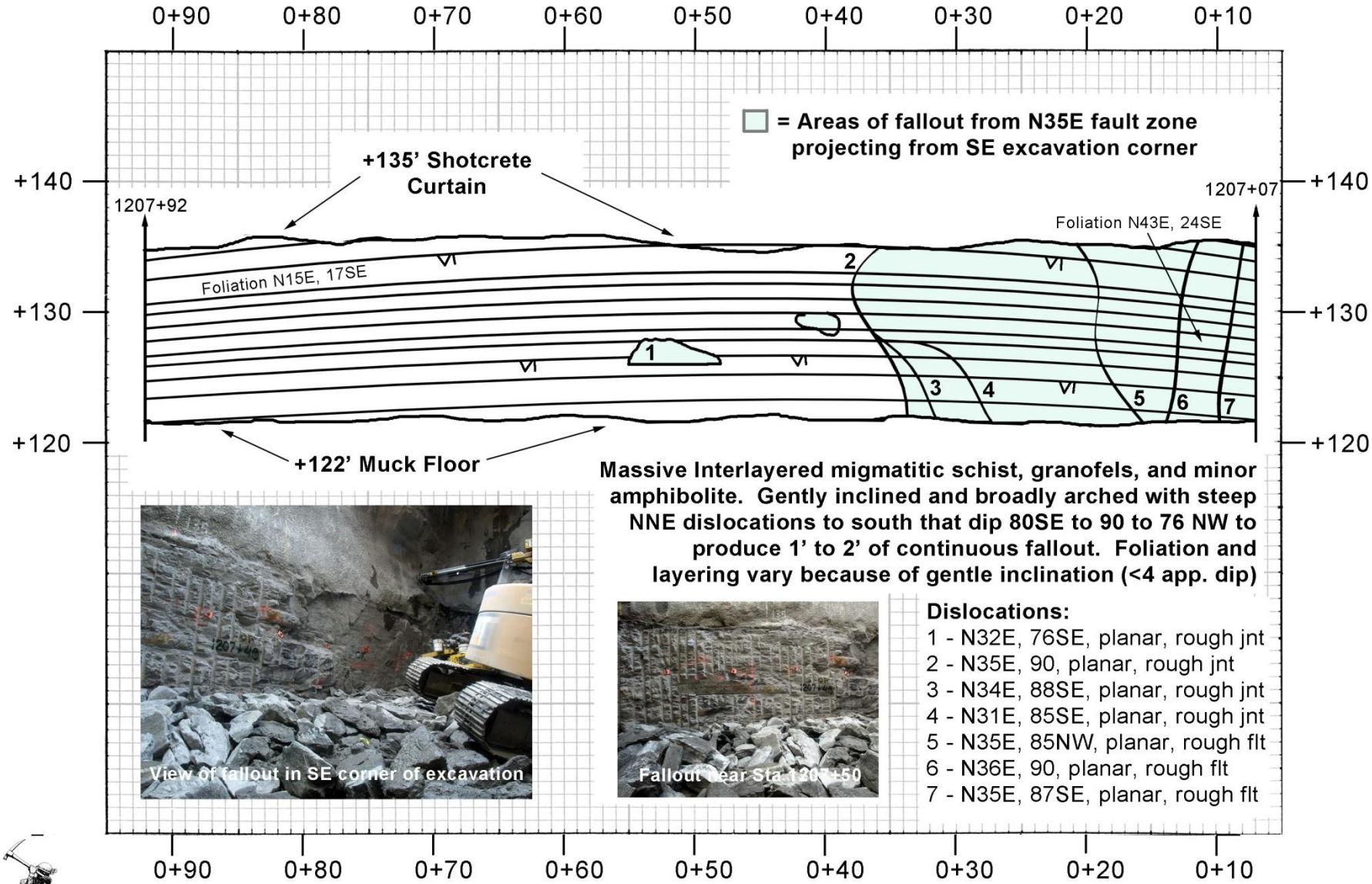
Second Avenue Subway - Ancillary #2 East Wall (Sta. 1207+07 to 1207+92); Elev. +135' to +122'



Massive Interlayered migmatitic schist, granofels, and minor amphibolite. Gently inclined and broadly arched with steep NNE dislocations to south that dip 80SE to 90 to 76 NW to produce 1' to 2' of continuous fallout. Foliation and layering vary because of gentle inclination (<4 app. dip)

View of fallout in SE corner of excavation

Fallout near Sta 1207+50

Dislocations:

1 - N32E, 76SE, planar, rough jnt
2 - N35E, 90, planar, rough jnt
3 - N34E, 88SE, planar, rough jnt
4 - N31E, 85SE, planar, rough jnt
5 - N35E, 85NW, planar, rough flt
6 - N36E, 90, planar, rough flt
7 - N35E, 87SE, planar, rough flt

0+90 0+80 0+70 0+60 0+50 0+40 0+30 0+20 0+10

Stationing in Feet North Along East Wall

(Map Drawn Parallel to Sta 0+50 West of Second Avenue Centerline)

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Mapped 21 November 2012

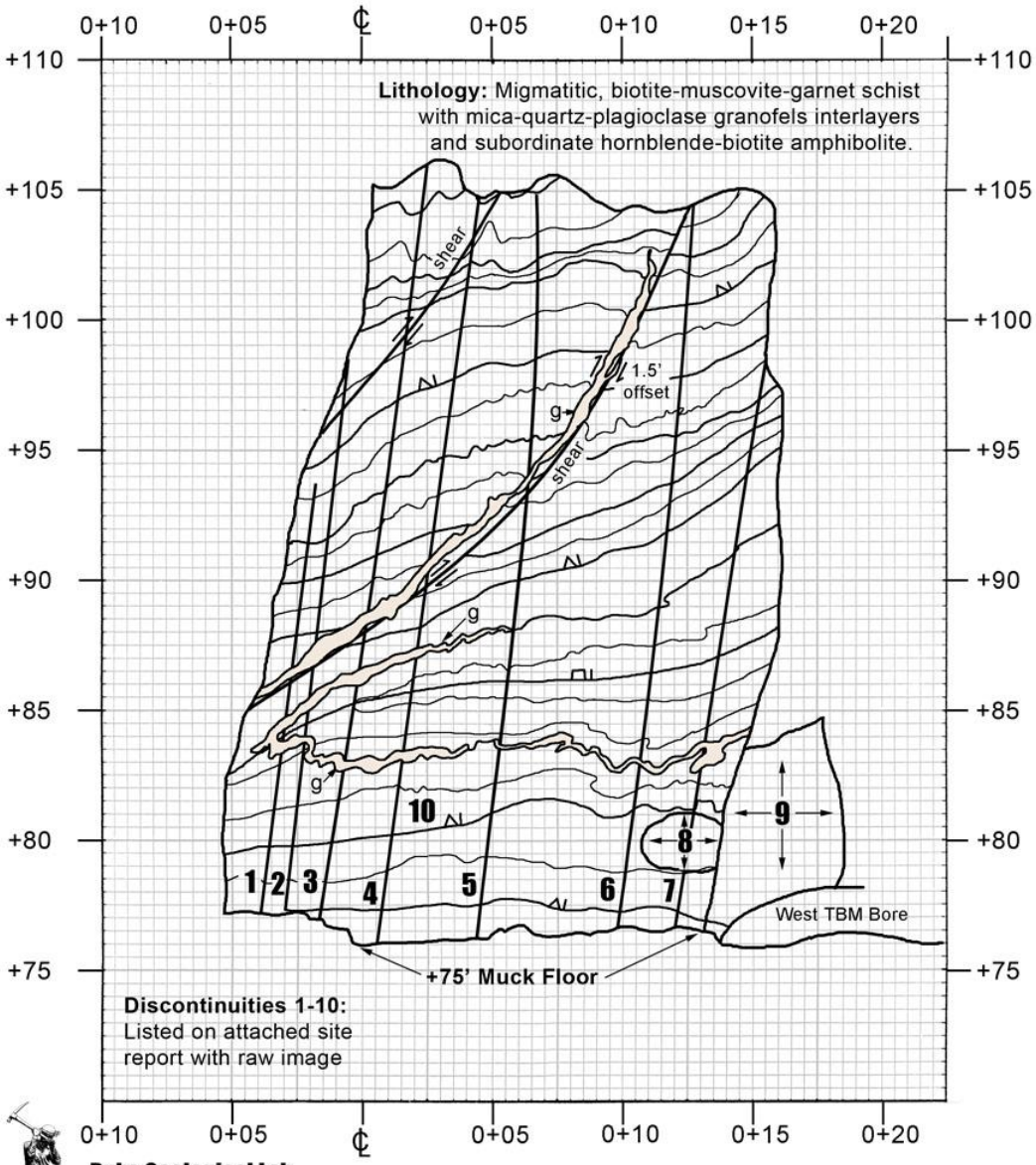
Second Avenue Subway
Sta 1207+50 – Ancillary #2 West Wall

Sta ~1205+00 – North Cavern
Center and West Slash

Second Avenue Subway

Sta 1204+90
North Cavern Center Slash

Second Avenue Subway



Sta 1204+90
North Cavern Center Slash

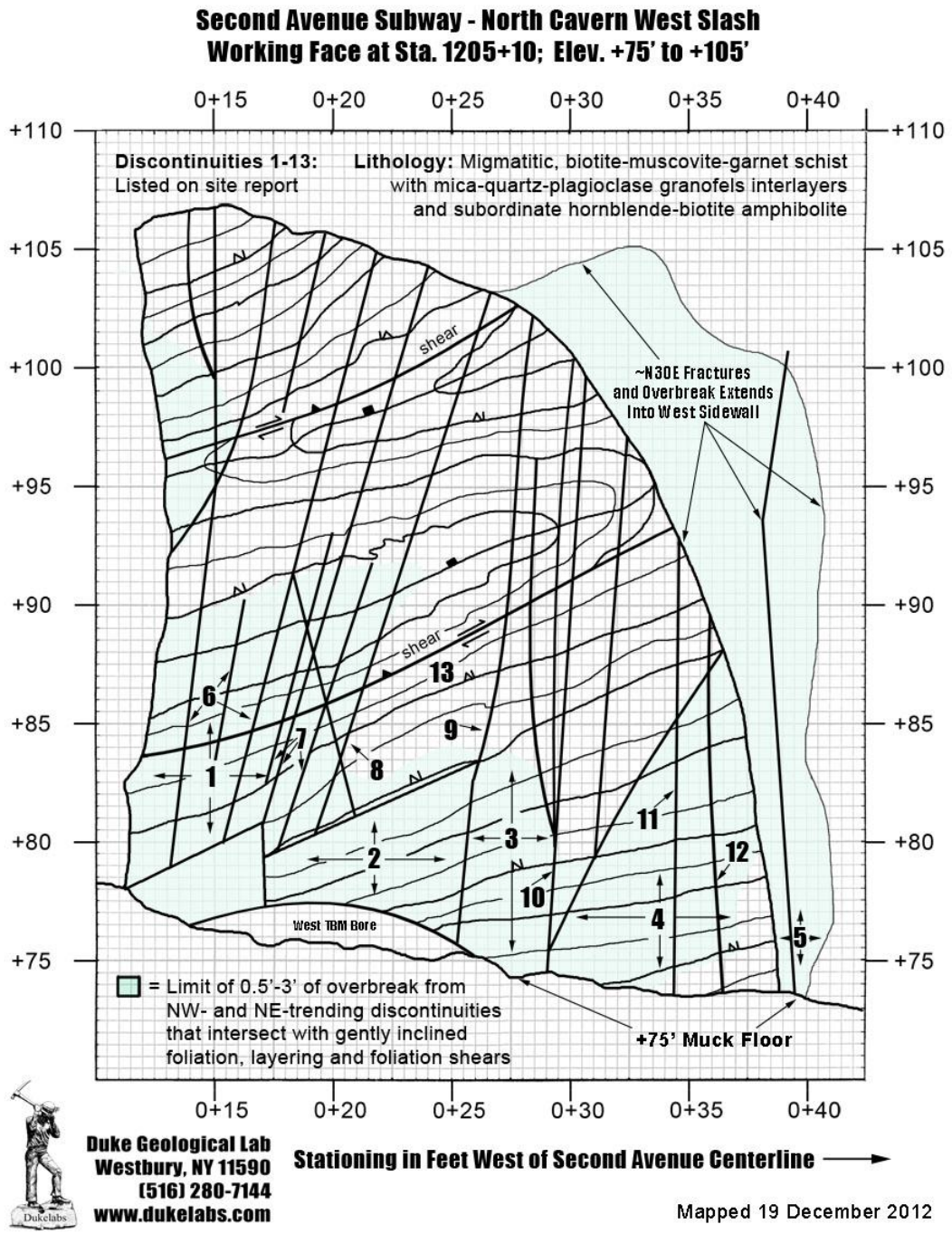
Second Avenue Subway

Sta 1204+90
North Cavern Center Slash

Second Avenue Subway

Sta 1205+10 – North Cavern
West Slash

Second Avenue Subway



Sta 1205+10 – North Cavern West Slash

Second Avenue Subway

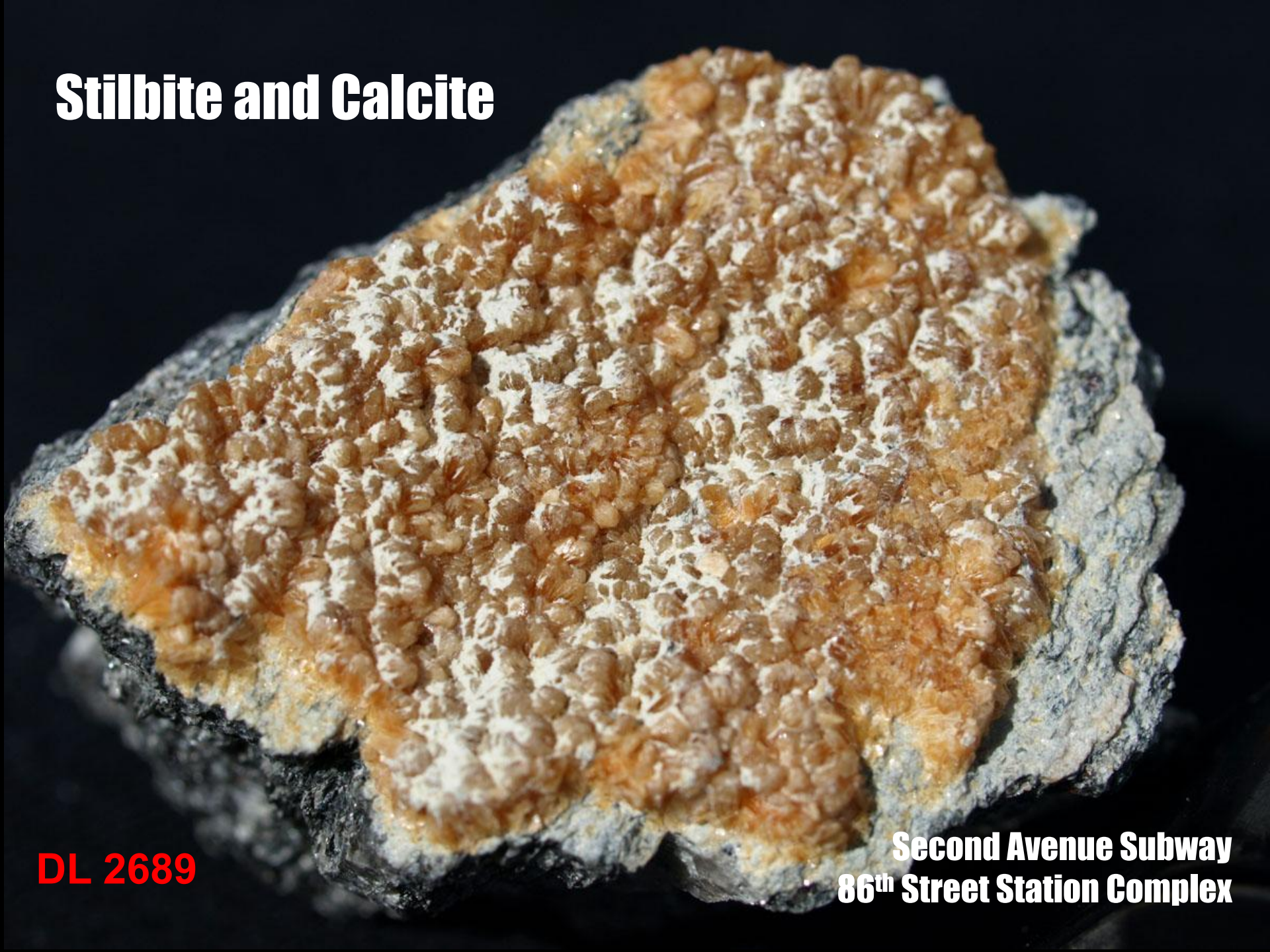
Sta 1205+10 – North Cavern

Second Avenue Subway
Sta 1205+10 – North Cavern

Epidote
DL 2840
Second Avenue Subway
86th Street Station Complex

Epidote
DL 2840
Second Avenue Subway
86th Street Station Complex

Epidote
DL 2845
Second Avenue Subway
86th Street Station Complex


Stilbite and Calcite
DL 2689
Second Avenue Subway
86th Street Station Complex

Stilbite
DL 2853
Second Avenue Subway
86th Street Station Complex

Stilbite
DL 2854
Second Avenue Subway
86th Street Station Complex

Stilbite
DL 2857
Second Avenue Subway
86th Street Station Complex

Stilbite cut by Calcite

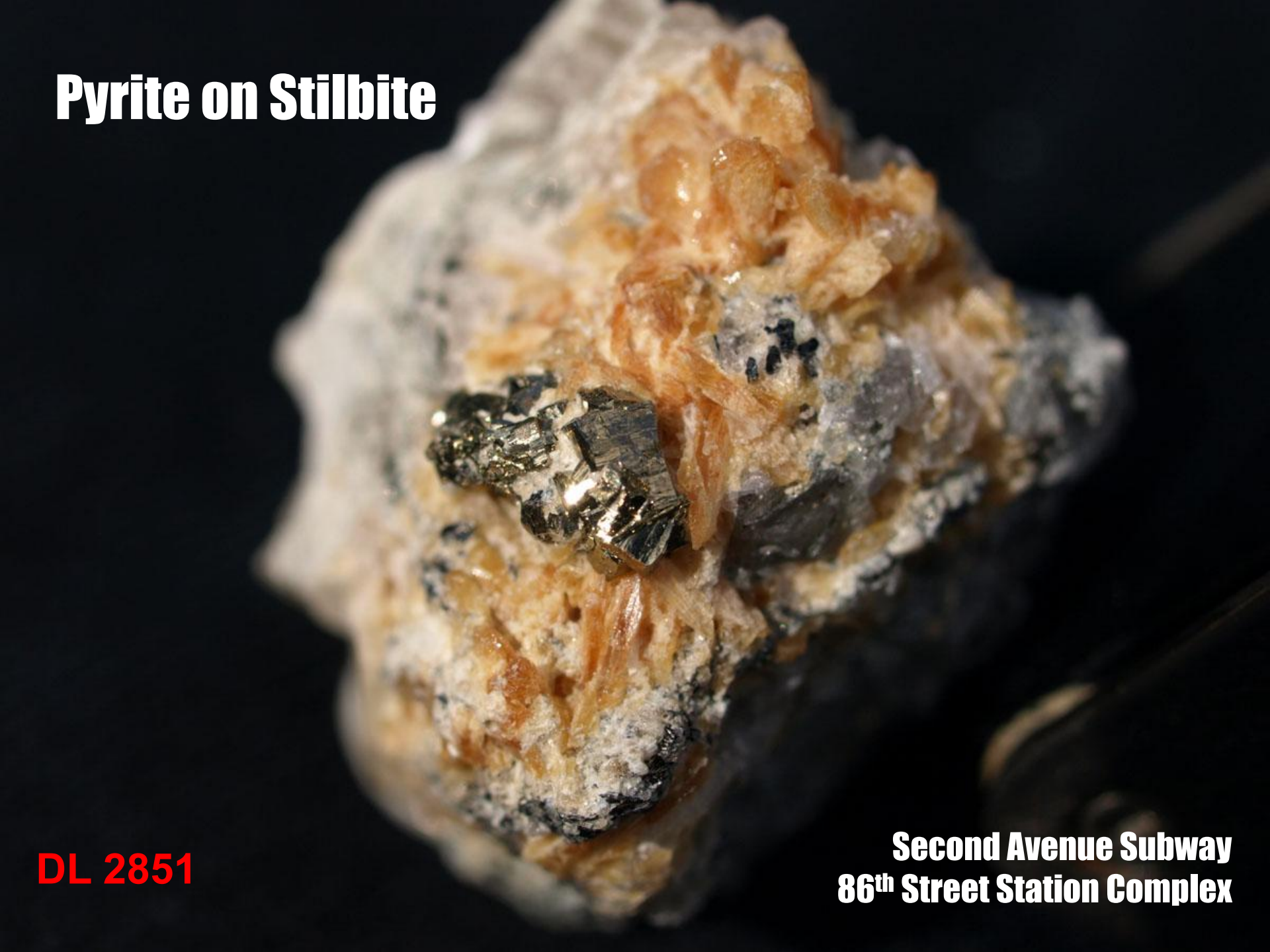
DL 2873

Second Avenue Subway
86th Street Station Complex

Calcite
DL 1075
Second Avenue Subway
86th Street Station Complex

Calcite
DL 1104
Second Avenue Subway
86th Street Station Complex

Pyrite on Stilbite



DL 2851

Second Avenue Subway
86th Street Station Complex

DUKE
OK, That's It!
I've Heard Enough!
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H. Manne