Climate Change Adaptation and the MTA

FTA Climate Change Adaptation Seminar

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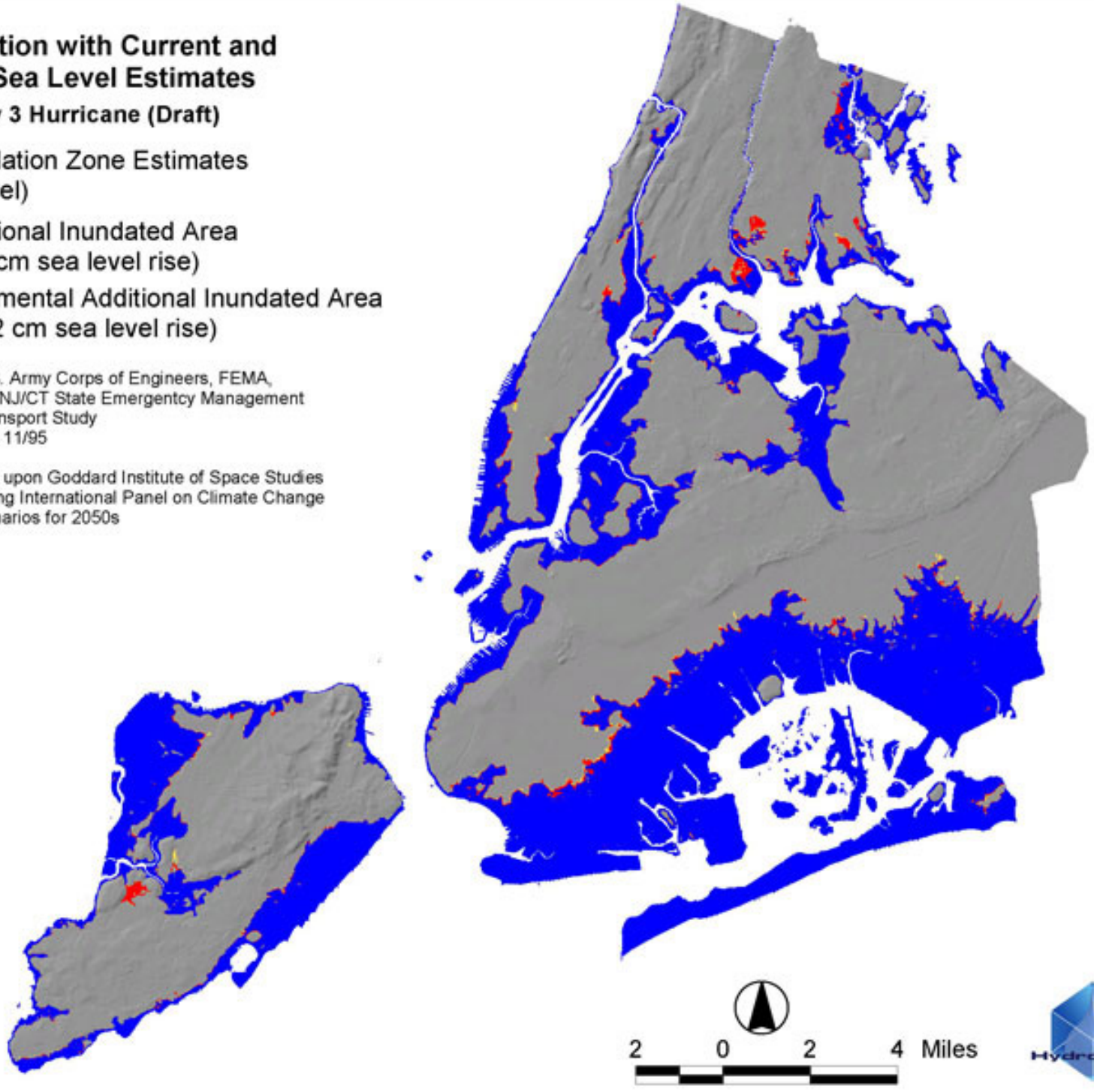
Comparing Inundation with Current and Projected (2050s) Sea Level Estimates

Case Study: Category 3 Hurricane (Draft)

- Projected Inundation Zone Estimates (current sea level)
- Projected Additional Inundated Area IPCC B1 (37.5 cm sea level rise)
- Projected Incremental Additional Inundated Area IPCC A1B (47.2 cm sea level rise)

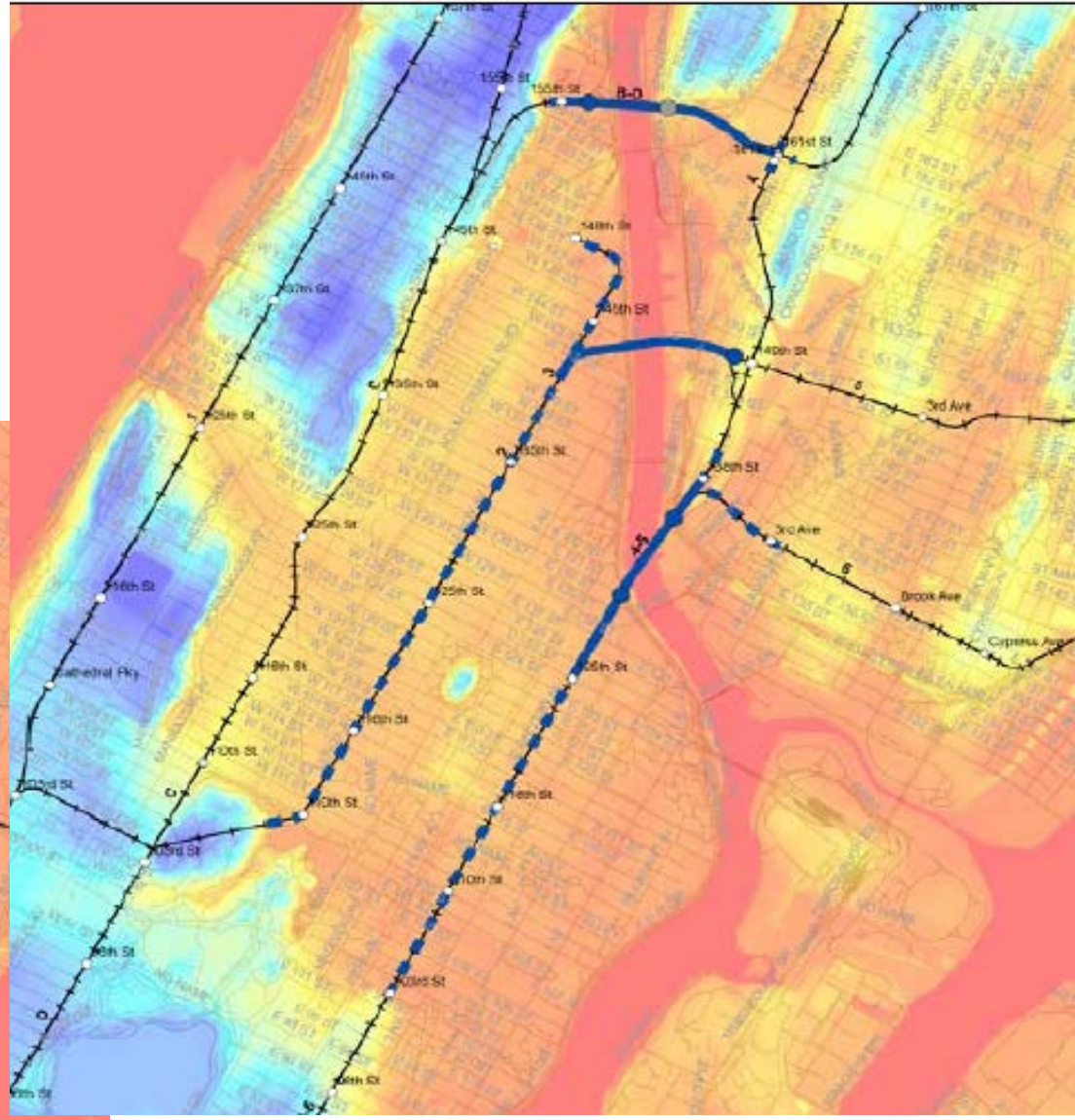
Storm Surge Data Source: U.S. Army Corps of Engineers, FEMA, National Weather Service, NY/NJ/CT State Emergentcy Management Metro New York Hurricane Transport Study
Interim Technical Data Report, 11/95

Sea level rise estimates based upon Goddard Institute of Space Studies Atmospheric-Ocean Model using International Panel on Climate Change greenhouse gas emission scenarios for 2050s



100-year flood with

4ft sea level rise



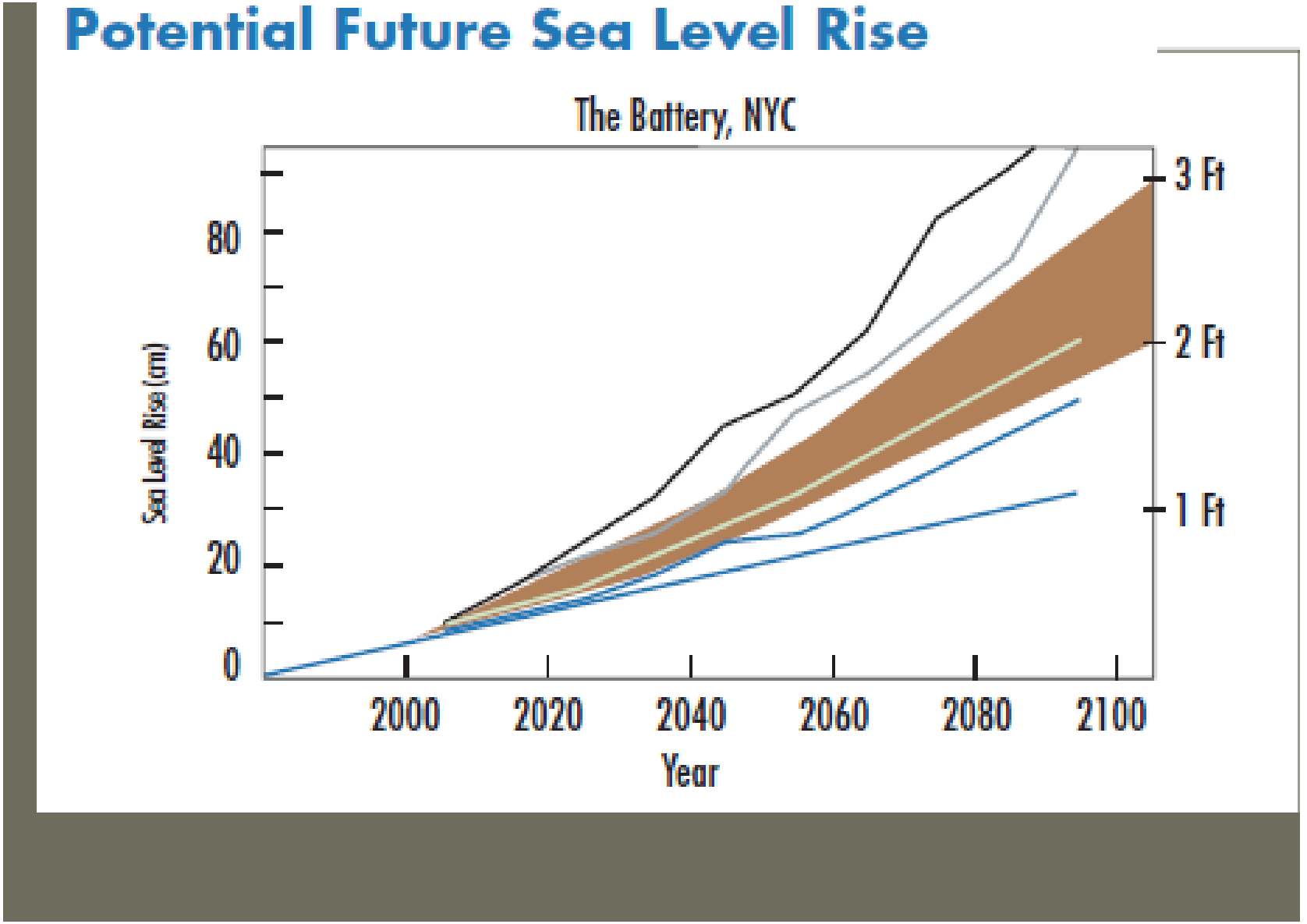
Lowest critical elevations

- The lowest points of entry to tunnels, subways or ventilation shafts.

MTA Subway Lines Lowest Critical Elevations(LCEs)	
A C Lines	7.0 feet
M N R Lines	7.5 feet
1 Line	9.1 feet
2 3 Lines	9.1 feet
4 5 6 Lines	9.9 feet
E F Lines	10.0 feet
B Q Lines	12.7 feet

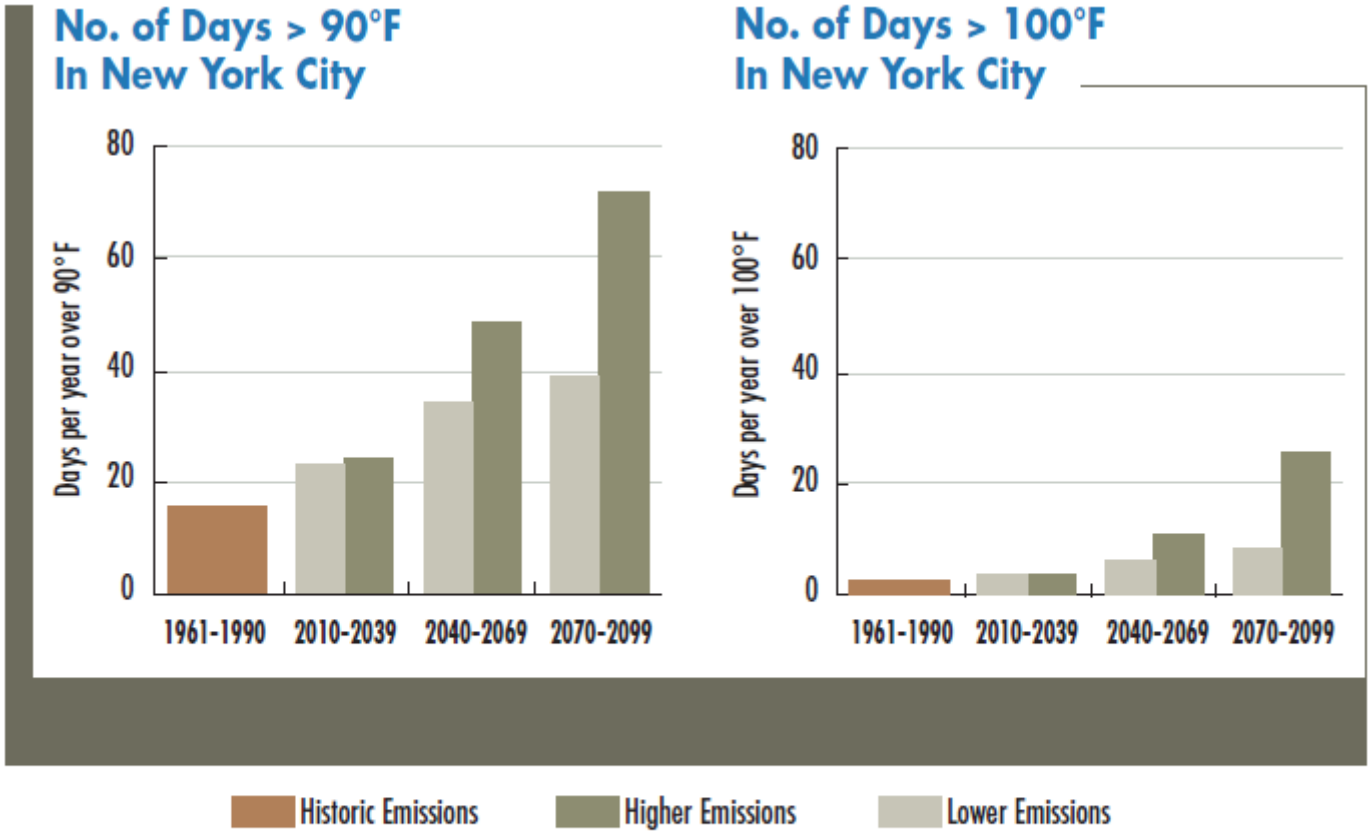
Elevations measured in feet above the National Geodetic Vertical Datum of 1929 – NGVD'29.
Source: Jacob et al. (2000)[2]

Potential Future Sea Level Rise



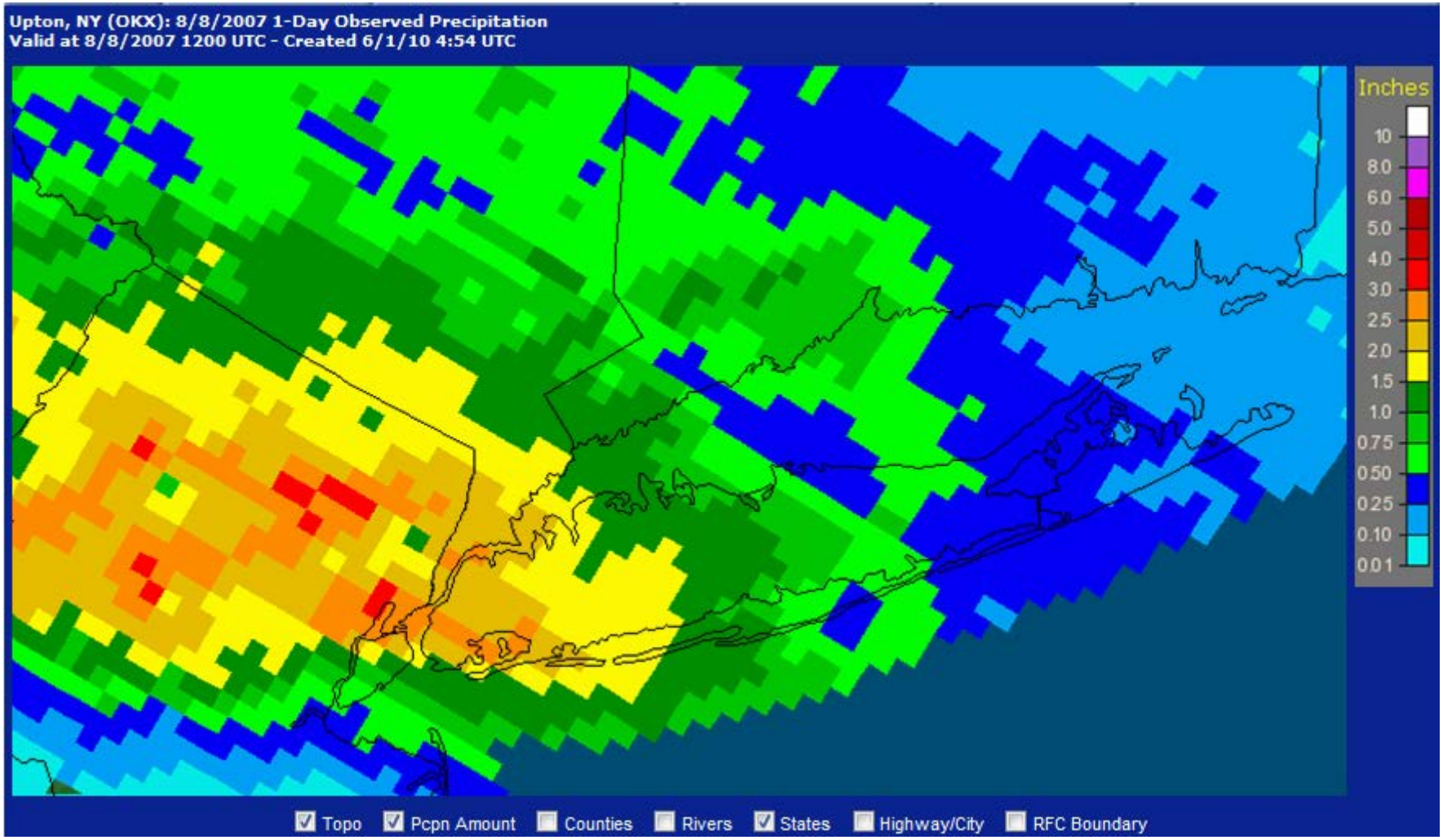
Range of projected local sea level rise (SLR) for New York City as optional input for precautionary planning purposes. The different lines represent projections for various atmospheric greenhouse gas scenarios and climate models. The orange band depicts a range of optional SLR planning scenarios during this century, implying 2ft SLR as a minimum scenario, and 3 ft by the end of this century as precautionary target planning scenario. (Source: Modified from Jacob et al, 2007).

Extreme Temperatures



Forecast of number of days/year in New York City with temperatures exceeding 90°F (left) and 100°F (right) for different decadal periods and for two GHG emissions scenarios. The orange bar represents observed occurrences prior to 1990. (Source: NECIA, 2006)

Anatomy of a Storm



Case Study:
Lessons from August 8, 2007

- 1.4 to 3.5 inches of rainfall in two-hour period
- Pockets of intense, sustained rain overwhelms regional drainage systems
- First tornados to hit Brooklyn in over 100 years
- Storm coincides with morning rush hour
- Reports of flooding throughout system begin just before 6am

Progression of the Worst Flooding

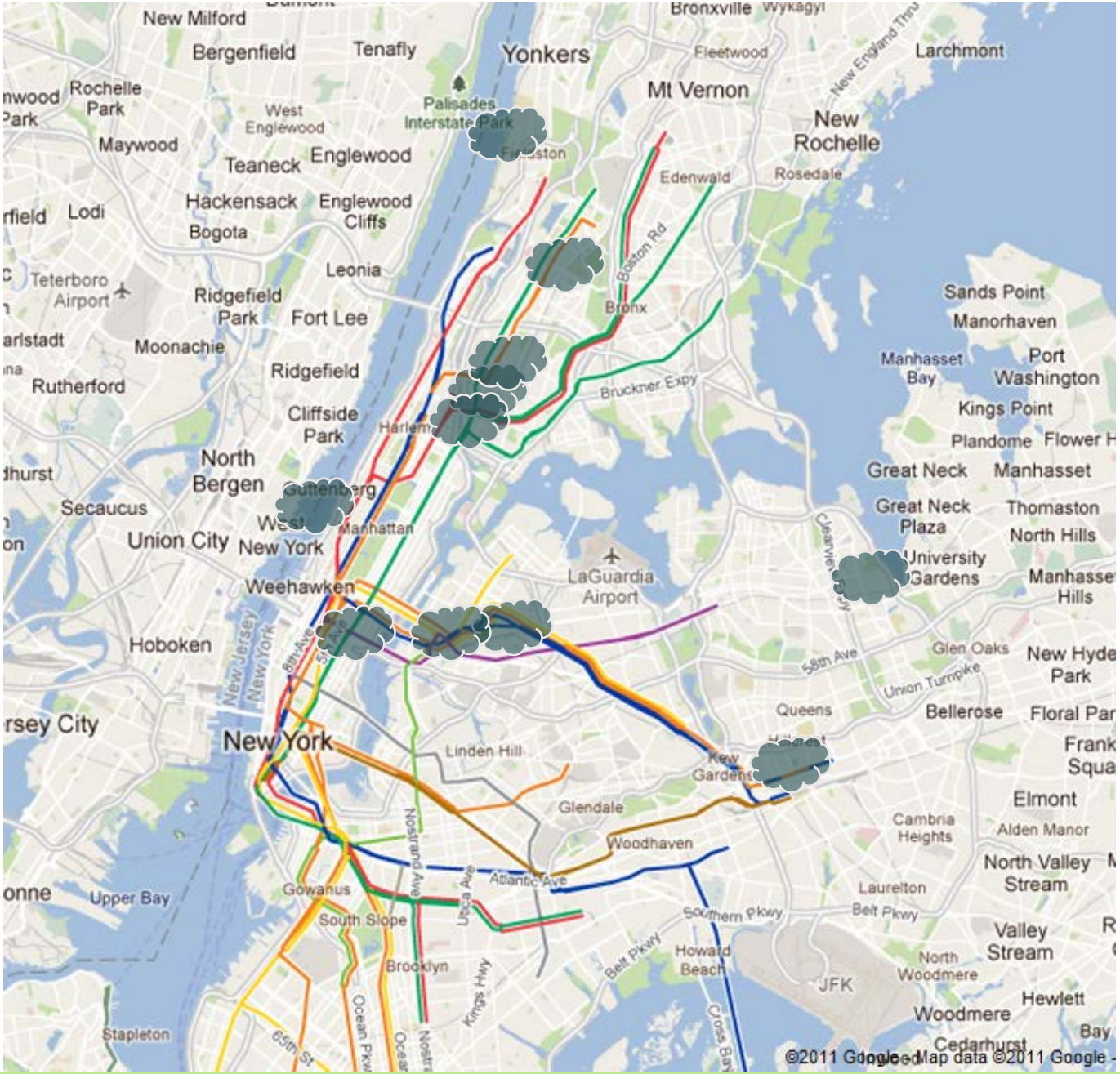
6:10 am

6:31 am

6:46 am

7:11 am

7:20 am



Exit
34 Street & 8 Avenue

3602
23
Ely
Exit

Most Flood-prone Subway locations

- 116th Street
- 86th Street
- 79th Street
- Times Sq. Shuttle
- 34th St. & 8th Ave.
- 34th St. & 6th Ave.
- 28th Street **
- Canal St.
- North of Chambers
- North of Cortlandt
- 145th Street
- 125th Street
- Queens Plaza
- 86th Street
- 36th Street
- 47-50th Sts.
- 65th Street
- Court Square
- Jefferson St.
- 23rd Street
- Broadway
- Borough Hall
- Chambers St. at Nassau
- Nevins St.
- Union Street
- Parsons Blvd
- Sutphin Blvd
- Myrtle Ave.
- Flushing Ave
- Utica Ave
- Hoyt-Schermerhorn
- Pacific St. **

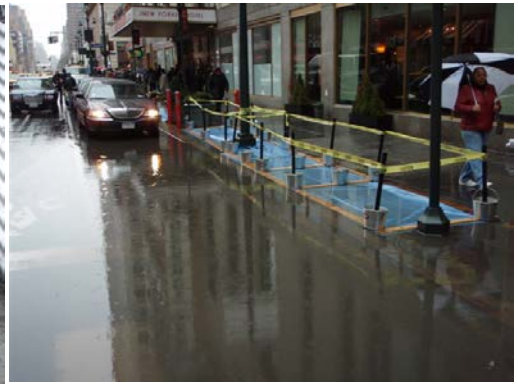
Most-Most Flood-prone Subway locations

NEW YORKER HOTEL
CAUTION

Enter with or buy
MetroCard at all
times or see agent
at Parsons Blvd.

LAUNDROMAT

19 raised pads



770 gratings paved-over

813 raised gratings

14 mechanical closing devices

in 4 locations:

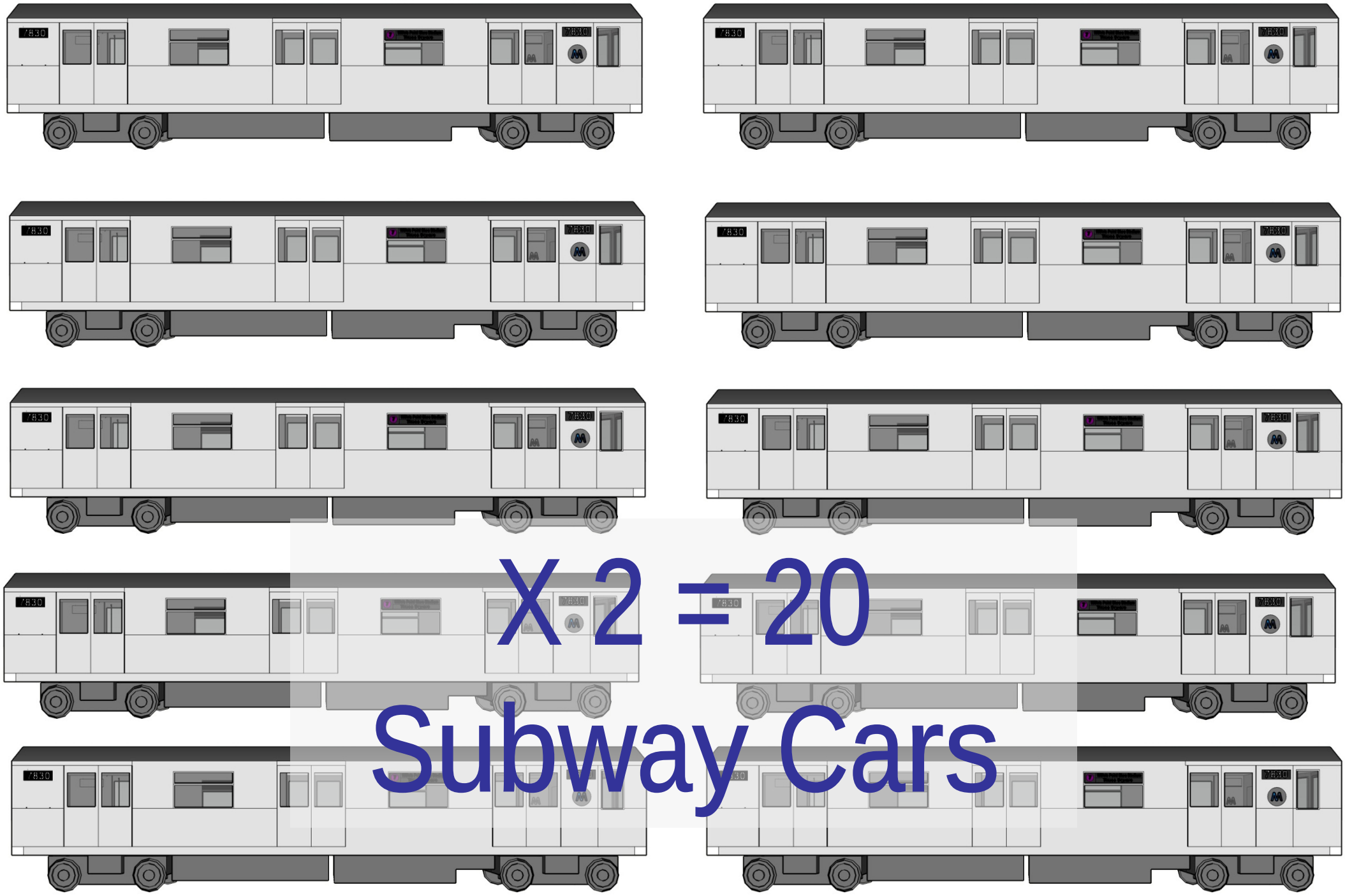
36th Street

65th Street

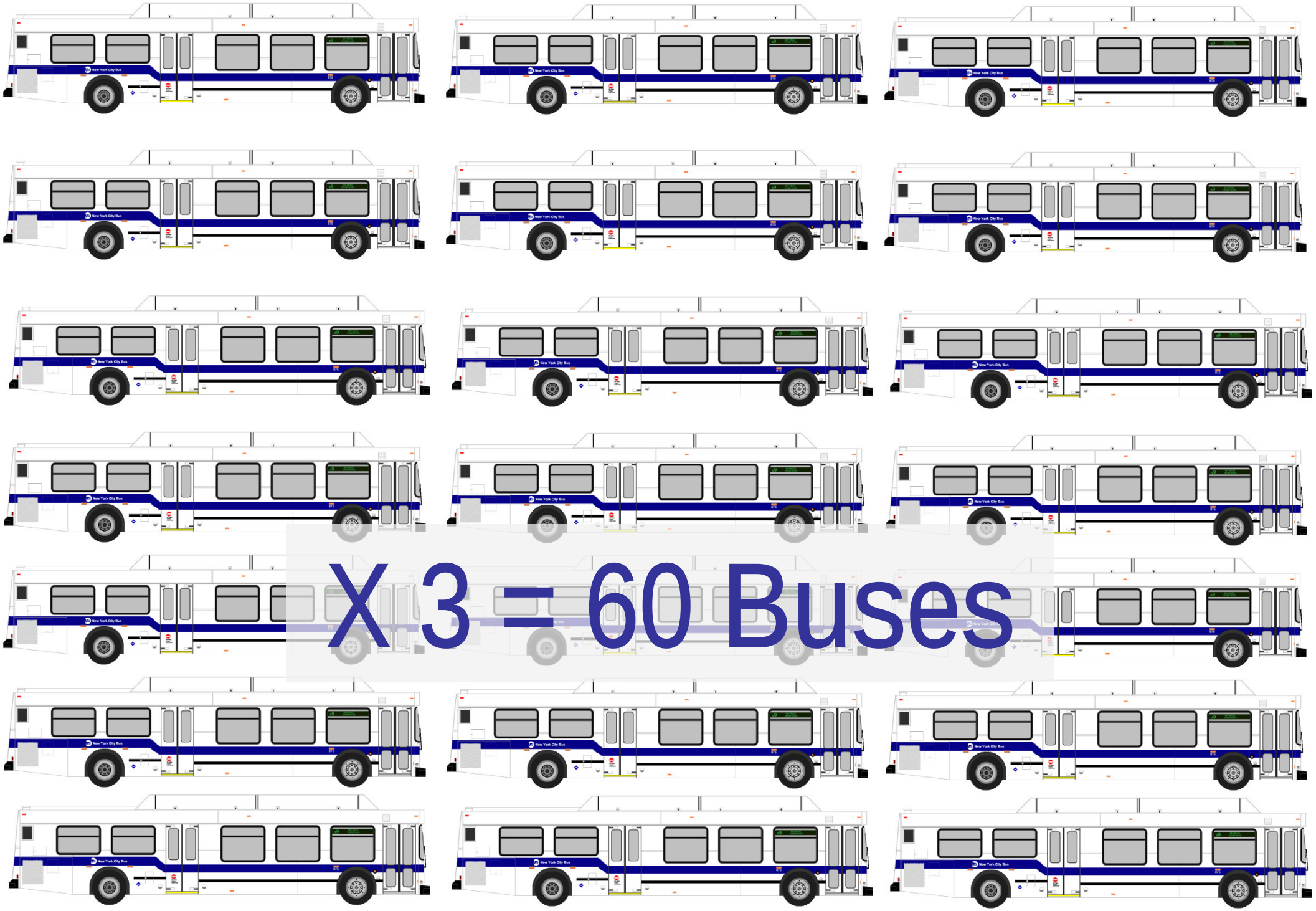
Sutphin Blvd.

Parsons Blvd

= $33.6 million

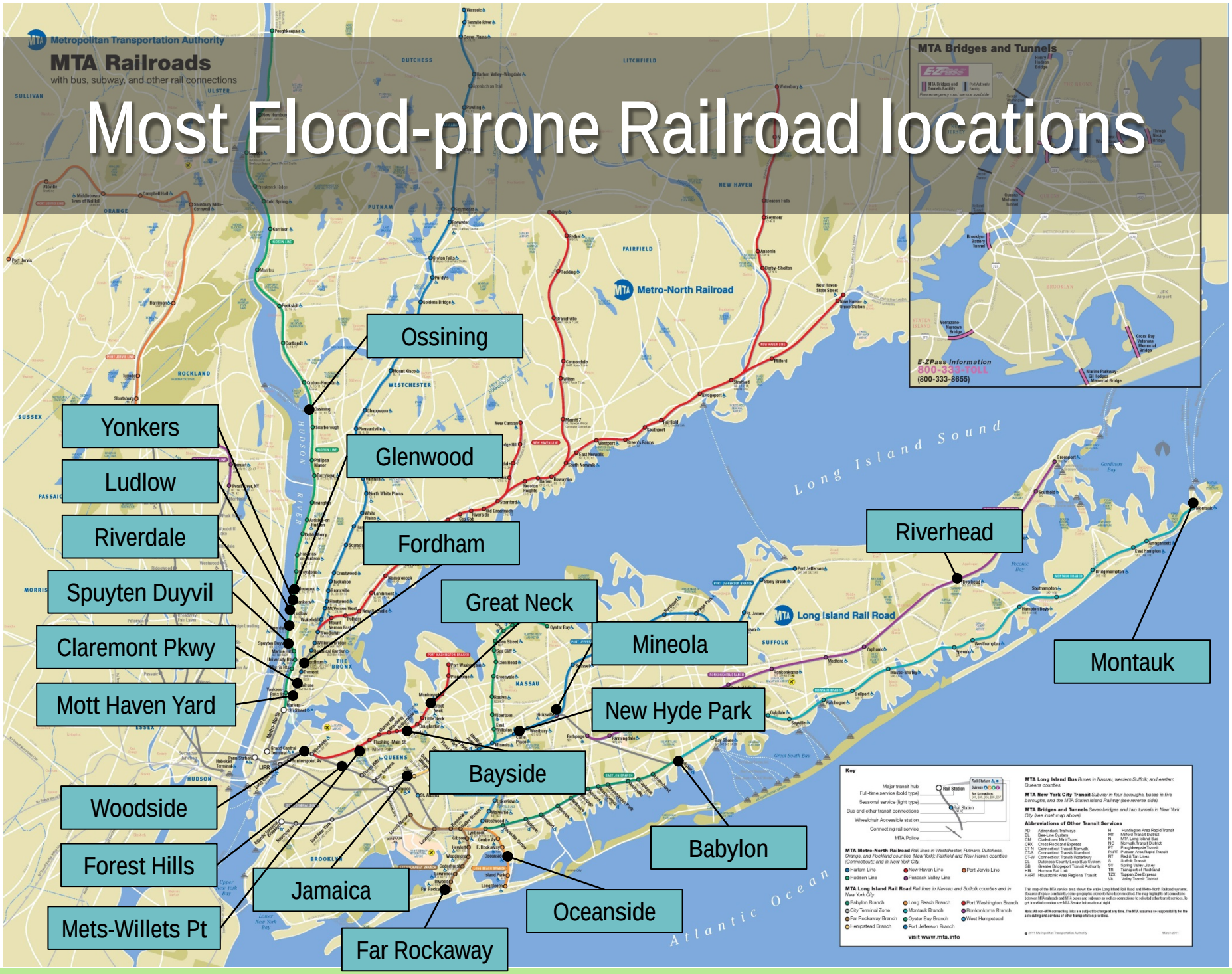


X 2 = 20 Subway Cars


X 3 = 60 Buses

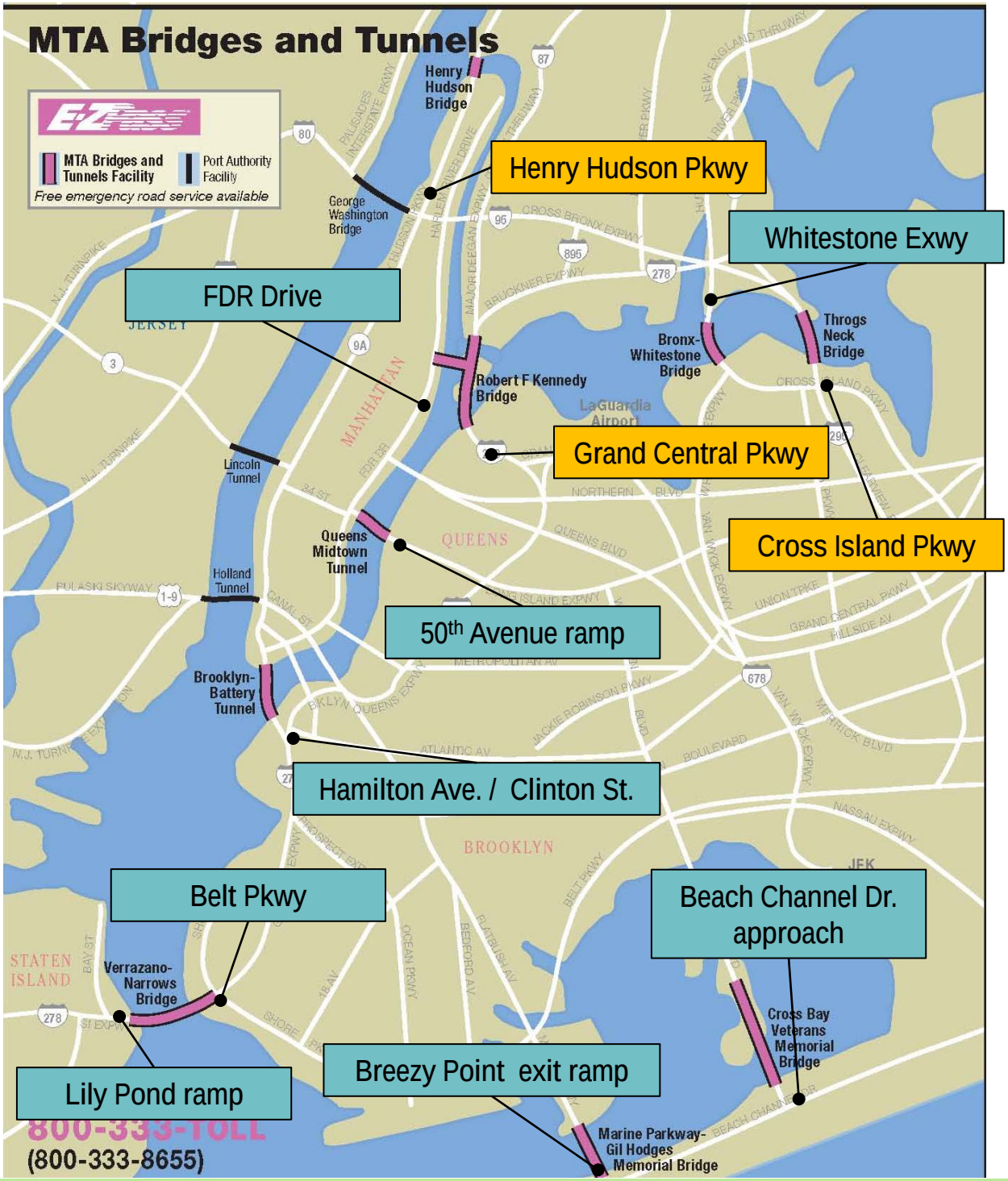
Storms on the Railroad

Most Flood-prone Railroad locations



Bridge and Tunnel Flooding

- Impacts resulting from flooding adjacent to B&T property
- i.e. Flooding on local roads and approaches

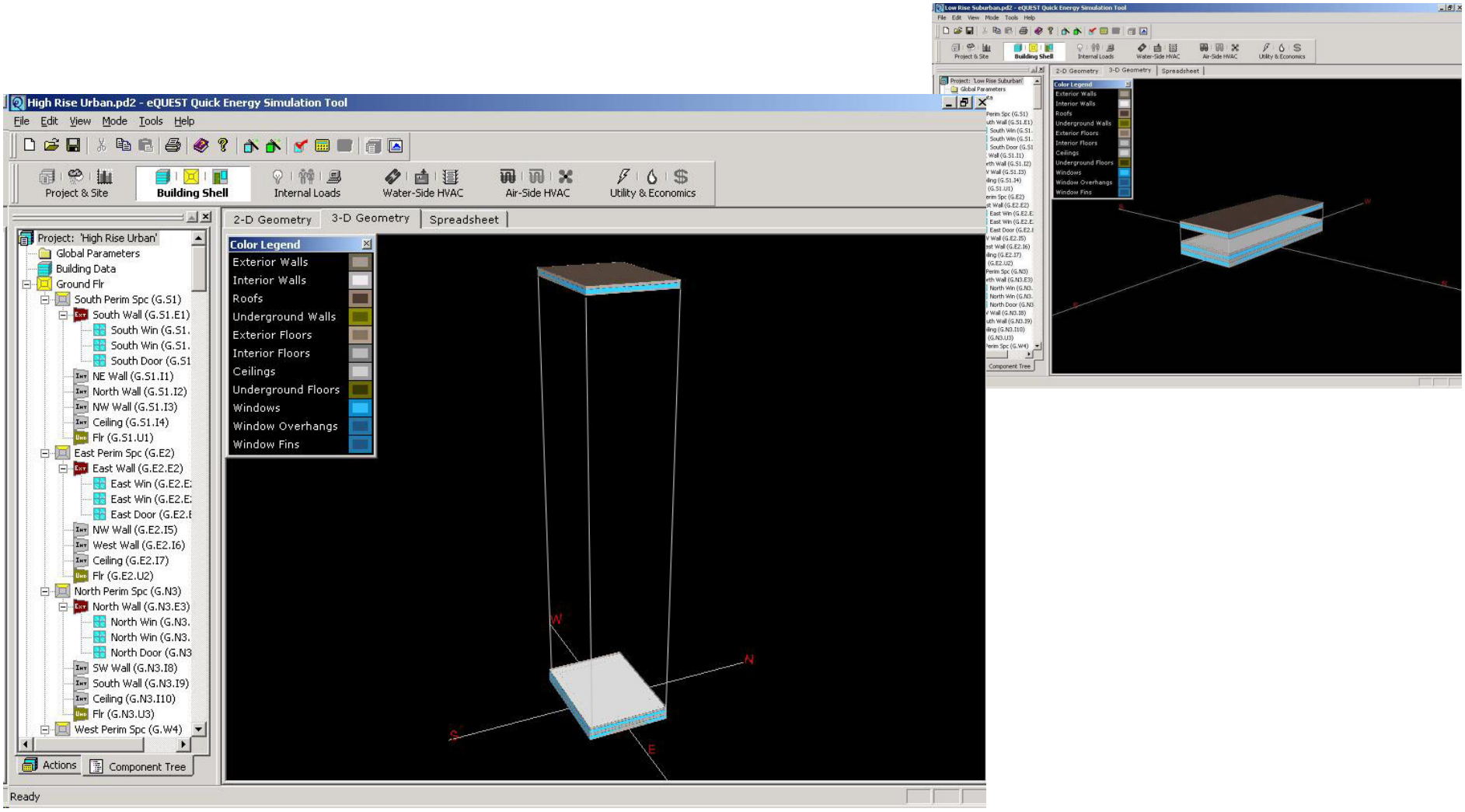


Mitigation

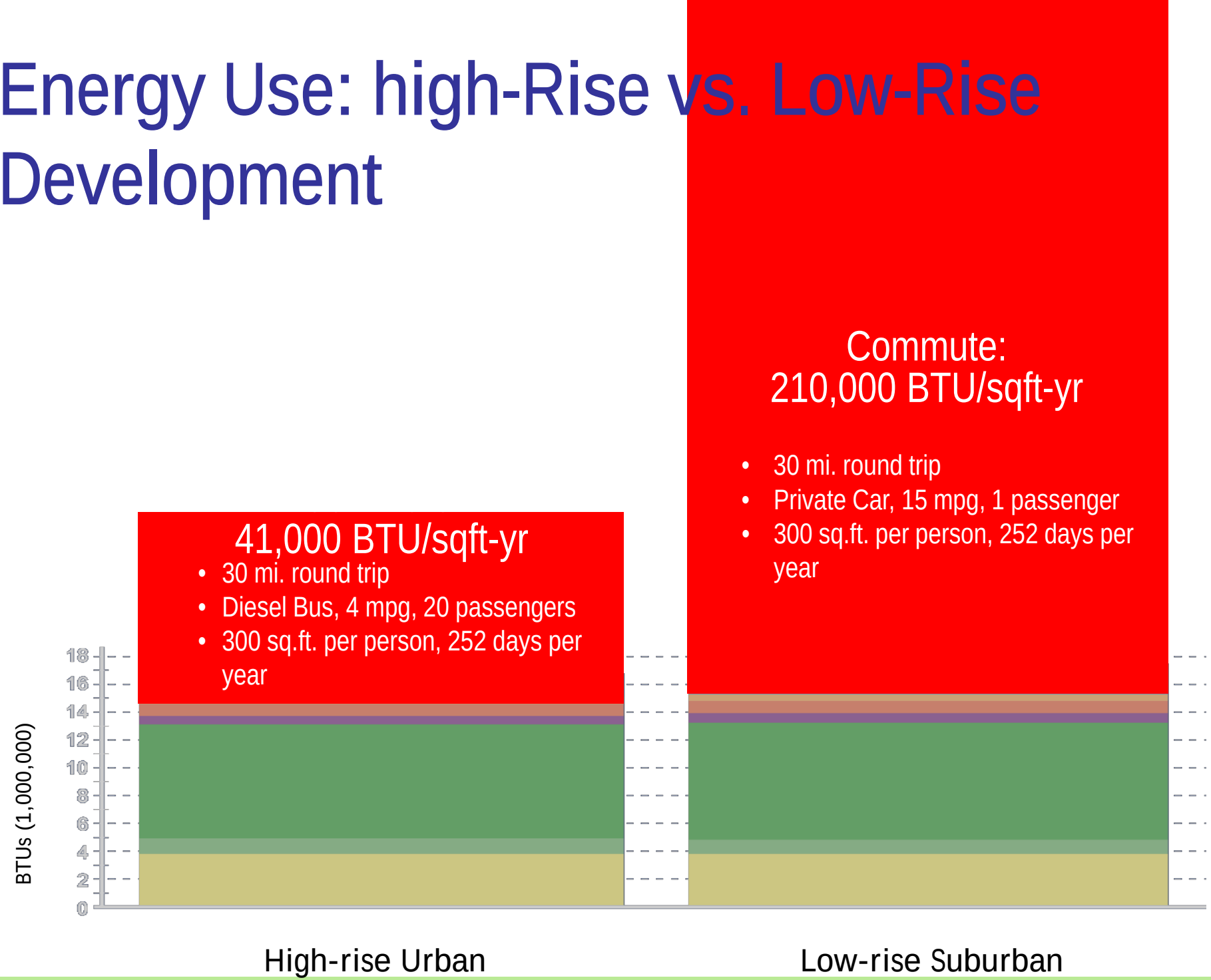
Energy Use: High-Rise vs. Low-Rise Development

	High-Rise	Low-Rise
Number of buildings	1	10
Average floor size	30,612 sf	36,000 sf
Area of roof	88,000 sf	375,000 sf
Area of ext wall	343,000 sf	385,000 sf
Area of parking	0 sf	1,837,500 sf

Energy Consumption: Low-Rise Office Park vs. Tall Urban Building



Energy Use: high-Rise vs. Low-Rise Development



2.3 million metric tons

Transit Effect Multiplier = 8.24

For every unit of GHG that the MTA emits

It helps avoid 8.24 units

In the net it helps avoid about 17million metric tons

@ $30 / ton ~ 500 million

Currently un-recognized and un-compensated

WATCH THE GAP

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