

Shutdown: NYCT's Extreme Weather Strategy for Safety and Recovery

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NYCT Subway:
 5.3 Million
 Riders Daily
 468 stations
 660 track miles



Key

- Rush hour line extension
- Local service only
- All trains stop (local and express service)
- Free subway transfer
- Free out-of-system subway transfer (excluding single ride ticket)
- Normal service
- Additional express service
- Station Name
- Terminal
- Accessible station



Events leading to a shutdown



Heat-Blackout



Snow



Hurricane



Terrorism



Strike



Shutdown basics

- Safety – Customers and Staff
 - Wind, rain and storm surge
 - Exposure – Avoid stranded customers (support services).
- Recovery = Protect equipment
 - Track, 3rd Rail, Communications, Lighting, Signals, Cars, Fare Control
- Vulnerability by location – equipment removal
- Logical recovery service



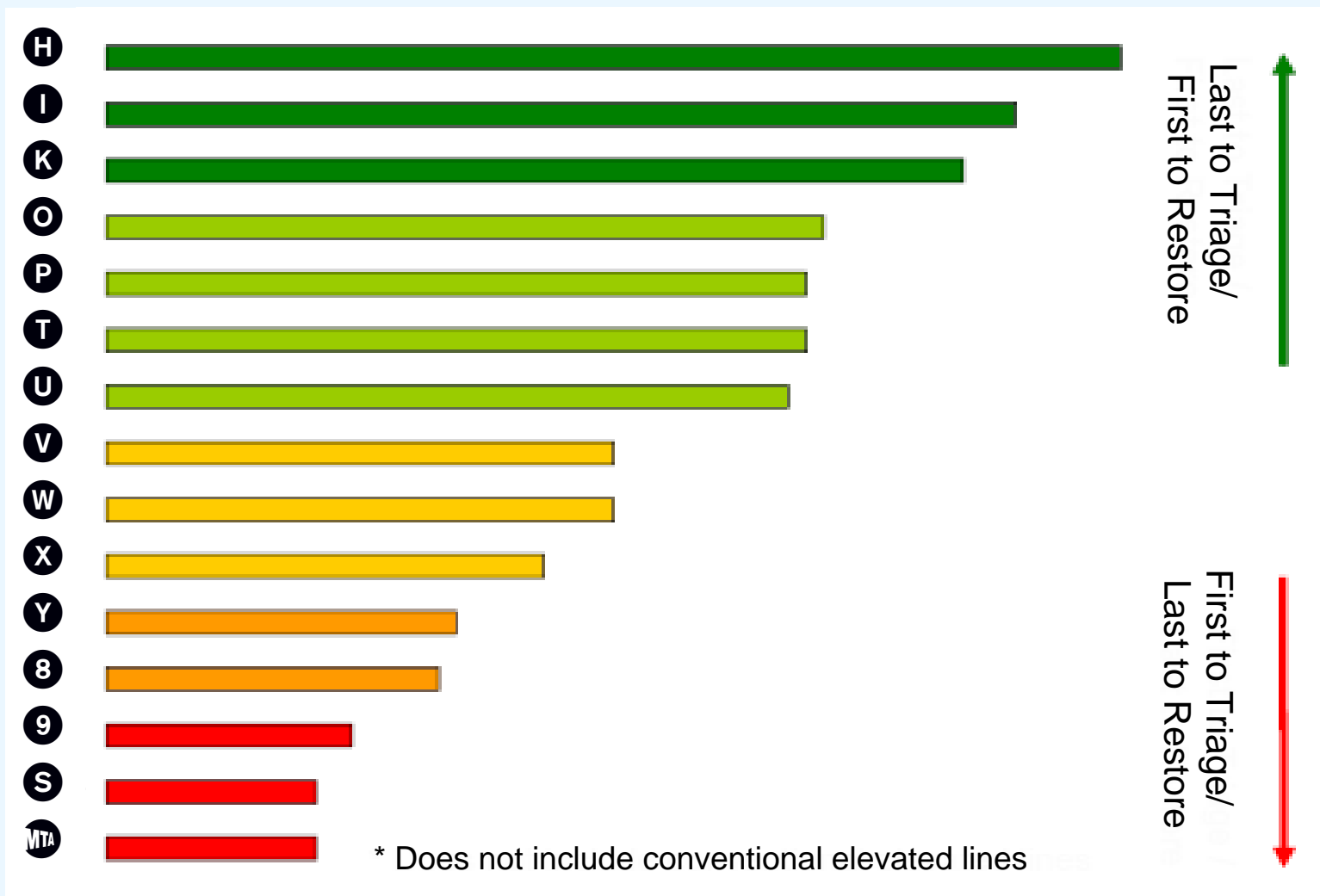
Winter Storms

- November 15 to April 1 – 1100 forecast determines winter operations plan for Subways
- Potential plans:
 - I 11 degrees to 30 degrees
 - II 10 degrees or lower
 - III Ice, Sleet, Freezing Rain
 - IV 5 or more inches of snow
 - V 8 to 10 or more inches of snow/Blizzard



NYCT Outdoor Line Subject to Snow Accumulation

Priority Order for Snow Removal



Customer Information is key.

MTA Winter Weather Travel Guide



When cold or inclement weather is in the forecast, MTA services are subject to change as conditions demand. Use this guide to plan your trip on our subways, buses, commuter rail, bridges and tunnels.

Our goal is to keep you informed. Remember that 'Service Status' for all MTA services is always available at mta.info 24/7. You can also tune into your local traffic and transit news broadcasts for updates, and follow us on Facebook and Twitter.

Service	Weather Condition	Possible Service Impacts
NYC Subways	<ul style="list-style-type: none"> • Temperatures of 10°F or less, or • Freezing rain and/or icing, or • Snow accumulation of 5" or more in the forecast. 	<ul style="list-style-type: none"> • Planned Service Changes may be cancelled. • Service on the 7 may end early. • Express service may run local on these lines: A, C, D, F, N, Q, R, S, 2, 3, 4, 5, 6, 7. • Service on the 7 may be reduced, with Flushing-bound trains running on the Times Sq/42 St-bound track at the 5 Av and Grand Central-42 St stations.
If weather conditions worsen, service on some subway routes may be temporarily suspended.		
Long Island Rail Road	Snow accumulation reaches 10" to 12".	Service may be temporarily suspended to clear tracks and avoid stranding trains.
Metro-North Railroad	Significant snowfall accumulation/ blizzard conditions.	Service may be temporarily reduced or suspended.
Staten Island Railway	<ul style="list-style-type: none"> • Freezing rain and/or icing, or • Snow accumulation of 6" or more. 	<ul style="list-style-type: none"> • Express service may be suspended. • Delays and service suspensions may occur.
	10" or more of snow in the forecast.	Limited service and suspensions of service may occur as conditions warrant.
NYC Buses	Snow accumulation of 6" with a forecast of up to 10".	Some or all of these as road conditions warrant: <ul style="list-style-type: none"> • Route cancellations • Longer headways. • Skipped stops.
	Snow accumulation of 10".	Bus service is subject to suspension as road conditions warrant.
Paratransit Access-A-Ride	Freezing Rain/Ice.	Service may be temporarily reduced or suspended.
	Snow Accumulation from 3" to 5".	<ul style="list-style-type: none"> • Call out to customers to confirm or cancel planned trips. • Feeder and Trip by Trip Eligibility will not be enforced under these conditions.
	Snow Accumulation of 6" or more.	<ul style="list-style-type: none"> • Service may be temporarily reduced or cancelled. • Cancel all hearings and assessments. • Change Reservation booking to 24 from 48 hours.
Bridges and Tunnels	Snow accumulation from 6" to 10".	Reduced speed on ramps, roadways and in toll plazas.
	Snow accumulation above 10".	Reduced roadway capacity or lane closures.
	Combined snow/ice storm.	Suspended-span bridges may be intermittently closed due to melting ice from suspender cables.

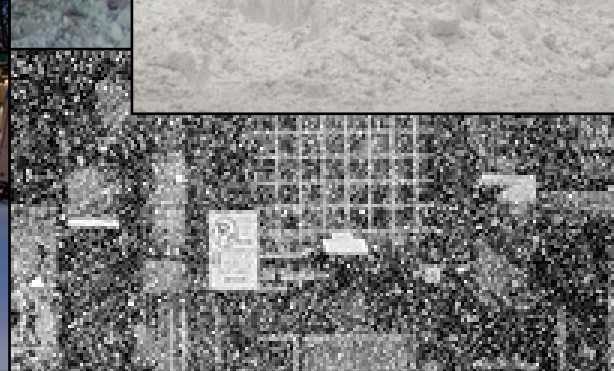
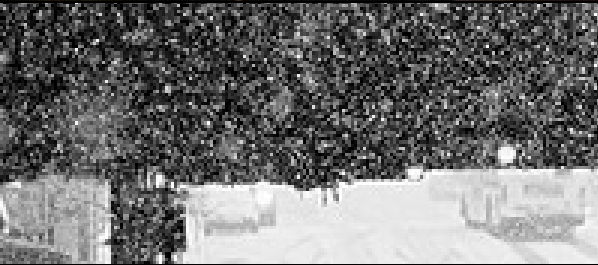
About these service changes

While forecasted temperatures and snow accumulations inform our preparations, the actual intensity of the storm, road conditions, and our ability to clear tracks will dictate the level of service we can safely provide and/or restore.

Your safety

We urge all of our customers to take extra care when traveling. Stay clear of the platform edges, use handrails, and walk carefully when entering or exiting stations and boarding or leaving trains and buses. Please allow extra time for travel during the storm.





Scenes from December 26, 2010 Blizzard

Factors in Evaluating a Coastal Storm

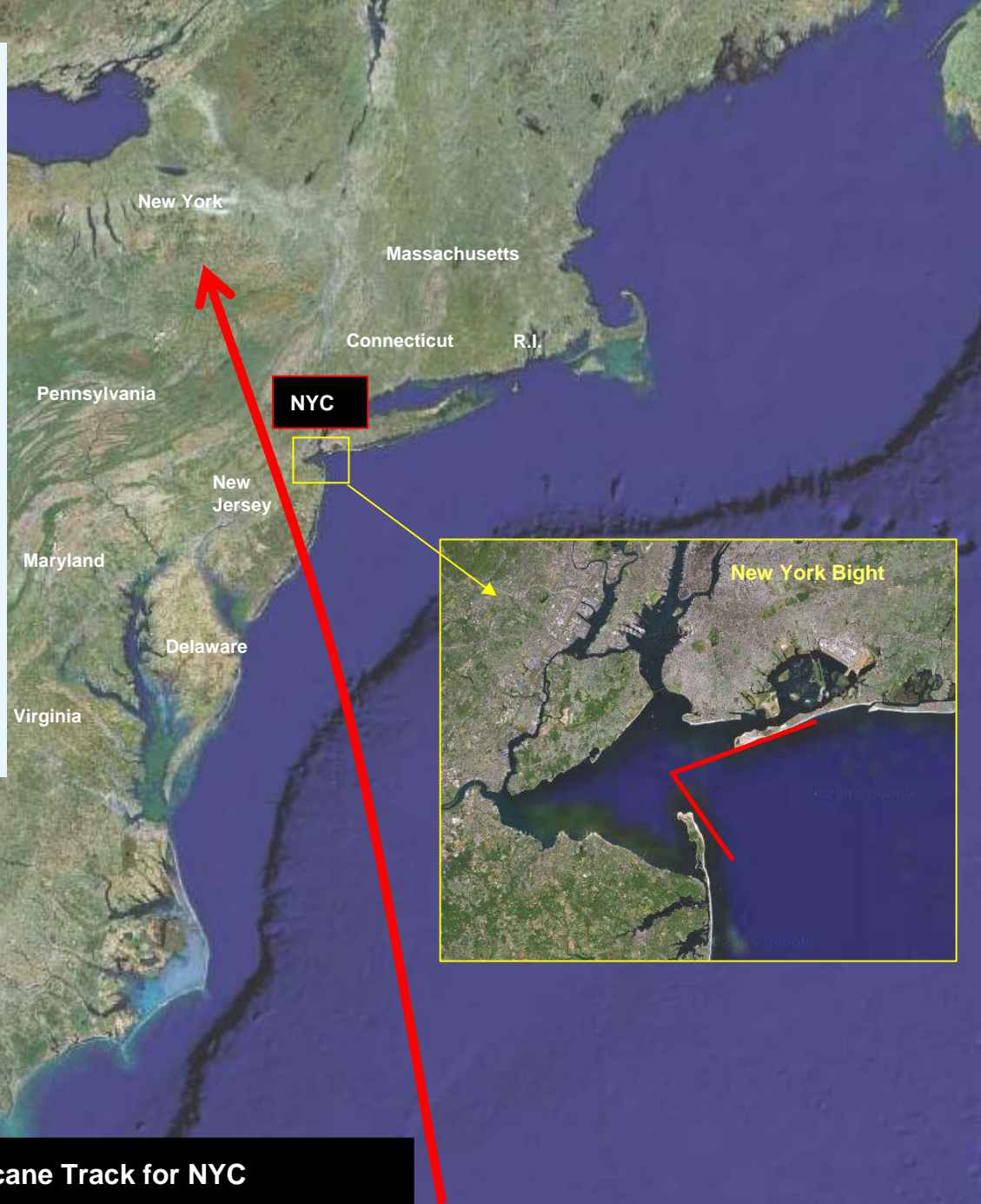
- Path, intensity, tide, storm surge
- Zero Hour
 - Hurricane Path
 - Evacuation System
 - Transitioning into shutdown



- Before Hurricane Sandy, New York City's plans anticipated the evacuation of 2.3 Million residents in the worst case

- New studies have increased the worst case scenario to 3 Million evacuees.

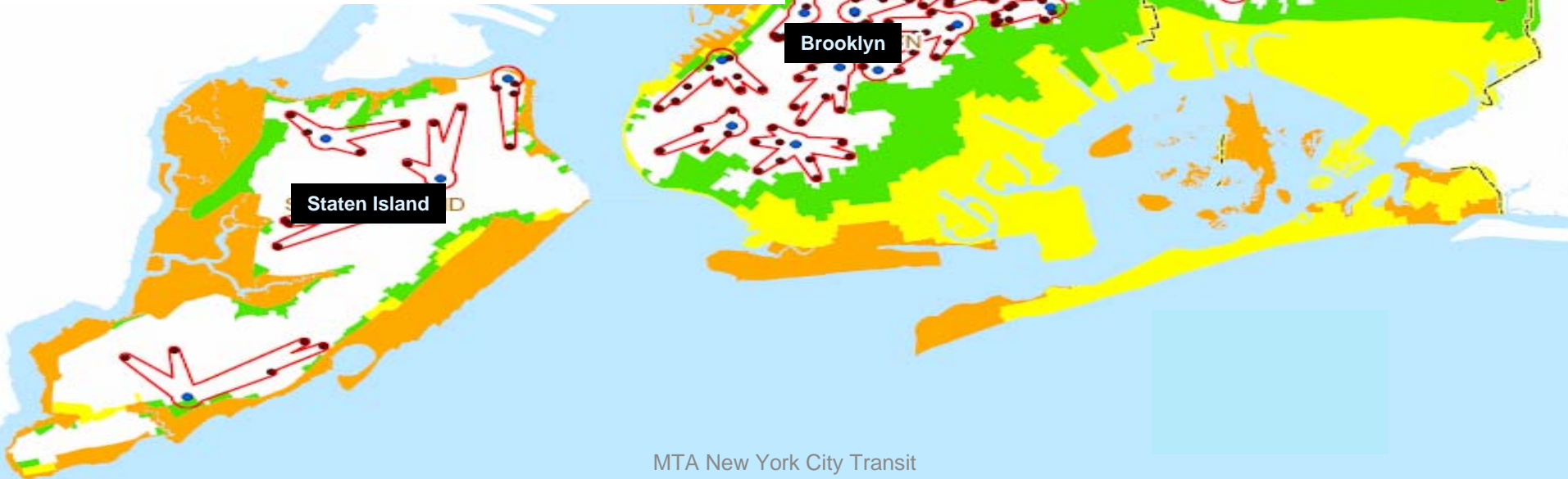
- Over 50% of evacuees are expected to use public transportation to reach public and private shelters.



Worst Case Hurricane Track for NYC

OEM Public Shelter System

- When evacuees arrive at an Evacuation Center, they will be directed to a Hurricane Shelter where they will be provided a safe place to wait out the storm.
- Each of the 65 Evacuation Centers is the hub of a network of between 5 to 10 Hurricane Shelters.
- When a Hurricane Shelter reaches 50 percent capacity, the next shelter in the sequence for that network will be activated.



Draft evacuation zones

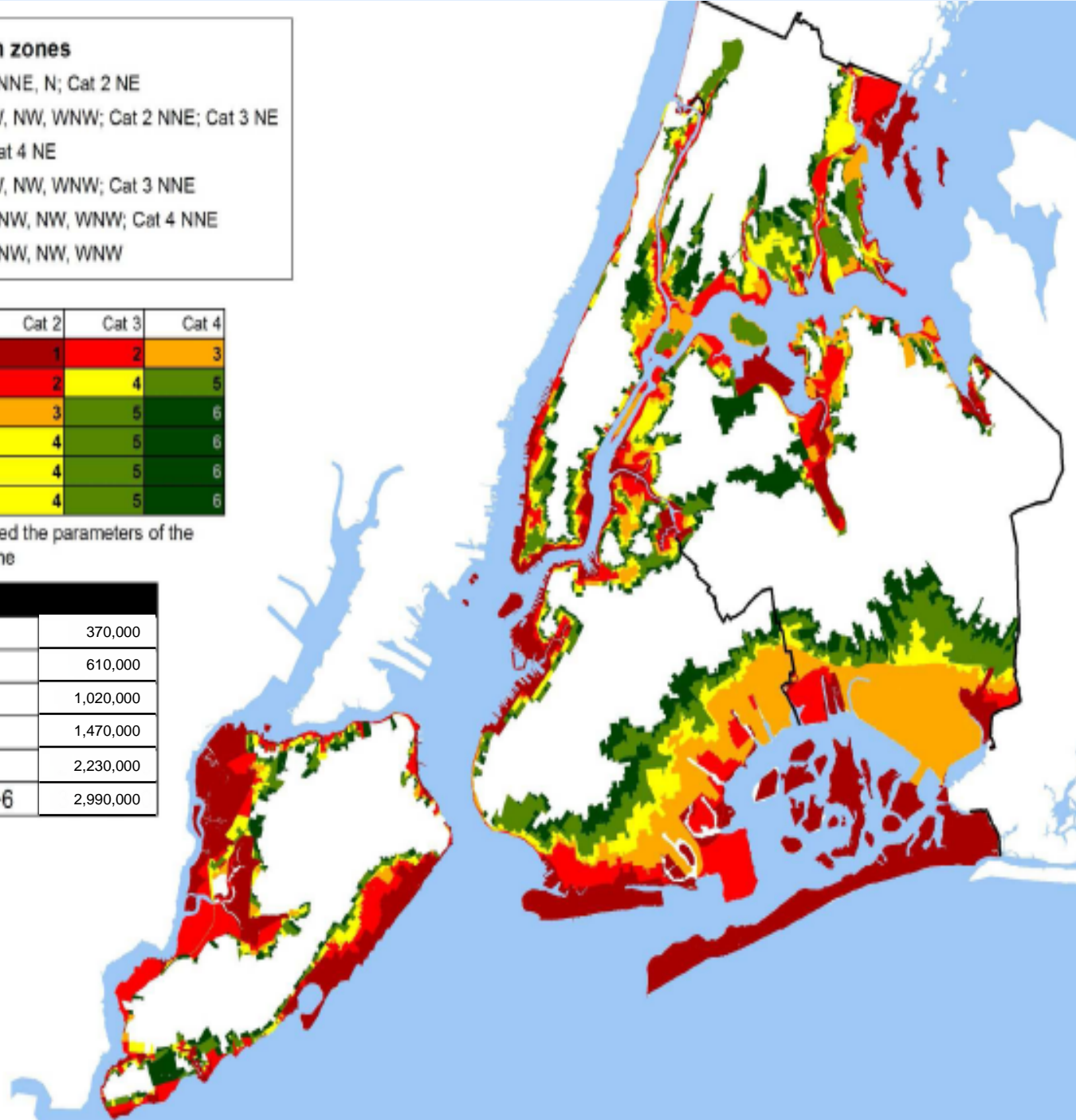
- 1 - Cat 1 NE, NNE, N; Cat 2 NE
- 2 - Cat 1 NNW, NW, WNW; Cat 2 NNE; Cat 3 NE
- 3 - Cat 2 N; Cat 4 NE
- 4 - Cat 2 NNW, NW, WNW; Cat 3 NNE
- 5 - Cat 3 N, NNW, NW, WNW; Cat 4 NNE
- 6 - Cat 4 N, NNW, NW, WNW

	Cat 1	Cat 2	Cat 3	Cat 4
NE	1	1	2	3
NNE	1	2	4	5
N	1	3	5	6
NNW	2	4	5	6
NW	2	4	5	6
WNW	2	4	5	6

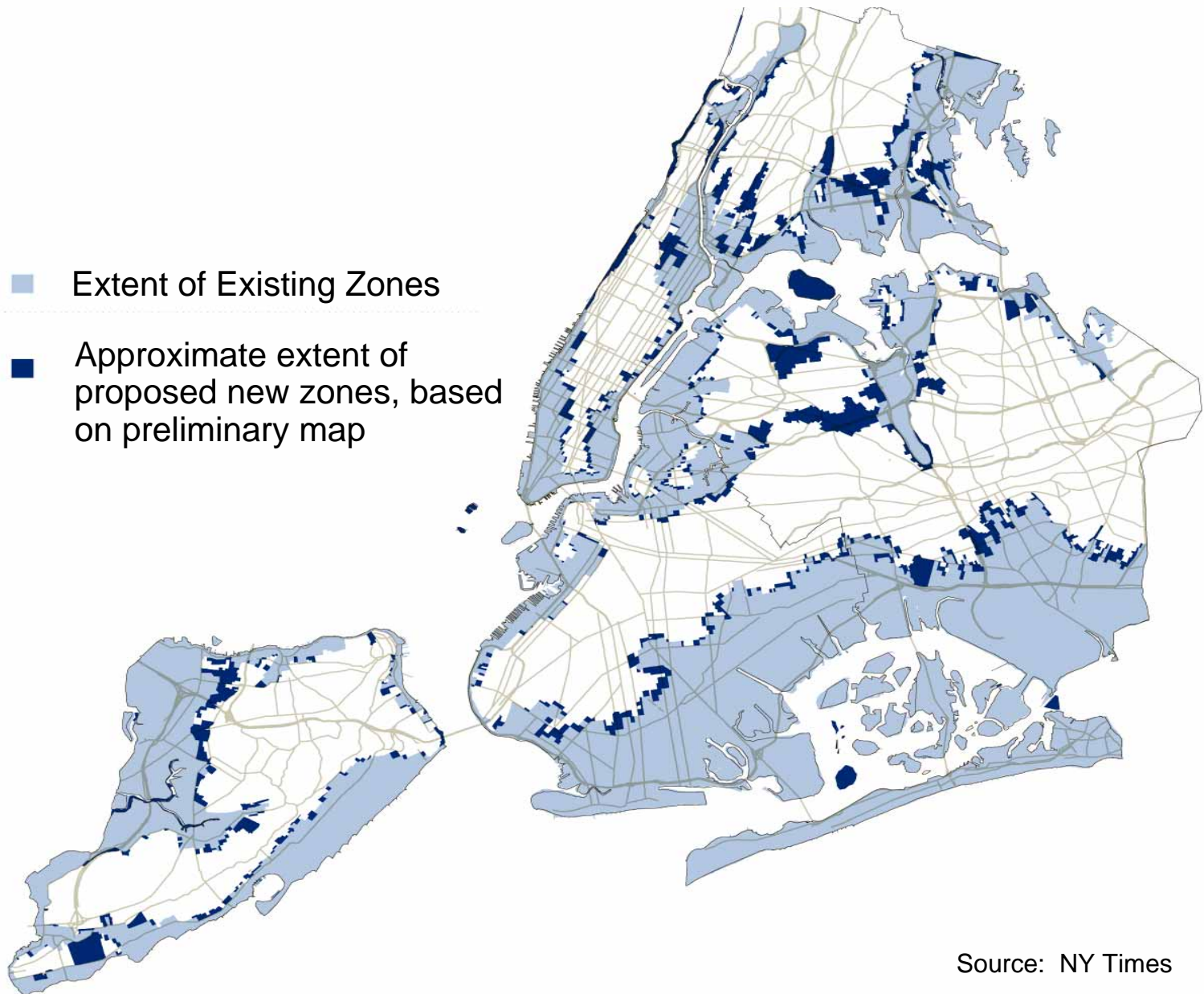
* For storms that exceed the parameters of the model, go up one zone

2010 Population

Zone 1	370,000
Zone 1+2	610,000
Zone 1+2+3	1,020,000
Zone 1+2+3+4	1,470,000
Zone 1+2+3+4+5	2,230,000
Zone 1+2+3+4+5+6	2,990,000



New Evacuation Zones vs. Old Evacuation Zones



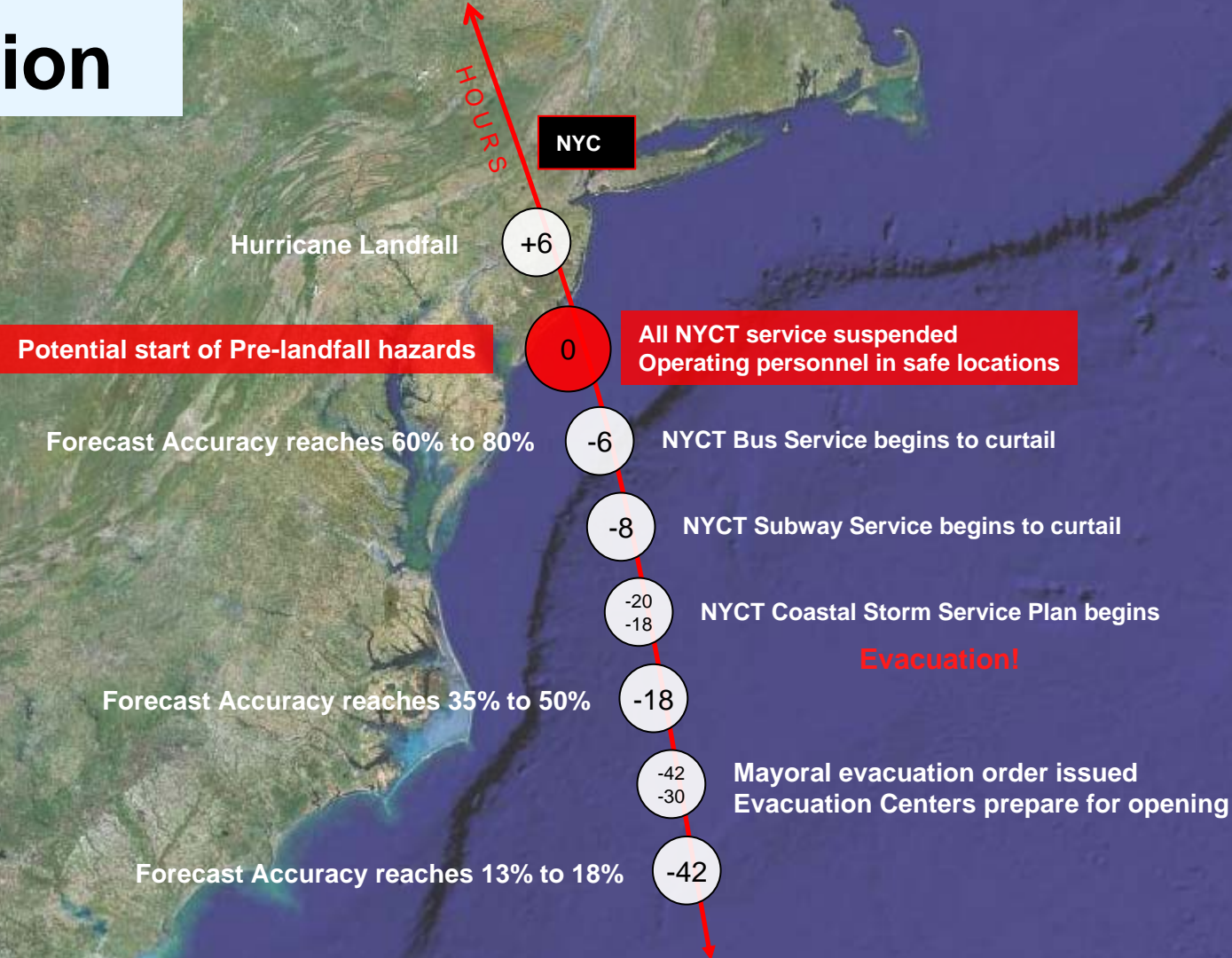
Source: NY Times

Transportation Strategy

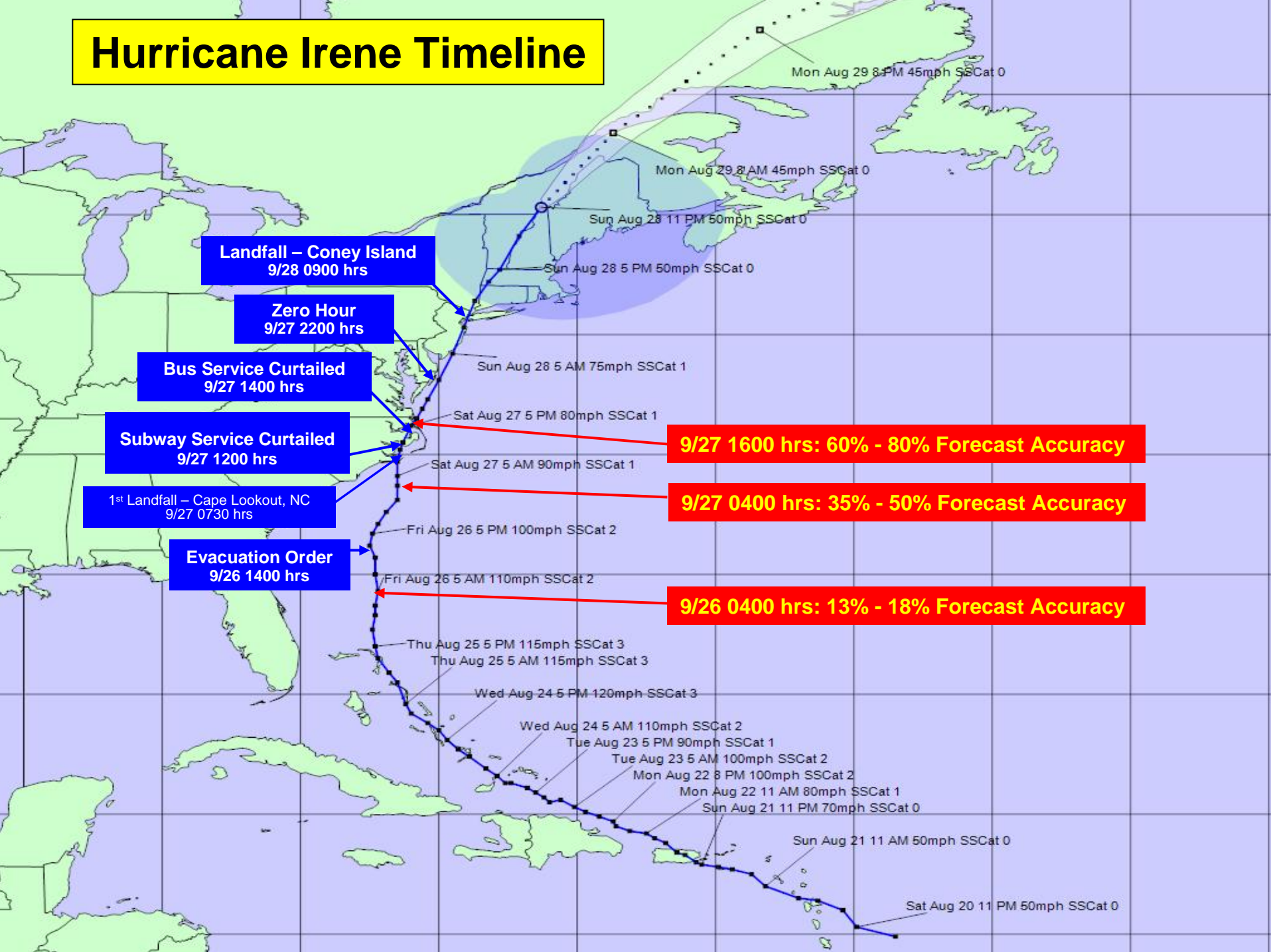
- In the AM peak hour, NYCT subways and buses carry about 530,000 and 203,000* passengers, respectively. Before a hurricane, there will be a reduction in the number of people traveling to work or to school.
- During an evacuation, bus & subway routes will operate as normal as possible because our customers and operating personnel are familiar with this service, allowing supervisors & managers to focus on service changes for the evacuation.
- Service will be added on those routes that are expected to have a significant increase in ridership.
- Evacuation plan is a guide. Implementation may be changed by operating supervisors and managers based on actual conditions.

* 2011 Figure 2012 figure not yet available

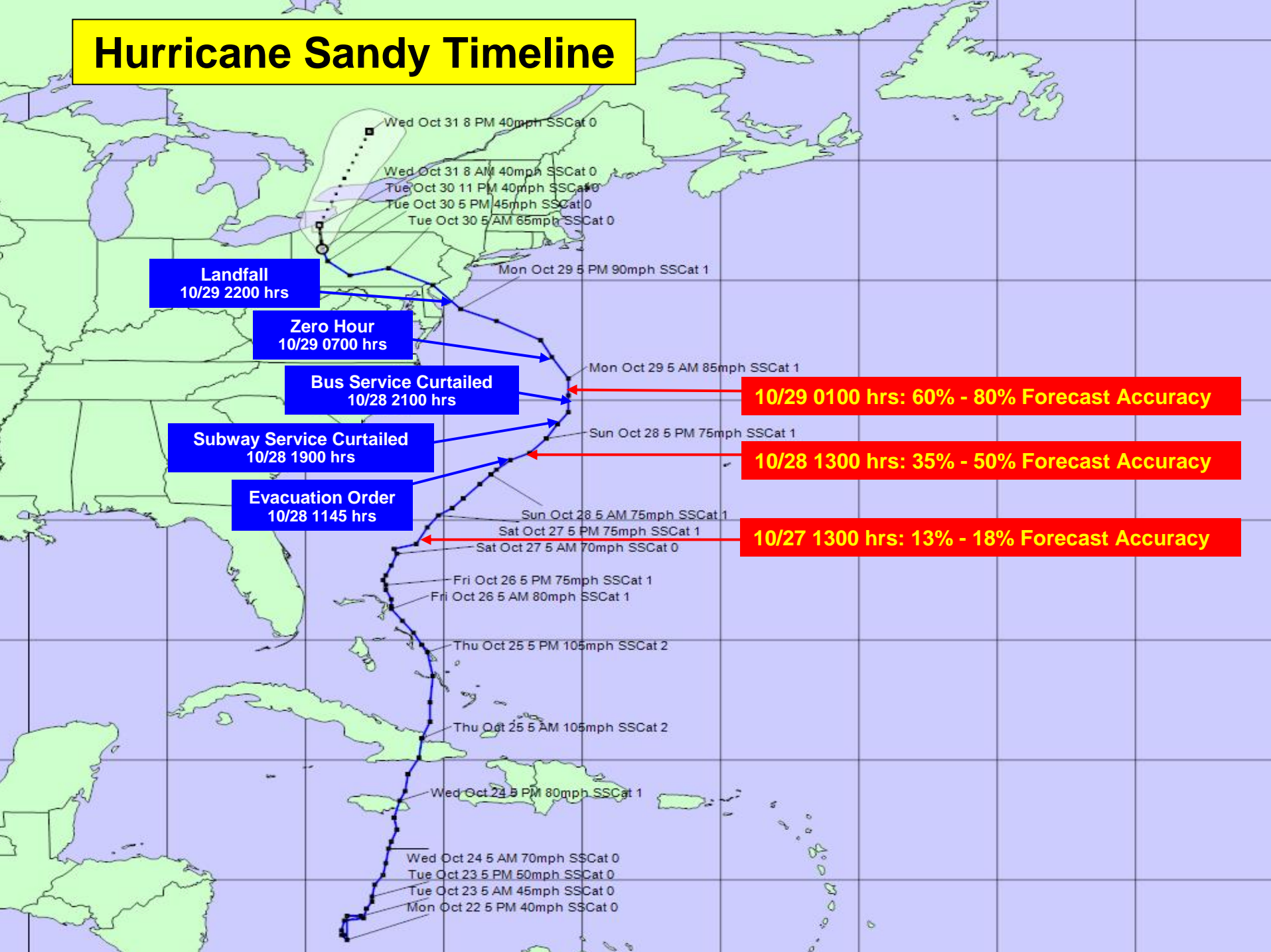
Timeline for Evacuation



Hurricane Irene Timeline



Hurricane Sandy Timeline



Evacuation vs. Shutdown

Reasons to Extend Evacuation

- Decision to evacuate is usually made when forecast is not very accurate.
- Message to evacuate may take time to reach vulnerable populations.
- Need to avoid overcrowding on evacuation service
- Early train lay ups may reduce capacity.

Reasons to Shutdown Early

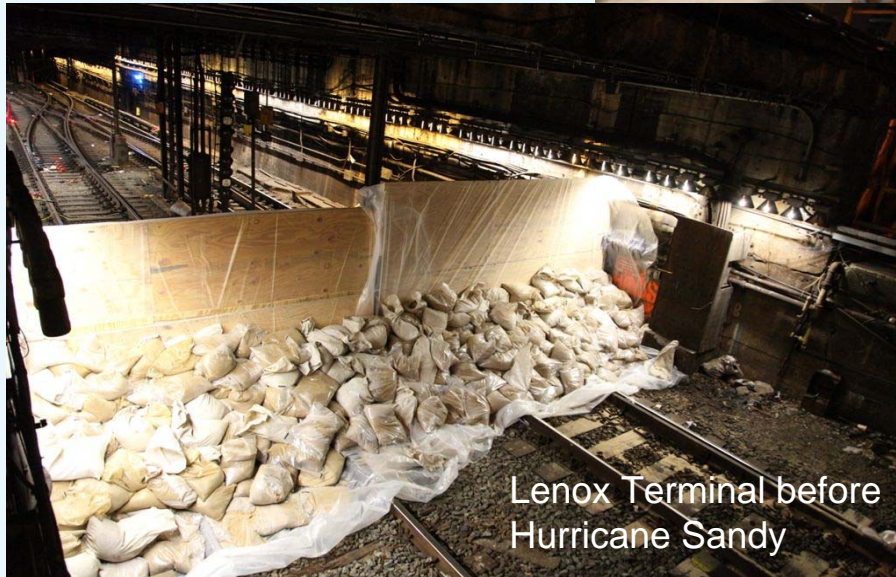
- Need to protect rolling stock and infrastructure.
- Improve ability to restore service quickly after storm.
- Need to protect employees.
- Storm could arrive earlier than predicted—forward speed can accelerate north of Cape Hatteras.



Storm Preparations



Special Needs
Evacuation for
Hurricane Irene

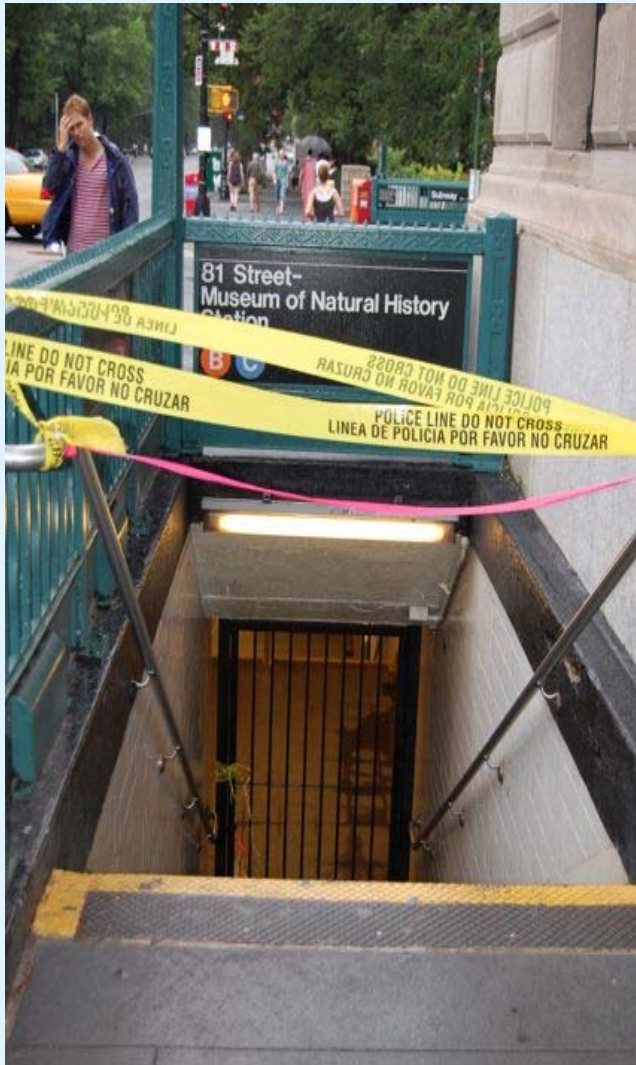


Lenox Terminal before
Hurricane Sandy



Bowling Green Station
before Hurricane Sandy

Hurricane Approaches – Service Shutdown



Flooding From Hurricane Irene

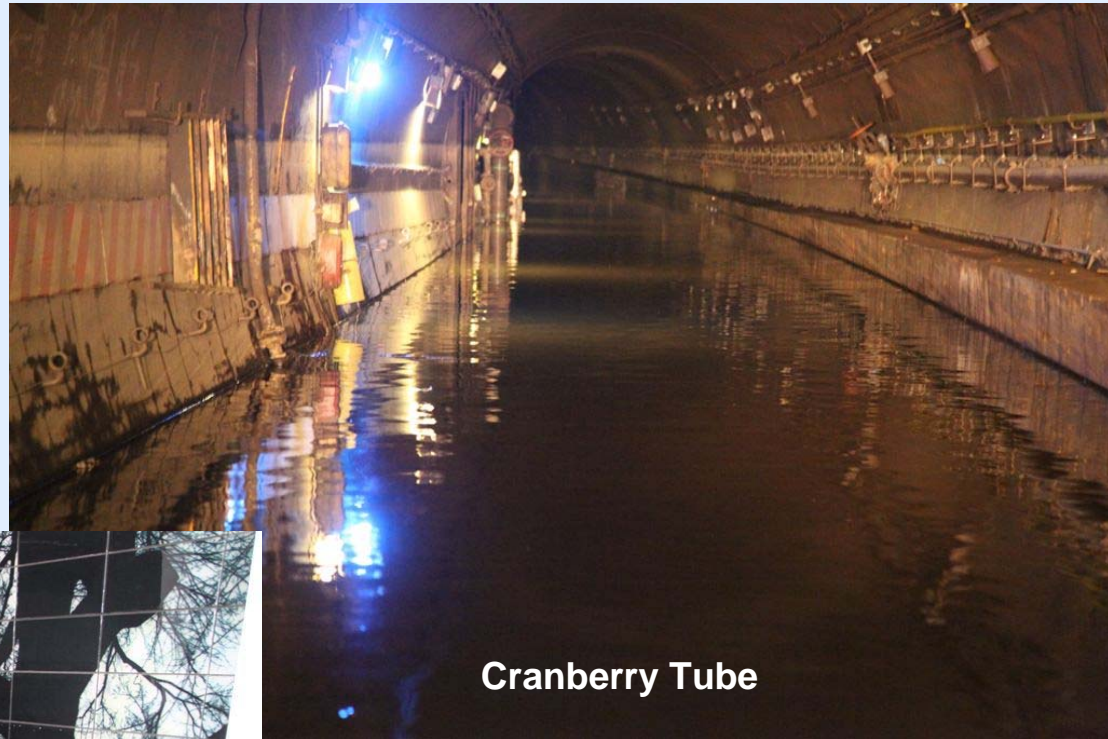


Lessons Learned from Hurricane Irene

- **Use of MTA vehicles after Service Curtailment** - The Evacuation Plan called for the curtailment of bus service six hours before zero, but some buses were out much later, mainly for the special needs evacuation.
- **Special needs evacuation** - OEM plans called for the special needs evacuation to be completed before the general evacuation, but some facilities were evacuated late and had difficulty providing accurate information on the number of evacuees and how many were in wheelchairs.
- **Lack of bi-directional flow** - Despite promises in planning meetings by NYPD, buses had difficulty re-entering evacuation zone to make additional trips.
- **Utilization of external resources** - NYCT needs to develop a plan to deploy and supervise available resources such as the National Guard.
- **Transportation for Employees** - Staff had difficulty travelling after revenue service was curtailed and before service was restored. A plan to transport personnel is being developed.



Flooding from Hurricane Sandy



Cranberry Tube



South Ferry Station

Sandy caused major flood damage across the system

NOT EXHAUSTIVE



8 flooded under-river tubes

8 stations with major flood damage – South Ferry, Whitehall, 148th St, 207th St, Dyckman, Beach 116th Station, 86th St Sea Beach, Stillwell

Staten Island Railway maintenance shop major flood damage

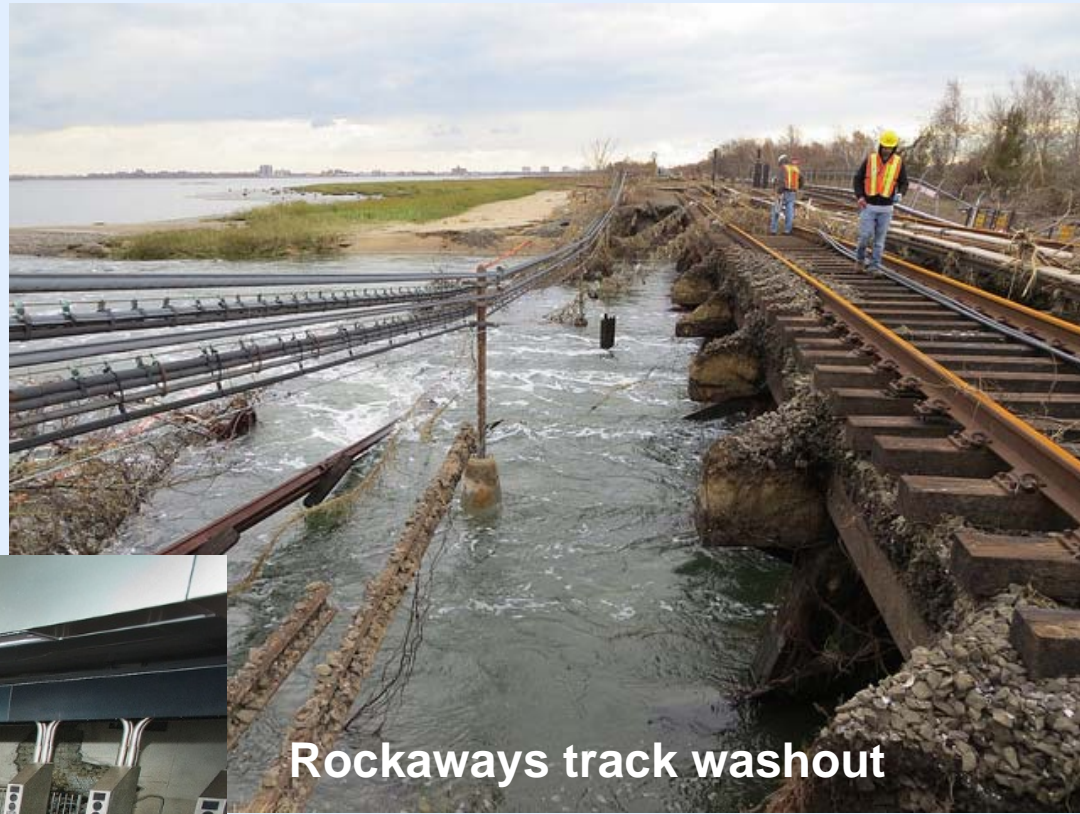
Train yards and bus depot with significant flood damage

Rockaways track washout

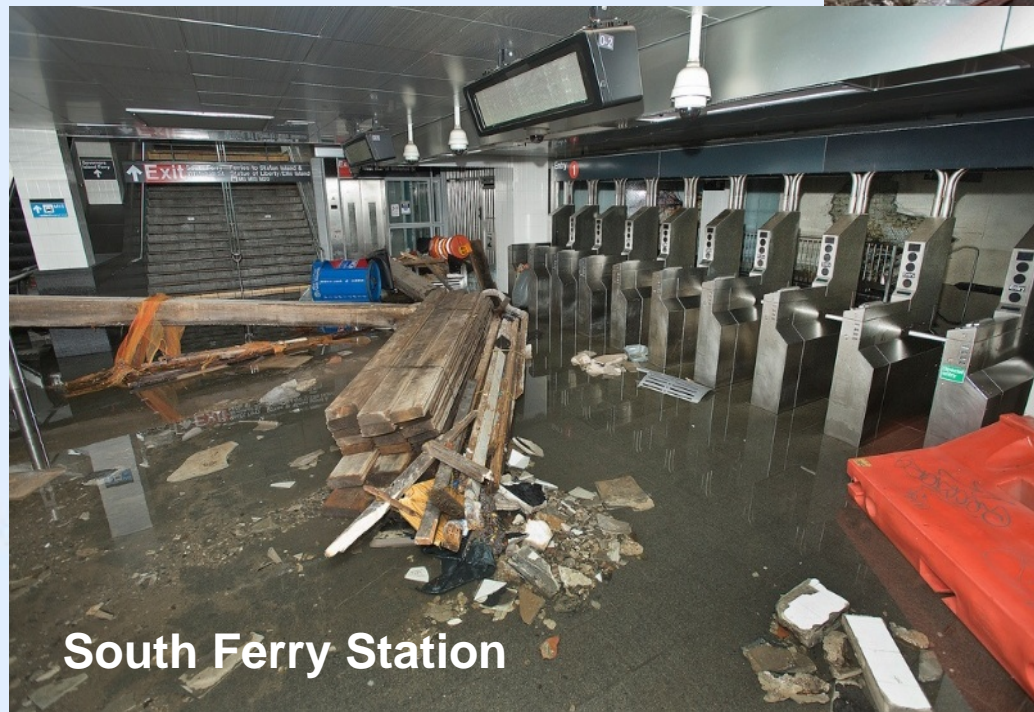
Numerous other locations with moderate flooding and wind damage including

- Downed trees
- Roof / canopy / sidings damages
- Communication systems damages
- Signal system damages

Other Damage from Hurricane Sandy



Rockaways track washout



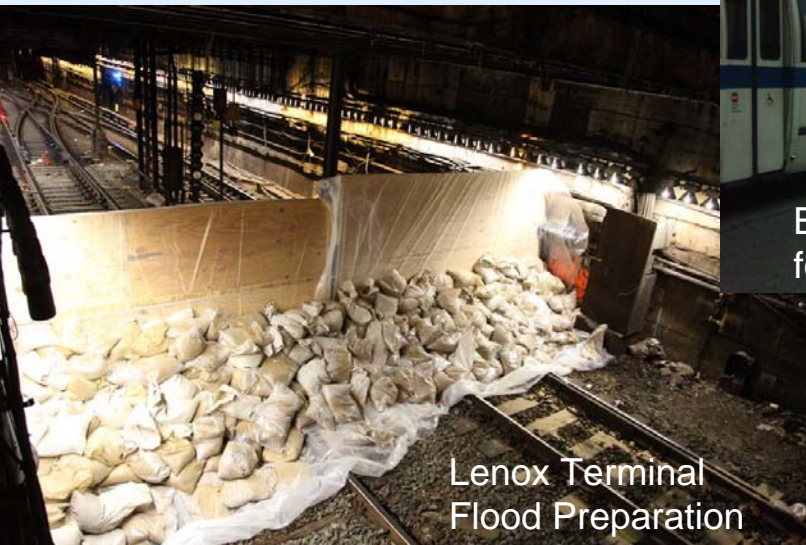
South Ferry Station

Other Damage from Hurricane Sandy



Sunday, October 28

- 1600 hours -- **3** service to Lenox Terminal terminated.
Additional service provided to Rockaways.
- 1900 hours -- Most Subway Service suspended.
- 2100 hours -- Bus service curtailed.
Service to the Rockaways suspended.



Monday, October 29

- No subway or bus service
- Storm preparations continue until onset of hazardous conditions.



Storm Preparations



Buses relocated to higher ground (Gun Hill Depot)



Stillwell Yard after trains evacuated to higher ground

Tuesday, October 30

- Limited bus service restored gradually started in the evening.
No Fares Collected.



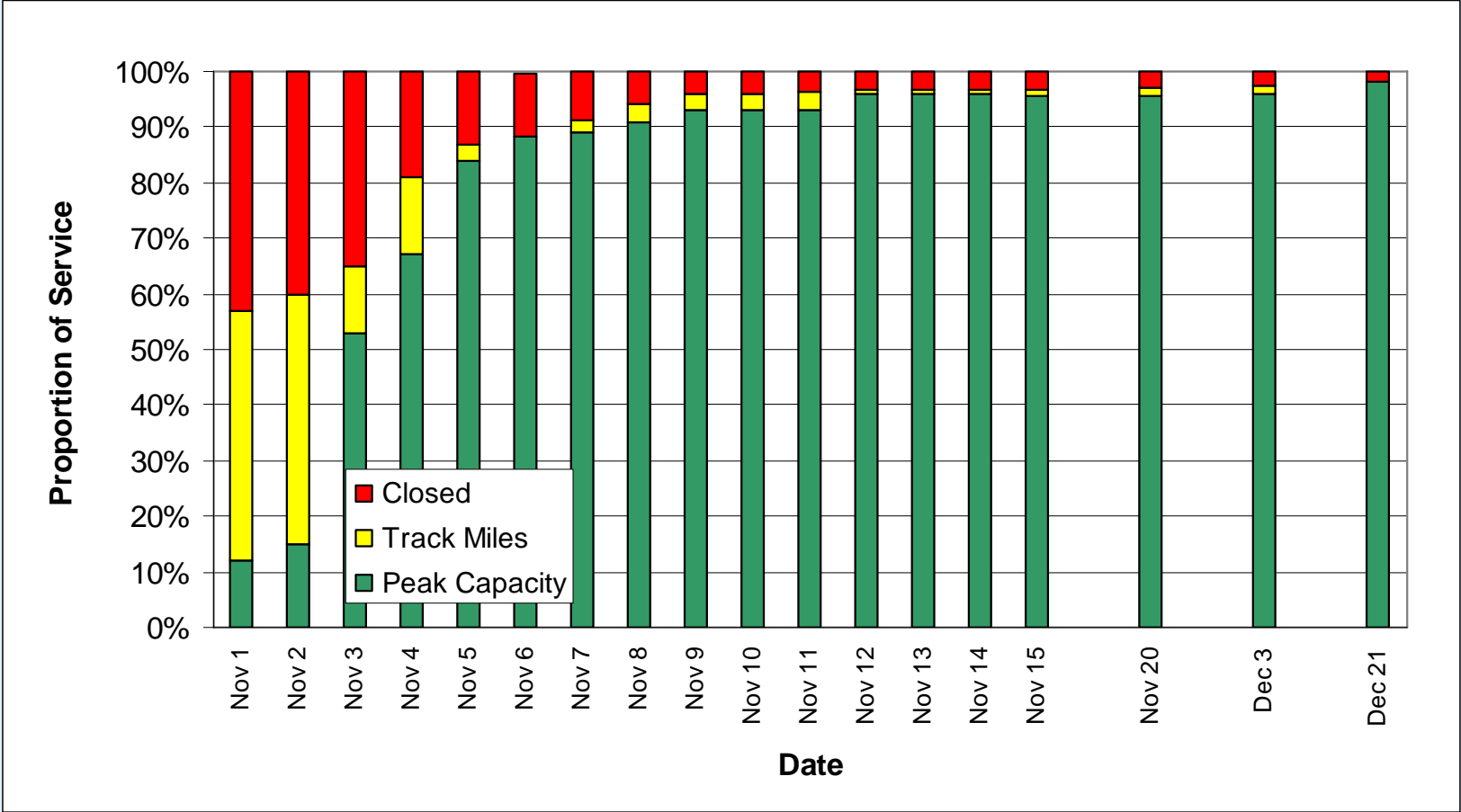
Debris on Bus Route



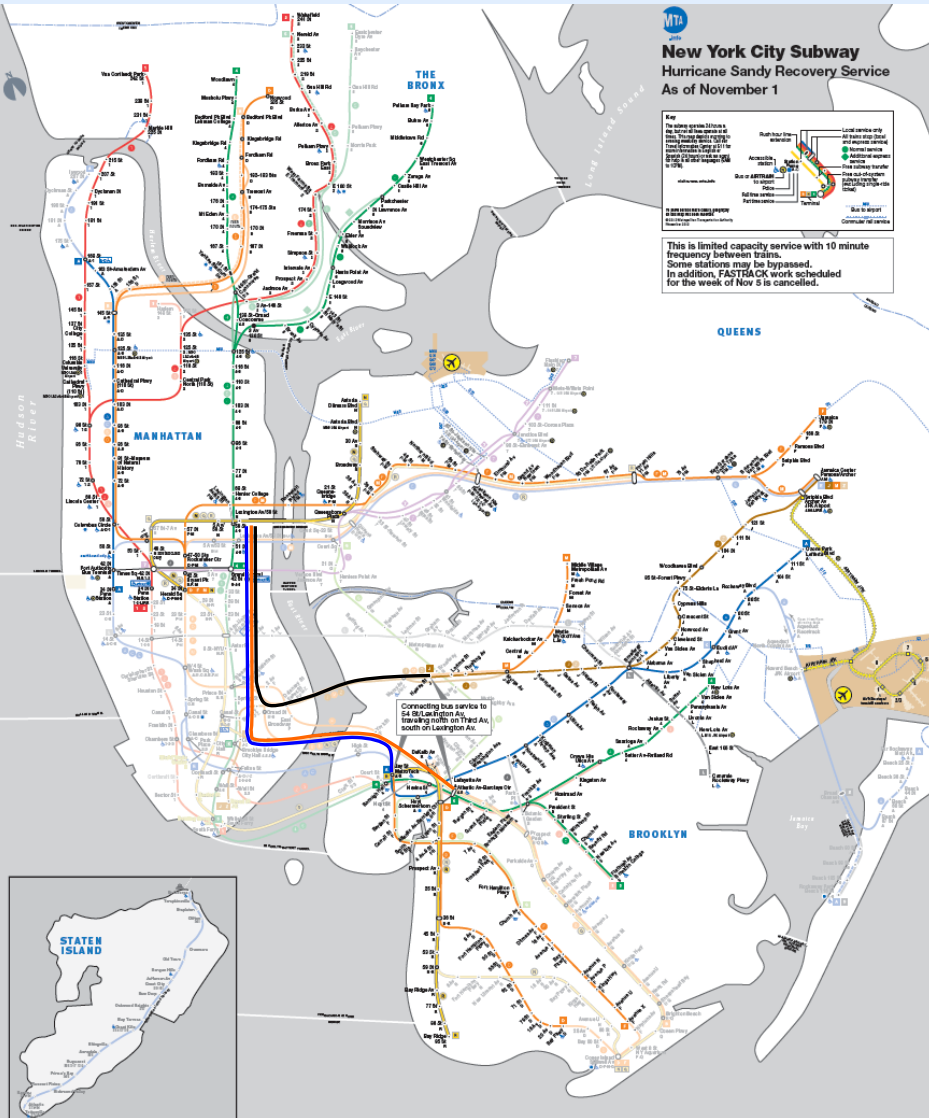
Water at South Ferry Station



Subway Service Restoration by Day



Thursday, November 1



Subway Service restored on **1** **2** **4**
5 **6** **A** **D** **F** **J** **L** **M** **N** **R** **S**.

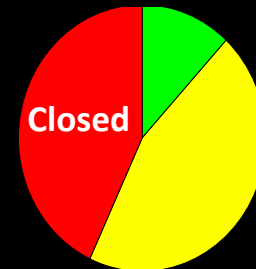
Many routes provide split service with decreased frequency.

No service in south of 34th Street in Manhattan.

Three bus bridges connect Brooklyn and Manhattan.

Fare payment suspended.

Systemwide Service Level

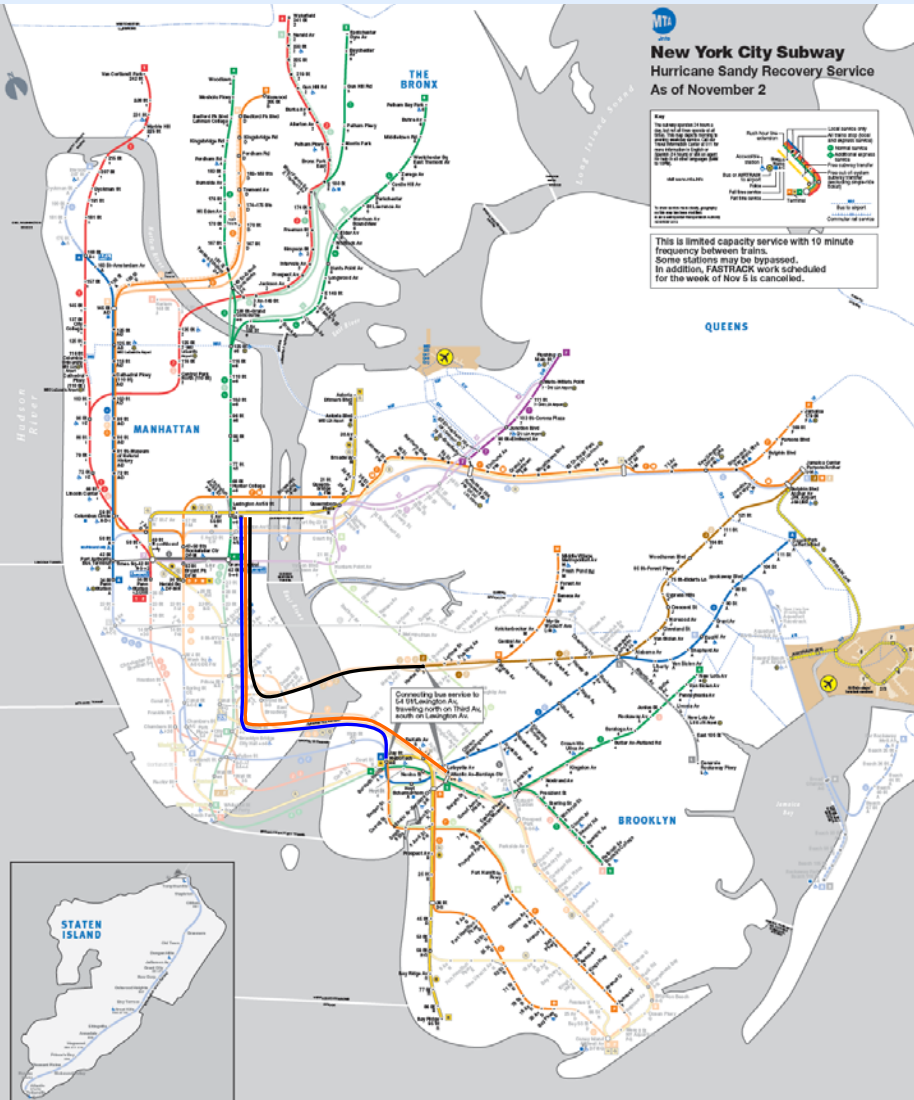


12% of Peak Capacity

57% of Track Miles

43% Closed

Friday, November 2



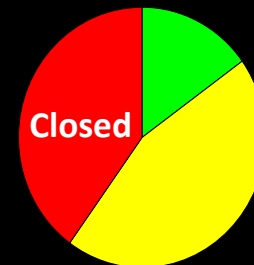
Service Additions from Nov. 1:

- 7 Main Street to 74th Street
- M Jamaica Center to 34th Street via 63rd Street Tunnel
- 5 Dyre Avenue to E.180th Street

Bus Bridges Continue.

Fare Payment Suspended.

**Systemwide
Service Level**

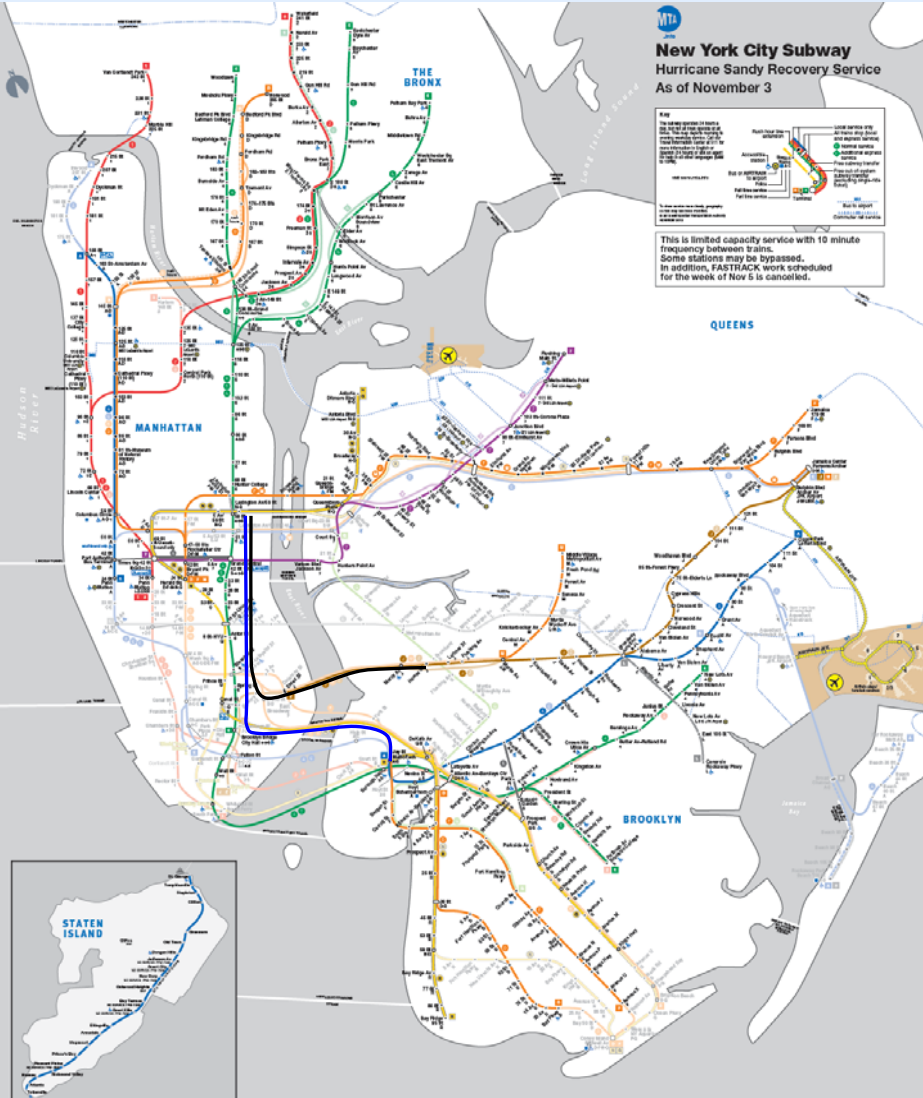


15% of Peak Capacity

60% of Track Miles

40% Closed

Saturday, November 3



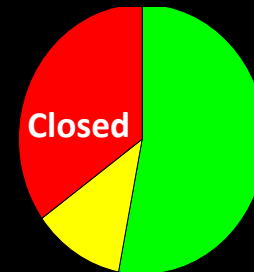
- 7 Main Street to Times Square
- 4 Woodlawn to New Lots
- 5 Dyre Avenue to Flatbush Avenue
- 6 Pelham Bay Park to Brooklyn Bridge
- J Jamaica Center to Essex St (late PM)
- Q Jay St/MetroTech to Kings Highway

Headways improved.

Atlantic Av-54th St Bus Bridge Closed.

Fare Payment Restored.

**Systemwide
Service Level**

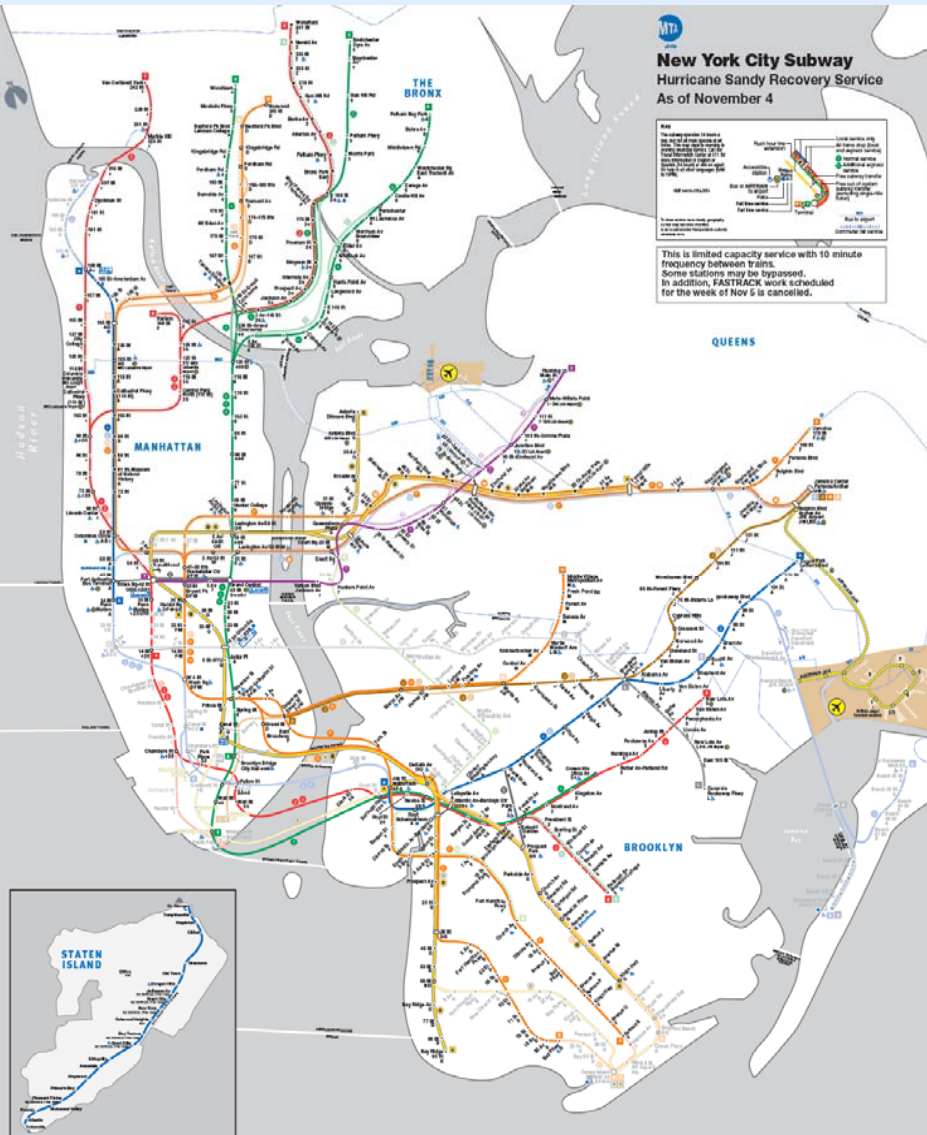


53% of Peak Capacity

65% of Track Miles

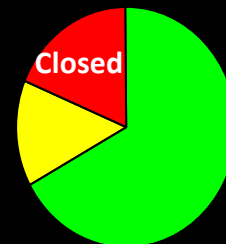
35% Closed

Sunday, November 4



- F** 179th St to Ave X
 - D** 205th St to Bay Parkway
 - M** 71st St to Metropolitan via 63rd St
 - N** Suspended
 - Q** Ditmars Blvd to Kings Highway
 - 1** 242nd St to 14th St
 - 2** 241st St to Flatbush Ave
 - 3** 148th St to New Lots
 - 4** Woodlawn to Utica
 - 5** Dyre to Bowling Green or Flatbush
- Franklin Shuttle Opens/Bus Bridges Close

Systemwide Service Level



67% of Peak Capacity

81% of Track Miles

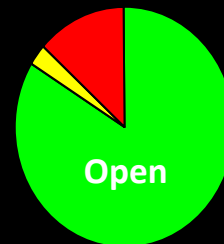
19% Closed

Monday, November 5



- 1 Extended to Chambers St
- A 168th St to Lefferts Blvd (express)
- C 145th St to Euclid
- E Jamaica Center to World Trade Center
- F 179th St to Avenue X
- J Jamaica Center to Chambers St (pm)
- M Service resumed via 53rd St Tunnel
- N Ditmars Blvd to 59th St/4th Ave
- R 71st St/Forest Hills to 34th Street
Jay St/MetroTech to 95th Street

Systemwide Service Level



84% of Peak Capacity

87% of Track Miles

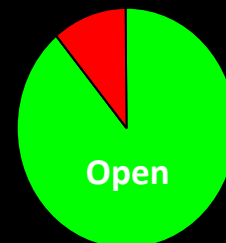
13% Closed

Tuesday, November 6



- Q** Extended to Brighton Beach
- B** 145th St or Bedford Pk to Kings Highway
- A** 207th St to Lefferts Blvd.
- C** 168th St to Euclid Avenue
- D** Resume express service on Central Park West

**Systemwide
Service Level**



89% of Peak Capacity

89% of Track Miles

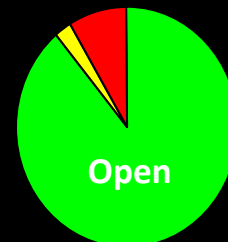
11% Closed

Wednesday, November 7



- G** Court Square to Church Avenue (12 minute Headway, 8 car trains)
- Q** Extended to Stillwell/Coney Island, Express Northbound in Manhattan
- B** Extended to Brighton Beach
- F** Extended to Stillwell/Coney Island

Systemwide Service Level



89% of Peak Capacity

91% of Track Miles

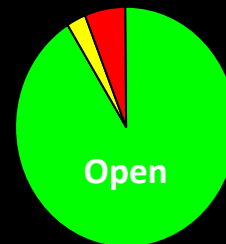
9 % Closed

Thursday, November 8



- D** Extended to Stillwell/Coney Island
- L** Rockaway Park to 8th Avenue

**Systemwide
Service Level**



91% of Peak Capacity

94% of Track Miles

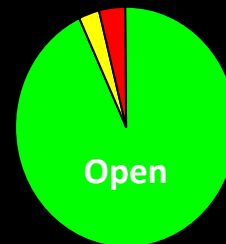
6 % Closed

Friday, November 9



- J / Z** Skip/stop and express service restored to/from Chambers Street
- N** Extended to Stillwell/Coney Island

Systemwide Service Level



93% of Peak Capacity

96% of Track Miles

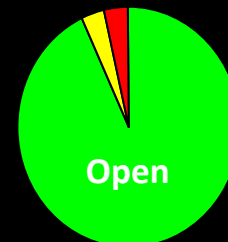
4 % Closed

Sunday, November 11



A Brooklyn service split between Lefferts Boulevard and Howard Beach Express Bus Shuttle between Mott Avenue and Howard Beach via Nassau Expressway

Systemwide Service Level

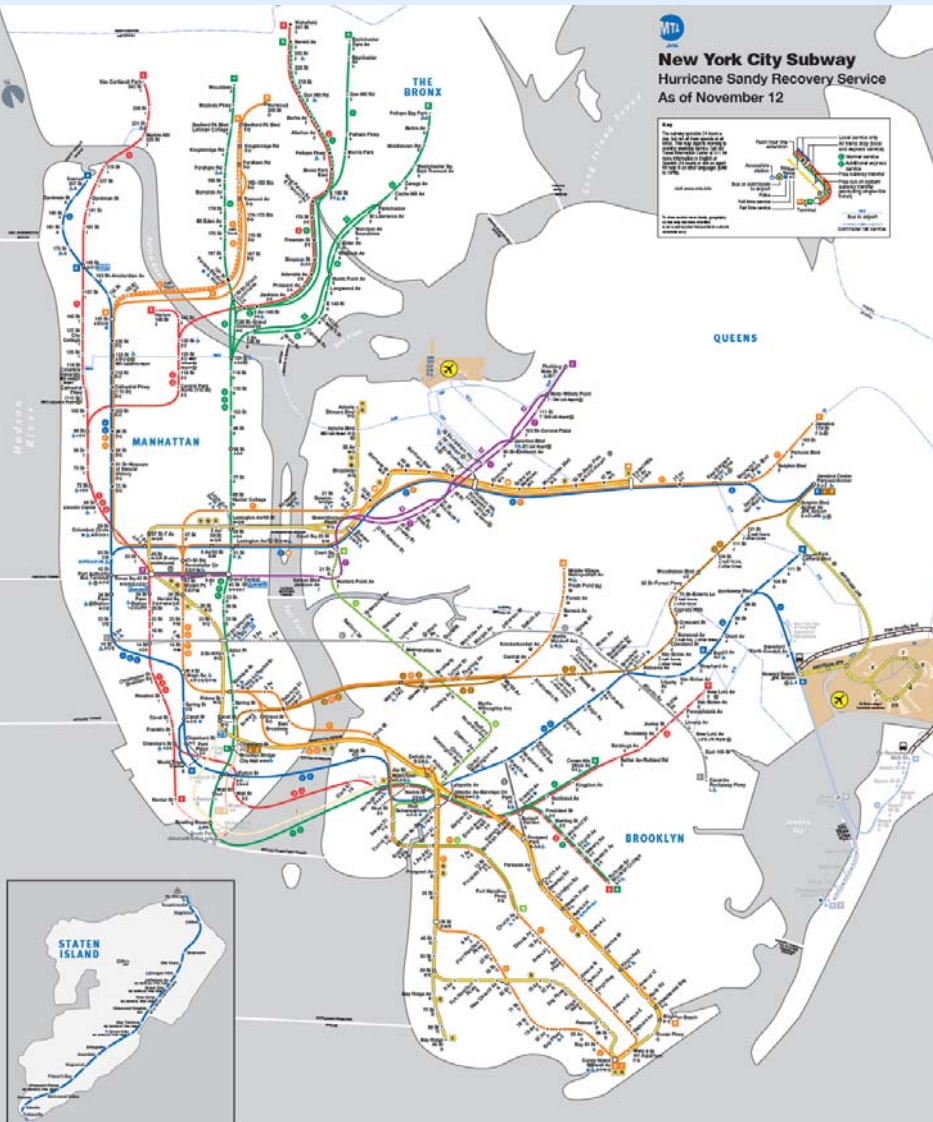


93% of Peak Capacity

96.5% of Track Miles

3.5 % Closed

Monday, November 12



1 Extended to Rector Street with normal headways (Trains travel without customers through old South Ferry Loop.)

**Systemwide
Service Level**



95.5% of Peak Capacity

96.7% of Track Miles

3.3 % Closed

Tuesday, November 20



H Free train shuttle between Beach 90th Street and Far Rockaway

**Systemwide
Service Level**



96% of Peak Capacity

97.1% of Track Miles

2.9 % Closed

December 2012

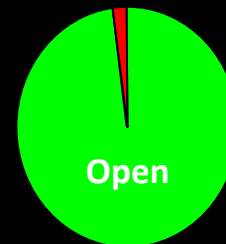


December 3: **R** Extended to Whitehall from north

December 4: **J/Z** Extended to Broad St

December 21: **R** Service between Manhattan and Brooklyn Restored.

**Systemwide
Service Level**



98.1% of Peak Capacity

98.1% of Track Miles

1.9 % Closed

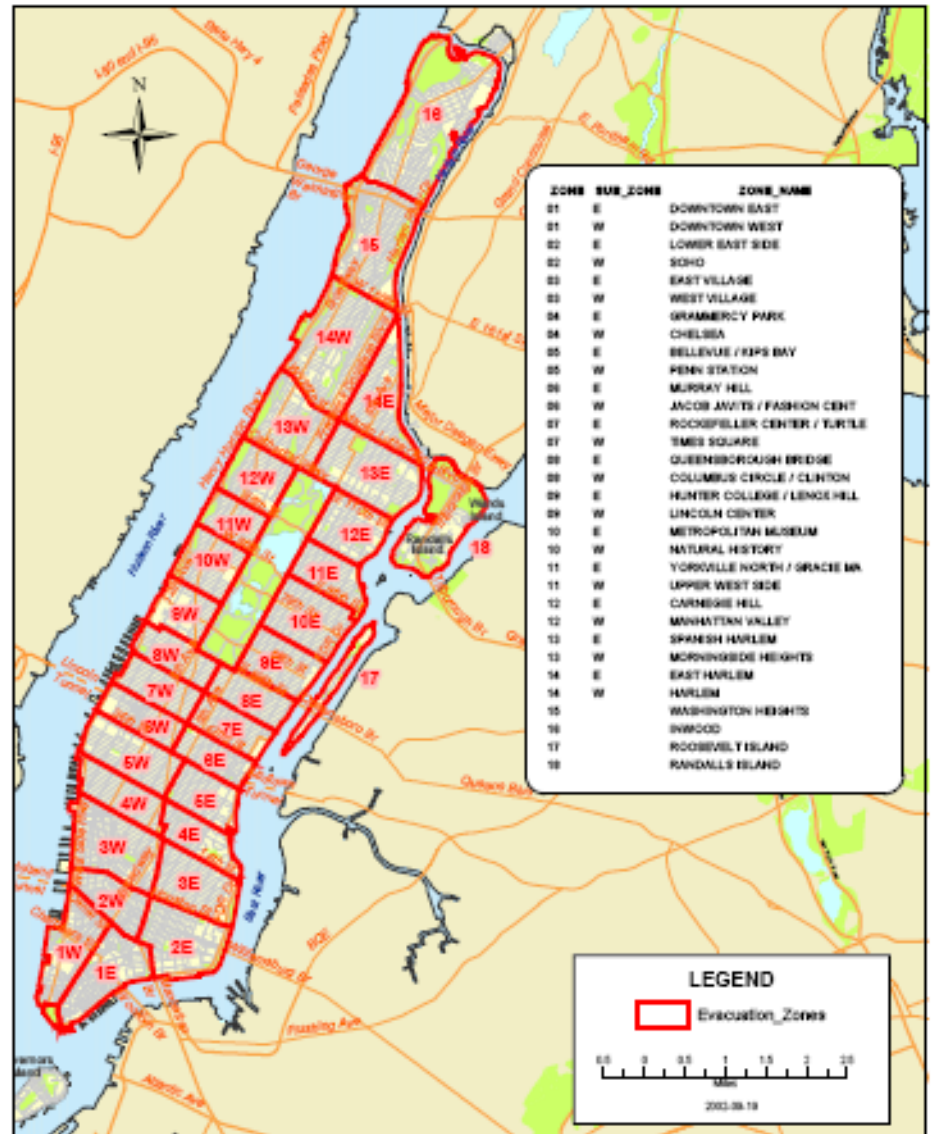
Lessons Learned from Hurricane Sandy

- Need better and more information on anti-zero hour (the end of hazardous conditions.)
- NYCT needs to work with OEM on what proportion of people in evacuations zones will actually evacuate.
- The availability of spare parts (electrical, signal etc.) expedited the recovery. The advanced procurement of parts for future emergencies should be conducted considering the usage after Hurricane Sandy.



Plans for no notice events

Manhattan Evacuation Plan Zones Map

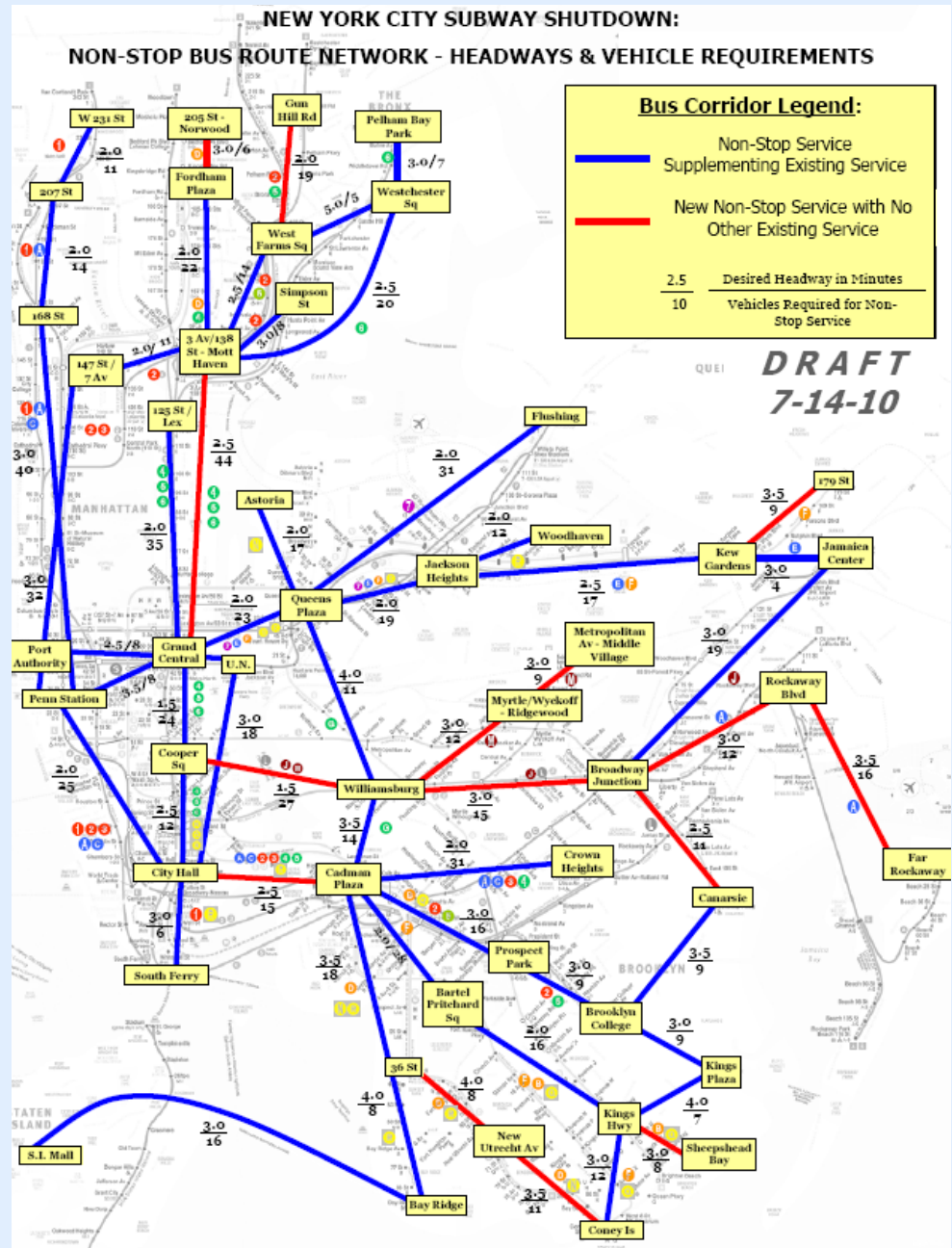


Office of Emergency Management

City of New York



Bus Only Plan



Tuesday, September 11, 2001
1000 hrs

A/C power fails on the **4 5 6** and the **N R** lines in lower Manhattan.

All train crews are instructed to stop trains and stay still in stations.

Several trains stop between stations.

Some trains are brought close to each other to allow passengers to walk through the cars to safety.

Others are wrong-railed to the nearest station.

**Systemwide
Service Level**



93%

MTA New York City Transit



Tuesday, September 11, 2001

1020 hrs

All train service is suspended due to continued disruptions in third rail and signal power. Trains are brought to stations to allow customers to exit system and trains without passengers were brought to yards.

Radio communication between Canal St and Brooklyn Bridge is lost.



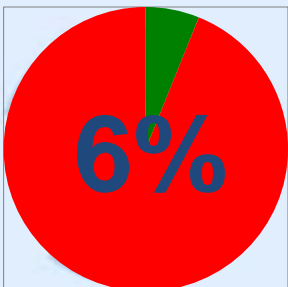
**Systemwide
Service Level**

0%

Tuesday, September 11, 2001
1248 hrs

A service is restored but trains bypass Chambers St and Broadway-Nassau in both directions because of their proximity to the attack site.

Systemwide
Service Level



MTA New York City Transit



Tuesday, September 11, 2001

1329-1340 hrs

7 service resumes.

5 service is restored between East 180 Street and Dyre Av, providing service only in the Northeast Bronx.

4 service is restored between Woodlawn and Grand Central, with no service to Lower Manhattan.

Systemwide
Service Level

33%

MTA New York City Transit

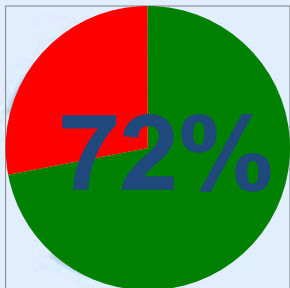


Thurs, September 13, 2001
1000 hrs

E service begins operating to Euclid Avenue, replacing the **C** as the local service in Brooklyn.



Systemwide
Service Level



Shutdown: NYCT's Extreme Weather Strategy for Safety and Recovery

Larry Gould

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New York City Transit

