

# NYCDOT'S EXPERIENCE WITH BIG DATA AND USE IN TRANSPORTATION PROJECTS

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Who we are and what we do...

NYCDOT's *Modeling & Data Analysis* unit supports the Agency's internal planning, project development, analysis and technical review processes, and coordinates/partners with external agencies on regional projects and planning.

- analytical support focusing on traffic flow and capacity
- static and dynamic simulation (macro-, meso-, micro-)
- development of analytical techniques
- management and evaluation of historic and real-time ITS data

NYCDOT currently leverages various archived and real-time datasets:

DATASET	USE
Medallion Taxi GPS	Travel times, O/D Patterns, Activity
MTA/NYCT Bus Time	Travel times
TIMS Count Database/Recurring counts	Volumes, Pedestrians
Midtown In Motion/Traffic sensors	Travel times (Midtown)
TRANSCOM's Data Fusion Engine	Travel times (Regional)
MuniMeter data	Activity
Toll Plazas	Classifications
Video counting methods	Volumes, Pedestrians
Cell phone data	O/D Patterns, Activity

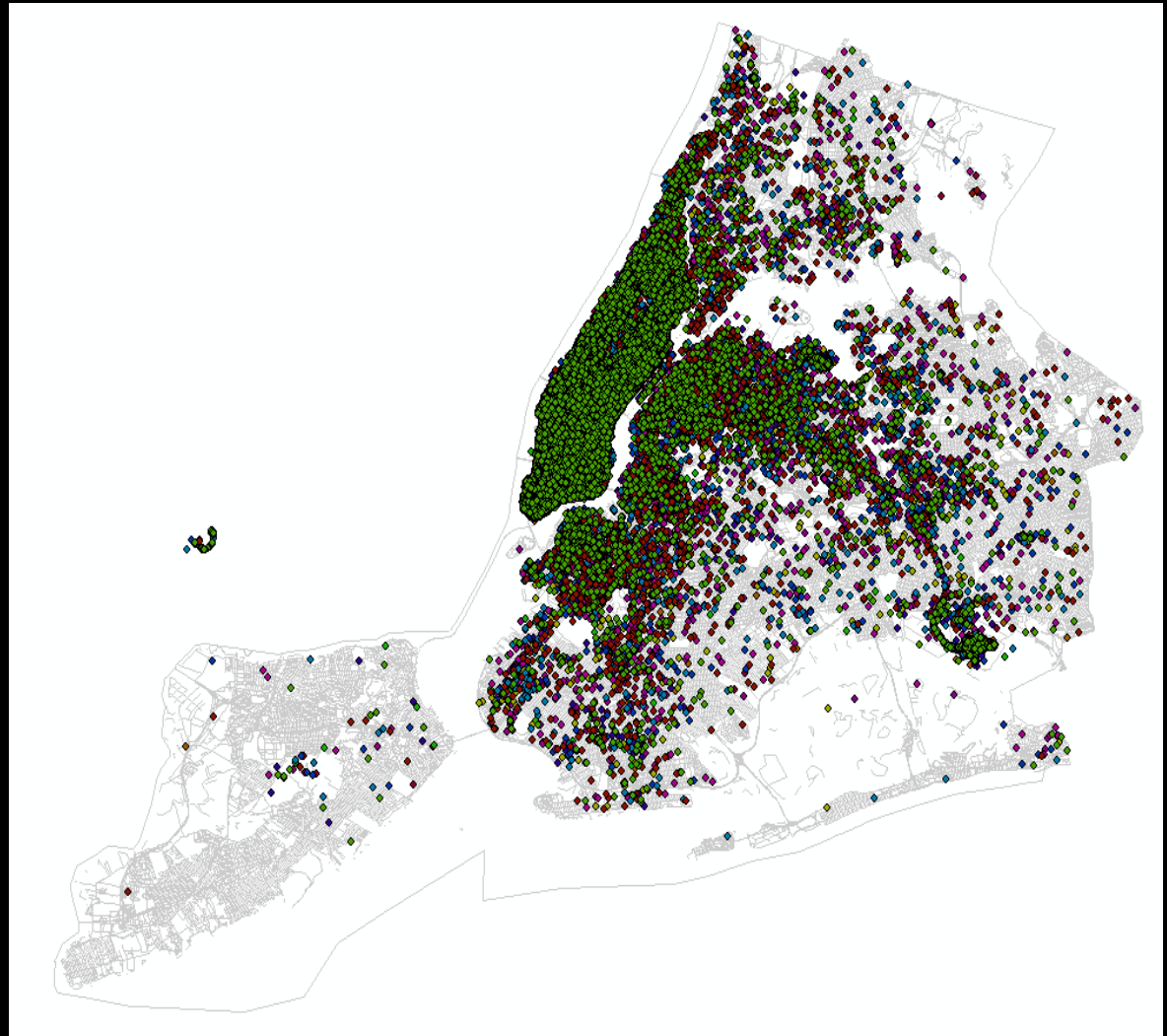
Data analysis tools:

SQL Server, ArcGIS, SPSS, TaxiVis, Excel Pivot Tables, PHP & MySQL

# Medallion Taxi GPS

- GPS in over 13,000 taxi cabs (TLC vehicles)
- Each fare trip is recorded; approx. 15 million/month
- Since 2008, over 1 billion records have been stored and analyzed
- Data are geo-referenced monthly by NYCDOT
- The data provide numerous insights:
  - ✓ **Spatial and Temporal Trip Distributions**
  - ✓ **Origin-Destination Patterns**
  - ✓ **Trip Length and Travel Times**
  - ✓ **Intra-zonal, Inter-zonal and corridor-wide travel speeds**
- Useful for Before-After project evaluations

One Month Taxi Trip Dataset

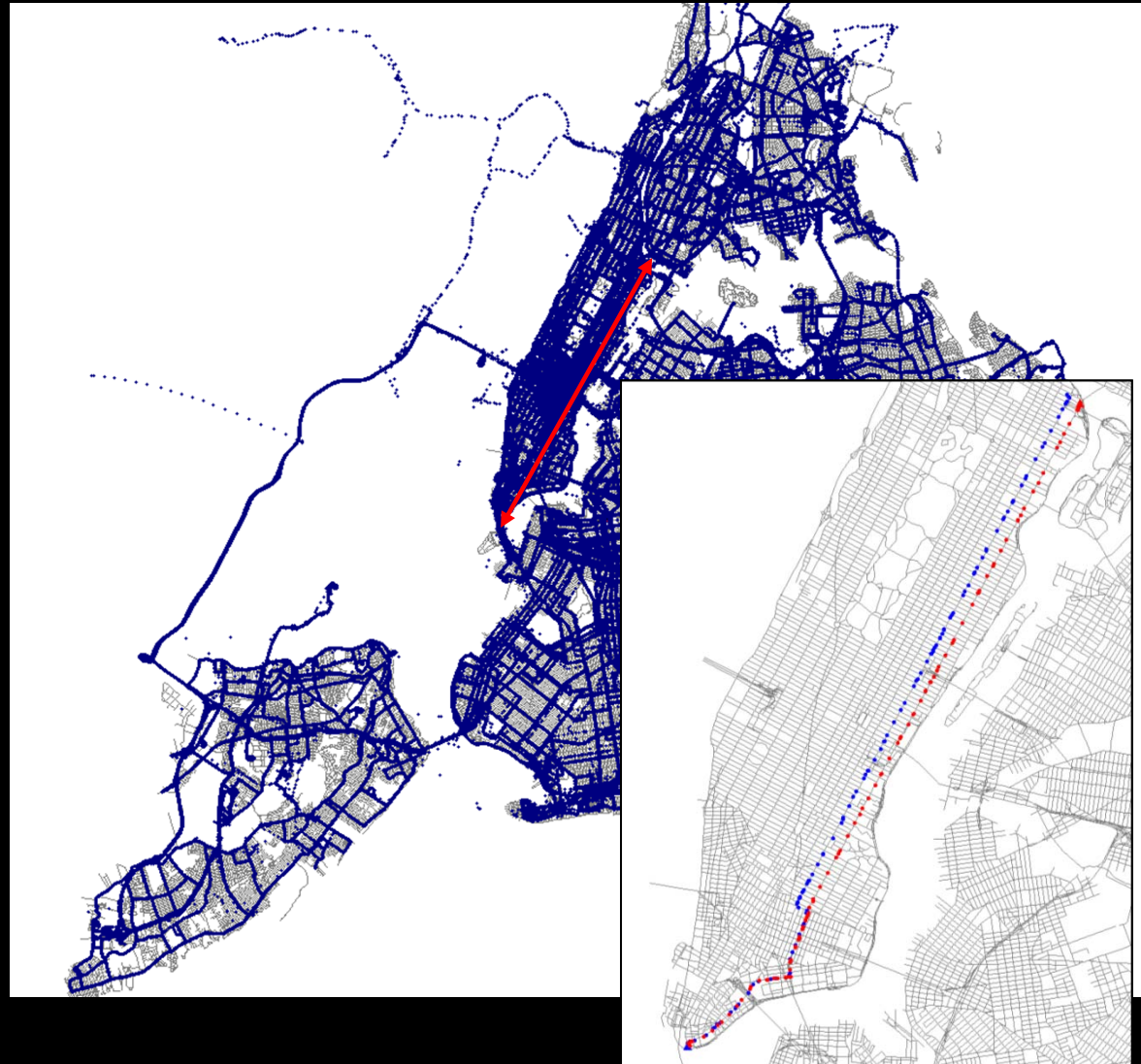


# MTA/NYCT Bus Time

[www.mta.info](http://www.mta.info)

- GPS devices on entire MTA NYCT and MTA Bus fleet in the 5 Boros
- Currently over 6 million records per day
- Gathers bus activity and position at 30-second frequency
- Includes data for corridors and crossing where other travel time data are not typically gathered
- Coverage of the Outer Boroughs in addition to Manhattan
- Specific vehicle, route and time-of-day data can be isolated and analyzed
- Useful for Before-After project evaluations

One Weekday Bus Time Dataset



## Uses of Data



### Trends Analysis

*Annual travel speeds, trip activity, VMT, VHT*

### Project Monitoring and Evaluation

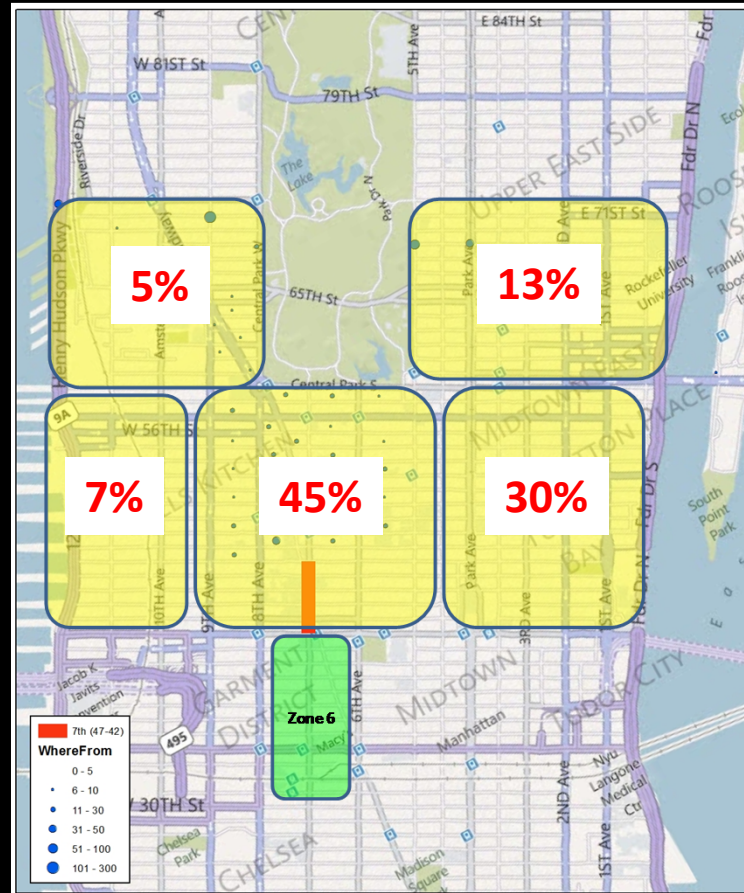
*Roadway changes, traffic calming, SBS projects*

### Maintenance & Protection of Traffic (MPT) Planning

*Closures, turn prohibitions, and diversion routing*

#### *MPT Example:*

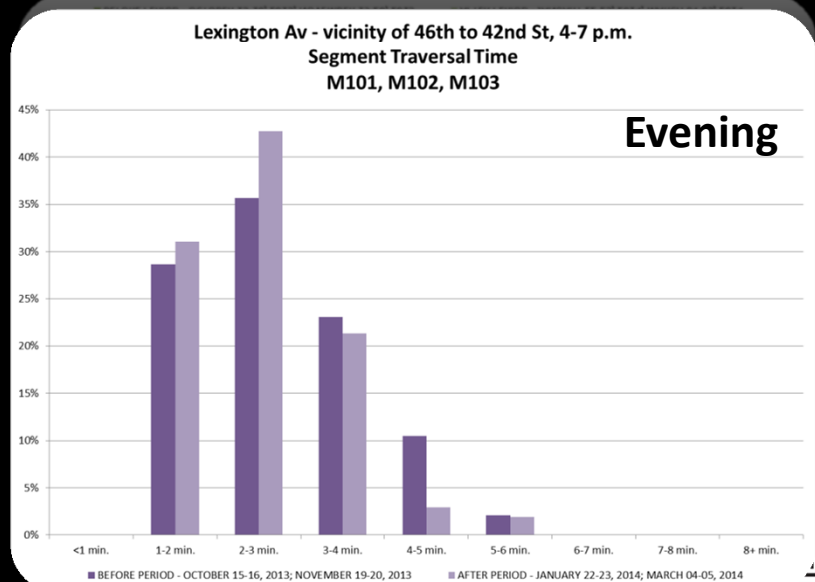
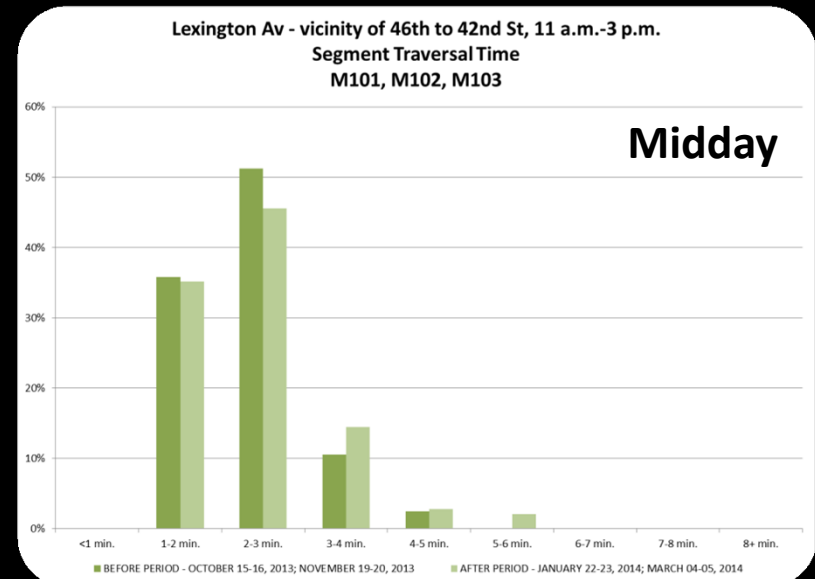
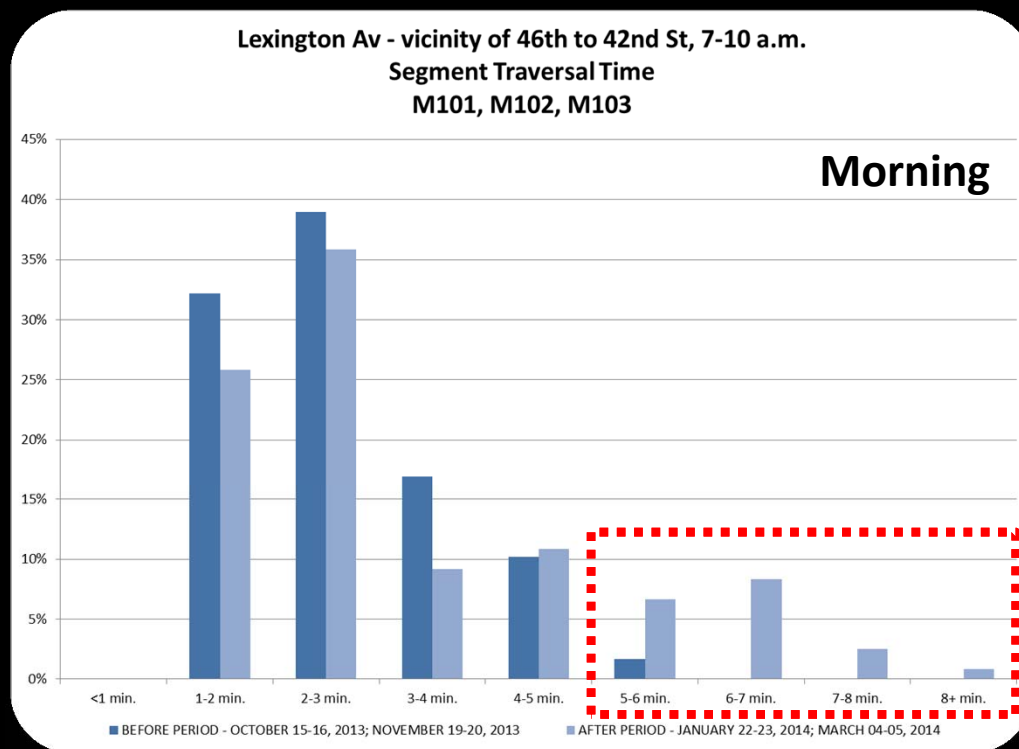
For the Times Square Reconstruction origin-destination patterns of taxi trips from zones in Midtown (shown in **yellow**) through the MPT area (shown in **green**) were used to identify likely diversion routes during construction closures...



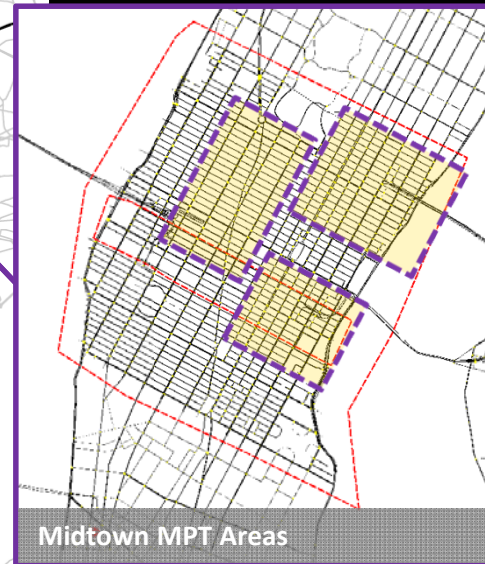
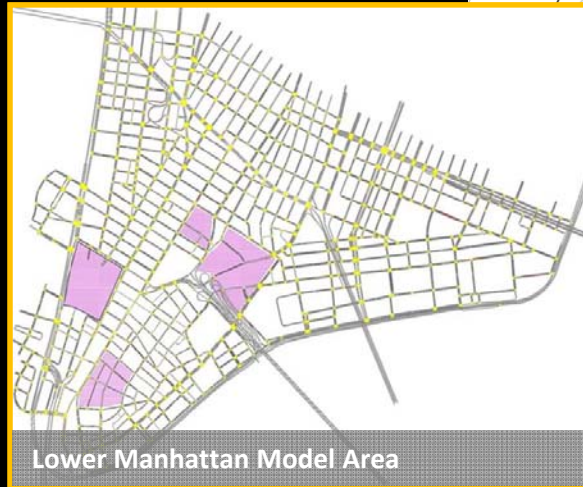
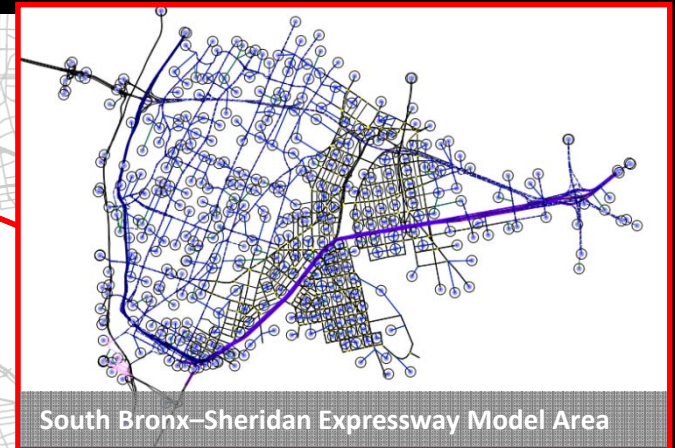
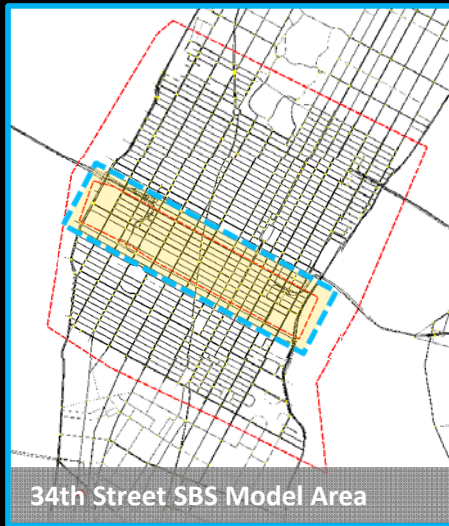
# Bus Time application

Looking at effects of construction zone on Lexington Avenue outside GCT

Before (dark) / During (light)



# Citywide application of data



# Medallion Taxi GPS Data

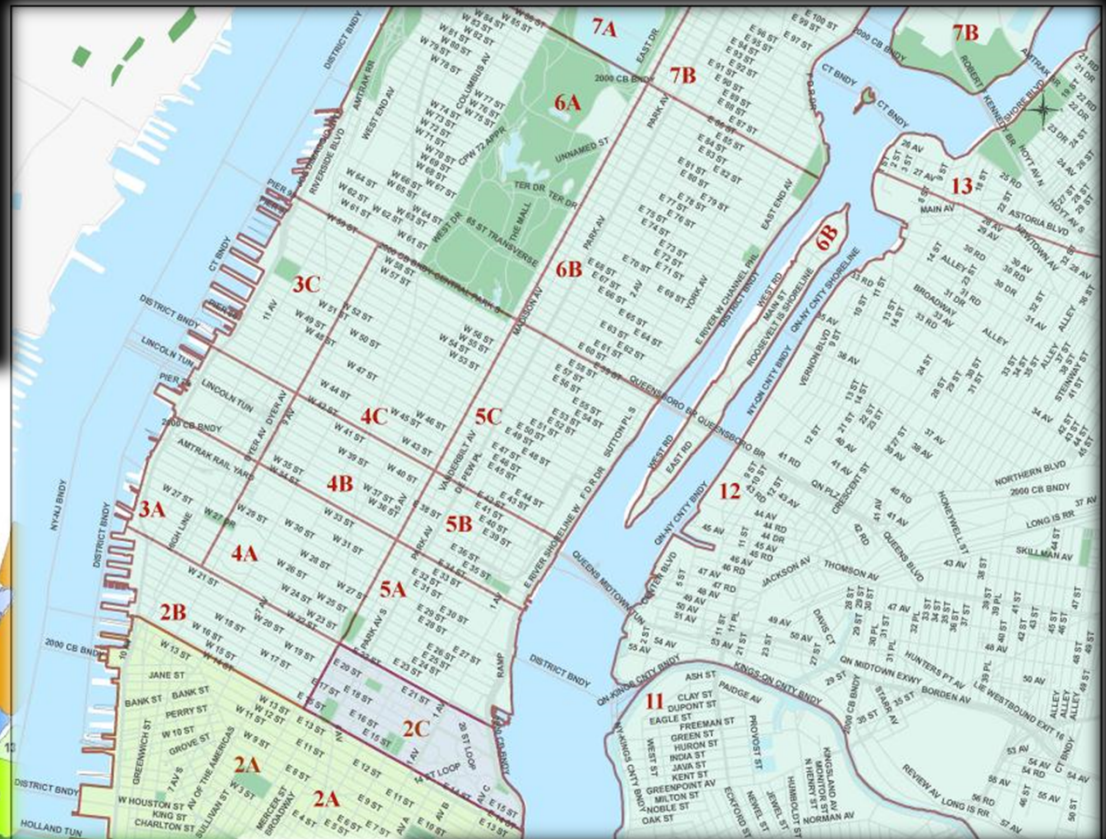
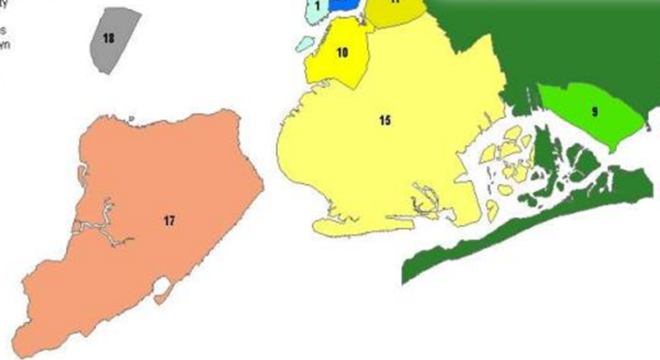
Data Analysis & Visualization  
Examples

# Geo referencing trips to zones

Manhattan CBD = zones 1-5,  
from the Battery to 60<sup>th</sup> Street

TAXI GPS ZONES

CODE	ZONE NAME	ZONE DESCRIPTION
1	Lower Manhattan	South of Canal Street inclusive
2A	Village	North of Canal Street to 14th Street
2B	South Chelsea	15th Street to 22nd Street, 5th Ave to Hudson River
2C	South Gramercy	15th Street to 22nd Street, East of 5th Ave
3A	West Chelsea	23rd Street to 34th Street, West of 9th Ave
3B	West Garment Dist	35th Street to 42nd Street, West of 9th Ave
3C	West Midtown	43rd Street to 59th Street, West of 9th Ave
4A	Central Chelsea	23rd Street to 34th Street, Between 9th Ave and 5th Ave inclusive
4B	Central Garment Dist	35th Street to 42nd Street, Between 9th Ave and 5th Ave inclusive
4C	Central Midtown	43rd Street to 59th Street, Between 9th Ave and 5th Ave inclusive
5A	Gramercy	23rd Street to 34th Street, East of 5th Ave
5B	Murray Hill	35th Street to 42nd Street, East of 5th Ave
5C	East Midtown	43rd Street to 59th Street, East of 5th Ave
6A	Upper West Side	60th Street to 88th Street, 5th Ave to Hudson River
6B	Upper East Side	60th Street to 88th Street, East of 5th Ave
7A	North Upper West Side	87th Street to 110th Street, 5th Ave to Hudson River
7B	North Upper East Side	87th Street to 110th Street, East of 5th Ave
8	LaGuardia	11th Street Harlem River
9	JFK	JFK John F. Kennedy Airport
10	Park Slope	Park Slope, Downtown Brooklyn, Cobble Hill, Boerum Hill, Carroll Gardens
11	Williamsburg	Williamsburg and Greenpoint
12	Long Island City	Long Island City
13	Astoria	Astoria
14	Queens	Rest of Queens
15	Brooklyn	Rest of Brooklyn
16	The Bronx	Rest of Bronx
17	Staten Island	Staten Island
18	New Jersey	New Jersey



# Taxi Speed Calendar for the Manhattan CBD (2011)

## Manhattan Traffic Speeds Day By Day

JANUARY						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

FEBRUARY						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28					

MARCH						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

APRIL						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

MAY						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

JUNE						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

JULY						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

AUGUST						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

SEPTEMBER						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

OCTOBER						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

NOVEMBER						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

DECEMBER						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

This calendar shows average daily speeds in the Manhattan CBD, 6 a.m. to 6 p.m.

### Key:

- The 25 fastest days (average speed between 16.3 m.p.h. and 11.9 m.p.h.). Most occur on major holidays or on Sundays in January or July.
- The next 75 fastest days (average daily speed between 11.7 m.p.h. and 10.5 m.p.h.). Most occur on weekends during spring or fall seasons, or immediately before or after holidays.
- Between the 100 fastest days and 100 slowest days are the 165 days with average daily speeds between 10.5 m.p.h. and 9.2 m.p.h. Most are weekdays during spring and summer seasons.
- The next 75 slowest days (9.2 to 8.6 m.p.h.) fall into mid-week weekdays late in the year.
- The 25 slowest days (8.6 to 6.9 m.p.h.) mostly occur in the latter part of the year and all are weekdays. The heaviest concentrations are in late September during the United Nations General Assembly, and in November and December.

### Fastest Day

- 2008: Sunday, June 1 (15.1 m.p.h.)
- 2009: Thursday, January 1 (13.9 m.p.h.)
- 2010: Sunday, July 4 (14.2 m.p.h.)
- 2011: Sunday, August 28 (16.3 m.p.h.)

### Fastest Non-Holiday Weekday

- 2008: Friday, May 11 (12.4 m.p.h.)
- 2009: Monday, September 28 (11.9 m.p.h.)
- 2010: Monday, January 4 (11.8 m.p.h.)
- 2011: Monday, January 3 (11.6 m.p.h.)

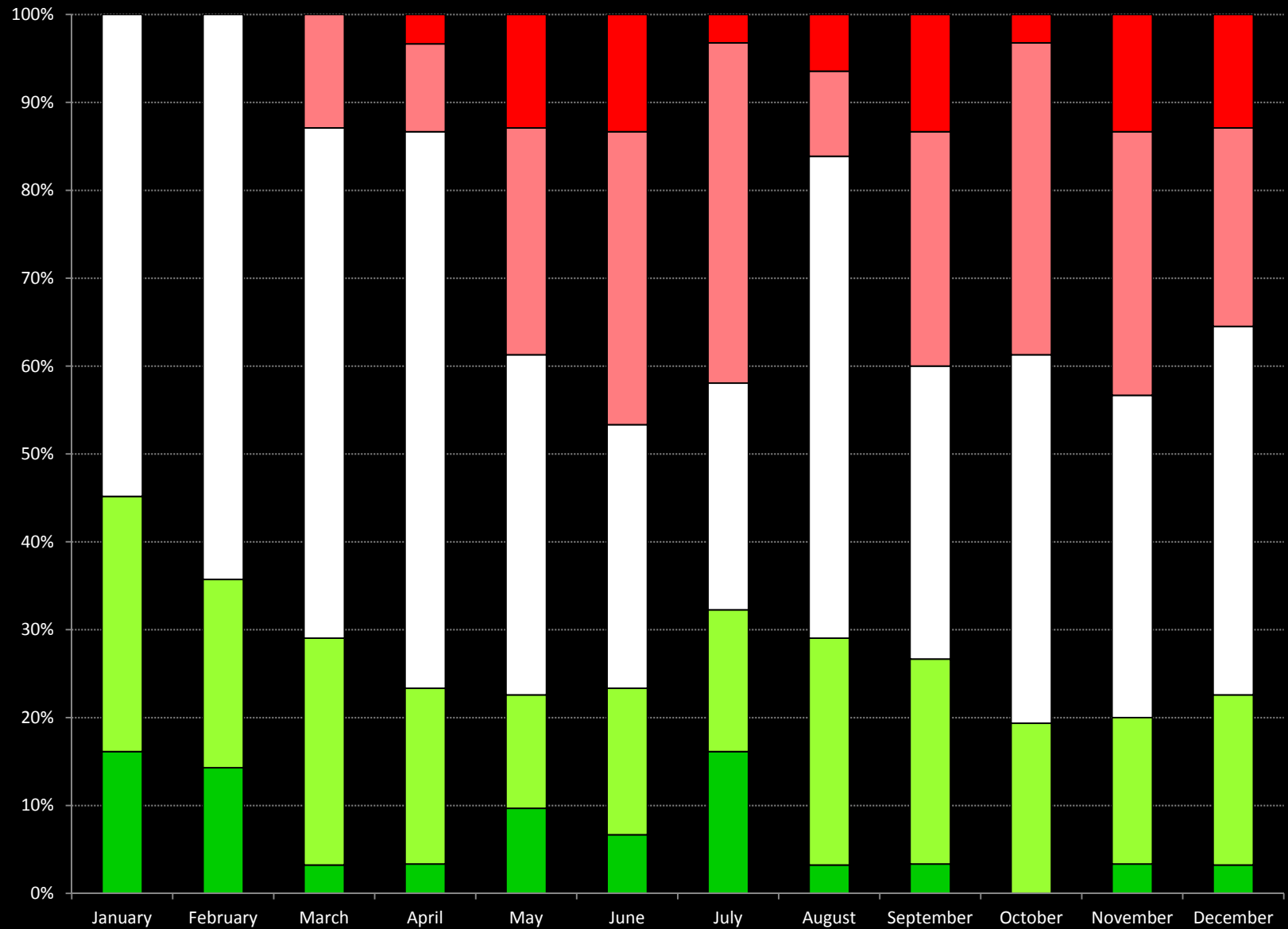
### Slowest Day

- 2008: Wednesday, September 24 (7.0 m.p.h.)
- 2009: Monday, December 21 (8.0 m.p.h.)
- 2010: Wednesday, December 29 (6.4 m.p.h.)
- 2011: Friday, January 28 (6.9 m.p.h.)

### 2011 Holidays

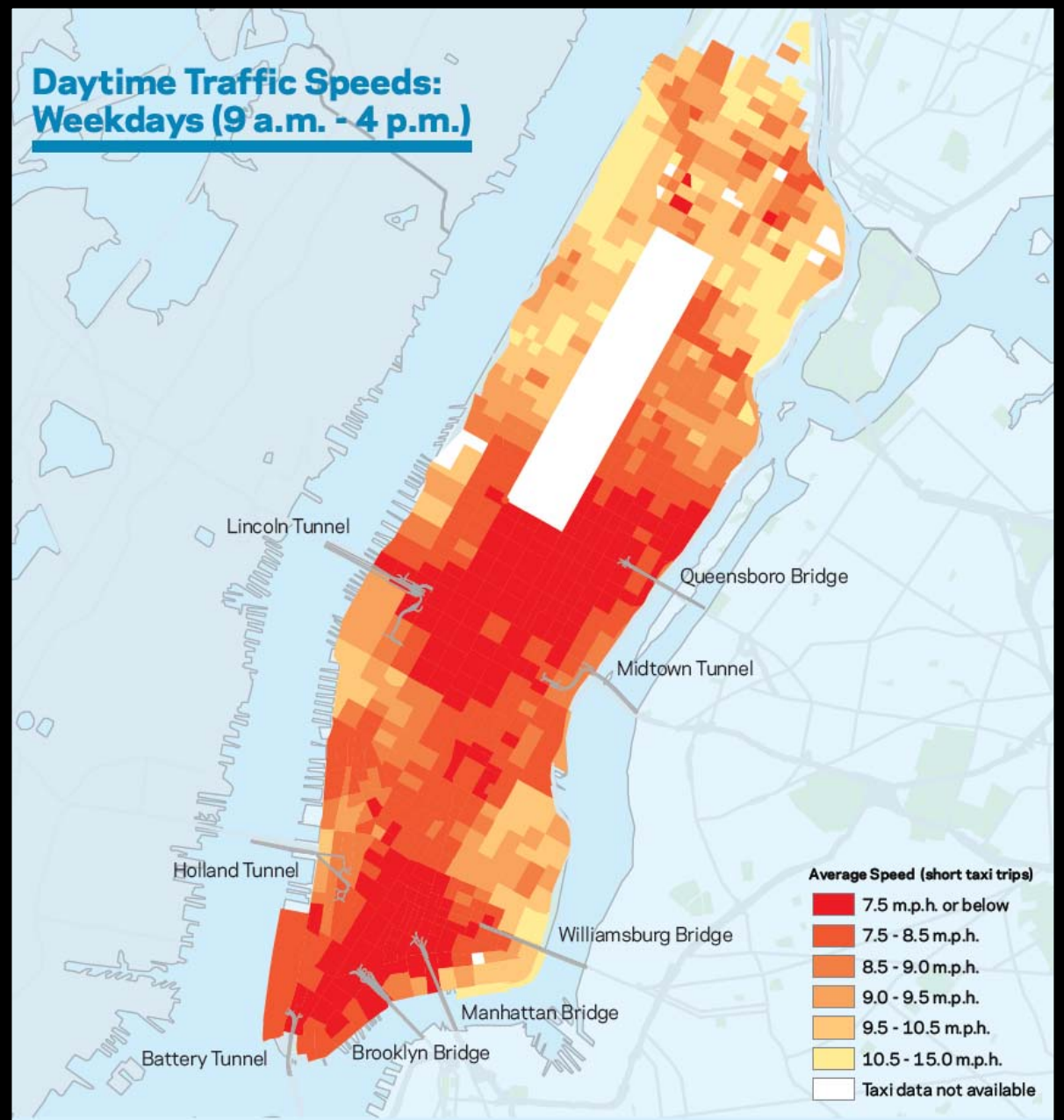
<b>January</b>	New Year's Day (1)
	Martin Luther King Jr. Day (17)
<b>February</b>	President's Day (21)
<b>April</b>	Easter Sunday (24)
<b>May</b>	Memorial Day (30)
<b>July</b>	Independence Day Observed (4)
<b>September</b>	Labor Day (5)
<b>October</b>	Columbus Day (10)
<b>November</b>	Veteran's Day (11)
	Thanksgiving (24)
<b>December</b>	Christmas Day (25)

# A different way to look at the Taxi Speed Calendar (2013)

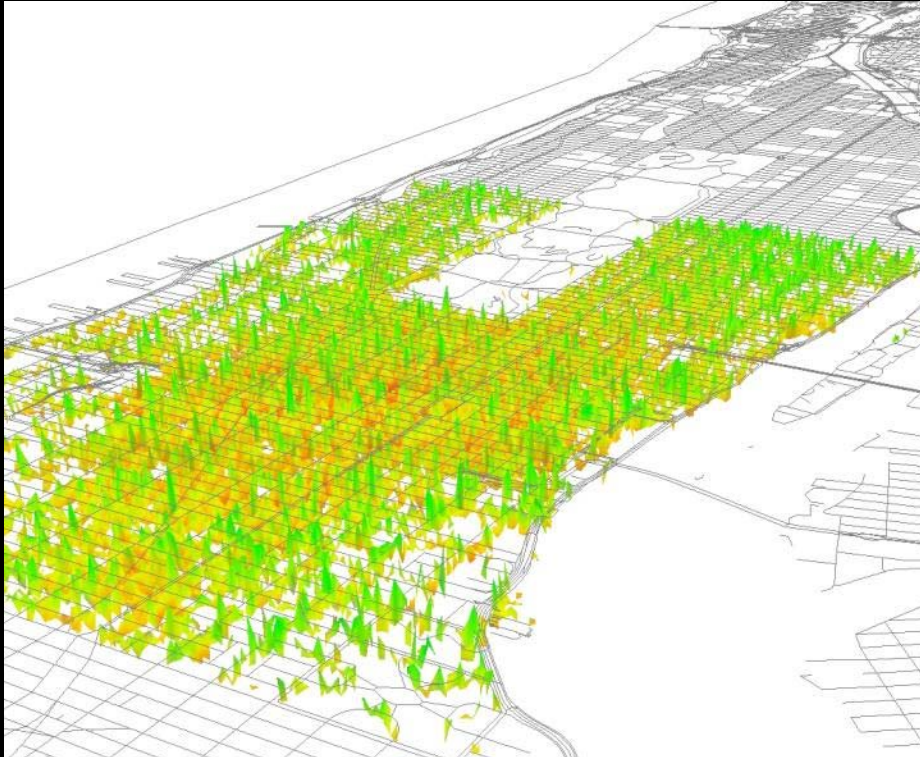


# Spatial view of taxi speeds

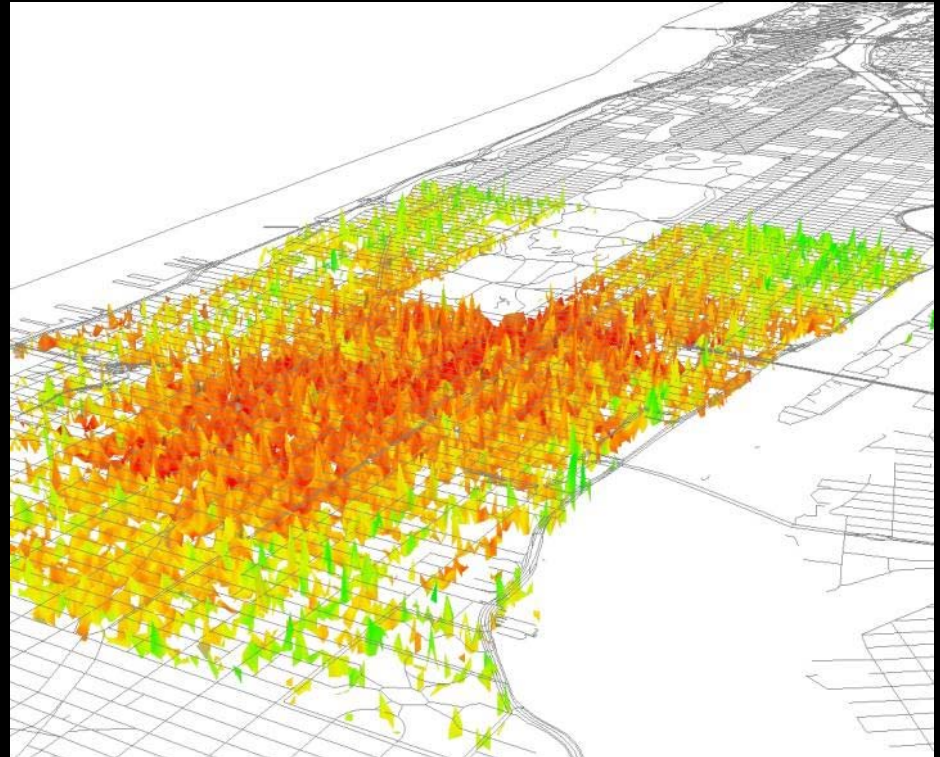
The data shown in the map are based on GPS data for short trips (up to a half mile) from typical weekdays (excluding major holidays) between 9 a.m. and 4 p.m. Speeds are calculated for small zones using the median speed for taxi trips in each zone. Data reflect these average zonal speeds, not speeds for individual streets...



# Identification of typical and atypical conditions

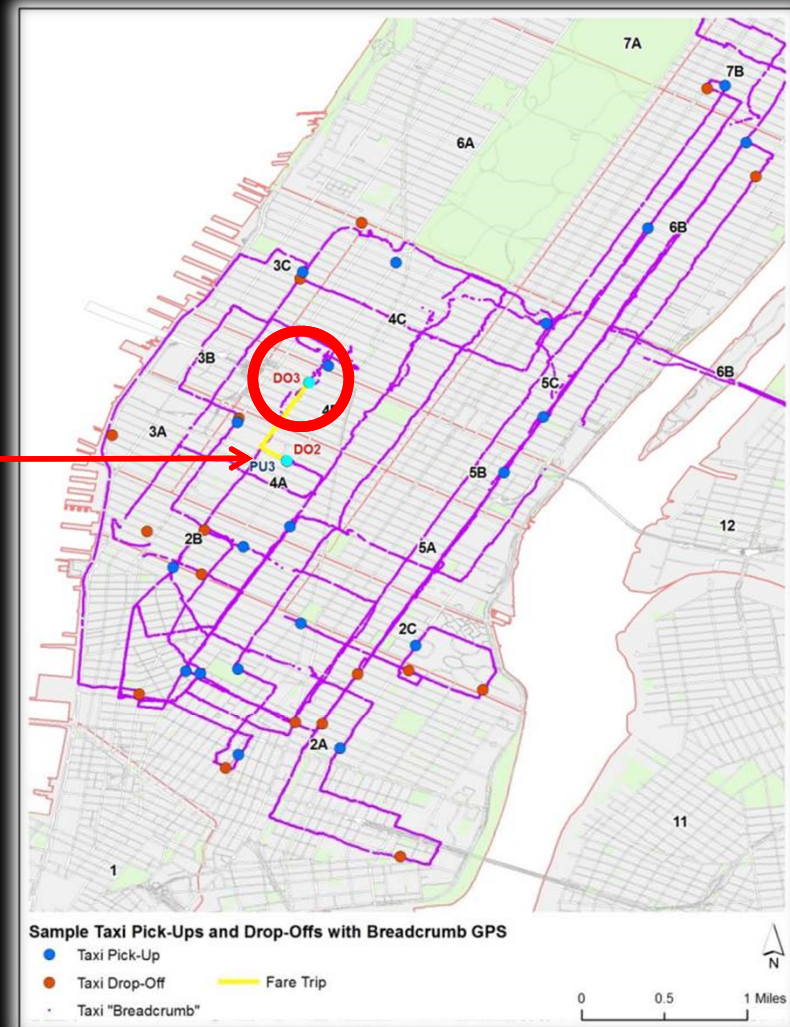
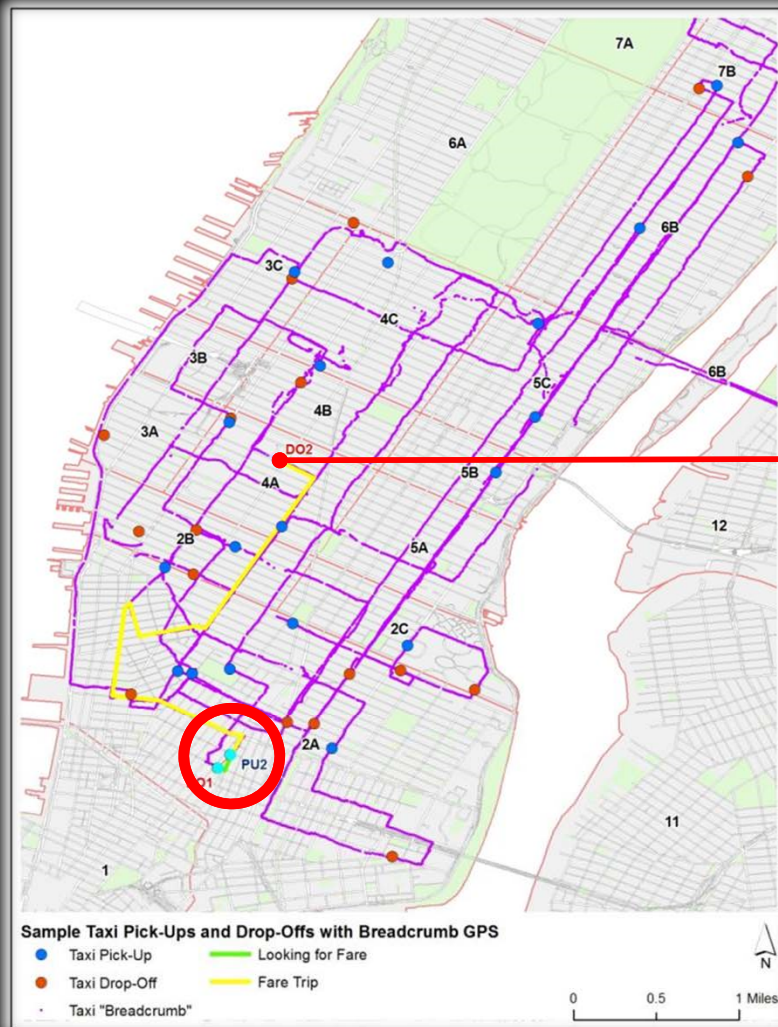


June 16, 2011  
Typical Thursday



June 23, 2011  
Special Event Thursday

# Future potential for TLC breadcrumb data NYCDOT Pilot Project



# THANK YOU!

Special thanks to the NYC Taxi and Limousine Commission  
and MTA / New York City Transit / MTA Bus

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Learn more at: <http://www.nyc.gov/html/dot/html/home/home.shtml>

