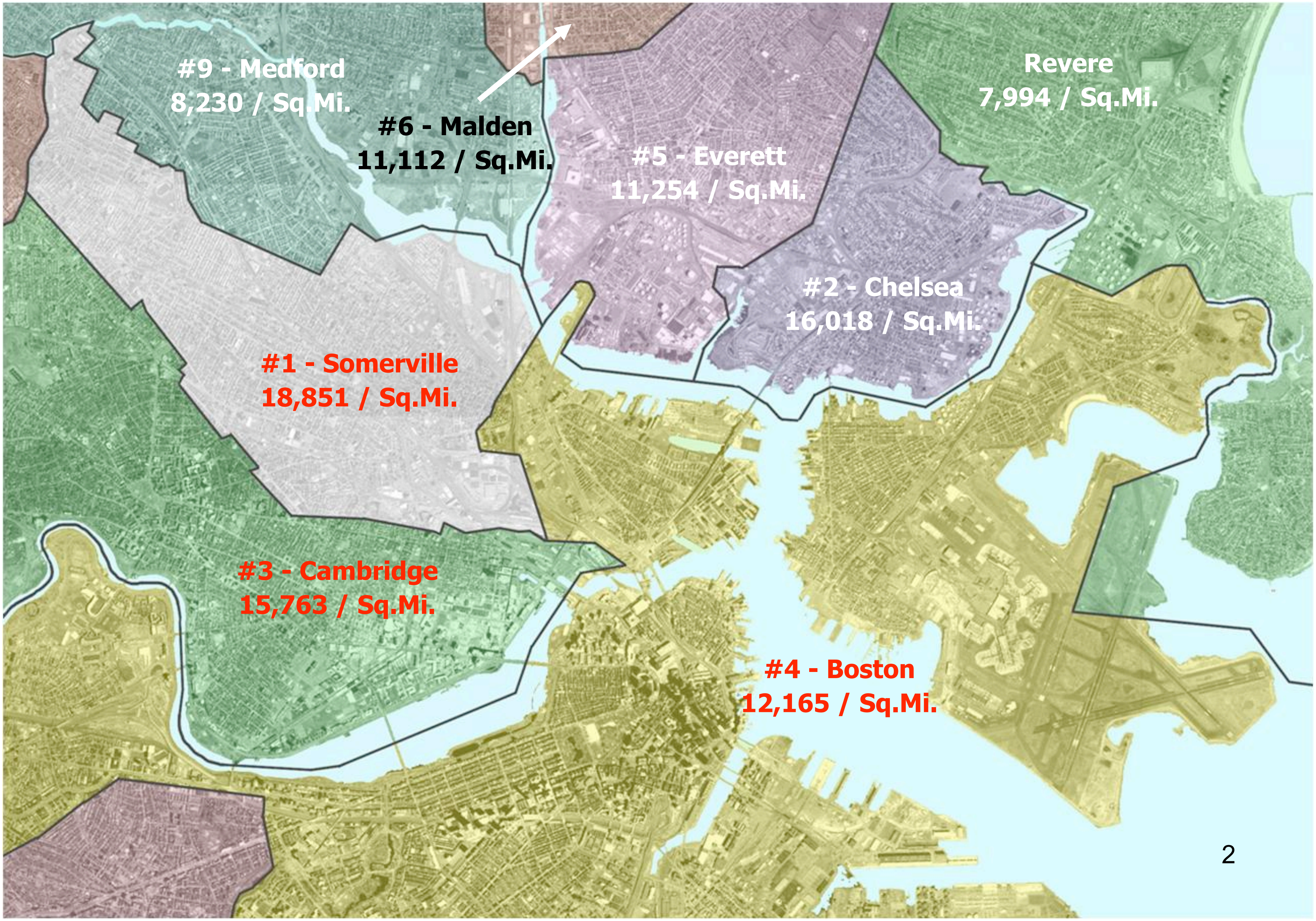
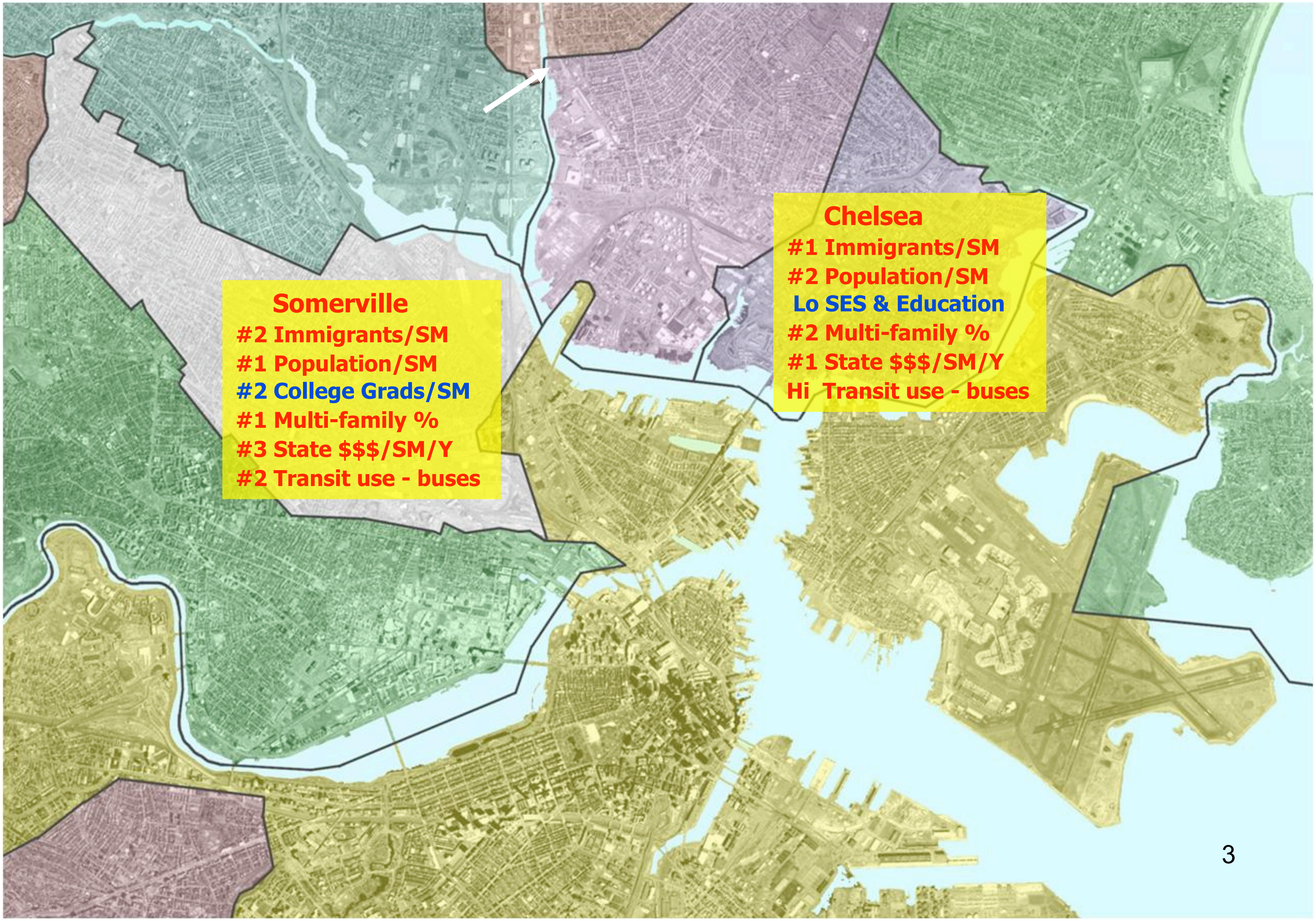

EPA Draft PM ISA - Citizen Comments
on Public Health and Near Source
Transportation Related Air Pollution
(TRAP)
LEFT LANE
CLOSED
AHEAD
LEARN TO DRIVE
Wig Zamore, April 2, 2009
On behalf of Mystic View Task Force &
Somerville Transportation Equity Partnership

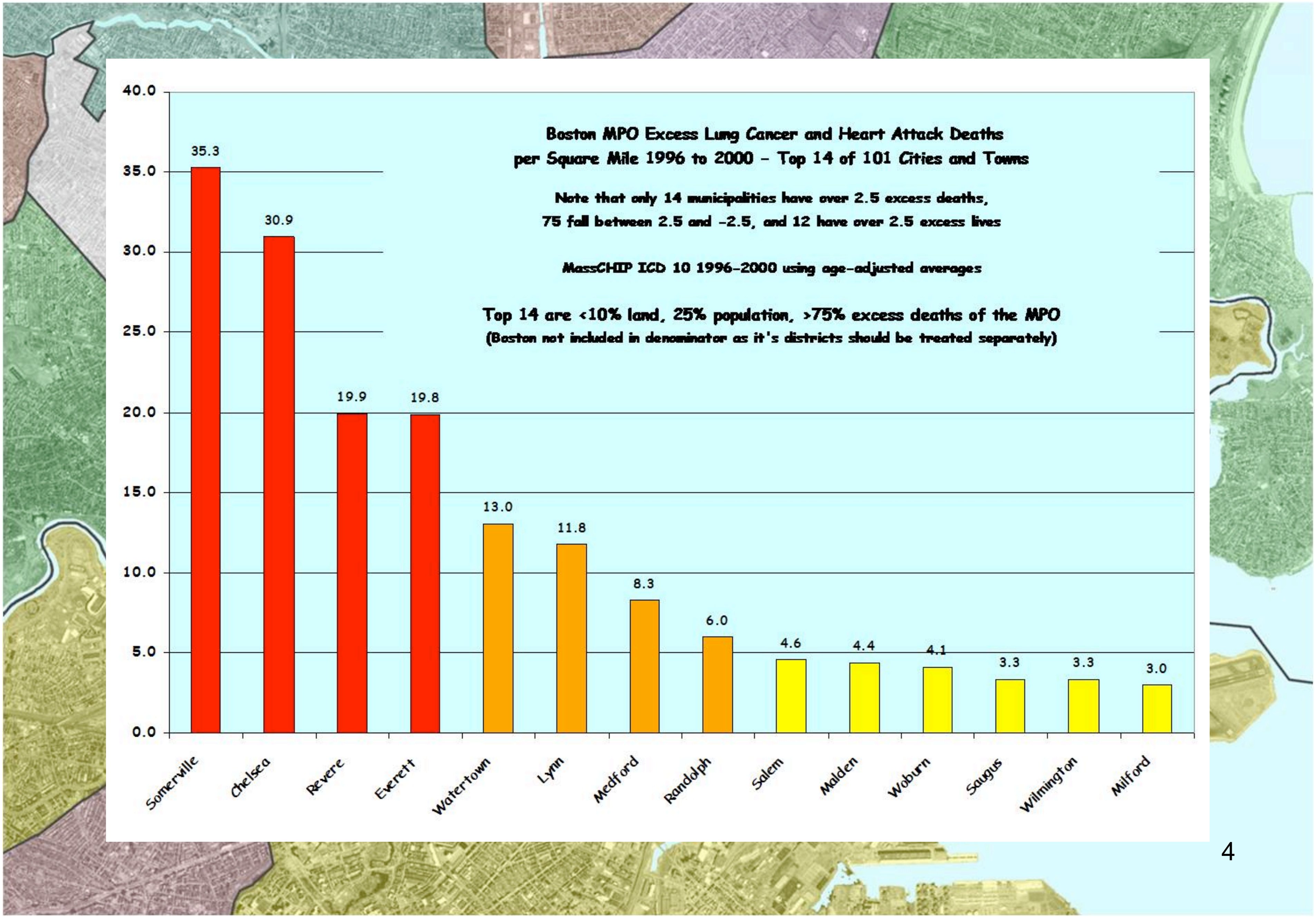
BOSTON Metropolitan Area Cities and Densities - 2000



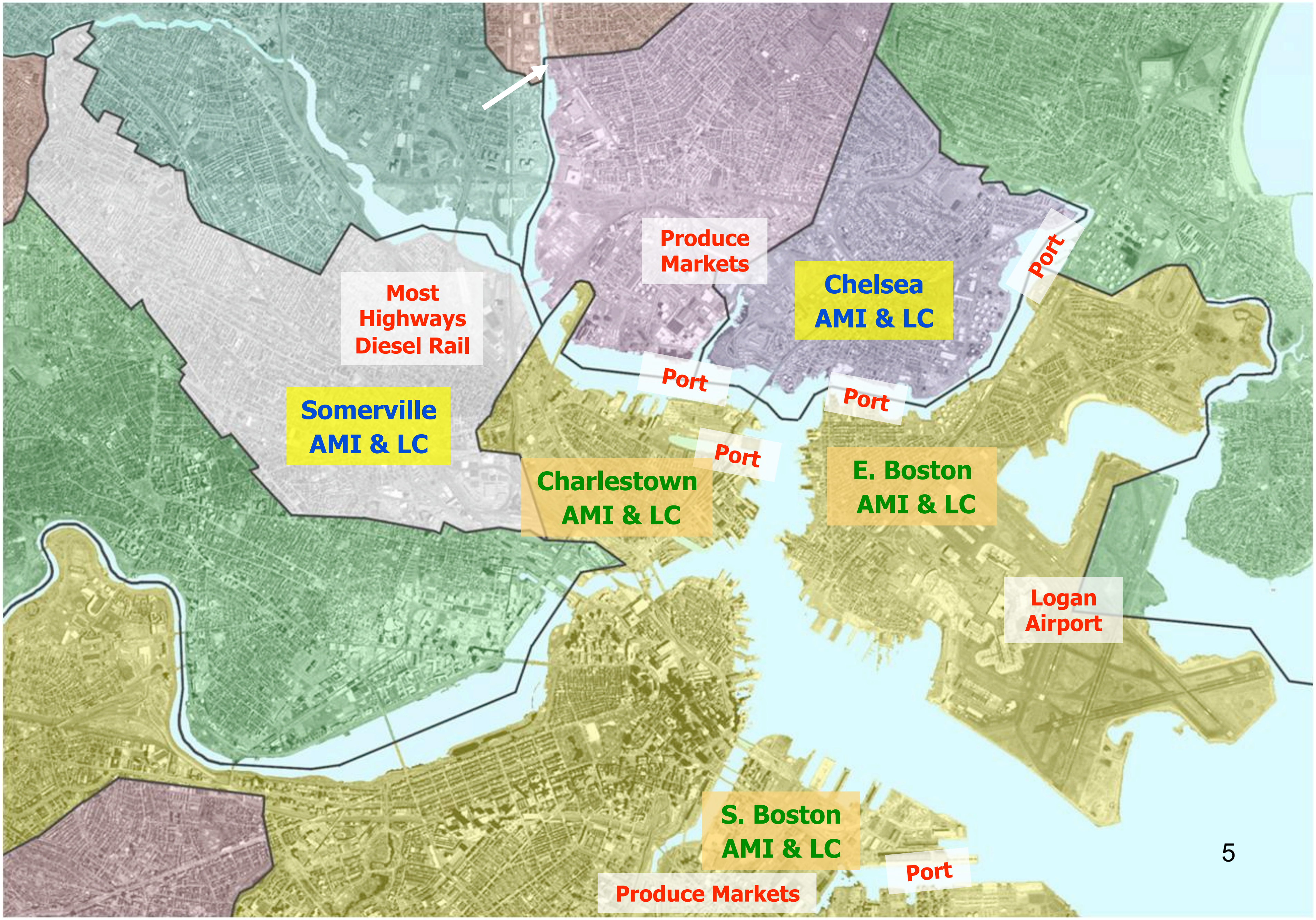
Somerville and Chelsea Characteristics - Susceptible and Vulnerable



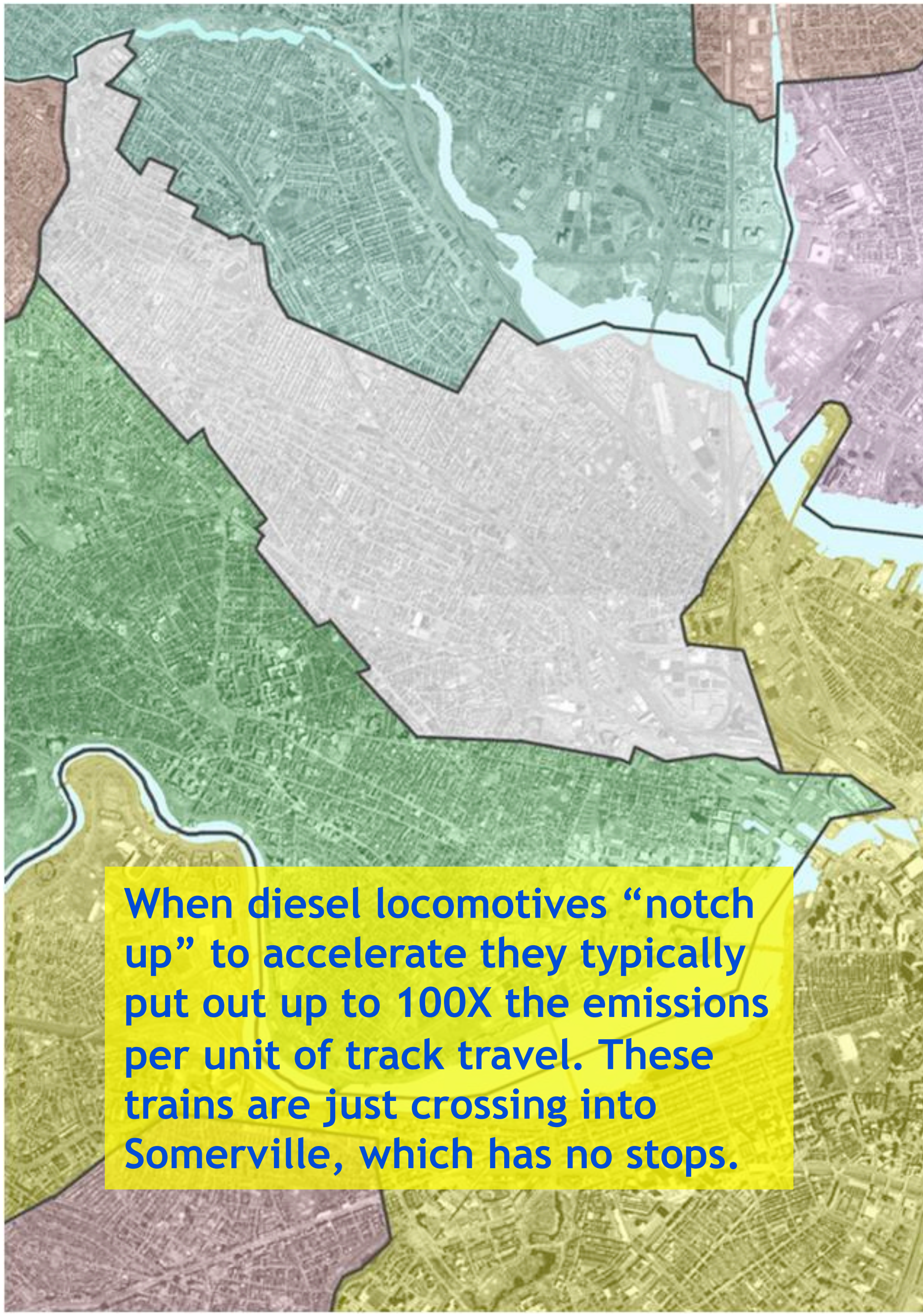
Somerville and Chelsea Characteristics - Eye opener data on AMI & LC



Density plus TRAP = Highest Age-adjusted Excess AMI & Lung Cancer / SM



Somerville Diesel Commuter Rail Trips - 200/Day - 15,000/SM/YR



When diesel locomotives “notch up” to accelerate they typically put out up to 100X the emissions per unit of track travel. These trains are just crossing into Somerville, which has no stops.

Somerville Highway Trips - 250,000 VPD - 200,000 VMT/SM City Average

Prospect St – Union Sq – extra busy

Route 28 – busy rush hour

Route 28 – busy rush hour

Somerville Ave –
Union Sq – extra busy

Somerville Highway Trips – 250,000/Day on just Interstate 93 and Routes 28 & 38
Busy rush hour on I93 shown - all rush hours congested in at least one direction

Harvard VA Transportation Worker Series – Garshick 2008 - one of many
This transportation worker series is highly relevant to near source TRAP

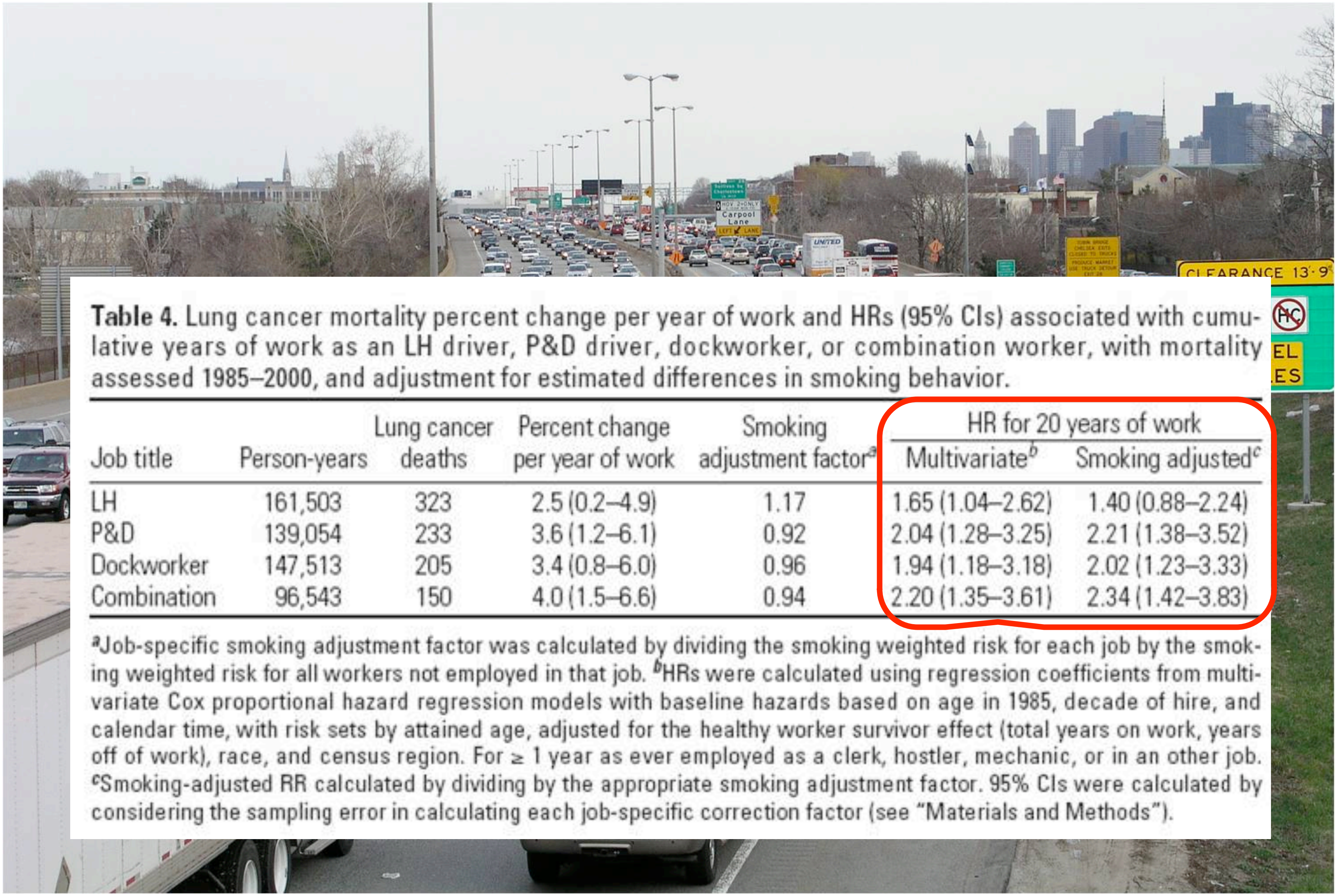


Table 4. Lung cancer mortality percent change per year of work and HRs (95% CIs) associated with cumulative years of work as an LH driver, P&D driver, dockworker, or combination worker, with mortality assessed 1985–2000, and adjustment for estimated differences in smoking behavior.

Job title	Person-years	Lung cancer deaths	Percent change per year of work	Smoking adjustment factor[a]	HR for 20 years of work: Multivariate[b]	HR for 20 years of work: Smoking adjusted[c]
LH	161,503	323	2.5 (0.2–4.9)	1.17	1.65 (1.04–2.62)	1.40 (0.88–2.24)
P&D	139,054	233	3.6 (1.2–6.1)	0.92	2.04 (1.28–3.25)	2.21 (1.38–3.52)
Dockworker	147,513	205	3.4 (0.8–6.0)	0.96	1.94 (1.18–3.18)	2.02 (1.23–3.33)
Combination	96,543	150	4.0 (1.5–6.6)	0.94	2.20 (1.35–3.61)	2.34 (1.42–3.83)

[a]Job-specific smoking adjustment factor was calculated by dividing the smoking weighted risk for each job by the smoking weighted risk for all workers not employed in that job. [b]HRs were calculated using regression coefficients from multivariate Cox proportional hazard regression models with baseline hazards based on age in 1985, decade of hire, and calendar time, with risk sets by attained age, adjusted for the healthy worker survivor effect (total years on work, years off of work), race, and census region. For ≥ 1 year as ever employed as a clerk, hostler, mechanic, or in an other job. [c]Smoking-adjusted RR calculated by dividing by the appropriate smoking adjustment factor. 95% CIs were calculated by considering the sampling error in calculating each job-specific correction factor (see "Materials and Methods").

Scandinavian NO2 / NOx Series – highly relevant to near source TRAP
Nyberg Stockholm 2000 lung cancer study - nice job on relevant factors

TABLE 2. Relative Risk of Lung Cancer (and 95% Confidence Interval) Associated with Smoking, Radon, Socioeconomic Status, Some Occupational Exposures and Employment in Risk Occupations

Variable	Cases	Controls	RR*	95% CI*
Smoking†,‡,§,‖				
Never smokers**	36	705	1	
Former smokers	273	844	6.19	4.30–8.90
Current smokers				
1–10 cig/day	143	313	8.45	5.70–12.5
11–20 cig/day	348	363	18.4	12.7–26.6
>20 cig/day	242	139	34.6	23.2–51.6
Estimated residential radon exposure‡,§,‖,¶				
Below 78 Bq/m^3 (cat. mean 68)**	272	579	1	
78–93 Bq/m^3 (cat. mean 85)	265	587	0.94	0.74–1.19
93–116 Bq/m^3 (cat. mean 106)	280	572	1.08	0.85–1.37
Above 116 Bq/m^3 (cat. mean 147)	225	626	1.07	0.83–1.39
Broad socioeconomic groupings†,§,‖,¶				
Unskilled blue collar**	291	488	1	
Skilled blue collar, farmer	352	677	0.92	0.73–1.15
Unskilled white collar	136	333	0.87	0.65–1.16
Skilled white collar	263	866	0.74	0.58–0.95
Occupational exposure to diesel exhaust†,‡,‖,¶,††				
None or low**	970	2262	1	
High (≥2.38 mg-years/m^3 NO_2)	72	102	1.41	0.97–2.05
Occupational exposure to other combustion products†,‡,‖,¶,††				
None or low**	969	2268	1	
High (≥23.9 μg-years/m^3 benzo(a) pyrene)	73	96	1.47	1.01–2.14
Occupational exposure to asbestos†,‡,‖,¶,††				
None or low**	909	2189	1	
High (≥0.89 fiber-years/mL)	133	175	1.47	1.10–1.97
Employed in risk occupations†,‡,§,¶				
Never**	721	1802	1	
Ever	321	562	1.15	0.95–1.41

Nyberg Stockholm 2000 – All statistical significance is in highest NO2 decile when viewing association of lung cancer with long term residential exposures

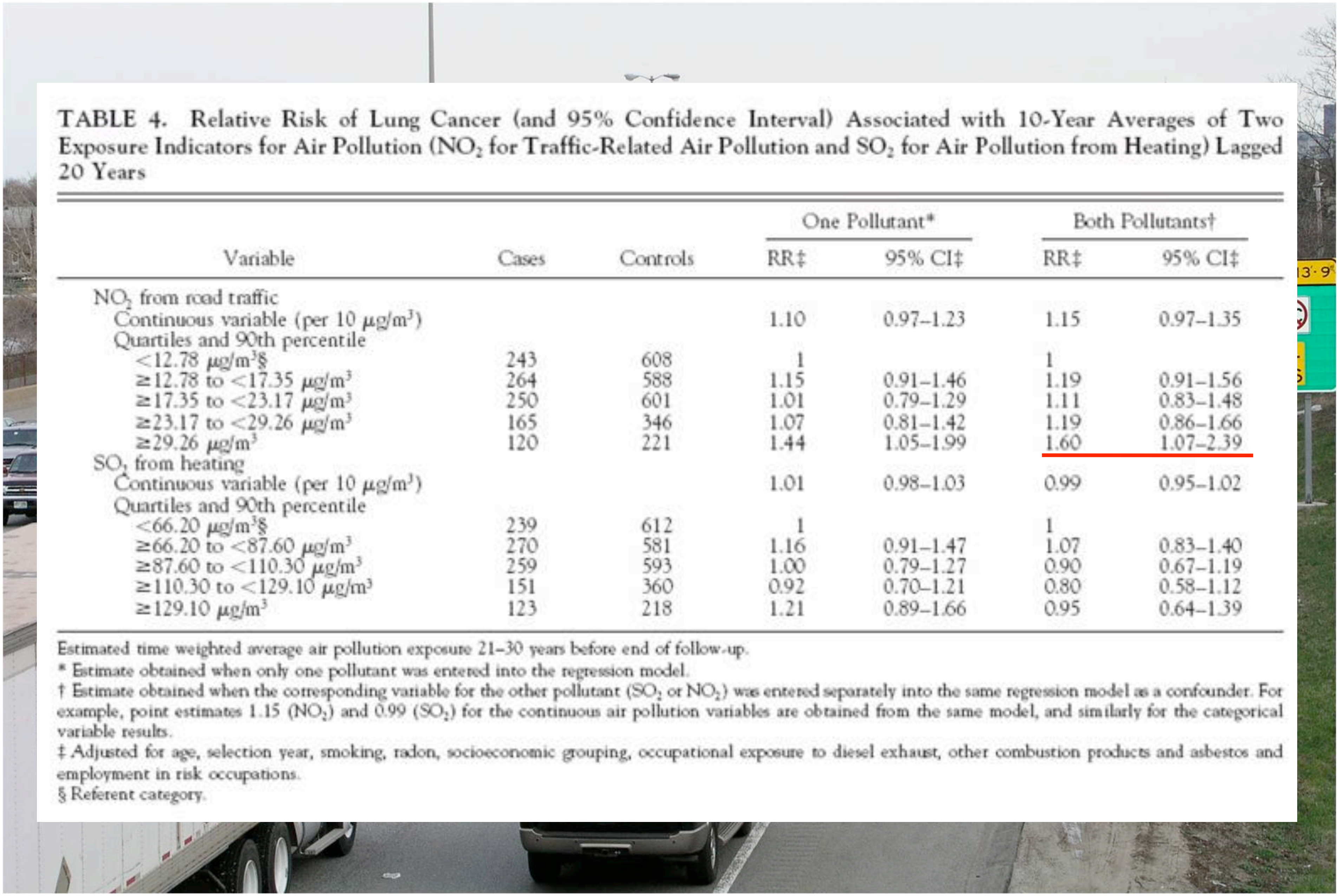


TABLE 4. Relative Risk of Lung Cancer (and 95% Confidence Interval) Associated with 10-Year Averages of Two Exposure Indicators for Air Pollution (NO_2 for Traffic-Related Air Pollution and SO_2 for Air Pollution from Heating) Lagged 20 Years

Variable	Cases	Controls	One Pollutant*		Both Pollutants†	
			RR‡	95% CI‡	RR‡	95% CI‡
NO_2 from road traffic						
Continuous variable (per 10 $\mu g/m^3$)			1.10	0.97–1.23	1.15	0.97–1.35
Quartiles and 90th percentile						
<12.78 $\mu g/m^3$§	243	608	1		1	
≥ 12.78 to <17.35 $\mu g/m^3$	264	588	1.15	0.91–1.46	1.19	0.91–1.56
≥ 17.35 to <23.17 $\mu g/m^3$	250	601	1.01	0.79–1.29	1.11	0.83–1.48
≥ 23.17 to <29.26 $\mu g/m^3$	165	346	1.07	0.81–1.42	1.19	0.86–1.66
≥ 29.26 $\mu g/m^3$	120	221	1.44	1.05–1.99	1.60	1.07–2.39
SO_2 from heating						
Continuous variable (per 10 $\mu g/m^3$)			1.01	0.98–1.03	0.99	0.95–1.02
Quartiles and 90th percentile						
<66.20 $\mu g/m^3$§	239	612	1		1	
≥ 66.20 to <87.60 $\mu g/m^3$	270	581	1.16	0.91–1.47	1.07	0.83–1.40
≥ 87.60 to <110.30 $\mu g/m^3$	259	593	1.00	0.79–1.27	0.90	0.67–1.19
≥ 110.30 to <129.10 $\mu g/m^3$	151	360	0.92	0.70–1.21	0.80	0.58–1.12
≥ 129.10 $\mu g/m^3$	123	218	1.21	0.89–1.66	0.95	0.64–1.39

Estimated time weighted average air pollution exposure 21–30 years before end of follow-up.

* Estimate obtained when only one pollutant was entered into the regression model.

† Estimate obtained when the corresponding variable for the other pollutant (SO_2 or NO_2) was entered separately into the same regression model as a confounder. For example, point estimates 1.15 (NO_2) and 0.99 (SO_2) for the continuous air pollution variables are obtained from the same model, and similarly for the categorical variable results.

‡ Adjusted for age, selection year, smoking, radon, socioeconomic grouping, occupational exposure to diesel exhaust, other combustion products and asbestos and employment in risk occupations.

§ Referent category.

Scandinavian NO2/NOx Series – Nafstad Oslo 2003 lung cancer study - once again all significance is in top 10% of LT NOx exposure - no SO2 association

Table 3 Incidences and crude and adjusted risk ratios with 95% confidence intervals of developing lung cancer and non-lung cancer among 16 209 middle aged men living in Oslo in 1972, according to average exposure to nitrogen oxides (NO_x) and sulphur dioxide (SO_2) at their home address during 1974 to 1978

	Incidence (1000/year)	cRR	95% CI	One pollutant aRR	One pollutant 95% CI	*Two pollutants aRR	*Two pollutants 95% CI
Lung cancer							
Model 1, NO_x							
0–9.99 µg/m³	1.09	1 (ref)					
10–19.99 µg/m³	1.05	0.96	0.75 to 1.23	0.90	0.70 to 1.15	1.02	0.75 to 1.39
20–29.99 µg/m³	1.34	1.25	0.96 to 1.62	1.06	0.81 to 1.38	1.33	0.87 to 2.04
30+ µg/m³	1.49	1.37	1.02 to 1.85	1.36	1.01 to 1.83	2.22	1.30 to 3.79
Model 2, NO_x							
Per 10 µg/m³		1.12	1.05 to 1.20	1.08	1.02 to 1.15	1.10	1.03 to 1.17
Model 1, SO_2							
0–9.99 µg/m³	1.13	1 (ref)					
10–19.99 µg/m³	1.28	1.15	0.89 to 1.48	1.05	0.81 to 1.35	0.84	0.57 to 1.23
20–29.99 µg/m³	1.26	1.12	0.84 to 1.49	0.95	0.72 to 1.27	0.78	0.53 to 1.16
30+ µg/m³	1.14	1.01	0.75 to 1.36	1.06	0.79 to 1.43	0.56	0.33 to 0.95
Model 2, SO_2							
Per 10 µg/m³		1.01	0.94 to 1.08	1.01	0.94 to 1.08	0.96	0.88 to 1.04

Scandinavian NO2 / NOx Series – Rosenlund Stockholm 2009 – TRAP and AMI - Significant Odds Ratios for fatal AMI - 90% exposure contrast for NO2 and CO

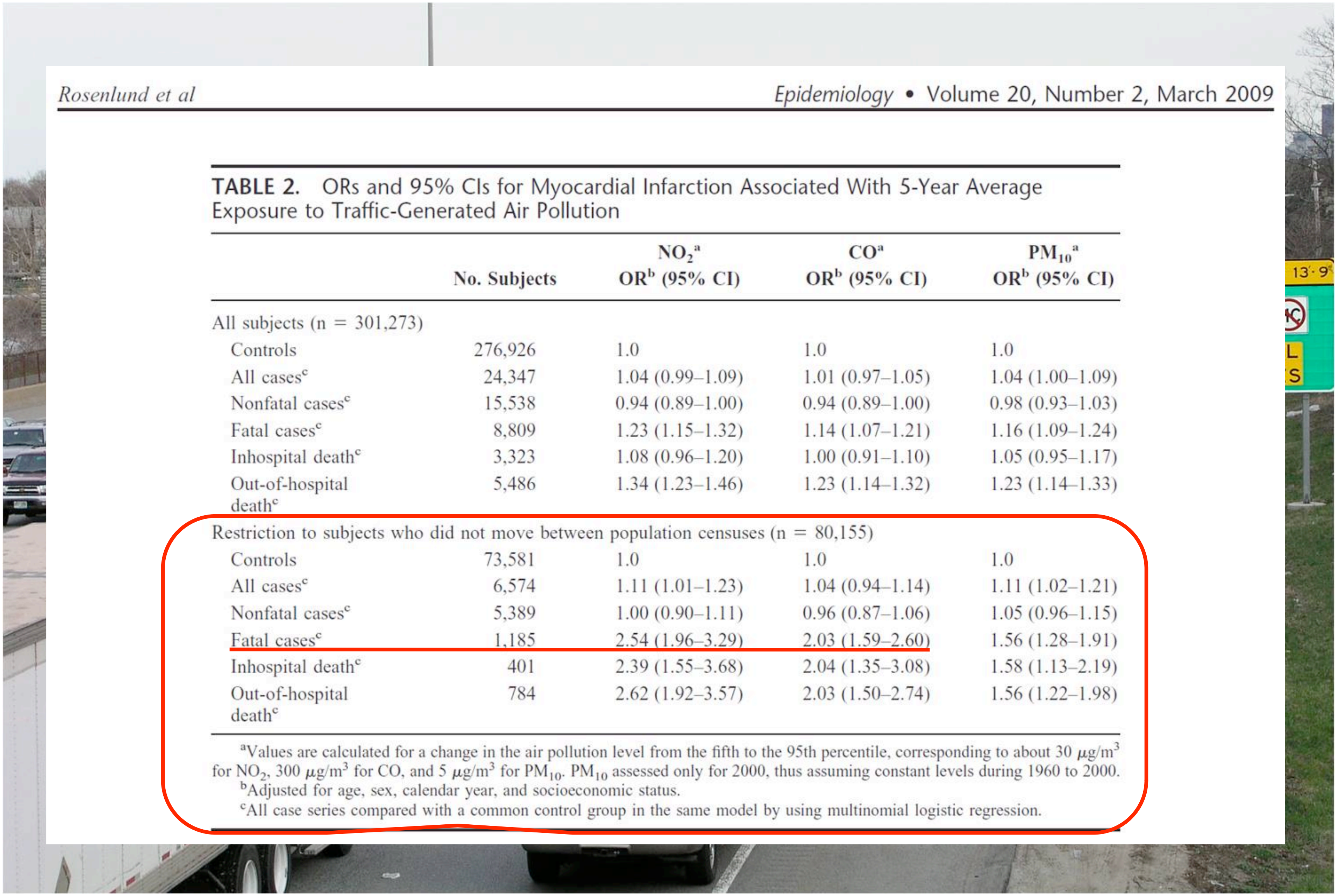


TABLE 2. ORs and 95% CIs for Myocardial Infarction Associated With 5-Year Average Exposure to Traffic-Generated Air Pollution

	No. Subjects	NO_2[a] OR[b] (95% CI)	CO[a] OR[b] (95% CI)	PM_{10}[a] OR[b] (95% CI)
All subjects (n = 301,273)				
Controls	276,926	1.0	1.0	1.0
All cases[c]	24,347	1.04 (0.99–1.09)	1.01 (0.97–1.05)	1.04 (1.00–1.09)
Nonfatal cases[c]	15,538	0.94 (0.89–1.00)	0.94 (0.89–1.00)	0.98 (0.93–1.03)
Fatal cases[c]	8,809	1.23 (1.15–1.32)	1.14 (1.07–1.21)	1.16 (1.09–1.24)
Inhospital death[c]	3,323	1.08 (0.96–1.20)	1.00 (0.91–1.10)	1.05 (0.95–1.17)
Out-of-hospital death[c]	5,486	1.34 (1.23–1.46)	1.23 (1.14–1.32)	1.23 (1.14–1.33)
Restriction to subjects who did not move between population censuses (n = 80,155)				
Controls	73,581	1.0	1.0	1.0
All cases[c]	6,574	1.11 (1.01–1.23)	1.04 (0.94–1.14)	1.11 (1.02–1.21)
Nonfatal cases[c]	5,389	1.00 (0.90–1.11)	0.96 (0.87–1.06)	1.05 (0.96–1.15)
Fatal cases[c]	1,185	2.54 (1.96–3.29)	2.03 (1.59–2.60)	1.56 (1.28–1.91)
Inhospital death[c]	401	2.39 (1.55–3.68)	2.04 (1.35–3.08)	1.58 (1.13–2.19)
Out-of-hospital death[c]	784	2.62 (1.92–3.57)	2.03 (1.50–2.74)	1.56 (1.22–1.98)

[a]Values are calculated for a change in the air pollution level from the fifth to the 95th percentile, corresponding to about 30 $\mu g/m^3$ for NO_2, 300 $\mu g/m^3$ for CO, and 5 $\mu g/m^3$ for PM_{10}. PM_{10} assessed only for 2000, thus assuming constant levels during 1960 to 2000.

[b]Adjusted for age, sex, calendar year, and socioeconomic status.

[c]All case series compared with a common control group in the same model by using multinomial logistic regression.

Jerrett 2009 Toronto TRAP and Circulatory Mortality Risk in a Susceptible Population

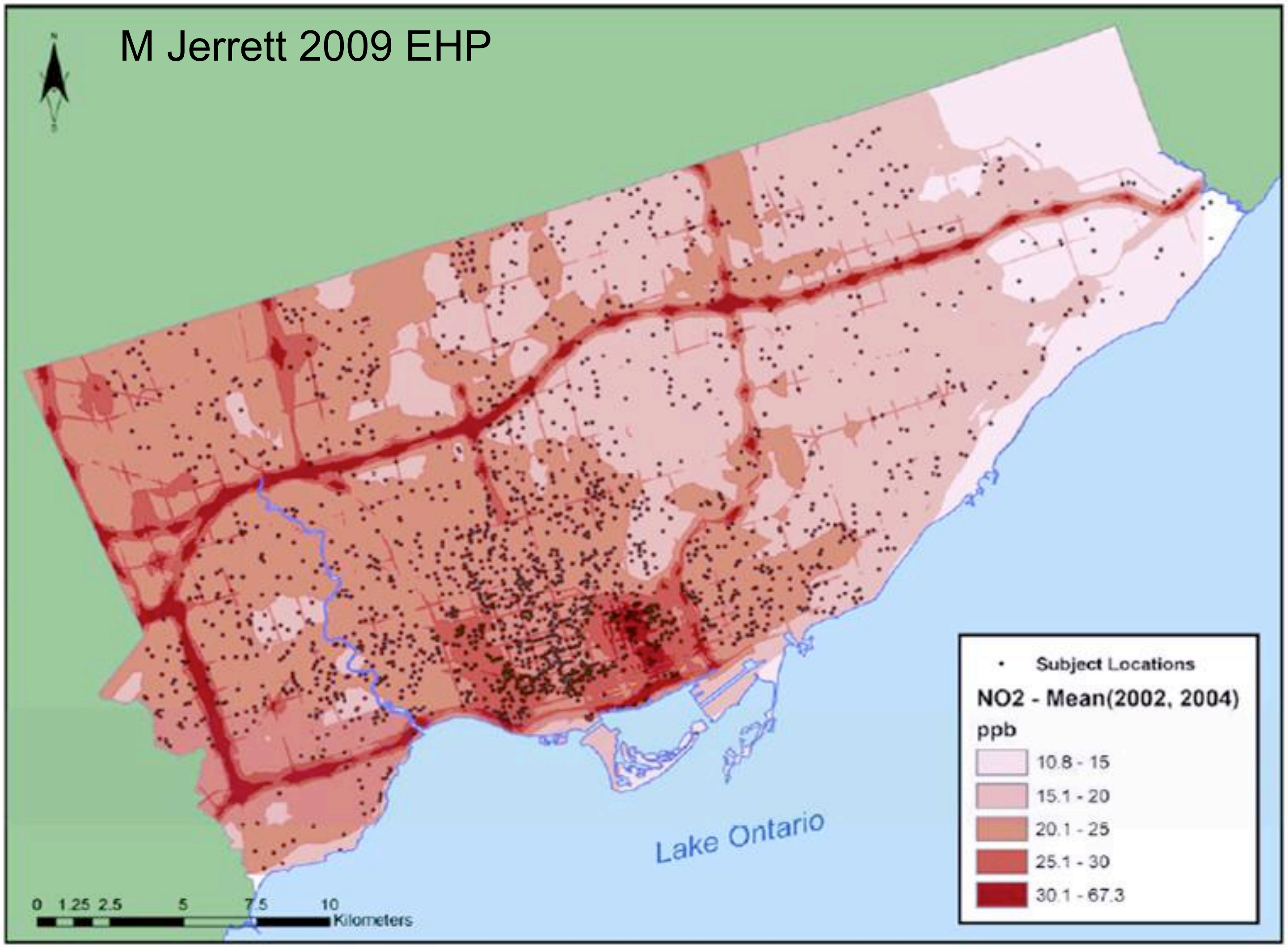


Figure 1

Jerrett 2009 Toronto Circulatory Risk in a Susceptible Population - NO2 IQR

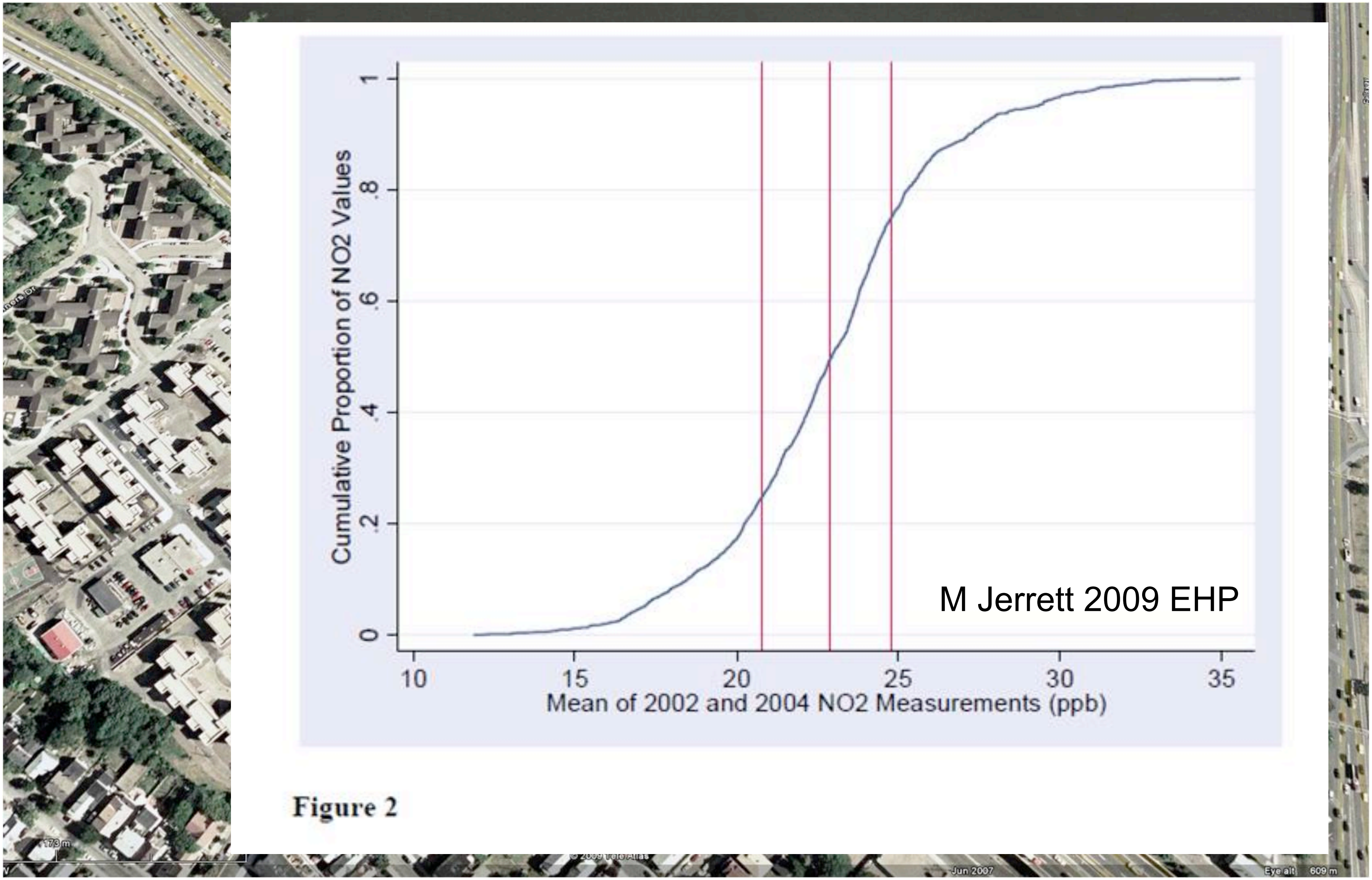


Figure 2

Jerrett 2009 Toronto Circulatory Mortality - Susceptible Population
IQR is 4 ppb NO2 and 1.39 RR - 10 ppb NO2 contrast is 2.28 HR

COMMUNITY ASSESSMENT OF FREEWAY EXPOSURE & HEALTH

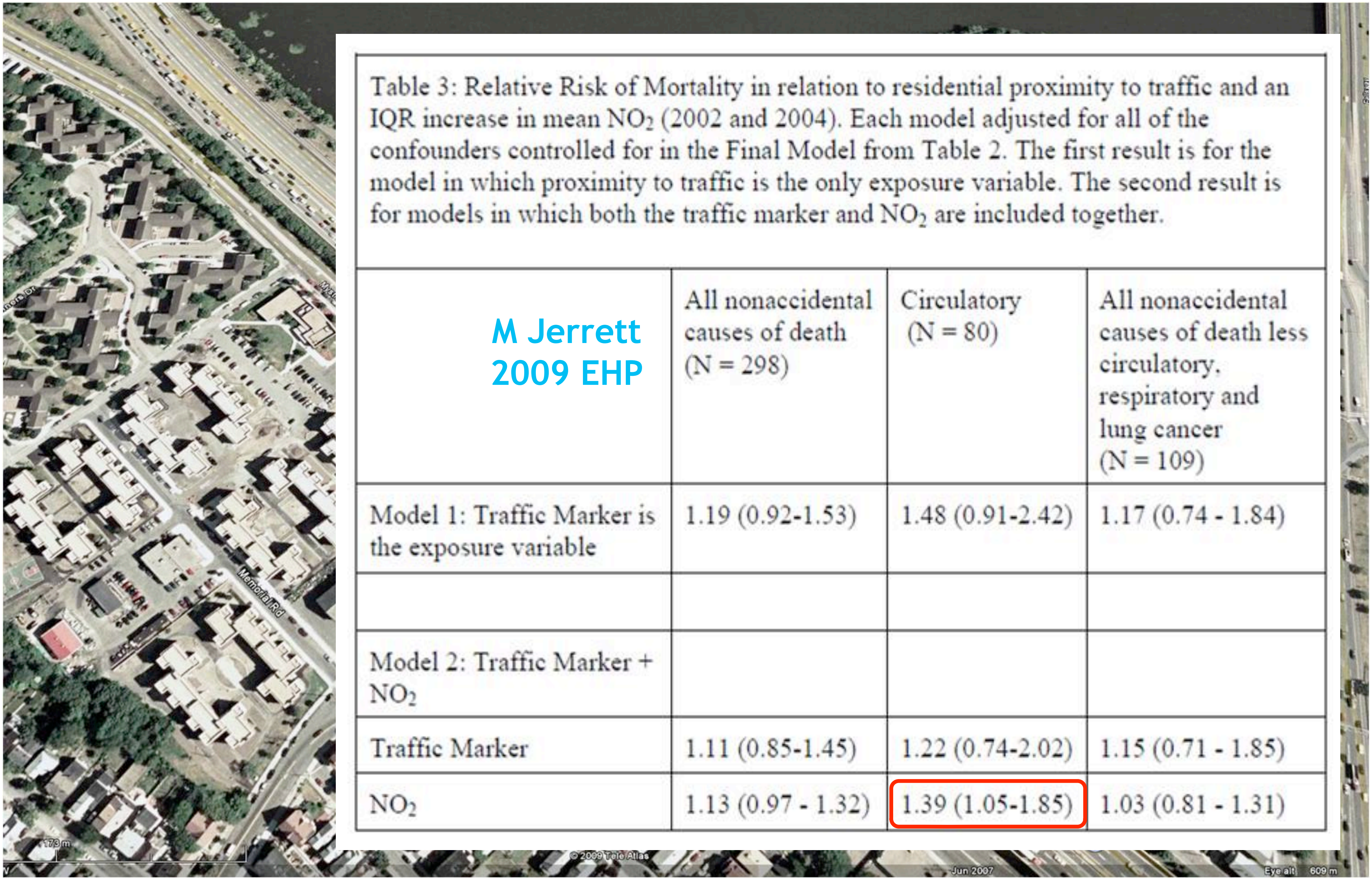


Table 3: Relative Risk of Mortality in relation to residential proximity to traffic and an IQR increase in mean NO_2 (2002 and 2004). Each model adjusted for all of the confounders controlled for in the Final Model from Table 2. The first result is for the model in which proximity to traffic is the only exposure variable. The second result is for models in which both the traffic marker and NO_2 are included together.

M Jerrett 2009 EHP	All nonaccidental causes of death (N = 298)	Circulatory (N = 80)	All nonaccidental causes of death less circulatory, respiratory and lung cancer (N = 109)
Model 1: Traffic Marker is the exposure variable	1.19 (0.92-1.53)	1.48 (0.91-2.42)	1.17 (0.74 - 1.84)
Model 2: Traffic Marker + NO_2			
Traffic Marker	1.11 (0.85-1.45)	1.22 (0.74-2.02)	1.15 (0.71 - 1.85)
NO_2	1.13 (0.97 - 1.32)	$\boxed{1.39 (1.05-1.85)}$	1.03 (0.81 - 1.31)

Accepted Manuscript

Title: Ultrafine particles near a major roadway in Raleigh, North Carolina: downwind attenuation and correlation with traffic-related pollutants

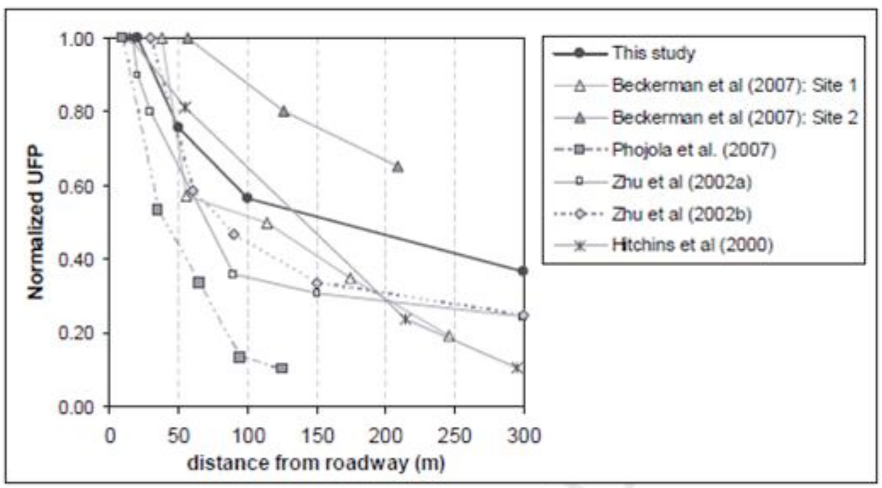
Authors: G.S.W. Hagler, R.W. Baldauf, E.D. Thoma, T.R. Long, R.F. Snow, J.S. Kinsey, L. Oudejans, B.K. Gullett

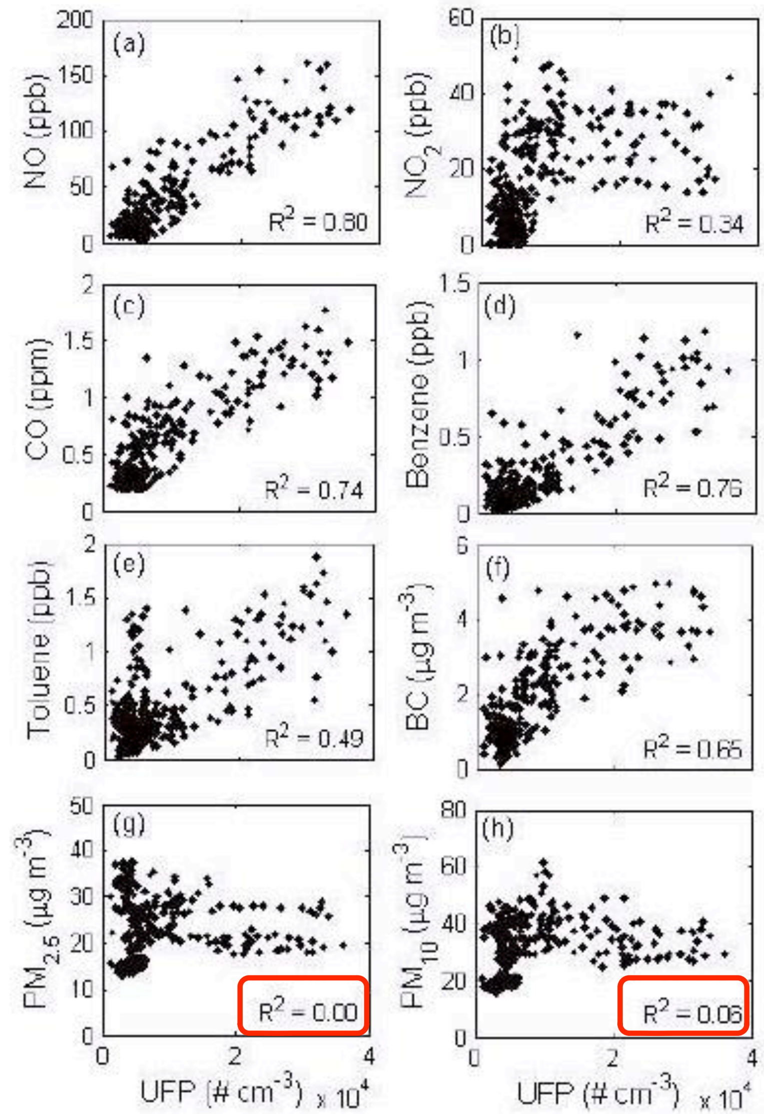
PII: S1352-2310(08)01083-2
DOI: 10.1016/j.atmosenv.2008.11.024
Reference: AEA 8726

To appear in: *Atmospheric Environment*

Received Date: 23 April 2008
Revised Date: 14 November 2008
Accepted Date: 15 November 2008

Please cite this article as: Hagler, G.S.W., Baldauf, R.W., Thoma, E.D., Long, T.R., Snow, R.F., Kinsey, J.S., Oudejans, L., Gullett, B.K. Ultrafine particles near a major roadway in Raleigh, North Carolina: downwind attenuation and correlation with traffic-related pollutants, Atmospheric Environment (2008), doi: 10.1016/j.atmosenv.2008.11.024





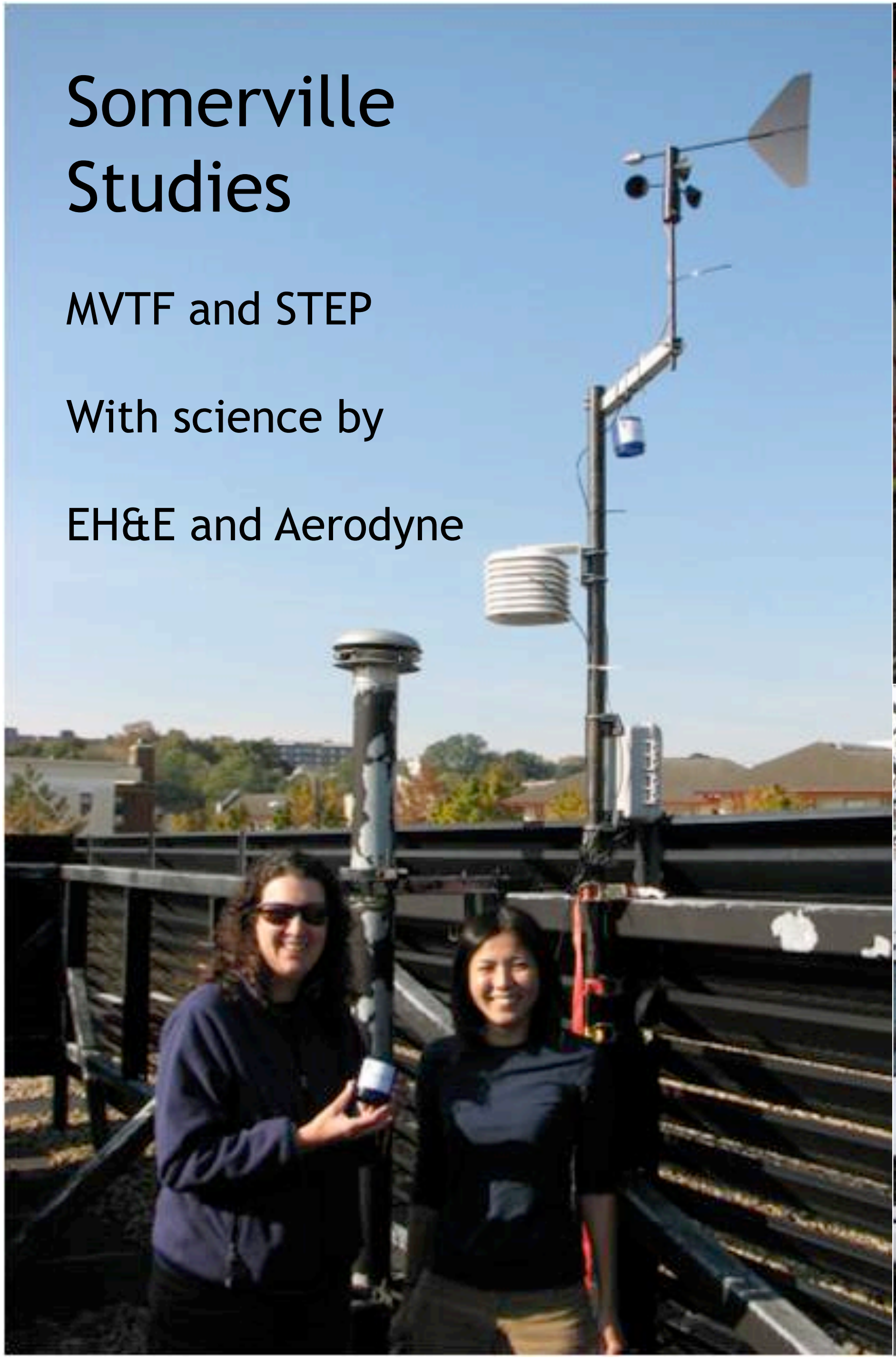
Nice work by EPA & NOAA - Hagler Raleigh NC - UFP does not correlate with PM2.5 or PM10 - PM2.5 regulations DO NOT PROTECT vulnerable populations from UFP-TRAP

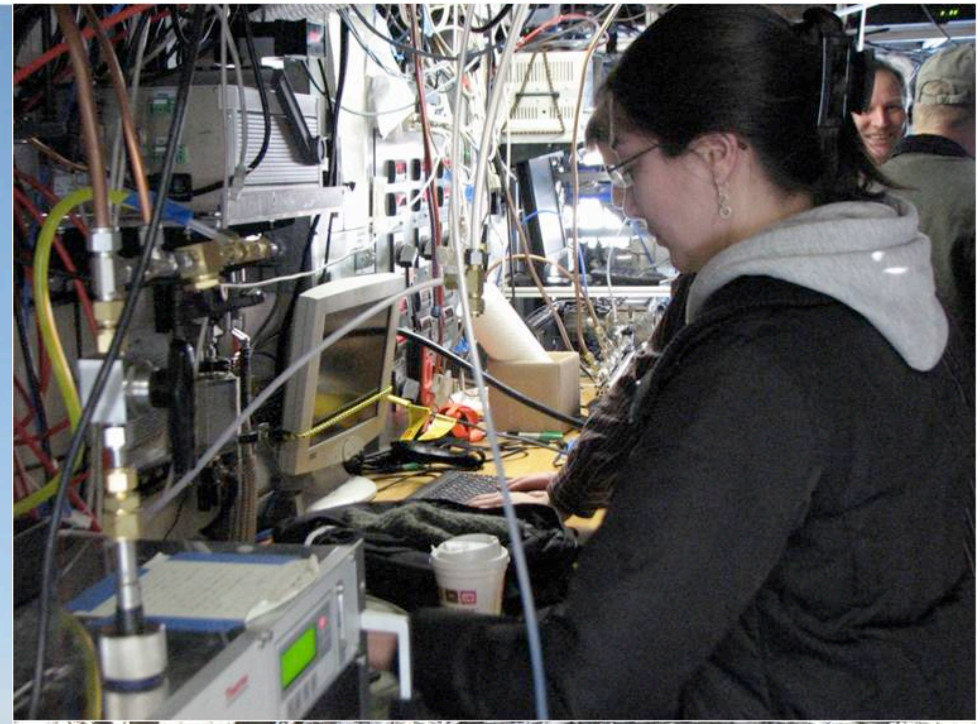
Somerville Studies

MVTF and STEP

With science by

EH&E and Aerodyne

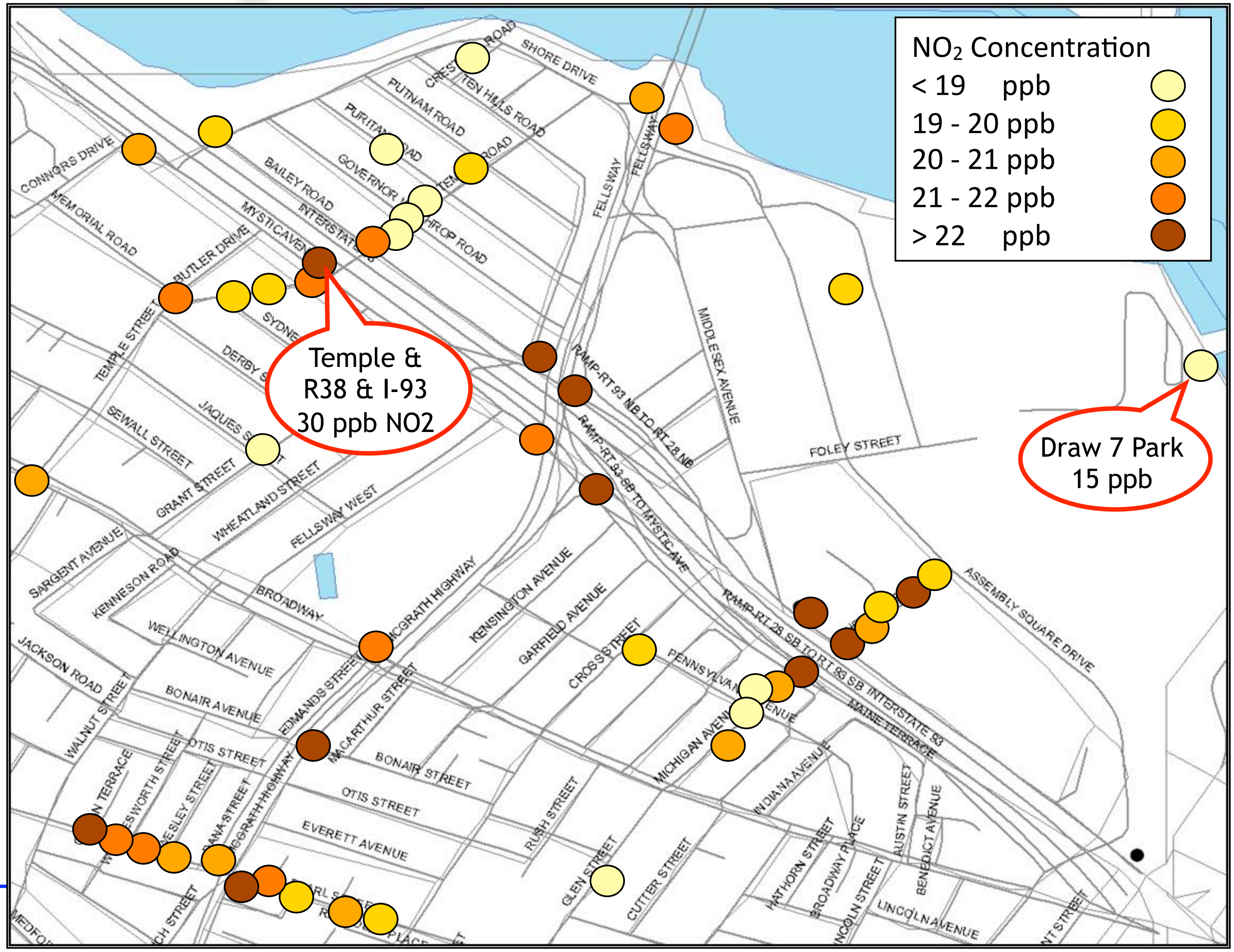




NO_2 Along Roads

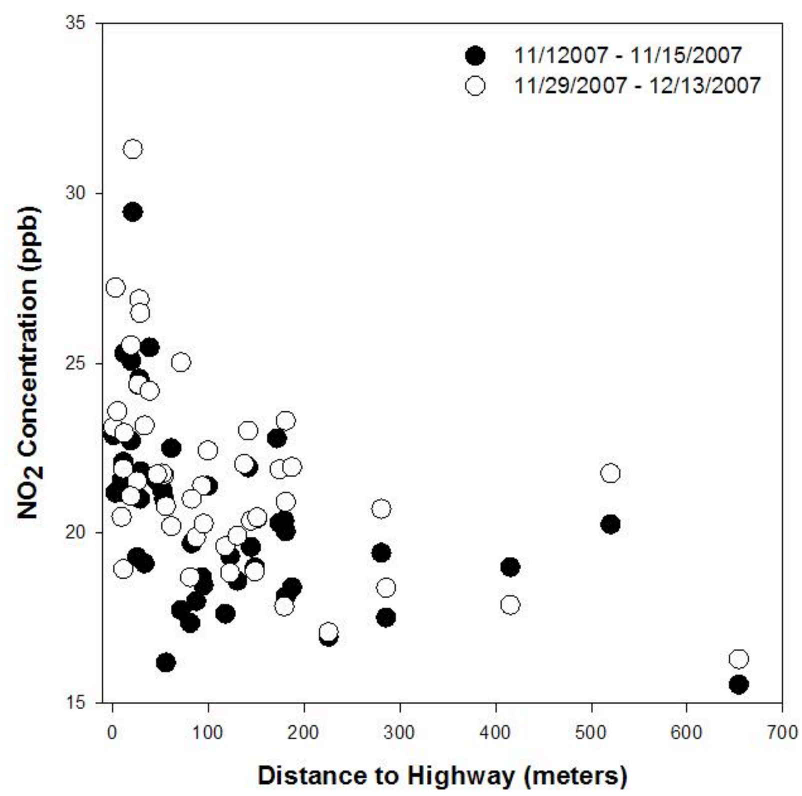
Lynn urban background
~ 10 ppb

- Clear traffic-related pattern
- NO_2 measured near I-93 is twice as high as the level in Draw 7 park
- NO_2 within 50 m of I-93 is similar to the concentrations at Roxbury Crossing and Kenmore Sq.

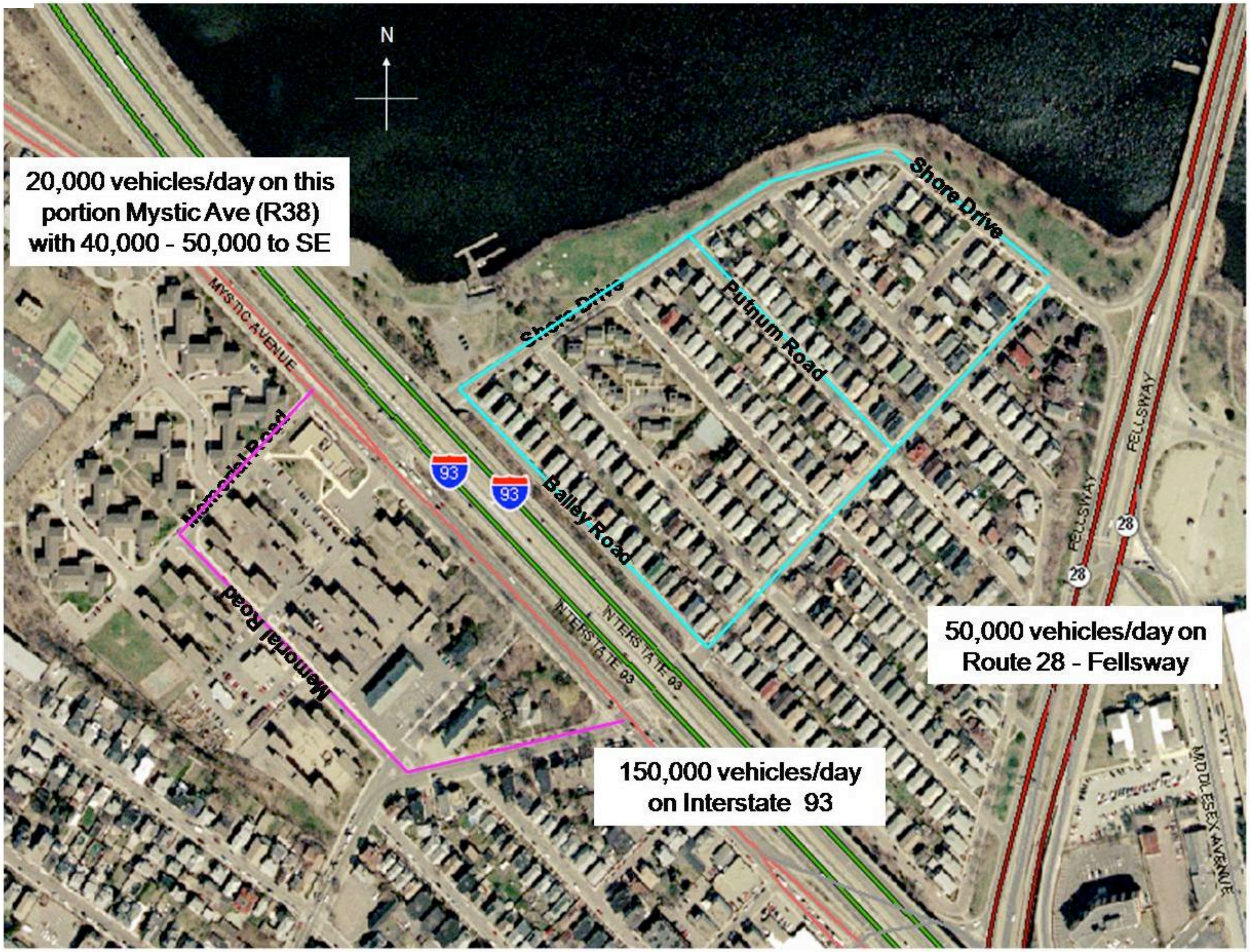


NO_2 Levels

- Two-week averages
  - Mean (SD): 20.6 (2.7) ppb
  - Range: 15 – 32 ppb
- NO_2 weakly correlated with distance (m) to highway
  - I-93: -0.19 (p=0.06)
  - MA-28: -0.28 (p=0.006)
- NO_2 strongly correlated with traffic density (TD)
  - TD_{25m}: 0.61 (p<0.0001)
  - TD_{50m}: 0.60 (p<0.0001)
  - TD_{100m}: 0.48 (p<0.0001)

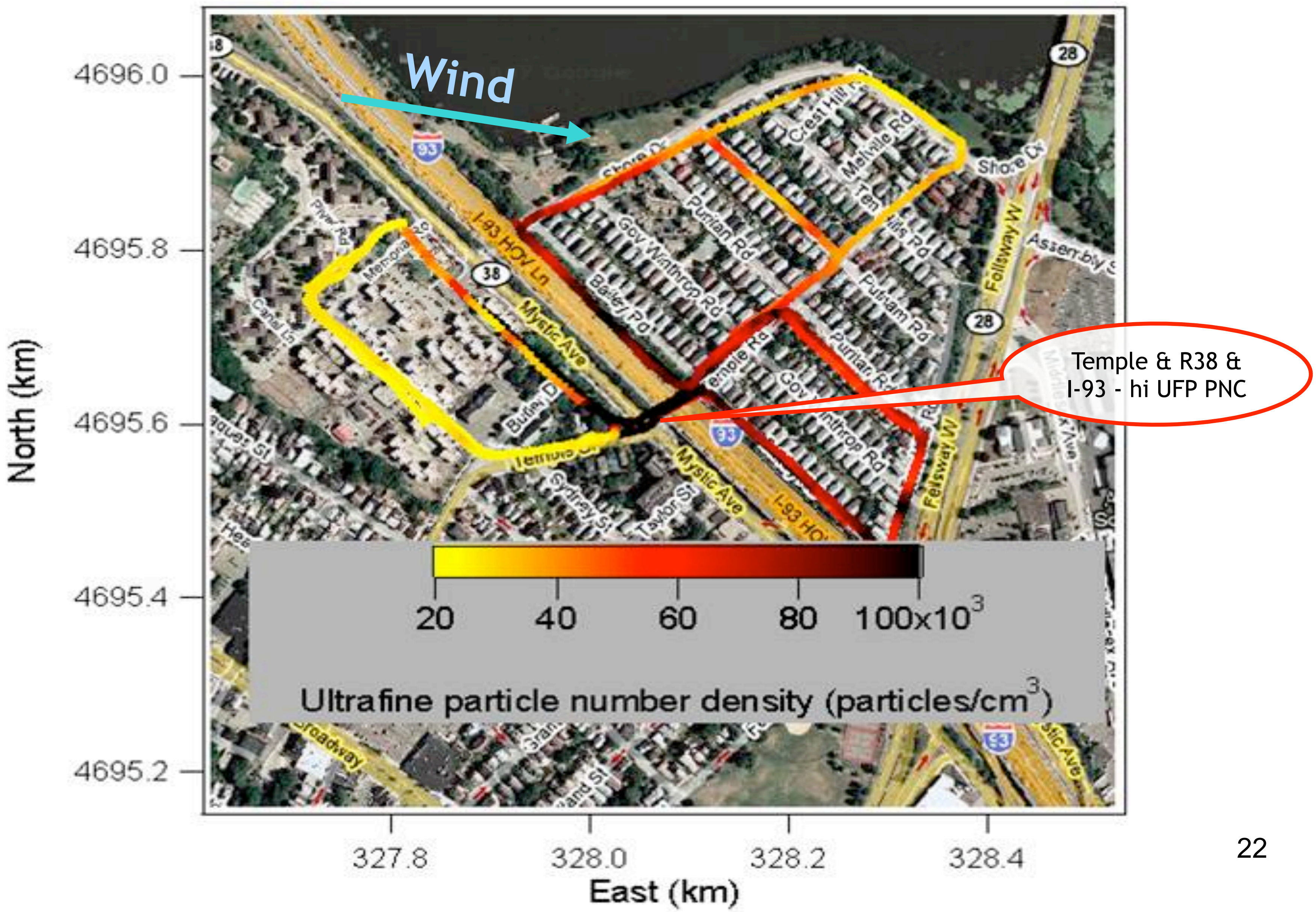


Route for a portion of Aerodyne investigation
Morning of January 16 2008 - analysis at Tufts

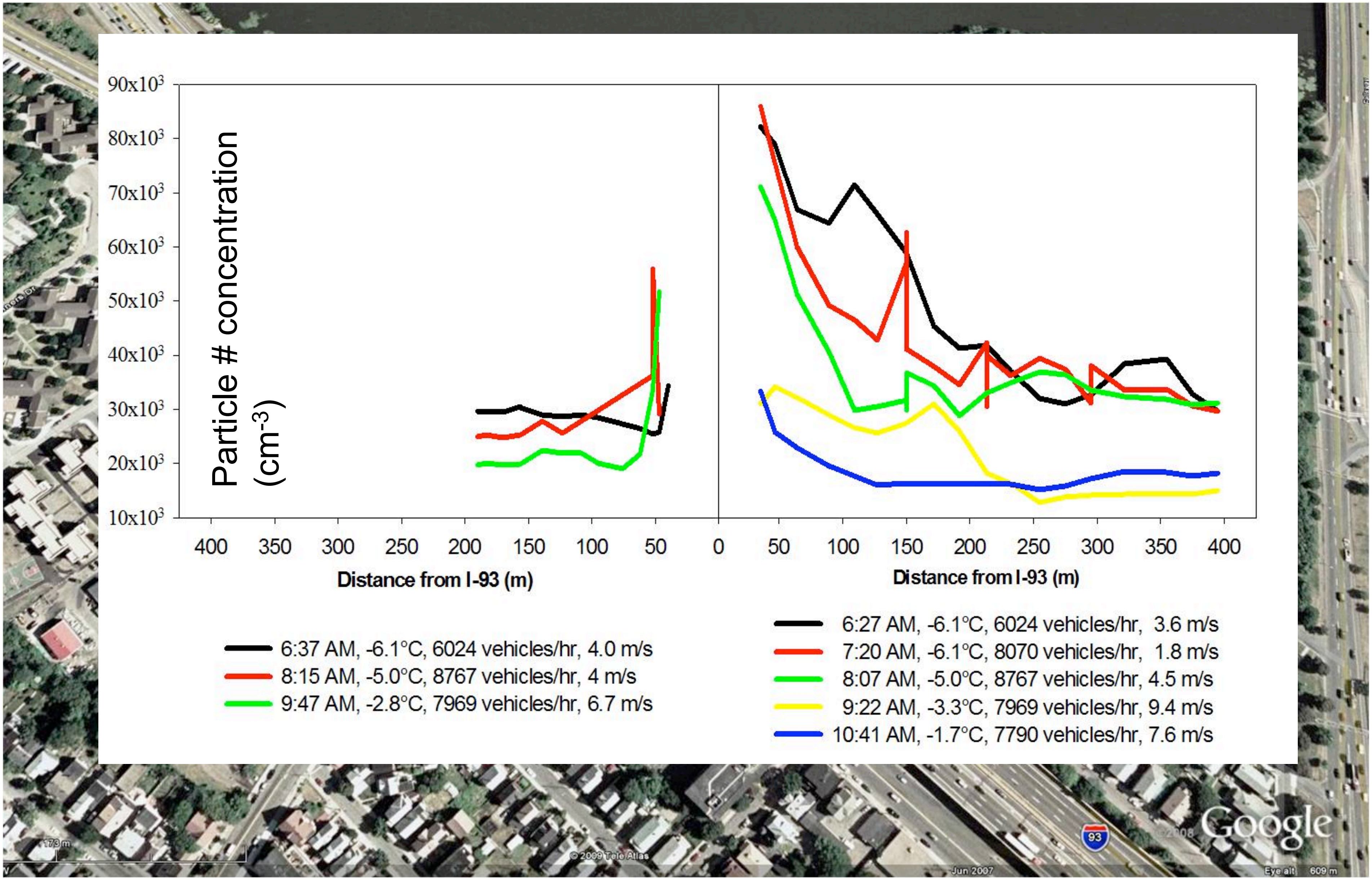


Pollutant map in Somerville: ultrafine particles

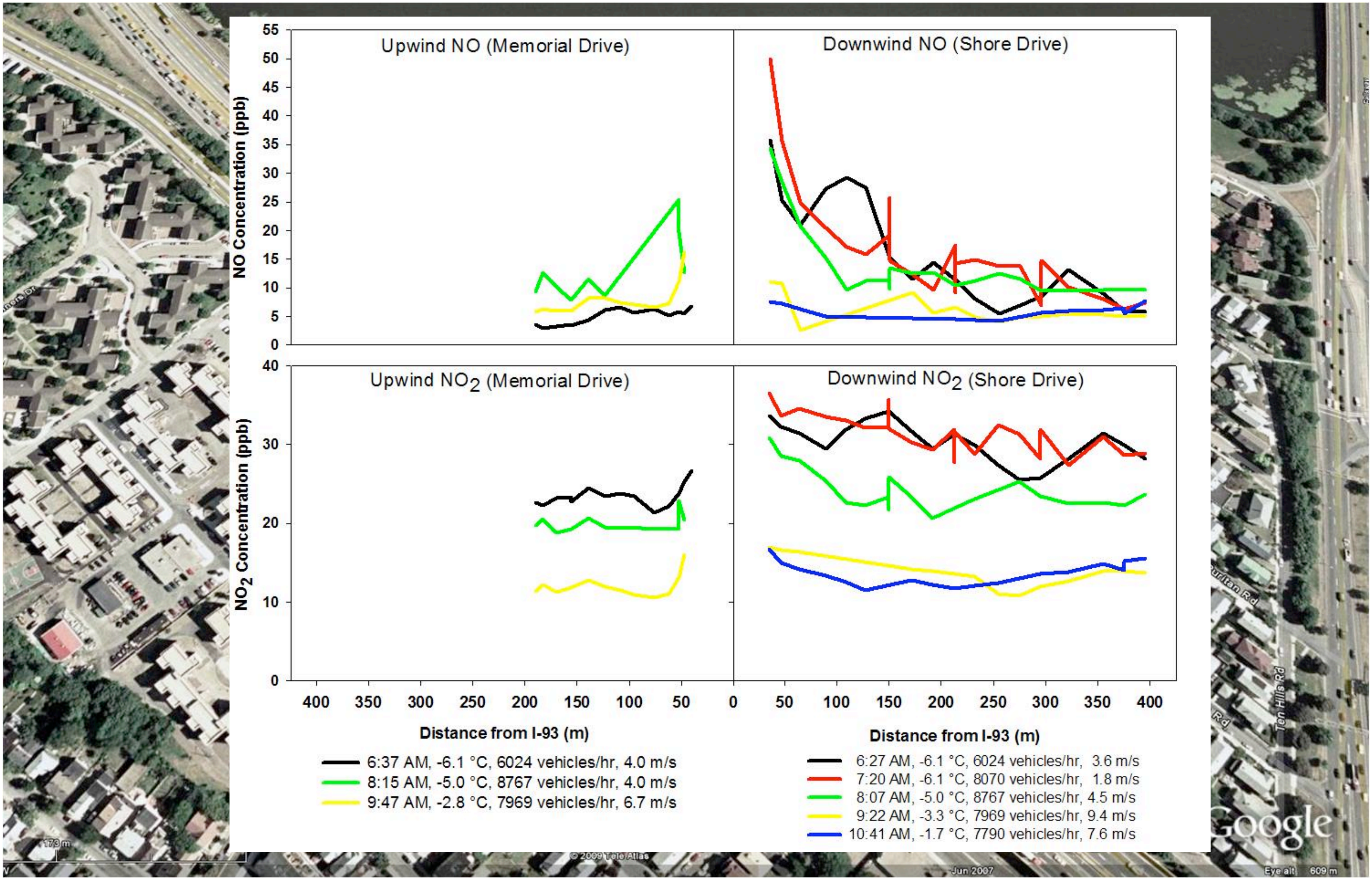
1/16/2008 7:00 – 7:45 am - map by Aerodyne Research



UFP Particle Number Count up to 100,000 per cubic centimeter of air January 16 2008

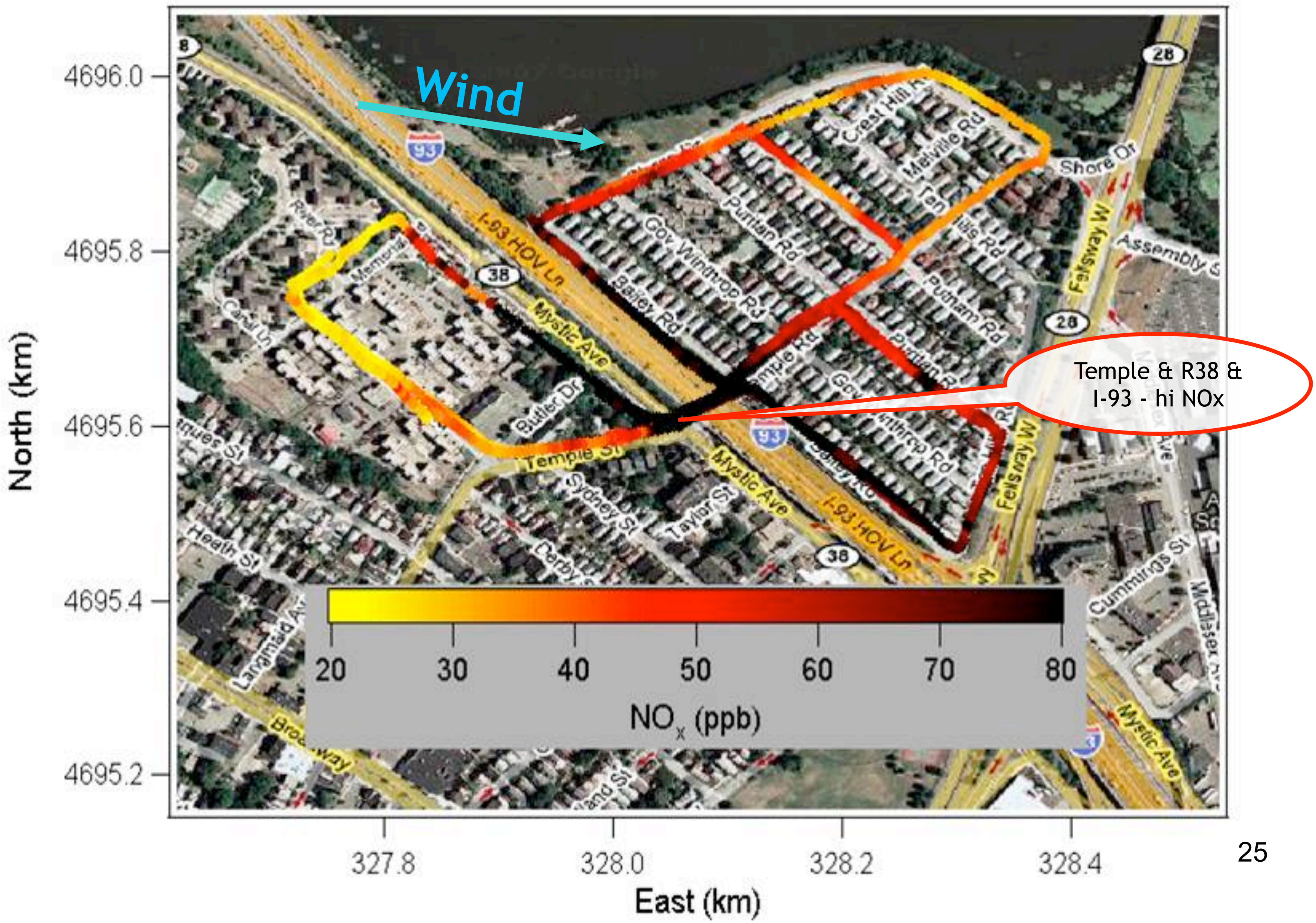


NO is proportional to UFP PNC but NO2 is less so
Drop in NOx & UFP as morning meteorology proceeds

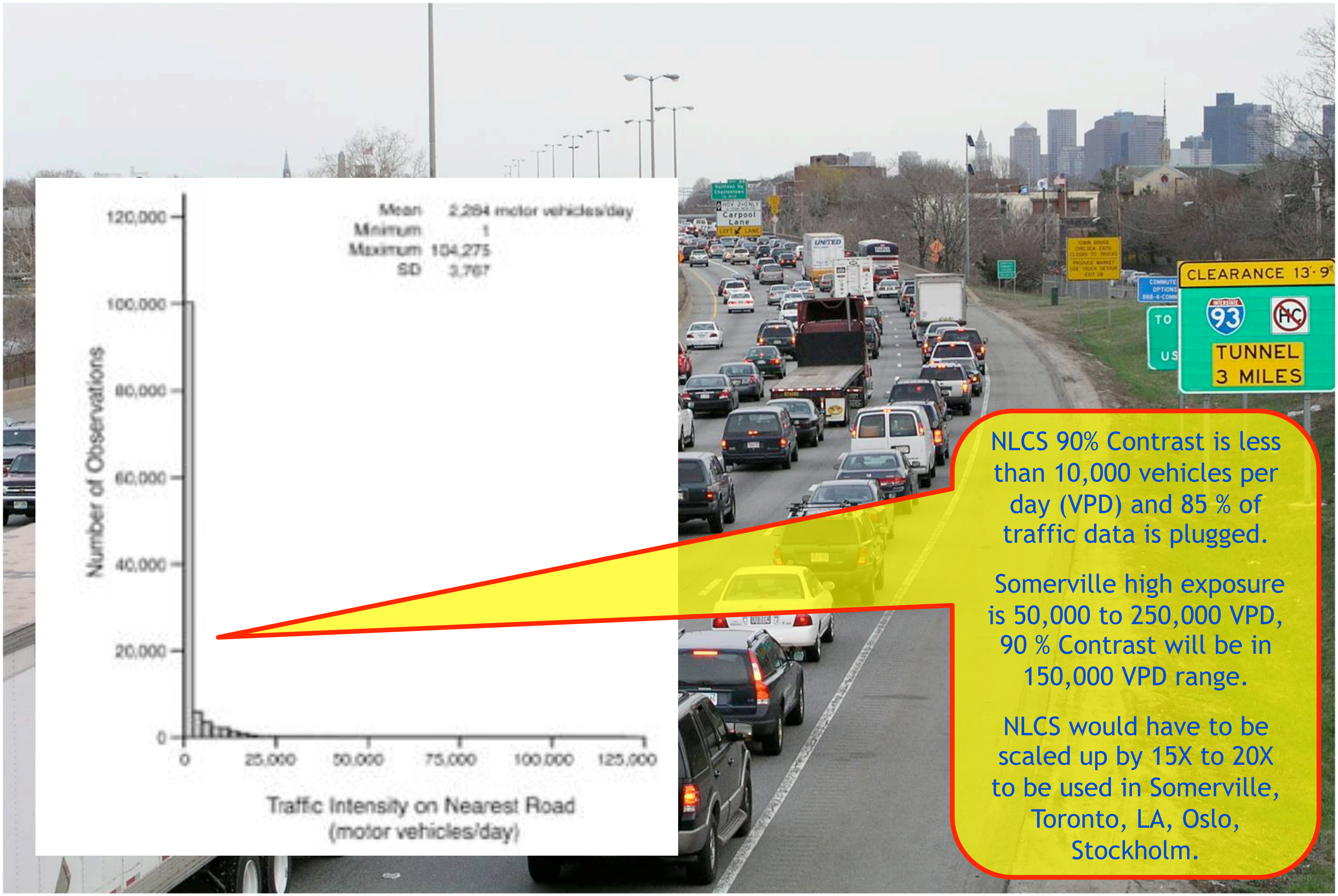


Pollutant map in Somerville: NO_x

1/16/2008 7:00 – 7:45 am - map by Aerodyne Research



Brunekreef 2009 HEI NLCS - great scientists, sponsor – big exposure issues



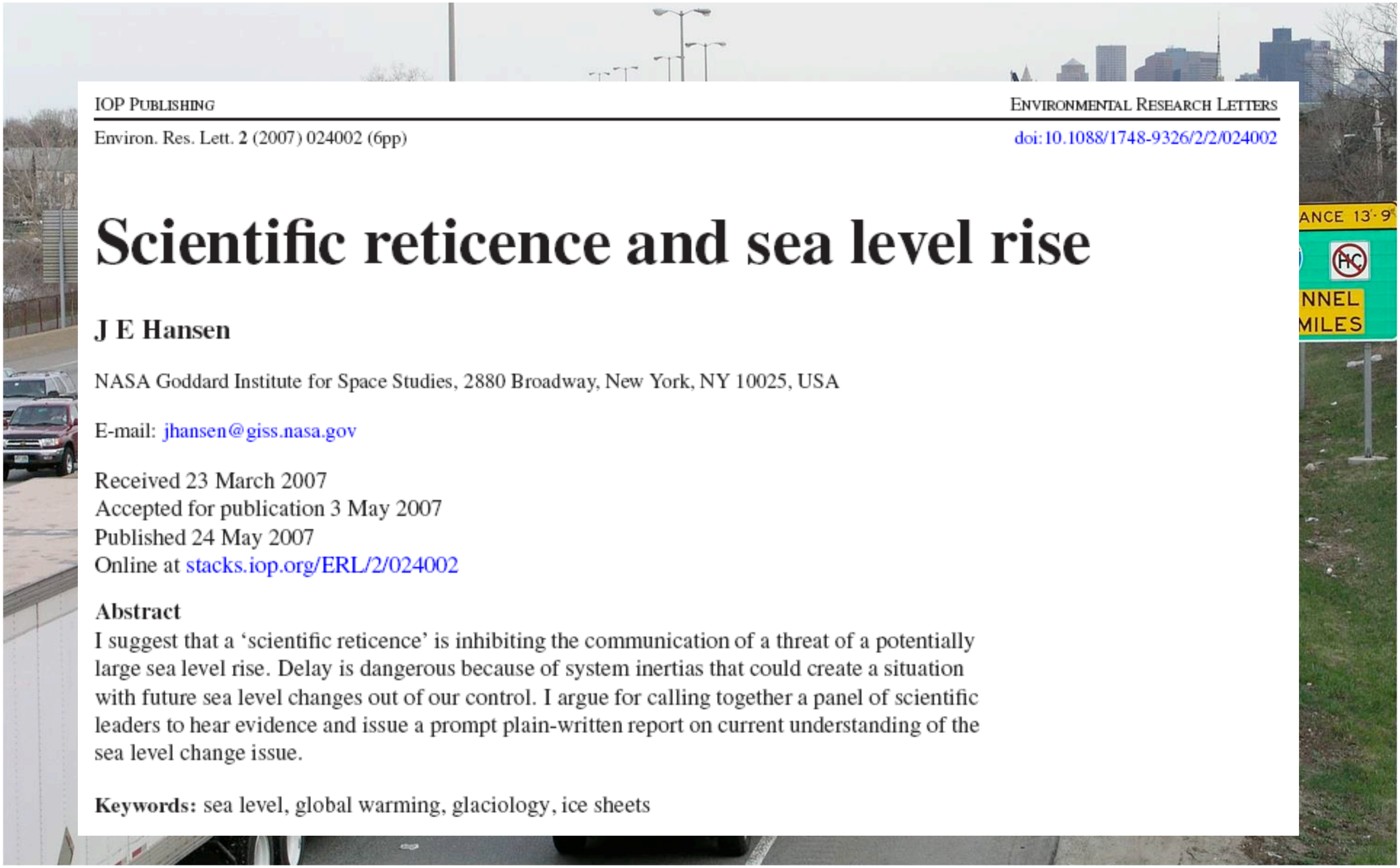
NLCS 90% Contrast is less than 10,000 vehicles per day (VPD) and 85 % of traffic data is plugged.

Somerville high exposure is 50,000 to 250,000 VPD, 90 % Contrast will be in 150,000 VPD range.

NLCS would have to be scaled up by 15X to 20X to be used in Somerville, Toronto, LA, Oslo, Stockholm.

Somerville – highest NO2 and UFP corner – Ground Zero for TRAP – is now a new low income housing project. Asked about air pollution, a proponent is reported to have said it would be a great buffer for the community – i.e., a new kind of human shield.

Biggest issue is, "When do we deal with TRAP?" Looks like there are about 100,000 near source TRAP pre-mature mortalities per year with 50,000 avoidable. Largest factors are focus and scientific reticence. We need a few heroes !!!



IOP PUBLISHING ENVIRONMENTAL RESEARCH LETTERS

Environ. Res. Lett. 2 (2007) 024002 (6pp) doi:10.1088/1748-9326/2/2/024002

Scientific reticence and sea level rise

J E Hansen

NASA Goddard Institute for Space Studies, 2880 Broadway, New York, NY 10025, USA

E-mail: jhansen@giss.nasa.gov

Received 23 March 2007
Accepted for publication 3 May 2007
Published 24 May 2007
Online at stacks.iop.org/ERL/2/024002

Abstract
I suggest that a 'scientific reticence' is inhibiting the communication of a threat of a potentially large sea level rise. Delay is dangerous because of system inertias that could create a situation with future sea level changes out of our control. I argue for calling together a panel of scientific leaders to hear evidence and issue a prompt plain-written report on current understanding of the sea level change issue.

Keywords: sea level, global warming, glaciology, ice sheets

Mortality Records for Somerville (age adj.) 1989 – 2003 (15Y):

Lung cancer & heart attack deaths - actual	1,572
Lung cancer & heart attack deaths - at Mass rates	1,281
Lung cancer & heart attack deaths - excess	291

Mystic Housing is Somerville's largest low income housing facility. The city has nearly 20,000 residents per SM with large vulnerable & susceptible populations along Interstate 93 and Routes 28 and 38. Every US urban area has many similar unprotected vulnerable & susceptible populations.