Issues Facing the Panel

- Choice of technology for Sheppard Avenue (not for every corridor every where for all time!): subway vs. LRT
- Budget implications

I would argue that procurement, construction management issues are not within the direct purview (or expertise) of this panel.

Technology Choice

- Choice of technology must be based upon considerations of:
  - Matching capacity (supply) to expected ridership (demand)
  - Level of service
  - Network connectivity
  - Current and projected land use patterns
  - Cost-effectiveness
  - Equity
  - Sustainability

Ridership & Capacity

- Both TTC and Metrolinx ridership forecasts are based on best-practice model systems.
- As with all forecasts, they clearly are subject to error.
- It is also clear, however, that there is no reasonable expectation that future ridership levels will justify investment in subway – the demand simply isn't there:
  - Travel patterns are not well served by the proposed subway (more on this later)
  - Densities simply are not high enough (also more on this later)

Level of Service

- There has been much discussion of travel speeds (which determine in-vehicle travel time).
- Out-of-vehicle travel time (access/egress walk times, wait/transfer times) constitute a significant proportion of transit travel times.
- OVTT is weighted much more heavily by trip-makers in making their travel decisions than in-vehicle travel time (usually 2x or more).

Level of Service, cont'd

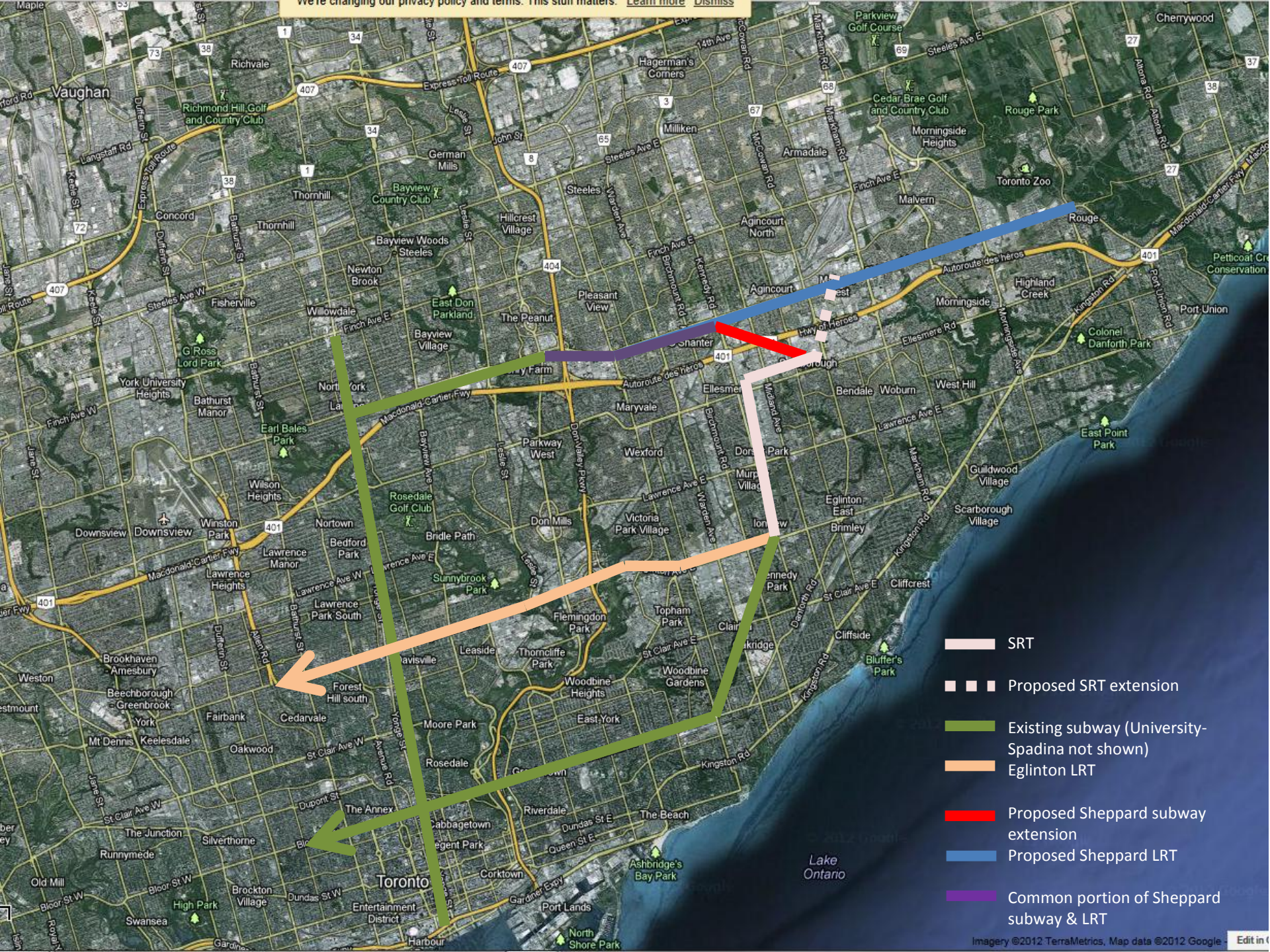
- Frequencies (and hence average walk and wait times) are similar between subway & LRT.
- LRT has more stops/stations than subway; results in many more people being within short walking distances of transit; this results in somewhat slower speeds (longer in-vehicle times).
- I.e., LRT trades off in-vehicle travel time for out-of-vehicle travel times; often a desirable trade-off & certainly the subway "time advantage" is less than is usually stated.
- Also, quoted times do not account for the time spent navigating through subway stations – can add several minutes to a trip, thereby further reducing any stated advantage.

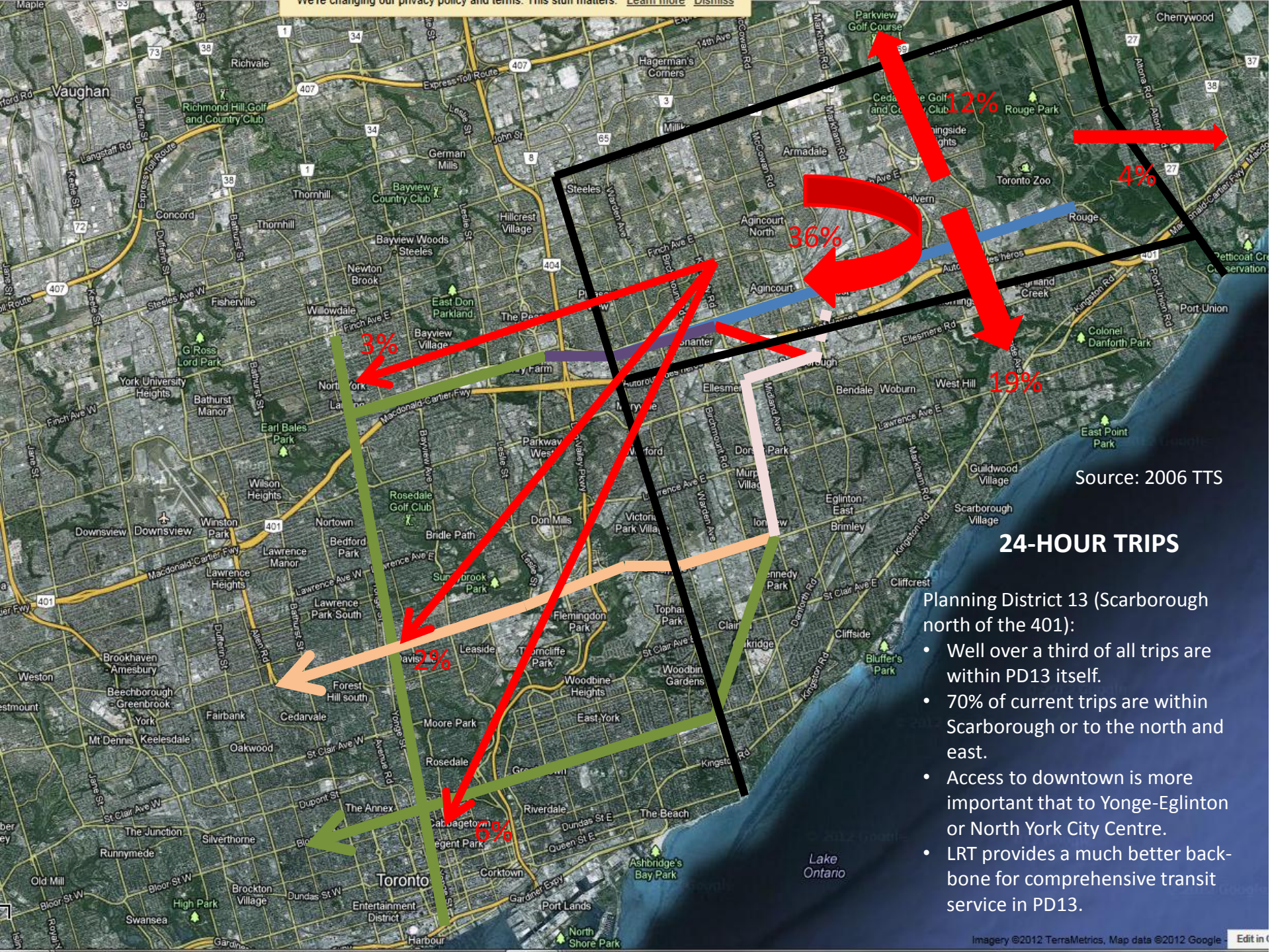
Level of Service, cont'd

- Extensive research in both Canada and the US has failed to identify any strong "preference" for subway* relative to other transit modes in terms of their mode choice behaviour. The assertion that people "like" subways in some absolute sense has no scientific basis.
- As noted above, people use transit when it is accessible (within easy walking distance), frequent and reliable, and takes them where and when they need to go in reasonable time.

* Or LRT for that matter.

Network Connectivity


SRT
Proposed SRT extension
Existing subway (University-Spadina not shown)
Eglinton LRT
Proposed Sheppard subway extension
Proposed Sheppard LRT
Common portion of Sheppard subway & LRT
Lake Ontario
Toronto
Vaughan
Richvale
Concord
Thornhill
Fisherville
Newton Brook
Bayview Village
York University Heights
Bathurst Manor
Earl Bales Park
Wilson Heights
Downsview
Winston Park
Lawrence Manor
Lawrence Heights
Lawrence Park South
Bedford Park
Nortown
Rosedale Golf Club
Bridle Path
Sunnybrook Park
Don Mills
Parkway West
Wexford
Maryvale
Victoria Park Village
Pleasant View
Hillcrest Village
Bayview Woods-Steeles
Bayview Country Club
German Mills
Hagerman's Corners
Milliken
Armadale
Agincourt North
Malvern
Morningside Heights
Highland Creek
Morningside
West Hill
Bendale
Woburn
Eglinton East
Scarborough Village
Guildwood Village
Port Union
Rouge
Rouge Park
Toronto Zoo
Cedar Brae Golf and Country Club
Parkview Golf Course
Cherrywood
Petticoat Creek Conservation
Colonel Danforth Park
East Point Park
Cliffcrest
Cliffside
Bluffer's Park
Scarborough
Brimley
Topham Park
Fleming Park
Woodbine Gardens
Woodbine Heights
East York
Leaside
Thorncliffe Park
Moore Park
Rosedale
Forest Hill South
Cedarvale
Fairbank
Oakwood
Mt Dennis
Keelesdale
Weston
Brookhaven-Amesbury
Beechborough-Greenbrook
York
The Junction
Silverthorne
Runnymede
Old Mill
High Park
Swansea
Brockton Village
Entertainment District
Harbour
Corktown
Port Lands
North Shore Park
Ashbridge's Bay Park
Riverdale
The Beach
The Annex
Yorkville
Cabbagetown
Regent Park
Queen St E
Dundas St E
Dundas St W
Bloor St W
St Clair Ave W
St Clair Ave E
Lawrence Ave W
Lawrence Ave E
Finch Ave W
Finch Ave E
Steeles Ave W
Steeles Ave E
Macdonald-Cartier Fwy
Autoroute des héros
Hwy of Heroes
Express Toll Route
Ellesmere Rd
Kingston Rd
Danforth Rd
Yonge St
Bathurst St
Dufferin St
Allen Rd
Jane St
Keele St
Leslie St
Don Valley Pkwy
Midland Ave
Markham Rd
McCowan Rd
Warden Ave
Birchmount Rd
Kennedy Rd
Port Union Rd
Morningside Ave
Avenue Rd
Gardiner Expy
Imagery ©2012 TerraMetrics, Map data ©2012 Google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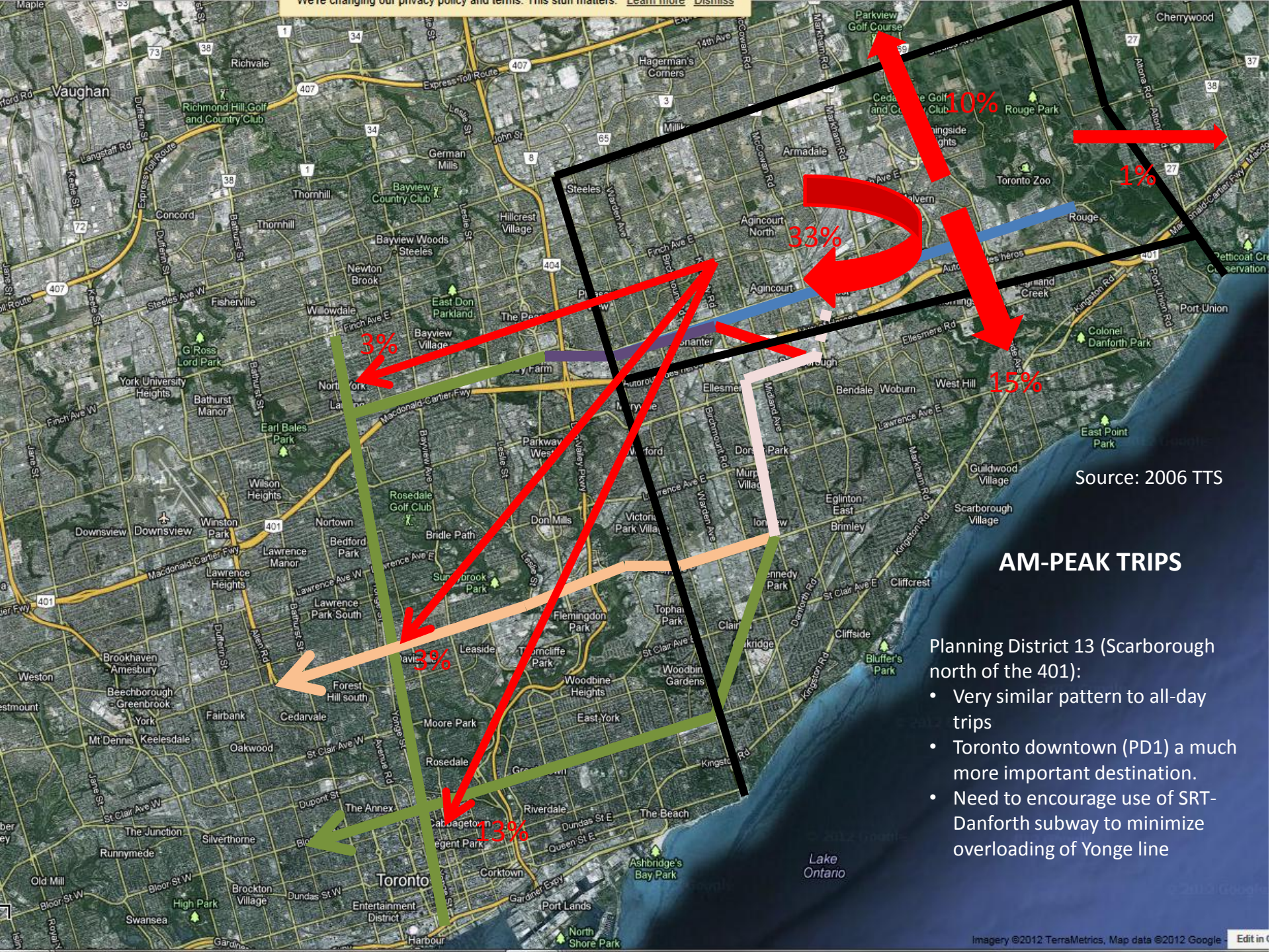
Source: 2006 TTS
24-HOUR TRIPS
Planning District 13 (Scarborough north of the 401):
• Well over a third of all trips are within PD13 itself.
• 70% of current trips are within Scarborough or to the north and east.
• Access to downtown is more important that to Yonge-Eglinton or North York City Centre.
• LRT provides a much better back-bone for comprehensive transit service in PD13.
Lake Ontario
Toronto
Vaughan
Scarborough
Imagery ©2012 TerraMetrics, Map data ©2012 Google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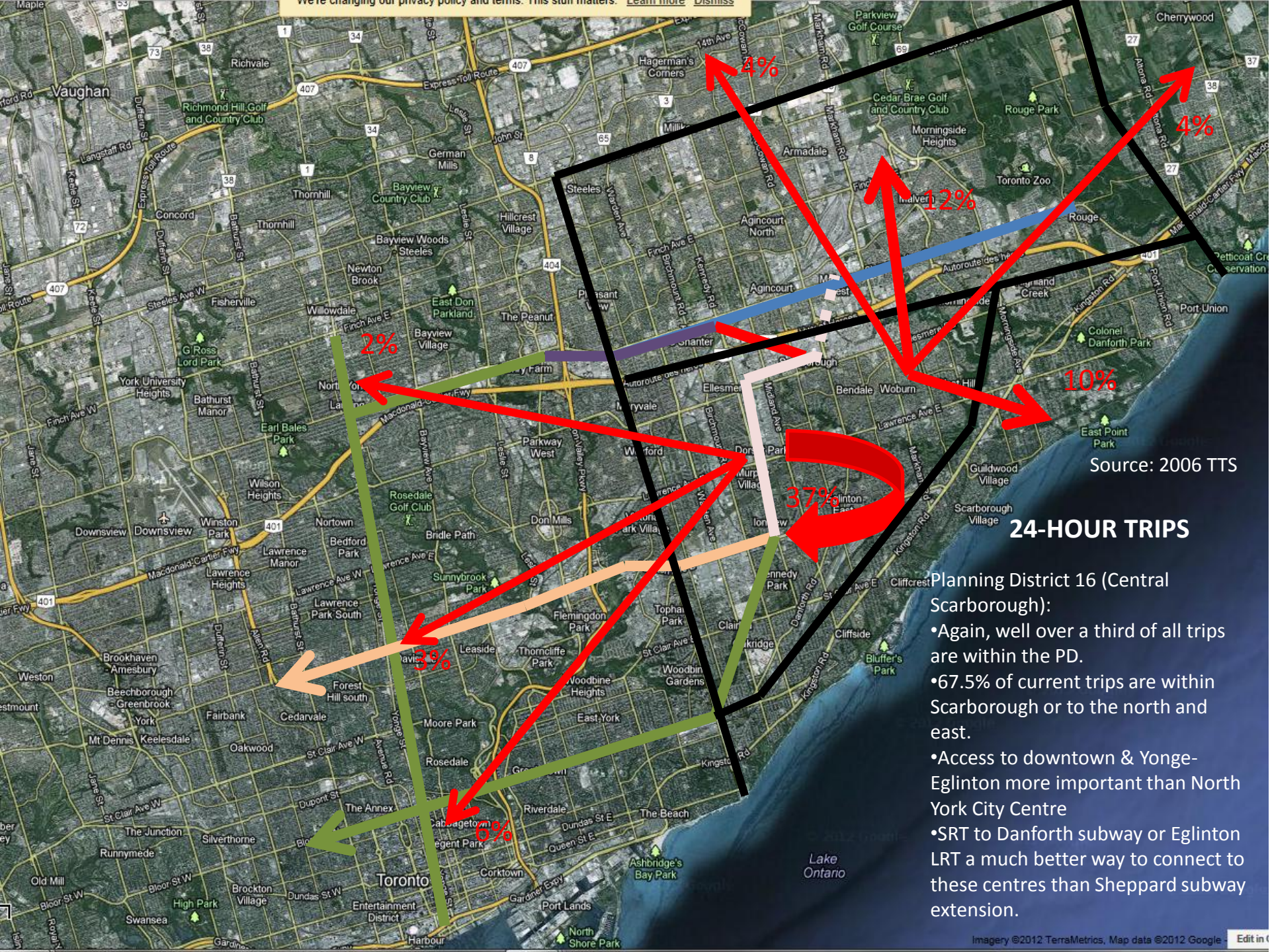
Source: 2006 TTS
AM-PEAK TRIPS
Planning District 13 (Scarborough north of the 401):
• Very similar pattern to all-day trips
• Toronto downtown (PD1) a much more important destination.
• Need to encourage use of SRT-Danforth subway to minimize overloading of Yonge line
Lake Ontario
Toronto
Vaughan
Imagery ©2012 TerraMetrics, Map data ©2012 Google



24-HOUR TRIPS

Planning District 16 (Central Scarborough):

- Again, well over a third of all trips are within the PD.
- 67.5% of current trips are within Scarborough or to the north and east.
- Access to downtown & Yonge-Eglinton more important than North York City Centre
- SRT to Danforth subway or Eglinton LRT a much better way to connect to these centres than Sheppard subway extension.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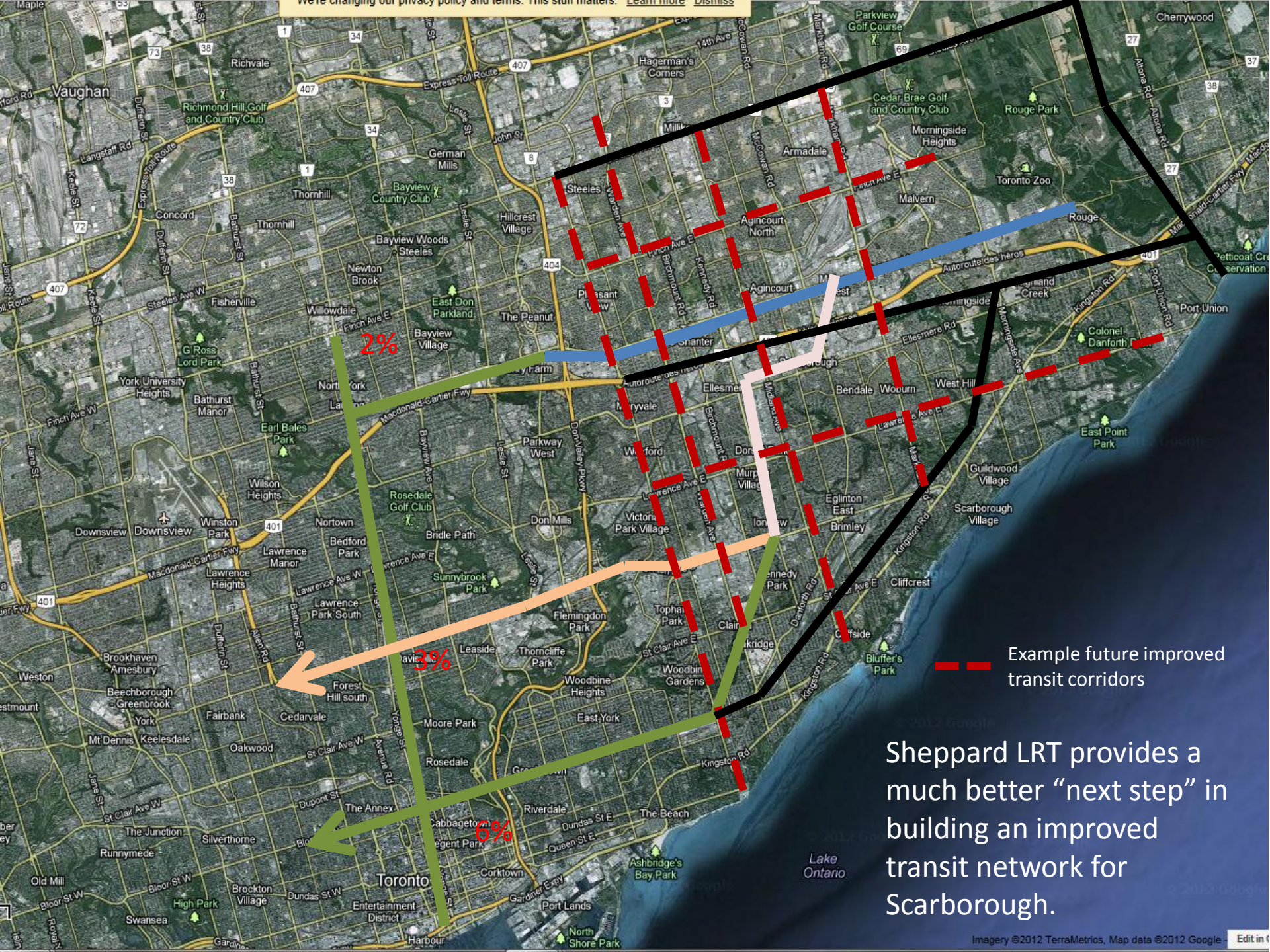
8%
30%
3%
16%
Source: 2006 TTS
AM-PEAK TRIPS
Planning District 16 (Central Scarborough):
• Again, similar pattern to all-day except that PD1 is a major destination.
• Again, want these trips on SRT to Danforth subway rather funnelling through North York Centre.
Lake Ontario
Toronto
Vaughan
Imagery ©2012 TerraMetrics, Map data ©2012 Google


Schnellbahnnetz
Bahn München
DB
MVV
Münchner Verkehrs- und Tarifverbund
In order to provide connectivity, coverage and high quality service levels, the transit network **must** be designed in a hierarchical fashion (high capacity trunk lines, feeder services; long-distance line-haul, local accessibility).
Flughafen München
Flughafen Besucherpark
Freising
Pulling
Neufahrn
Lohhof
Eching
Hallbergmoos
Ismaning
Unterföhring
Johanneskirchen
Englschalking
Daglfing
Garching-Hochbrück
Fröttmaning
Kieferngarten
Freimann
Studentenstadt
Alte Heide
Nordfriedhof
Dietlindenstraße
Münchner Freiheit
Giselastraße
Universität
Odeonsplatz
Lehel
Max-Weber-Platz
Arabellapark
Richard-Strauss-Straße
Böhmerwaldplatz
Prinzregentenplatz
Leuchtenbergring
Rosenheimer Platz
Isartor
Karlsplatz (Stachus)
Marienplatz
Hauptbahnhof (Central Station)
Ostbahnhof
Berg am Laim
Kreillerstraße
Trudering
Messestadt-West
Messestadt-Ost
Moosfeld
Riem
Feldkirchen
Erding
Altenerding
Aufhausen
St. Kolomann
Ottenhofen
Markt Schwaben
Poing
Grub
Heimstetten
Gronsdorf
Haar
Vaterstetten
Baldham
Zorneding
Eglharting
Kirchseeon
Grafing Bahnhof
Grafing Stadt
Ebersberg
Harthof
Am Hart
Frankfurter Ring
Milbertshofen
Scheidplatz
Bonner Platz
Olympiazentrum
Olympiapark Nord
OEZ
Georg-Brauchle-Ring
Petuelring
Hohenzollernplatz
Josephsplatz
Theresienstraße
Königsplatz
Mail-lingerstraße
Stigl-maierplatz
Rotkreuzplatz
Westfriedhof
Gern
Fasanerie
Moosach
Niederroth
Maisach
Bachern
Schwab-hausen
Dachau Stadt
Dachau
Gernlinden
Karlsfeld
Allach
Obermenzing
Esting
Olching
Gröbenzell
Lochhausen
Langwied
Pasing
Donnersberger-brücke
Aubing
Leienfelsstr.
Westkreuz
Puchheim
Eichenau
Neuaubing
Harthaus
Laim
Hackerbrücke
Friedenheimer Str.
Heimeranpl.
Theresienwiese
Schwanthalerhöhe
Laimer Platz
Westendstraße
Partnachplatz
Germering-Unterpfaffenhofen
Fürstenfeldbruck
Geisenbrunn
Buchenau
Gilching-Argelsried
Schöngeising
Neugilching
Grafrath
Weßling
Türkenfeld
Steinebach
Seefeld-Hechendorf
Geltendorf
Herrsching
Ammersee
Gräfelfing
Planegg
Stockdorf
Gauting
Mühlthal
Starnberg Nord
Starnberg
Possenhofen
Feldafing
Tutzing
Starnberger See
Lochham
Holzapfelkreuth
Westpark
Haderner Stern
Aidenbachstraße
Großhadern
Klinikum Großhadern
Machtlfinger Straße
Forstenrieder Allee
Basler Straße
Fürstenried West
Harras
Mittersendling
Obersendling
Thalkirchen (Zoo)
Siemenswerke
Solln
Großhesselohe Isartalbf
Pullach
Höllriegelskreuth
Buchenhain
Baierbrunn
Hohenschäftlarn
Ebenhausen-Schäftlarn
Icking
Wolfratshausen
Implerstraße
Poccistraße
Brudermühlstraße
Goetheplatz
Sendlinger Tor
Fraunhoferstraße
Candidplatz
Wettersteinplatz
St.-Quirin-Platz
Mangfallplatz
Kolumbusplatz
Untersbergstraße
Silberhornstraße
Giesing
Fasangarten
Fasanenpark
Unterhaching
Taufkirchen
Furth
Deisenhofen
Sauerlach
Otterfing
Holzkirchen
St.-Martin-Straße
Karl-Preis-Platz
Josephsburg
Innsbrucker Ring
Michaelibad
Quiddestraße
Neuperlach Zentrum
Therese-Giehse-Allee
Neuperlach Süd
Neubiberg
Ottobrunn
Hohenbrunn
Perlach
Wächterhof
Höhenkirchen-Siegertsbrunn
Dürrnhaar
Aying
Peiß
Großhelfendorf
Kreuzstraße
Tarifzonen:
München XXL
Innenraum
Außenraum
© MVV / Stand: April 2004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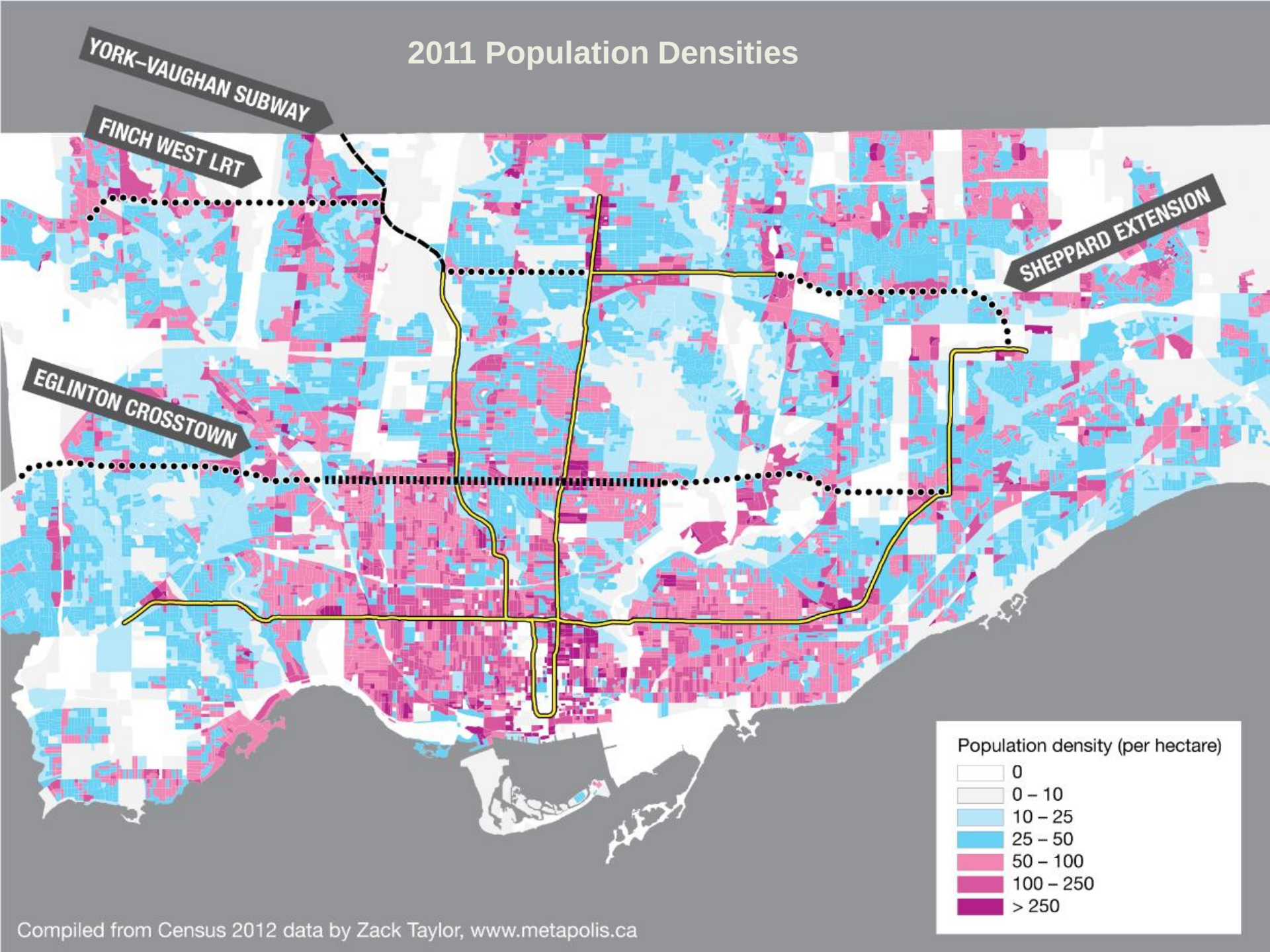
Example future improved transit corridors
Sheppard LRT provides a much better “next step” in building an improved transit network for Scarborough.
Lake Ontario
Toronto
Vaughan
Scarborough
Imagery ©2012 TerraMetrics, Map data ©2012 Google

Network Connectivity: Summary

- Over 2/3 of current Scarborough-based trips are within Scarborough or to/from 905 to the north or east.
- Proposed LRT line provides much more extensive coverage & connectivity, equal frequency and provides a better "backbone" for building an improved transit network within Scarborough.
- Yonge Subway is at capacity: need to very carefully consider how new lines connect to it (if at all).
- Looking beyond the immediate decision re. Sheppard, we must get back to thinking about a comprehensive, hierarchical network that best balances coverage, connectivity, frequency and speed.

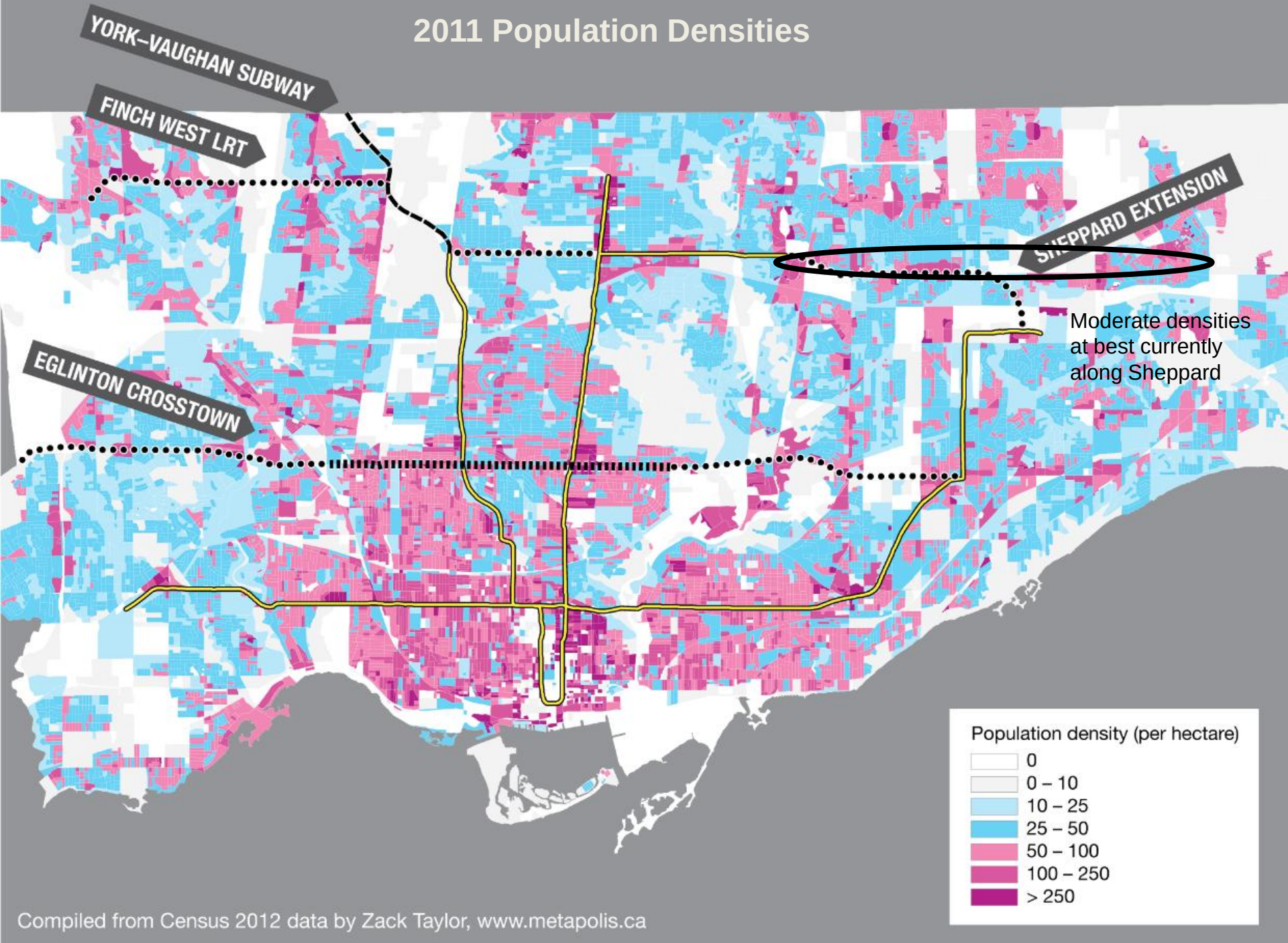
Land Use & Density

2011 Population Densities



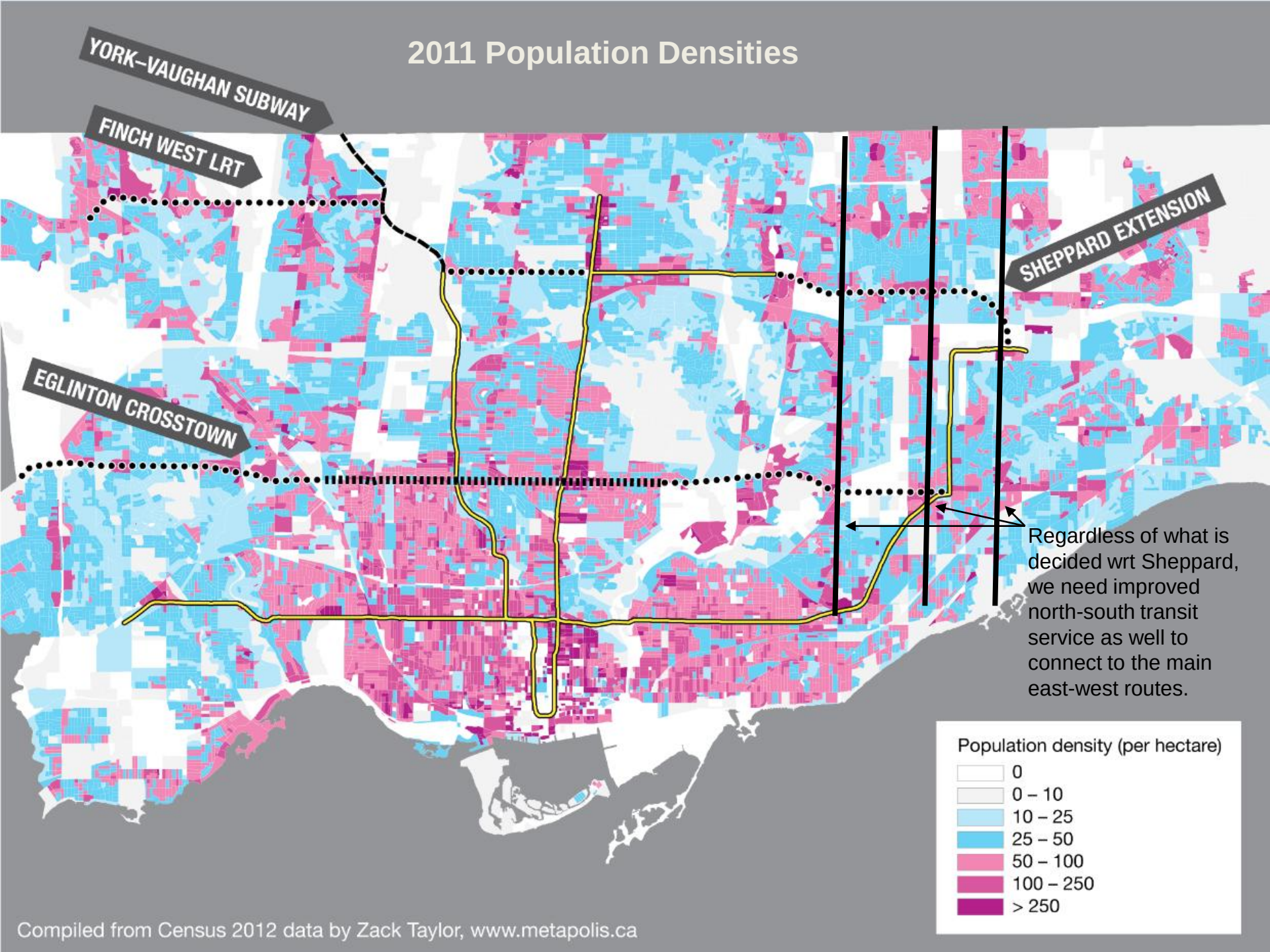
Compiled from Census 2012 data by Zack Taylor, www.metapolis.ca

2011 Population Densities

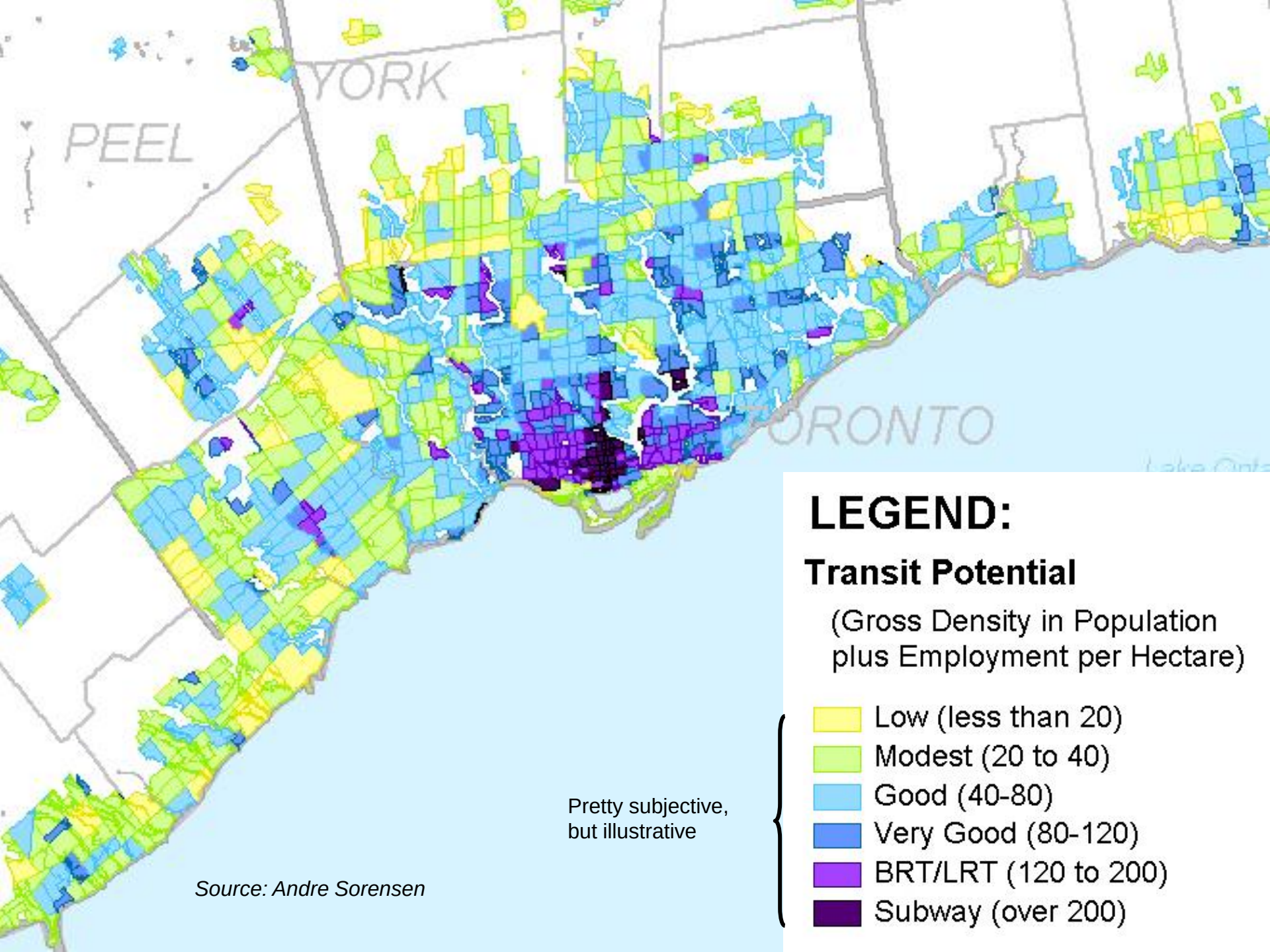


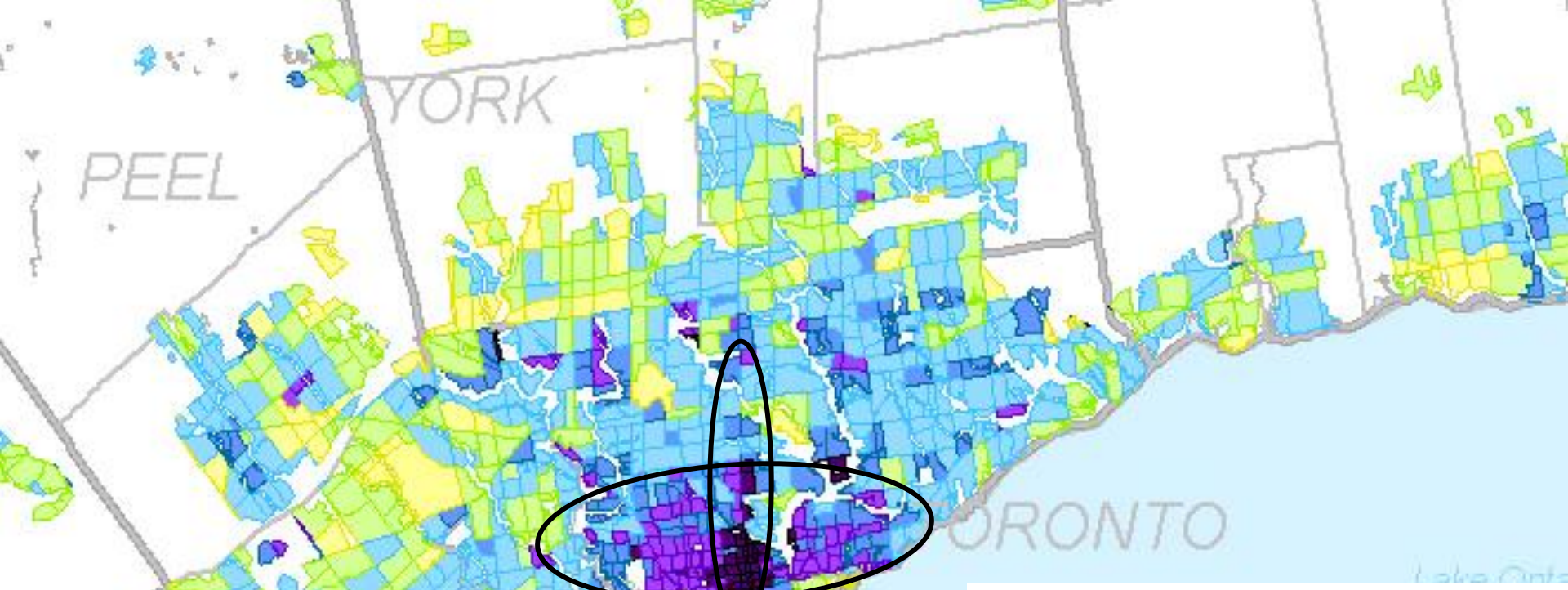
Compiled from Census 2012 data by Zack Taylor, www.metapolis.ca

2011 Population Densities



Compiled from Census 2012 data by Zack Taylor, www.metapolis.ca


YORK
PEEL
ORONTO
LEGEND:
Transit Potential
(Gross Density in Population plus Employment per Hectare)
Low (less than 20)
Modest (20 to 40)
Good (40-80)
Very Good (80-120)
BRT/LRT (120 to 200)
Subway (over 200)
Pretty subjective, but illustrative
Source: Andre Sorensen



Our current subway system is very successful despite not very high densities along much of the routes due to a combination of:

Well-designed, hierarchical network

- Very good feeder bus/streetcar system

I.e., a combination of nodal and linear ("avenues") intensification

- Dense development around many stations
- Attractive, mixed-use, walkable, medium density along many sections of Bloor & Danforth

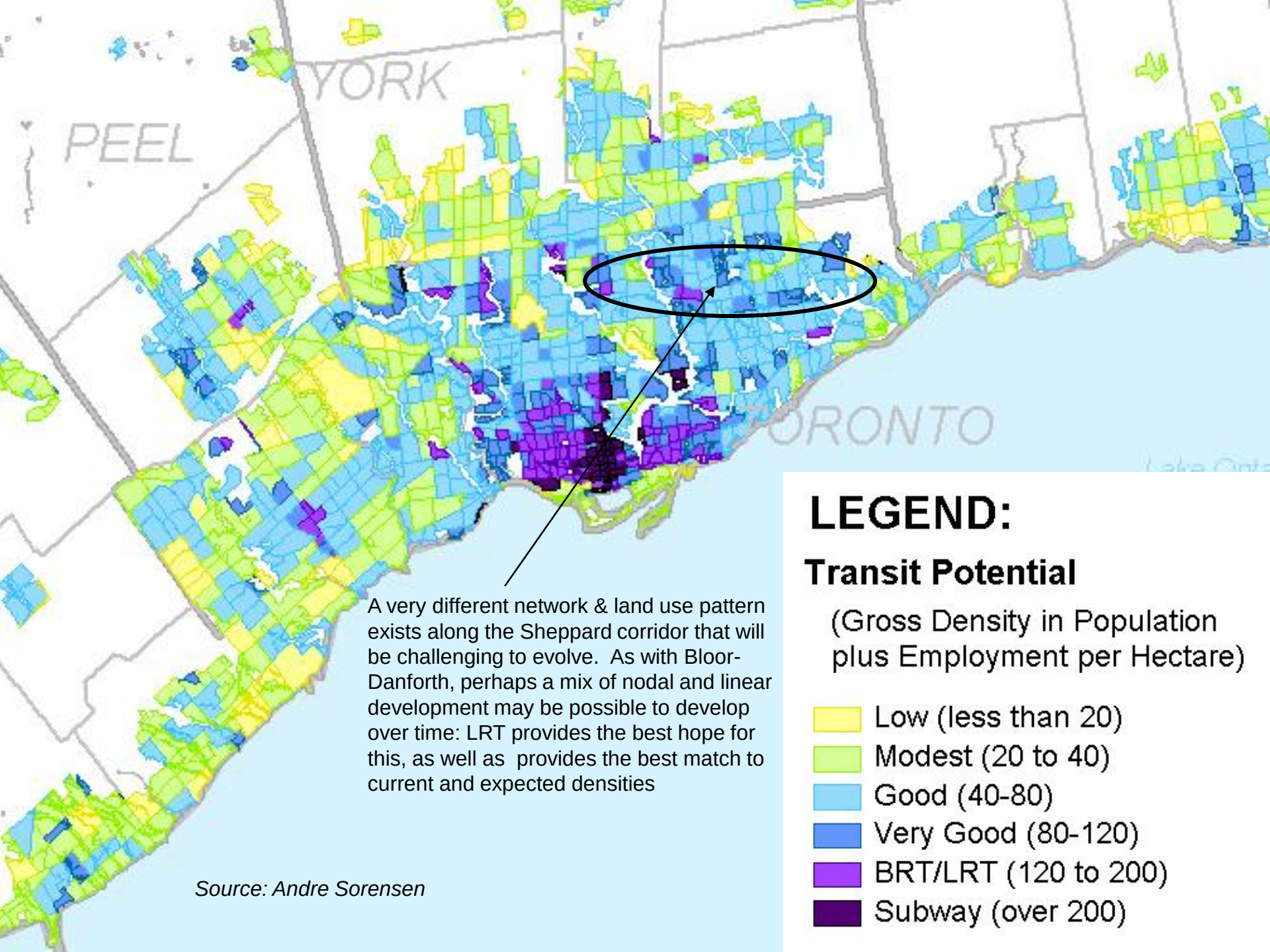
Source: Andre Sorensen

LEGEND:

Transit Potential

(Gross Density in Population plus Employment per Hectare)

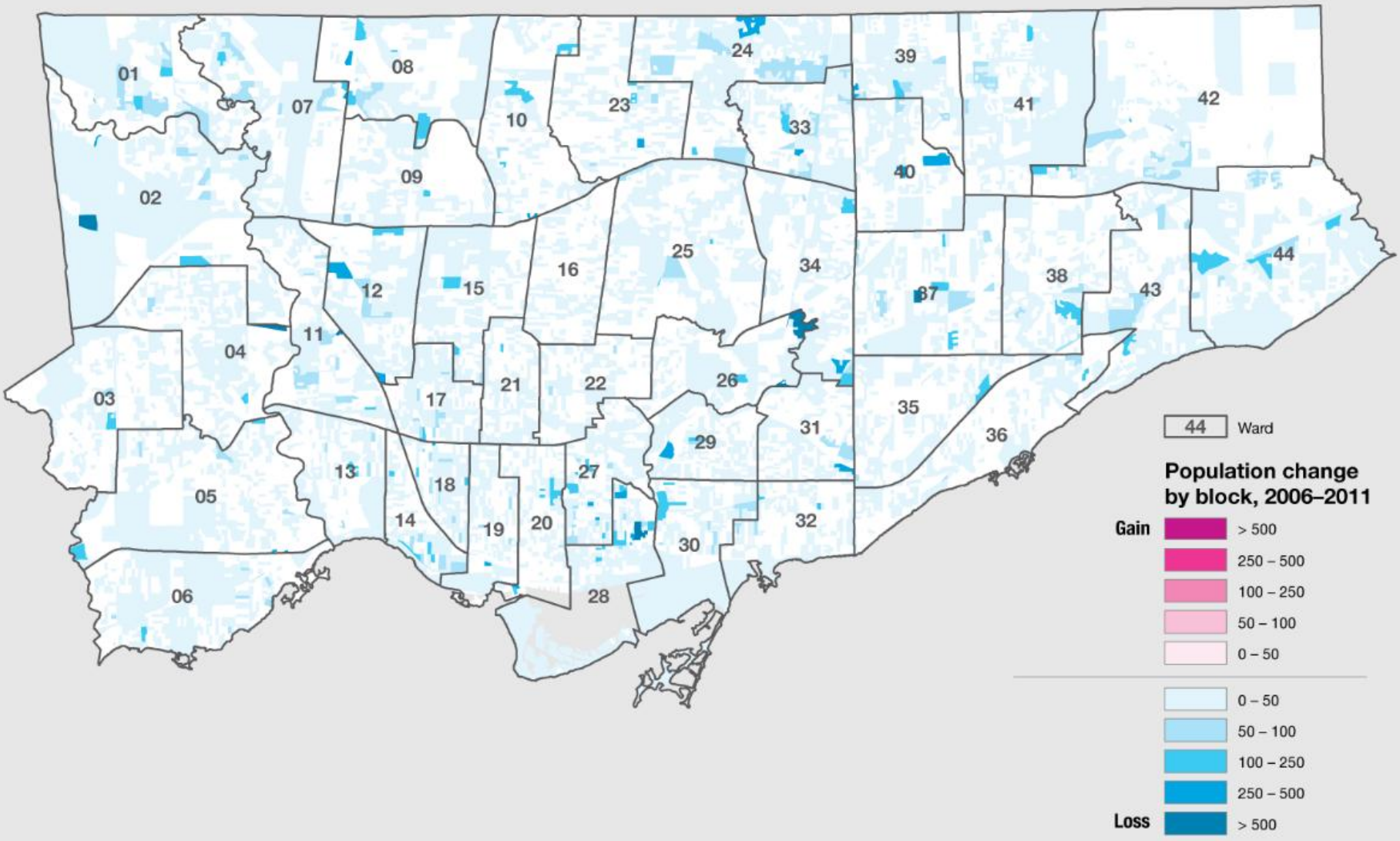
- Low (less than 20)
- Modest (20 to 40)
- Good (40-80)
- Very Good (80-120)
- BRT/LRT (120 to 200)
- Subway (over 200)



A very different network & land use pattern exists along the Sheppard corridor that will be challenging to evolve. As with Bloor-Danforth, perhaps a mix of nodal and linear development may be possible to develop over time: LRT provides the best hope for this, as well as provides the best match to current and expected densities

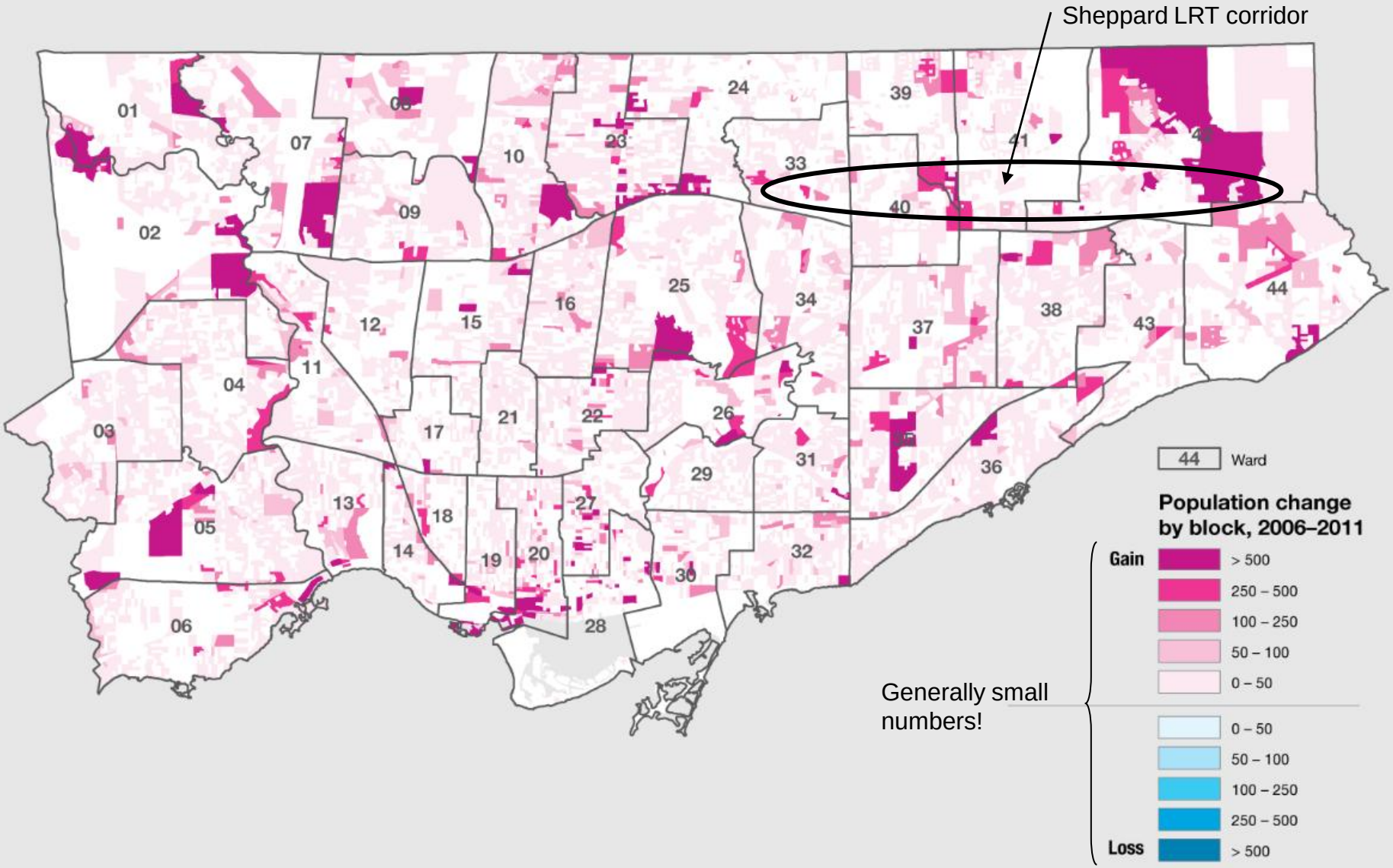
Source: Andre Sorensen

Population Decline by Block, 2006-2011



Source: Zack Taylor, 2012 Census Data

Population Growth by Block, 2006-2011



Source: Zack Taylor, 2012 Census Data

Sustainability I: Gas Prices

- Gasoline prices are going to increase significantly and permanently in the future.
- The effect of much higher gas prices have not been incorporated into the ridership forecasts.
- Suburban areas such as Scarborough will be much more dramatically affected by this than downtown areas.
- The LRT option, with its greater coverage, provides a greater potential for mode switching than the subway option.

Sustainability II: Walkability

- Mixed-use, higher-density, more walkable/bikeable neighbourhoods are an essential component in promoting healthier and less auto-dependent lifestyles.
- Developing such neighbourhoods in suburban areas such as Scarborough will be challenging under any scenario.
- On-street LRT has much greater potential for facilitating this sort of development than the subway option.
- LRT is a neighbourhood-building technology!

Rendering of a proposed transit line on Hurontario Street in Mississauga, Ont.

Source: Andre Sorensen

Cost-Effectiveness of Investment

	Sheppard LRT	Sheppard Subway	Sheppard & Finch LRT
Annual New Riders (millions)	7.7	12.2	14.0
Capital Cost ($billions)	1.0	3.3	1.9
Cost/New Rider ($)	130	266	136
Source: TTC Submission to Transit Expert Panel, Feb. 17/12			

- Sheppard subway is much less cost-effective than LRT on a per new rider basis – an important metric for judging transit investments.*
- Building the Sheppard subway would consume the $2.33B available from Metrolinx and the Federal Government, leaving nothing for Finch West* and would still require $1B in additional, unsecured funding.
- Investing $1.9B in Sheppard and Finch LRTs will generate more new riders than investing this money in the Sheppard subway.

* These statements hold in general even if the subway can be built more cost-effectively than currently assumed by the TTS (although, obviously, the numbers would change accordingly).