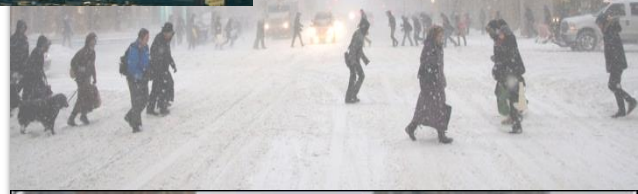
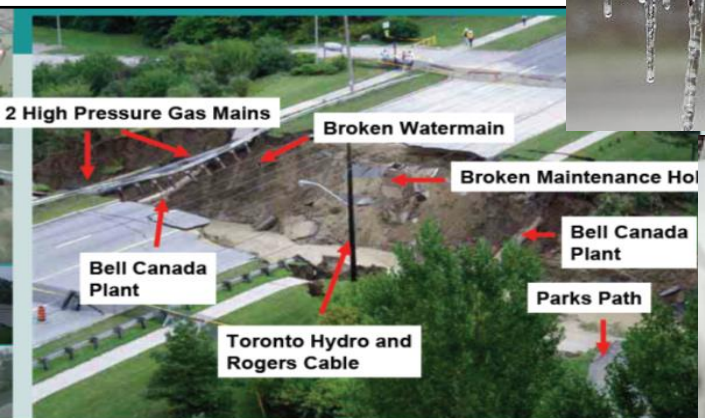
Great Lakes and
St. Lawrence Cities Initiative
Webinar



Towards Extreme Weather Resilience: *Working with the Electrical Sector*

David MacLeod
City of Toronto
Environment & Energy Division
Feb. 11, 2015




Climate change is happening.

Outline

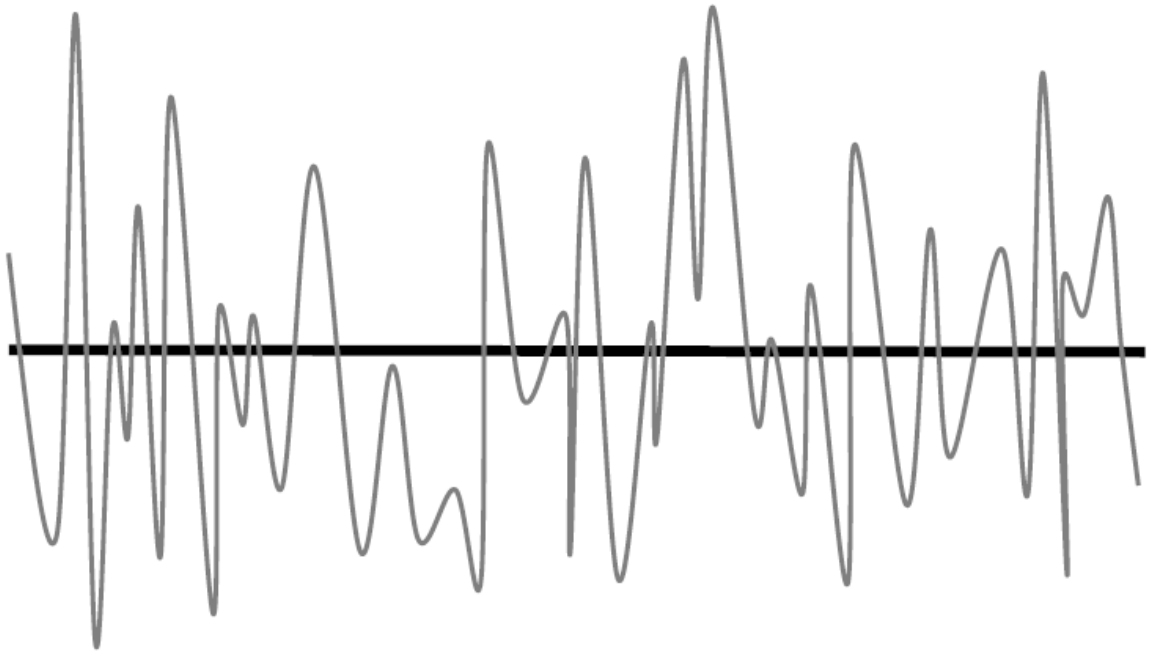
1. Context
2. Strategy to engage the electrical sector
3. Actions to assist the electrical sector
4. Next steps

Temperature & precipitation-related extremes are forecast to increase in frequency & intensity

Extreme Weather	Parameter	Units	2000 to 2009	2040 to 2049
Rainfall	Maximum amount in one day	MM	66	**166**
	# of days with more then 25 mm	Days	19	**9**
	Average annual daily maximum	MM	48	**86**
Heat	Maximum daily temperature	Degrees	37	**44**
	# of days hotter then 30 degrees	Days	20	**66**
	Number of heat waves per year	3-day events	0.6	**2.5**

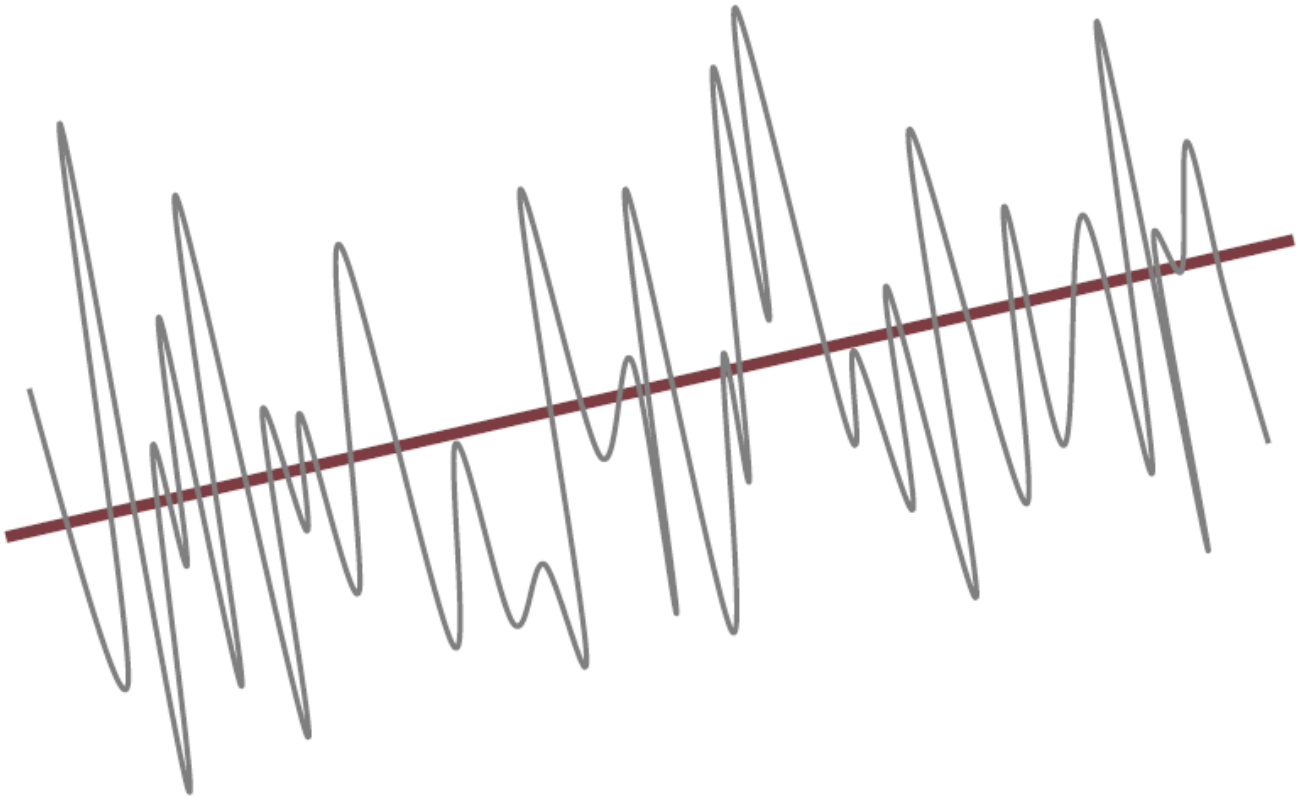
TORONTO

Our infrastructure is built on the assumption of a stable climate



TORONTO

What happens if that climate isn't stable anymore?



TORONTO

Drivers for Adaptation Action

1. **Safety: avoid harm to public & employees**

2. **Customer Service**

3. **Maintain prosperity and achieve cost avoidance:**
   - damage to infrastructure from extreme weather
   - credit & insurance risk rating
   - business / reputation disruption

4. **Achieve efficiencies through co-operation, especially recognizing interdependencies of infrastructure**

5. **Corporate & personal legal liability**

City of Toronto - Climate Adaptation Milestones

2008	Climate Change Adaptation Strategy
2009	Forum on Infrastructure & CC Adaptation
2010 / 12	Climate Modelling for Toronto area. Risk Assessment Tool Benchmarking
2011	WeatherWise Partnership formed: Convened the electrical sector

TORONTO

Dependency on other sectors affected by weather

Municipalities don't control all infrastructure – but we depend on it!

Multi – Sectoral Engagement WeatherWise Partnership

Purpose - Manage risks of extreme weather impacts on critical infrastructure & services

Membership - >50 organizations across Toronto region including banking, insurance, electricity, telecom, high rise residential & commercial real estate, retail, transportation, water management, emergency services, federal, provincial & local governments, NGOs and academia.

Similar Models: London, New York & Barcelona

Vote result:
Focus on Electrical Sector

Over 50 WeatherWise Partnership Members collectively managing $100s of Billions in infrastructure & economic activity voted to focus on extreme weather vulnerability of the electrical sector.

Why is the business sector concerned the electrical sector?

Energy costs are important to business competitiveness but equally important ***Businesses and Critical Infrastructure owners seek an investment climate where energy supply is reliable and secure.***

Emerging Issues:
Energy Crunch in the City

- Population growth, more high rises, aging distribution system, capped electrical supply
- More frequent extreme weather:
  - Peak demand
  - Stress & damages to infrastructure

Approach with the Electrical Sector

1. Demonstrate **concern of key customers**.
2. **Benchmark** to prove other electrical jurisdictions are taking adaptation action.
3. Establish support for electrical **business case**.
4. Understand major **stakeholders' tolerance** to power disruption.
5. Assess the potential impacts on a **representative sample** of the electrical system.
6. Identify where additional risk reduction **actions** are required (based on impacts & risk tolerance).

.

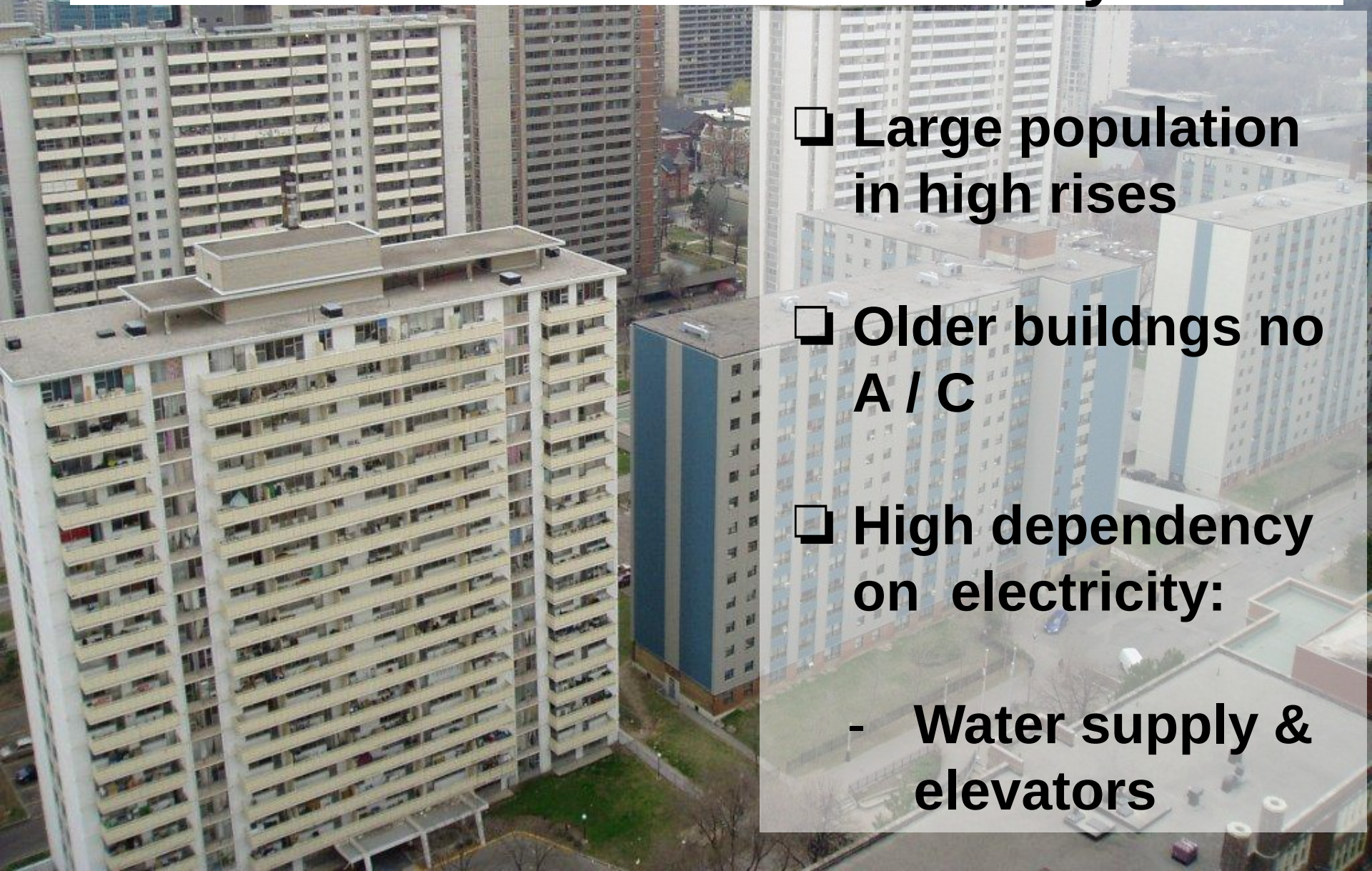
Tolerance Survey

Independent survey of critical infrastructure & service sectors' tolerance for power disruption. **173** respondents provided info on emergency preparedness and operational tolerance.

- **57%** of respondents have a **formal** Emergency Management Plan (up-to-date or otherwise).
- **48%** respondents have a formal Business Continuity Plan (up-to-date or otherwise).
- **61%** of respondents with +250 employees have a Business Continuity Plan.

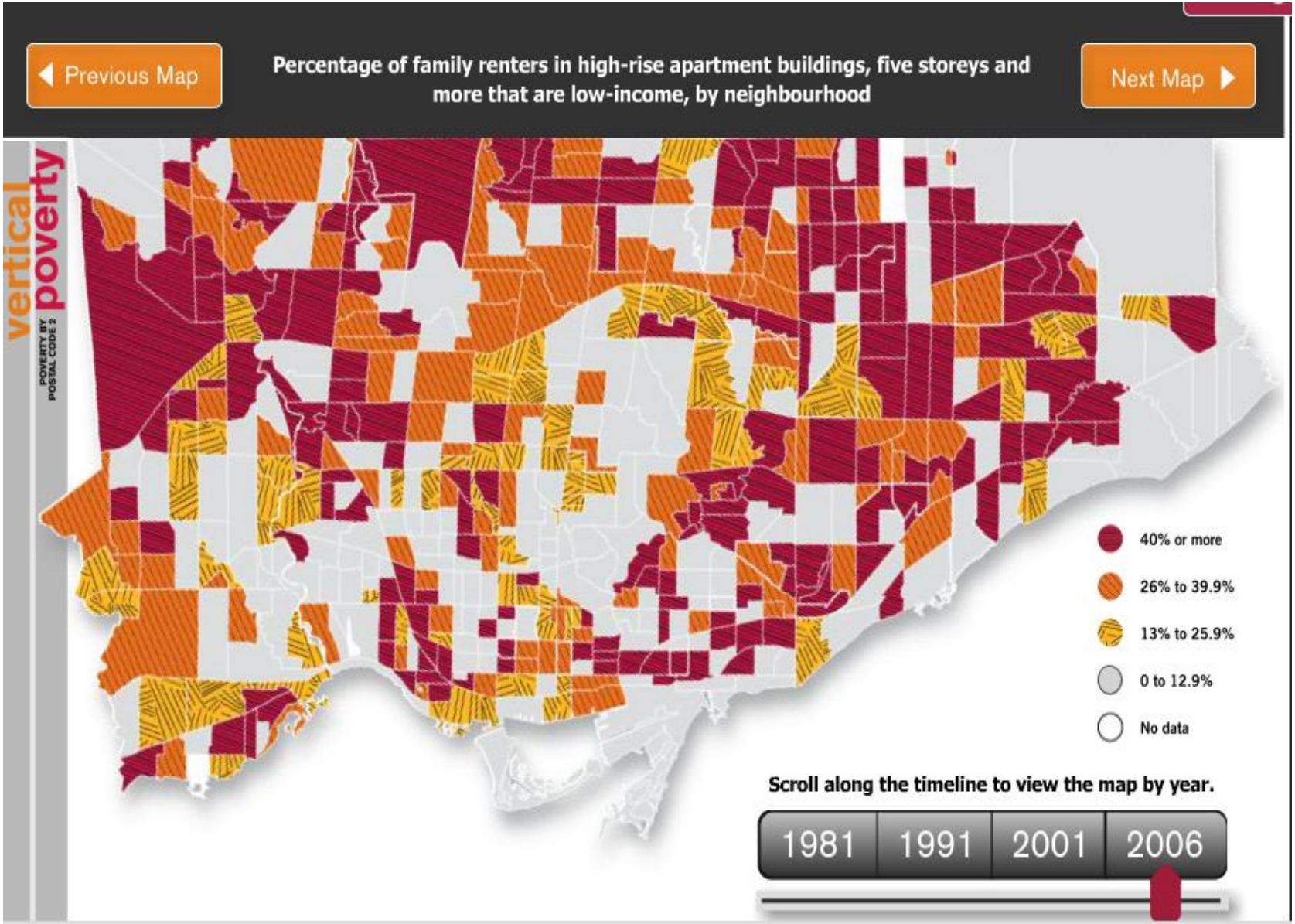
Strong indication of lack of tolerance to power disruption.

Business Case: Unique High Rise Conditions for Vulnerability



- Large population in high rises
- Older buildngs no A / C
- High dependency on electricity:
  - Water supply & elevators

Map of Toronto highlighting percentage of families in high rise apartments that are low income by postal code -
http://www.unitedwaytoronto.com/verticalpoverty/report/introduction/

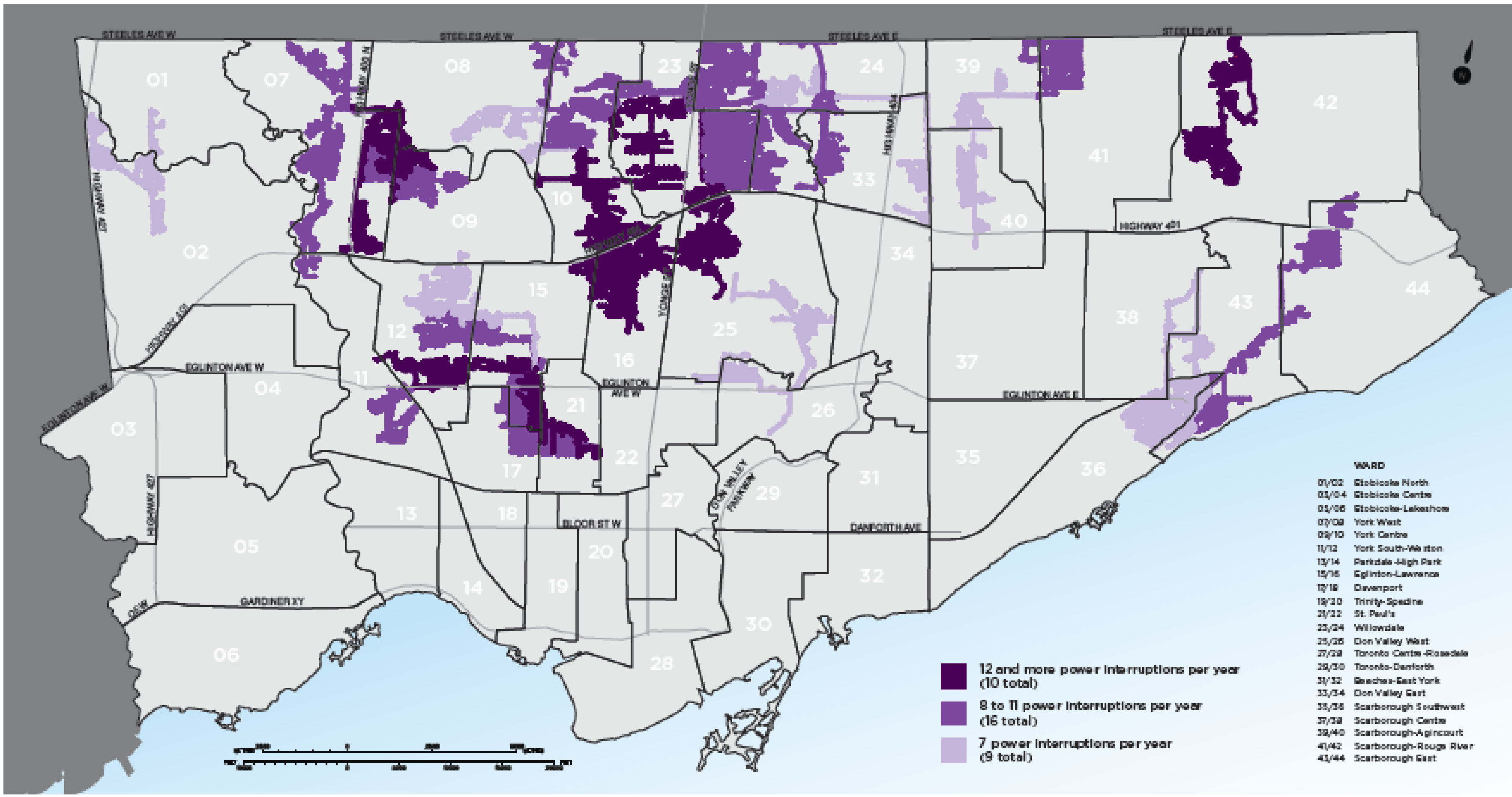


Map of Toronto highlighting power disruption by postal code

http://www.torontohydro.com/sites/corporate/LearnMore/Documents/TH-Areas-of-Power-Interruption.pdf

Areas of Poor Power Reliability

Outages per year



Power Interruption by Postal Code

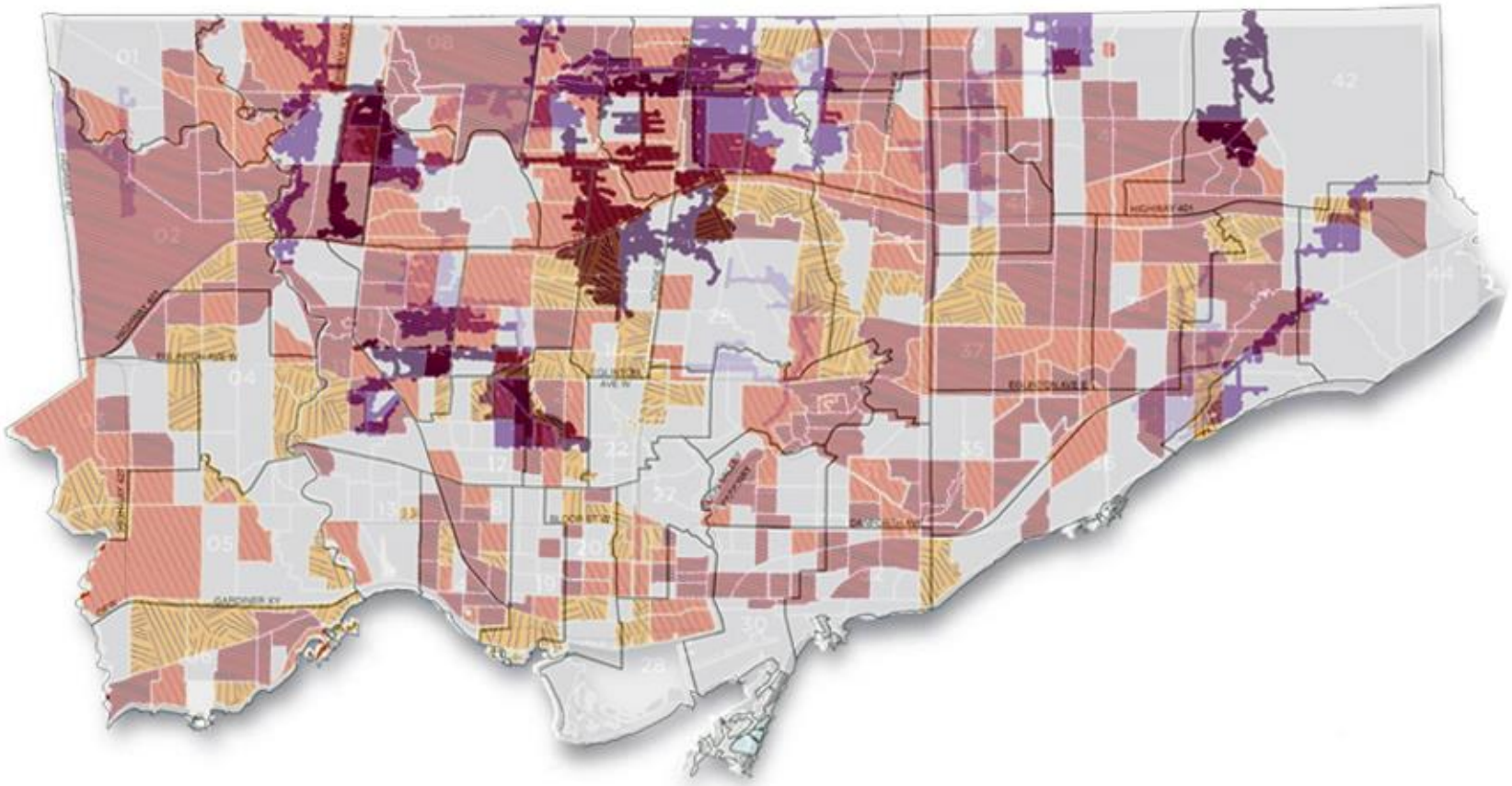
12 and more power interruptions per year: M1B, M1X, M2L, M2M, M2N, M2P, M2R, M3K, M3H, M3L, M3N, M4N, M4R, M5M, M5N, M5P, M5R, M6A, M6B, M6C, M6E, M6M, M9M

8 to 11 power interruptions per year: M1B, M1C, M1E, M1J, M1V, M2H, M2J, M2K, M2M, M2N, M2R, M3H, M3J, M3L, M3M, M3N, M5P, M6B, M6C, M6E, M6M, M6N, M9L, M9M, M9N

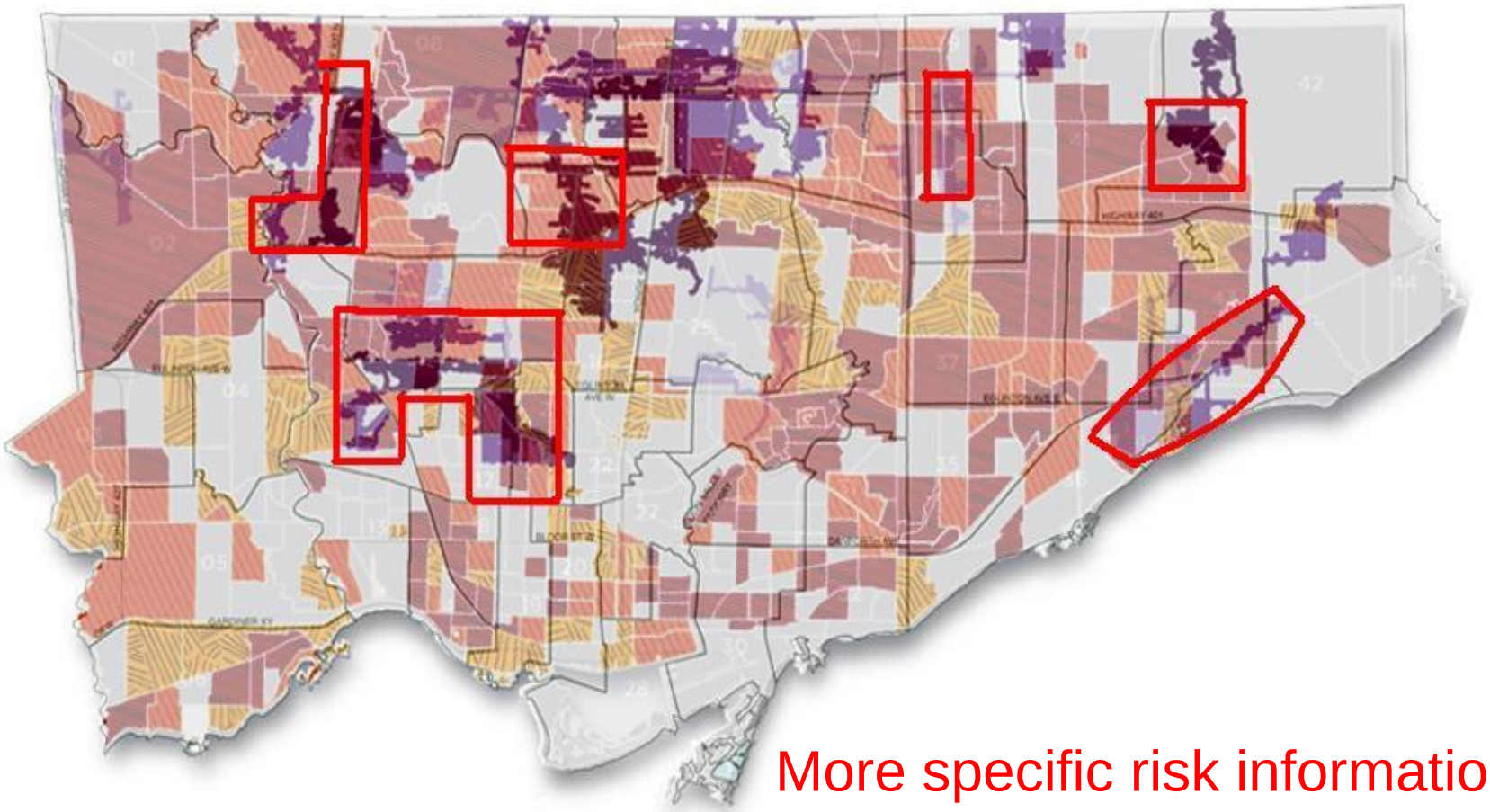
7 power interruptions per year: M1G, M1H, M1J, M1M, M1R, M1T, M1V, M1W, M2H, M2J, M2K, M2L, M2M, M3B, M3C, M3H, M3J, M3K, M4G, M4H, M4P, M6B, M6L, M6M, M9V, M9W

TORONTO HYDRO

Map Overlay – Electrical System Vulnerability and Potential Human Vulnerability



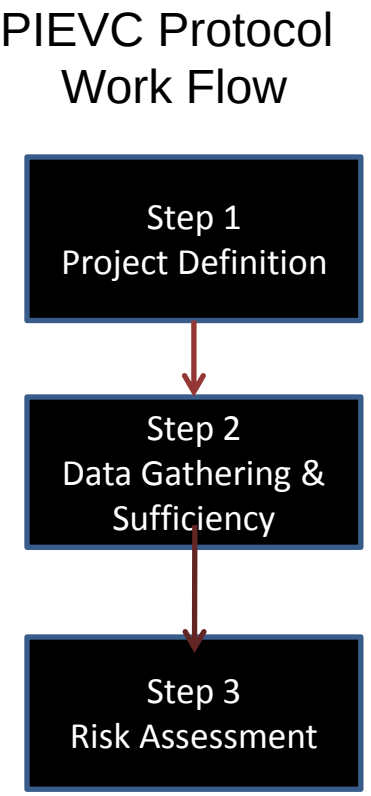
Key Vulnerability – Frequent Power Disruption & Low Income Residents in Apartments



More specific risk information for the electrical regulator

Risk Assessment

A pilot "Climate Change Engineering Vulnerability Assessment" of a small sample of Toronto Hydro infrastructure completed using protocol developed by Engineers Canada.



- Involved Reps form Field, Control Room, Engineering & Planning.
- Discussions on weather impact based on design criteria, equipment condition, industry standards, protection systems etc.
- Impact and reactions of components and system.
- 2nd Phase in progress examine future weather risks.

Further info: Sheikh Nahyaan
sheikh.nahyaan@torontohydro.com

:
http://www.pievc.ca/e/casedocs/TorontoHydro/Toronto_Hydro_PIEVC_Pilot_Case_Study_Final_Report.pdf

WeatherWise: Lessons Learned

- Education, then customer voting (pressure) worked!
- Multi-sectoral co-ordination is time consuming
- Private sector helped sustain momentum
- Need for ongoing staff facilitation

Lessons from 2013 storms

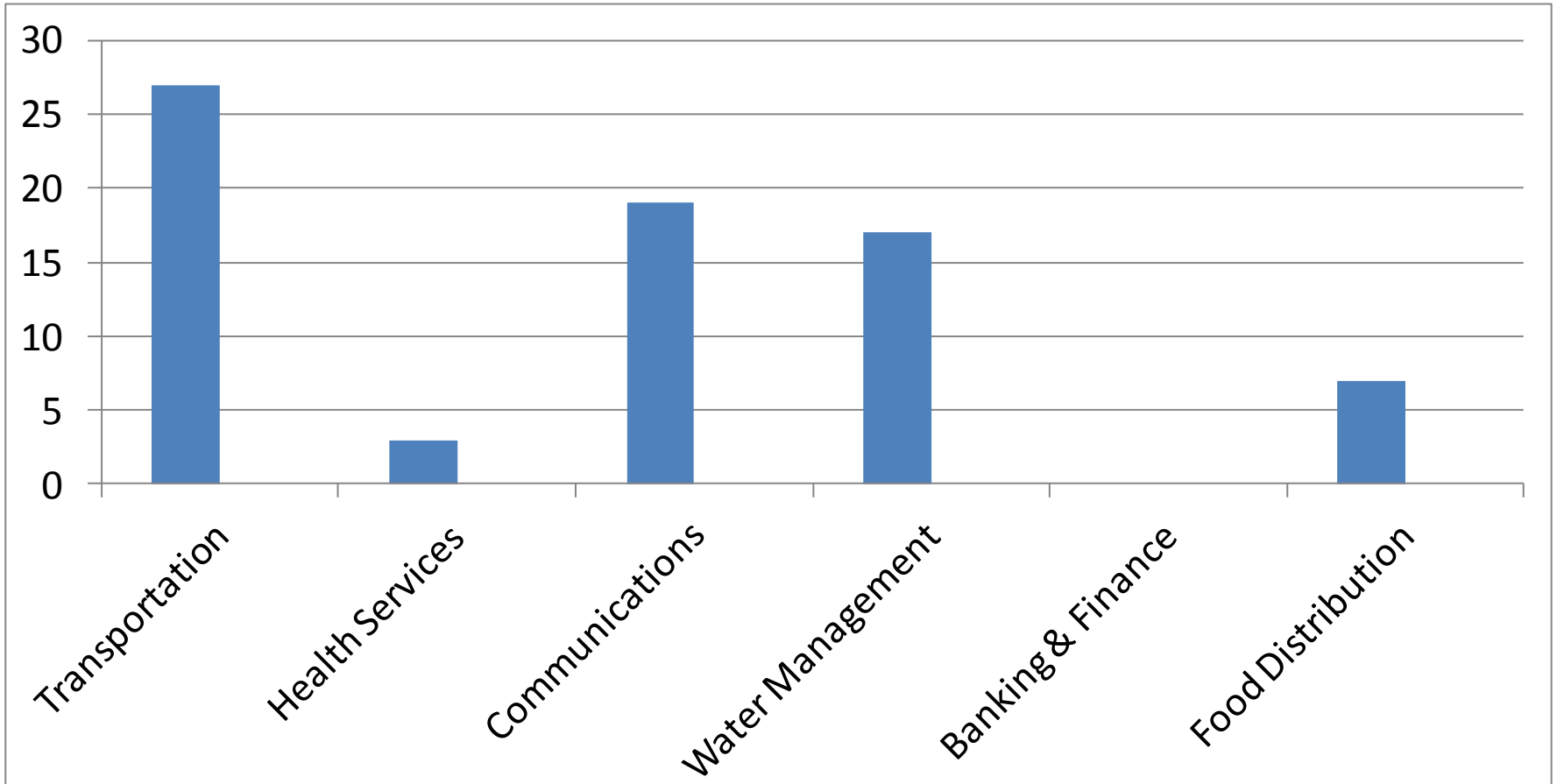
- We were right…electrical system very vulnerable!
- Need to enhance communication systems
- Need to track vulnerable people better
- Trees on wires and flooding key vulnerability
- Demand due to A/C will be future concern

NEXT STEPS ……

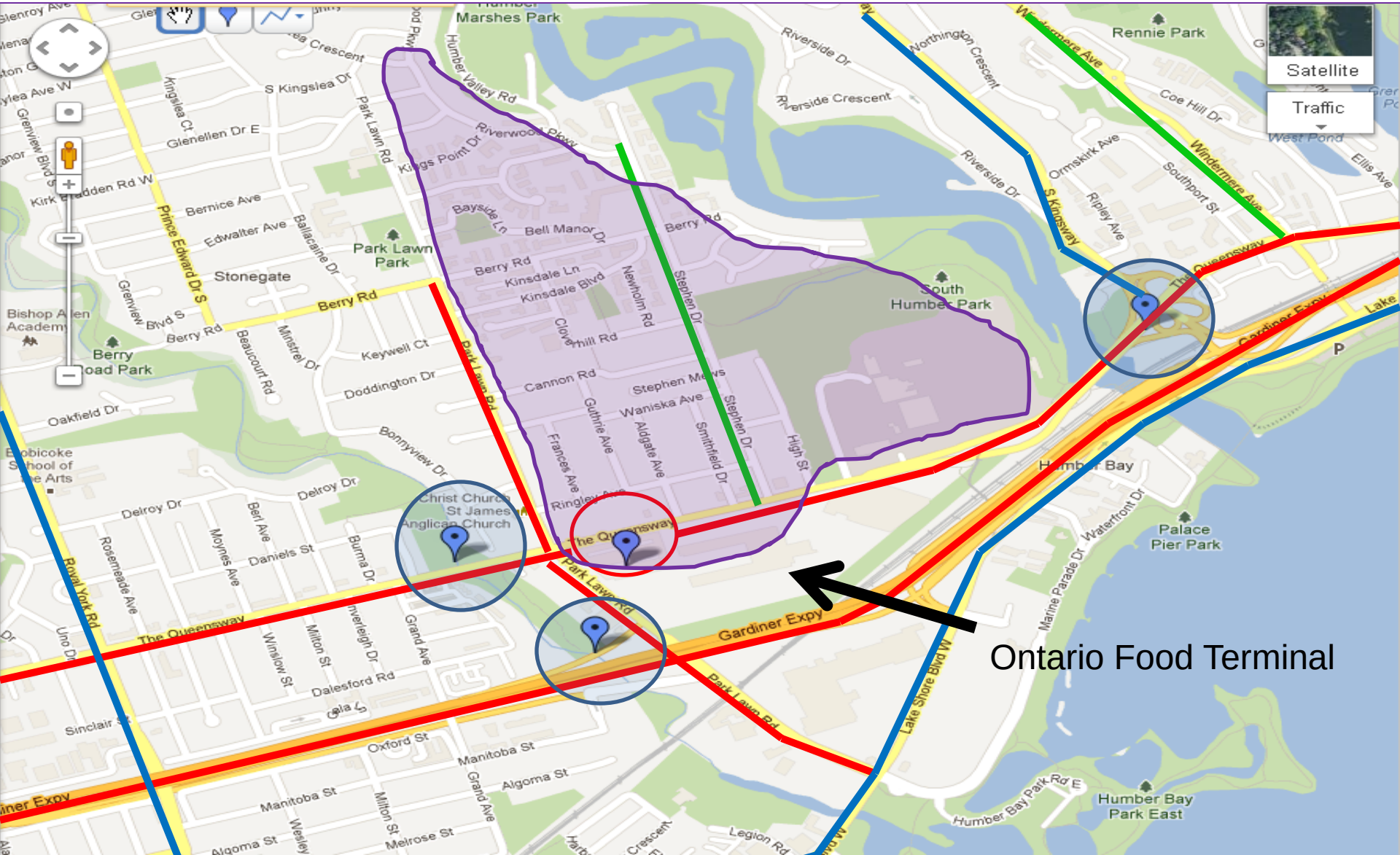
WeatherWise Partnership Forum Nov. 2012:

Selection of priority sectors

- 73 Votes, 66 organizations represented



GIS Based Risk Assessment:



Towards a culture of climate change risk management

Balancing priorities:

- Public & employee safety
- Engagement of interdependent sectors & public
- Fiscal responsibility
- Liabilities
- Address current & future needs

David MacLeod
Environment & Energy Division
City of Toronto dmacleo2@toronto.ca