

Freight Day VI

City Logistics Solutions for Express Package Delivery

Mehdi Nourinejad, Ph.D. Candidate

Mahyar Jahangiriesmaili, M.Sc. Candidate

Puyuan Deng, M.Sc. Candidate

Sina Bahrami, Ph.D. Candidate

Matthew J. Roorda, Ph.D.

Challenges Faced by The Express Courier Industry



High last-mile delivery costs including cost of transportation and parking



Inefficient distribution (logistics) systems



Provide greener delivery options



Urban Logistics offer unique **taylor-made** solutions for the transport of goods in cities by **consolidating** & creating **innovative solutions** for the future through the use of information and communication technologies.

Overview of Solutions for Express Couriers

Facility-to-Facility Distribution



Mobile Hubs



Consolidation Centres

Last Mile Delivery



Express Tricycles



Pack Stations



Delivery Drones

Overview of Solutions for Express Couriers

Urban Distribution



Mobile Hubs



Consolidation Centres

Last Mile Delivery



Express Tricycles



Pack Stations

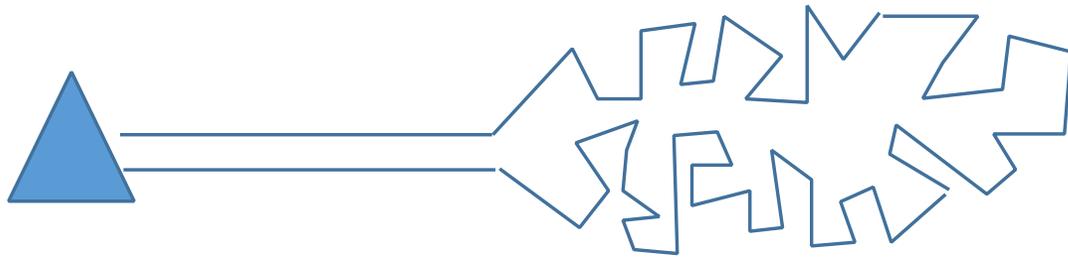


Delivery Drones

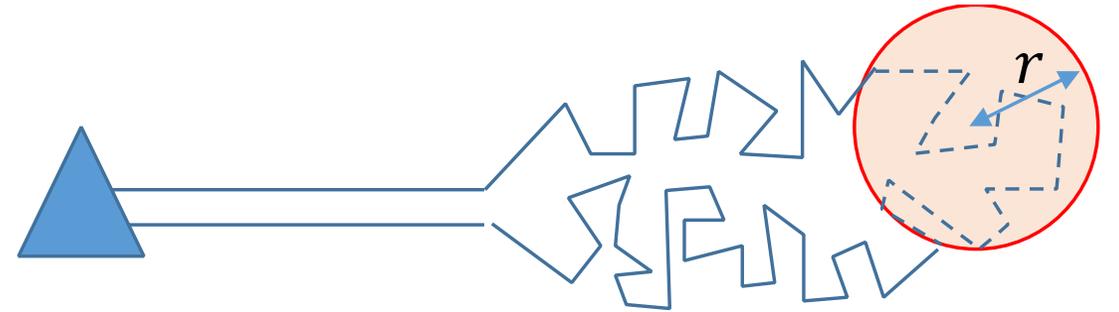
Pack Stations



Vehicle Routing with/without Pack-Stations



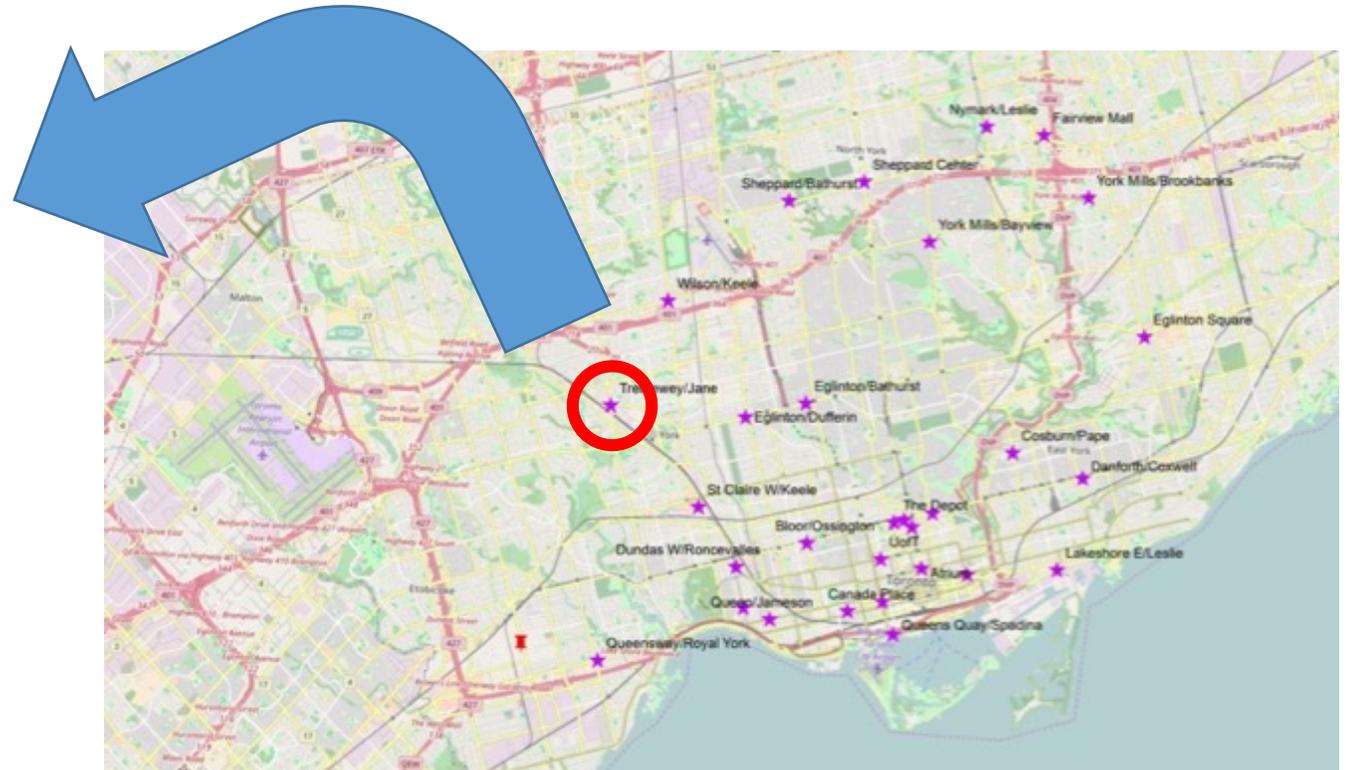
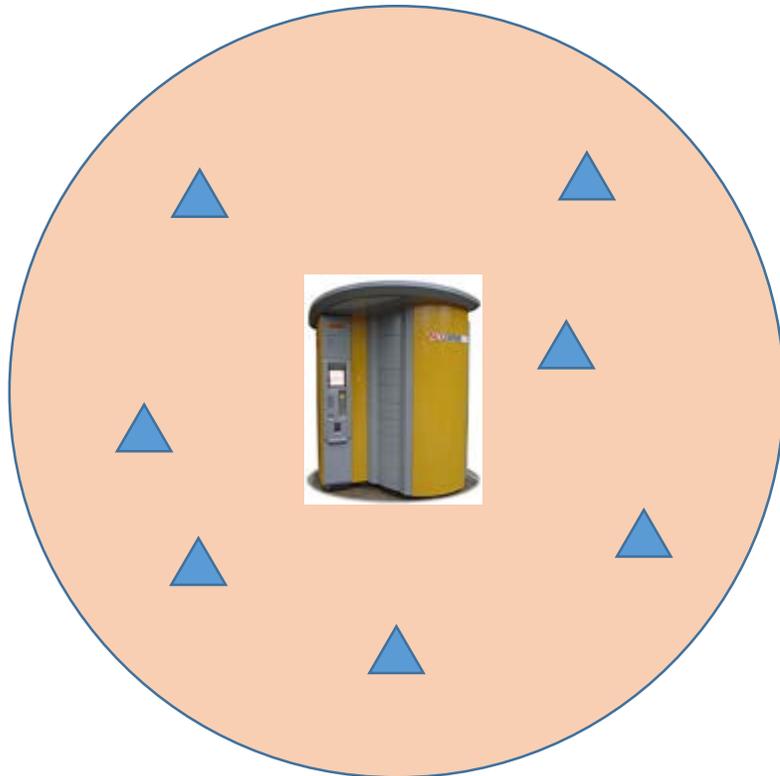
Without Pack-Stations



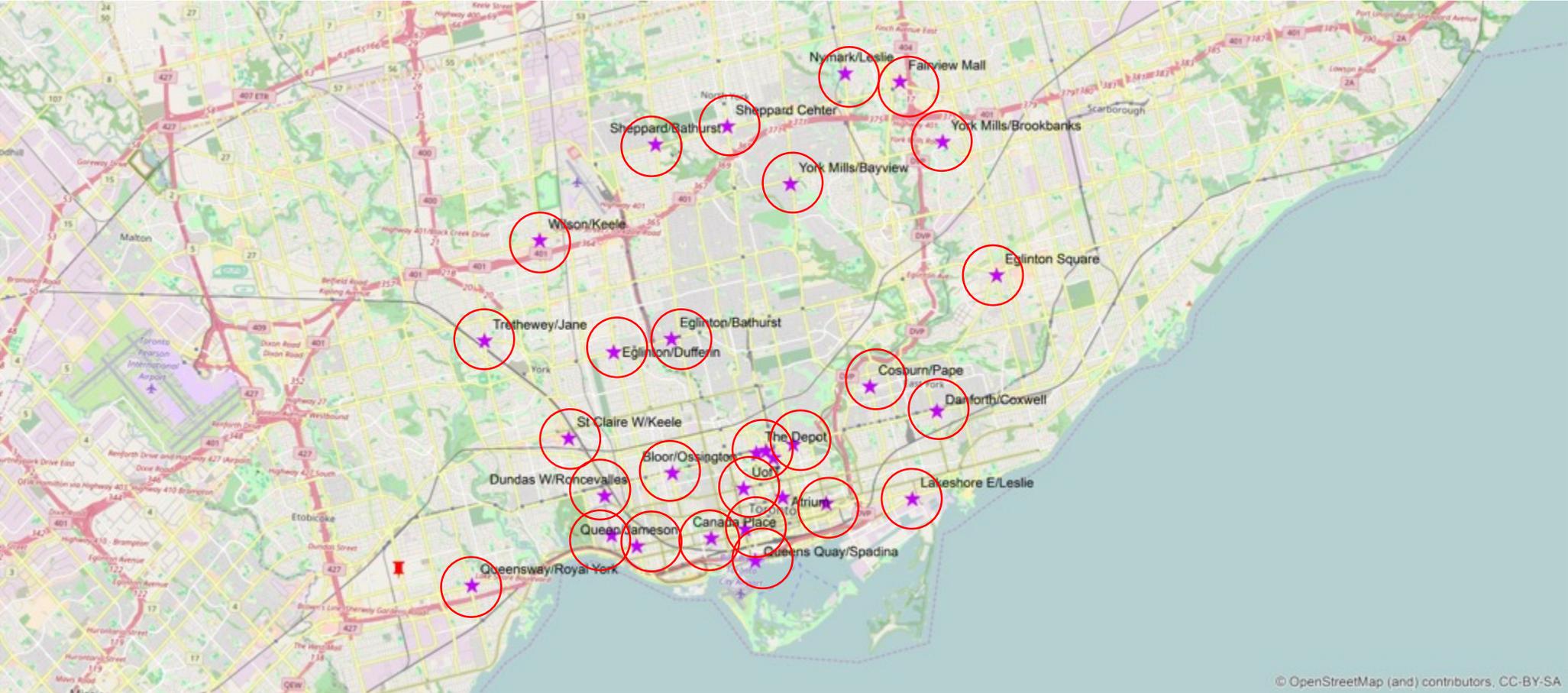
With Pack-Stations

Where to Locate Pack-Stations?

Build pack-station if $g < k\pi r^2\sqrt{D}$

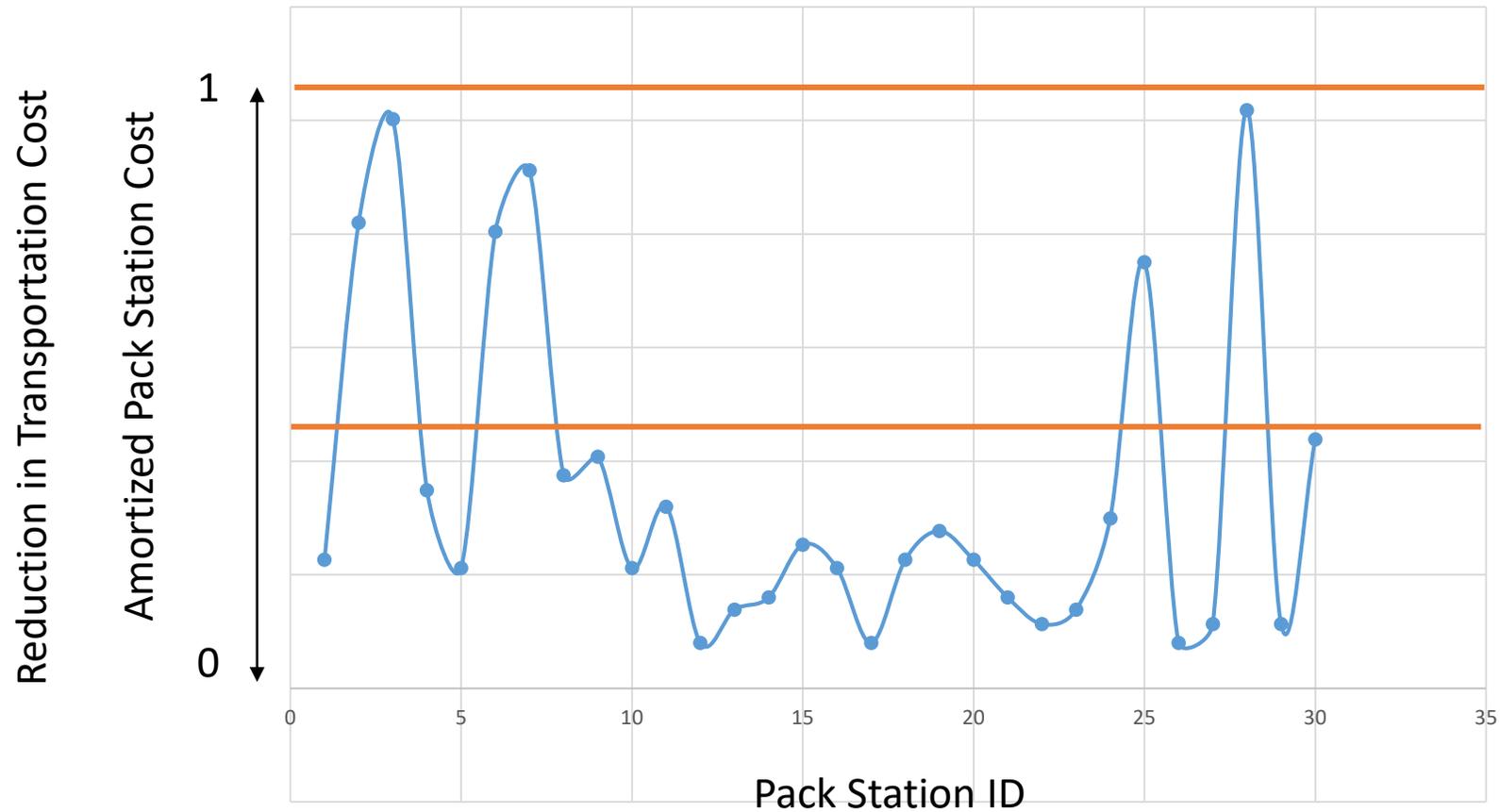


200 m Radius of Each Pack Station

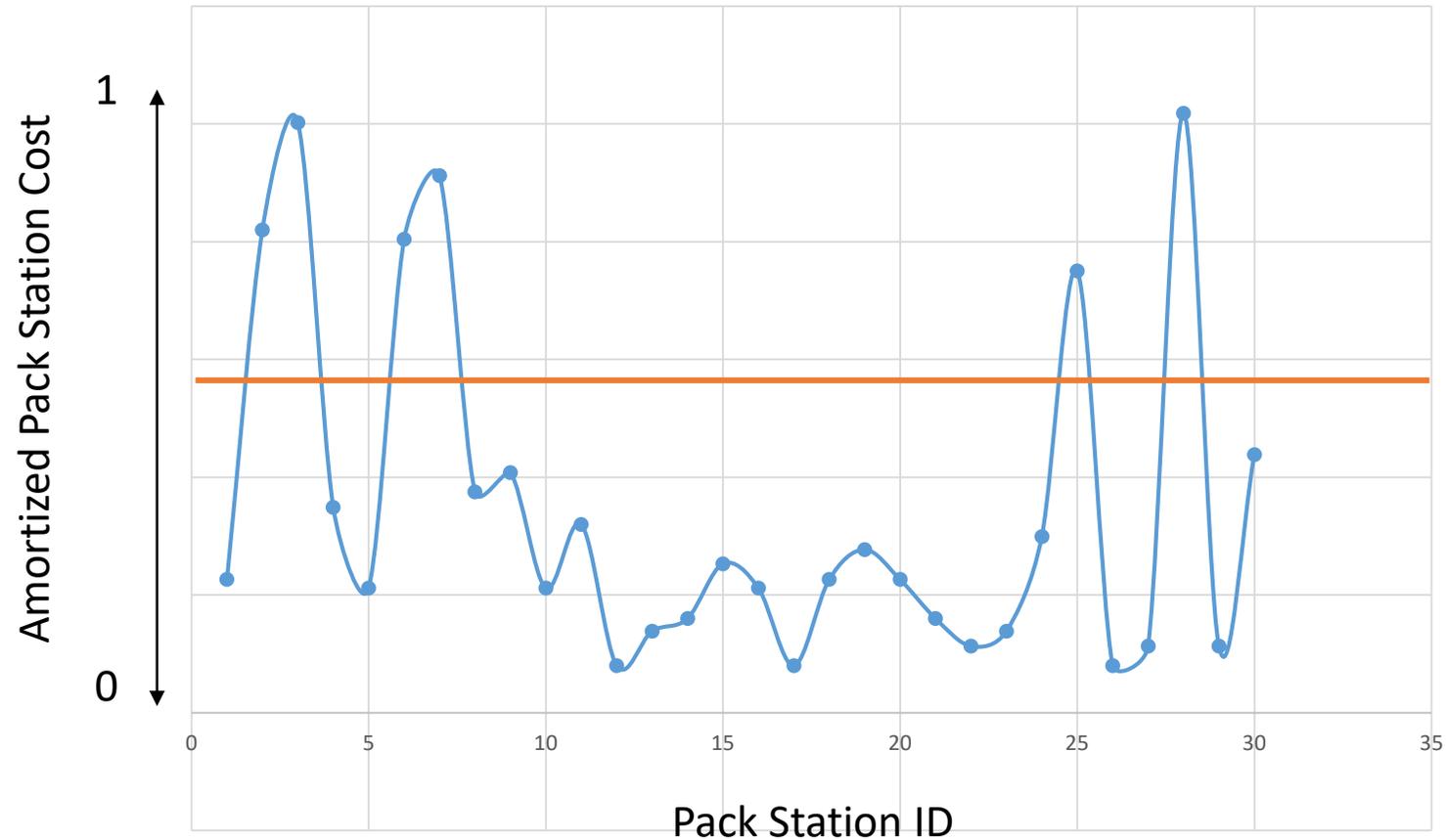


© OpenStreetMap (and) contributors, CC-BY-SA

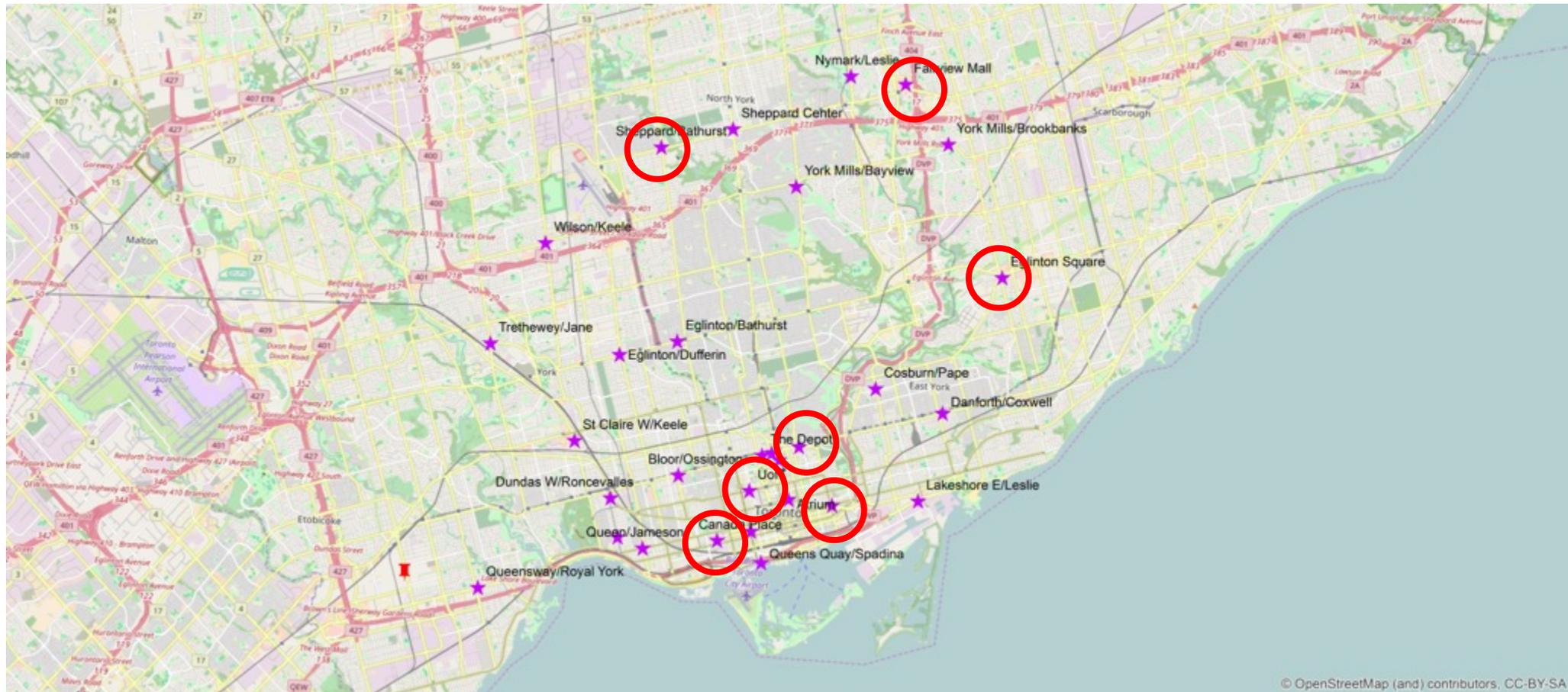
Which Pack-Stations to Open?



Which Pack-Stations to Open?

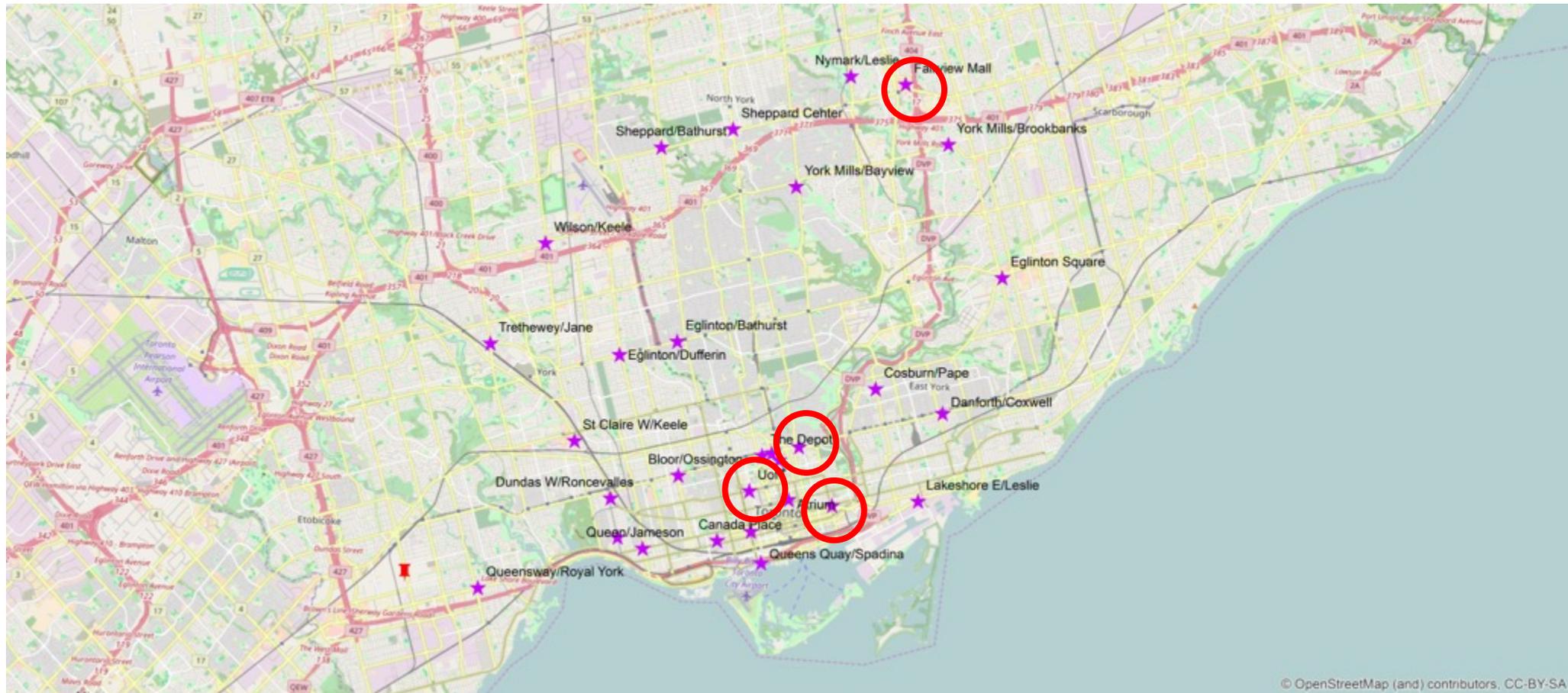


At Facility Cost $g = 0.75$



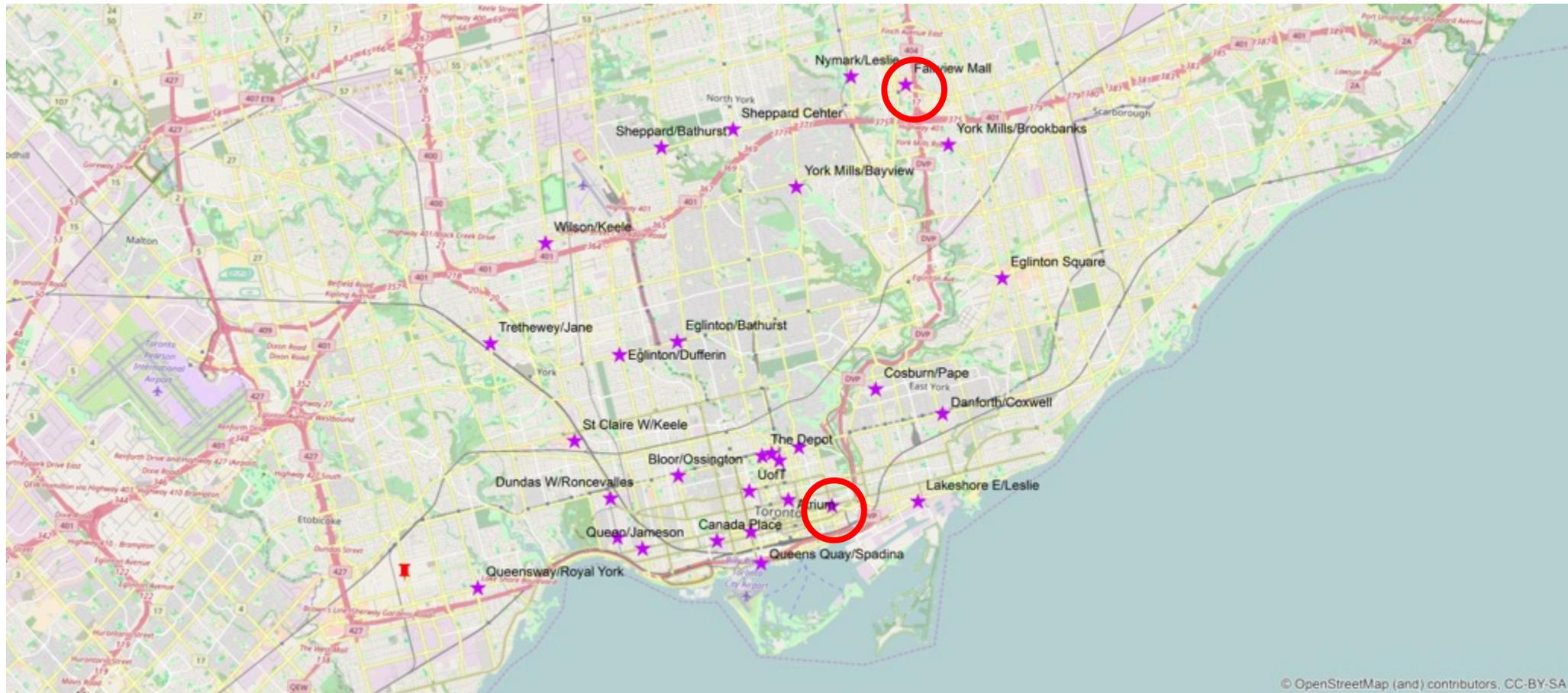
© OpenStreetMap (and) contributors, CC-BY-SA

At Facility Cost $g = 0.85$

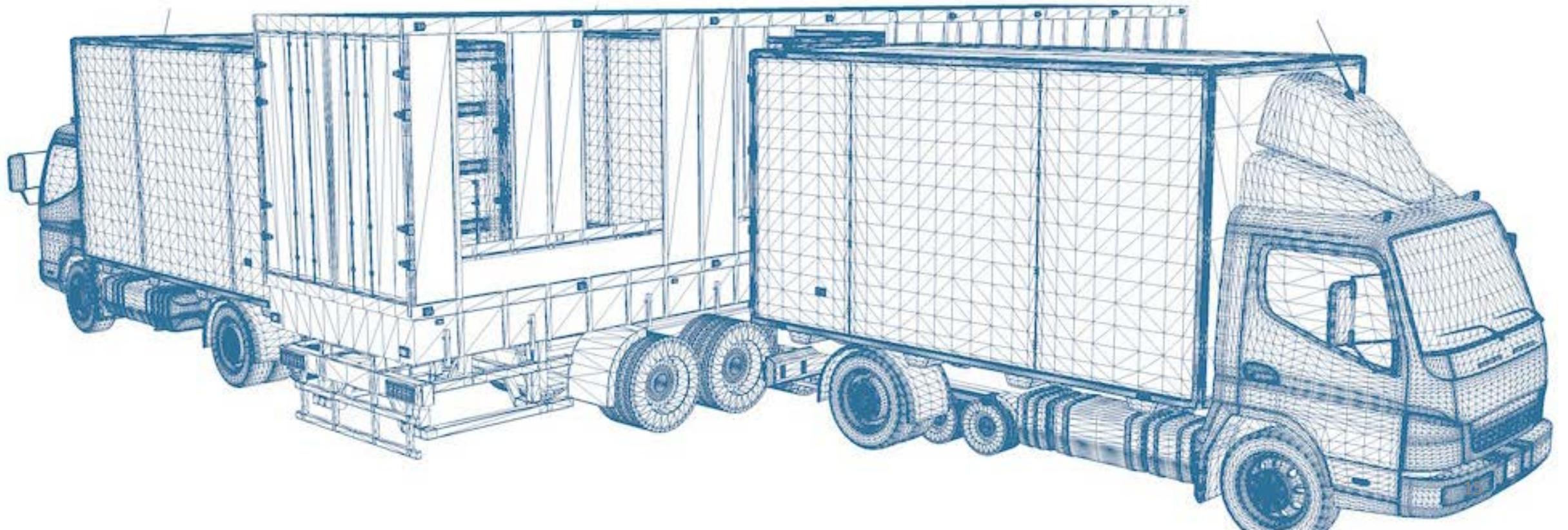


© OpenStreetMap (and) contributors, CC-BY-SA

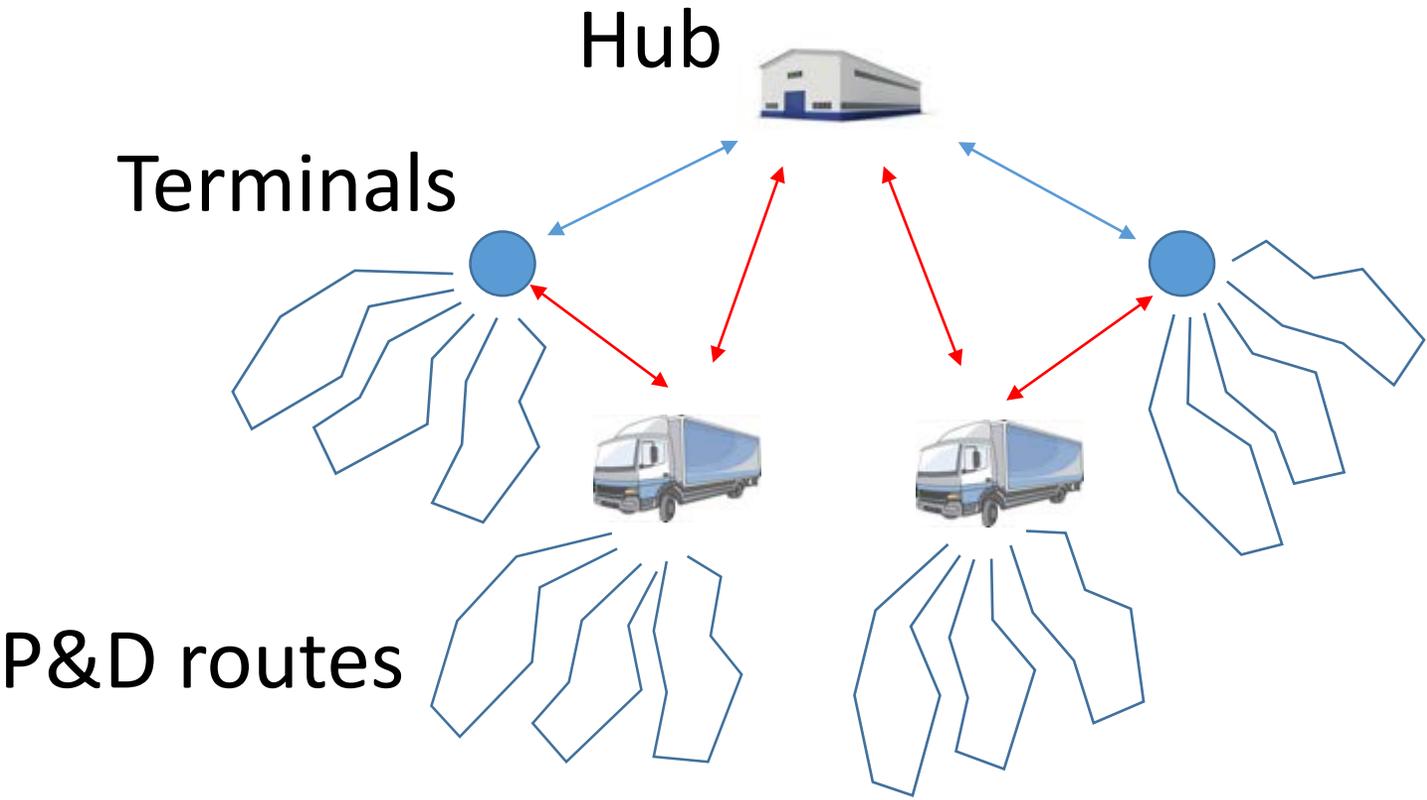
At Facility Cost $g = 0.95$



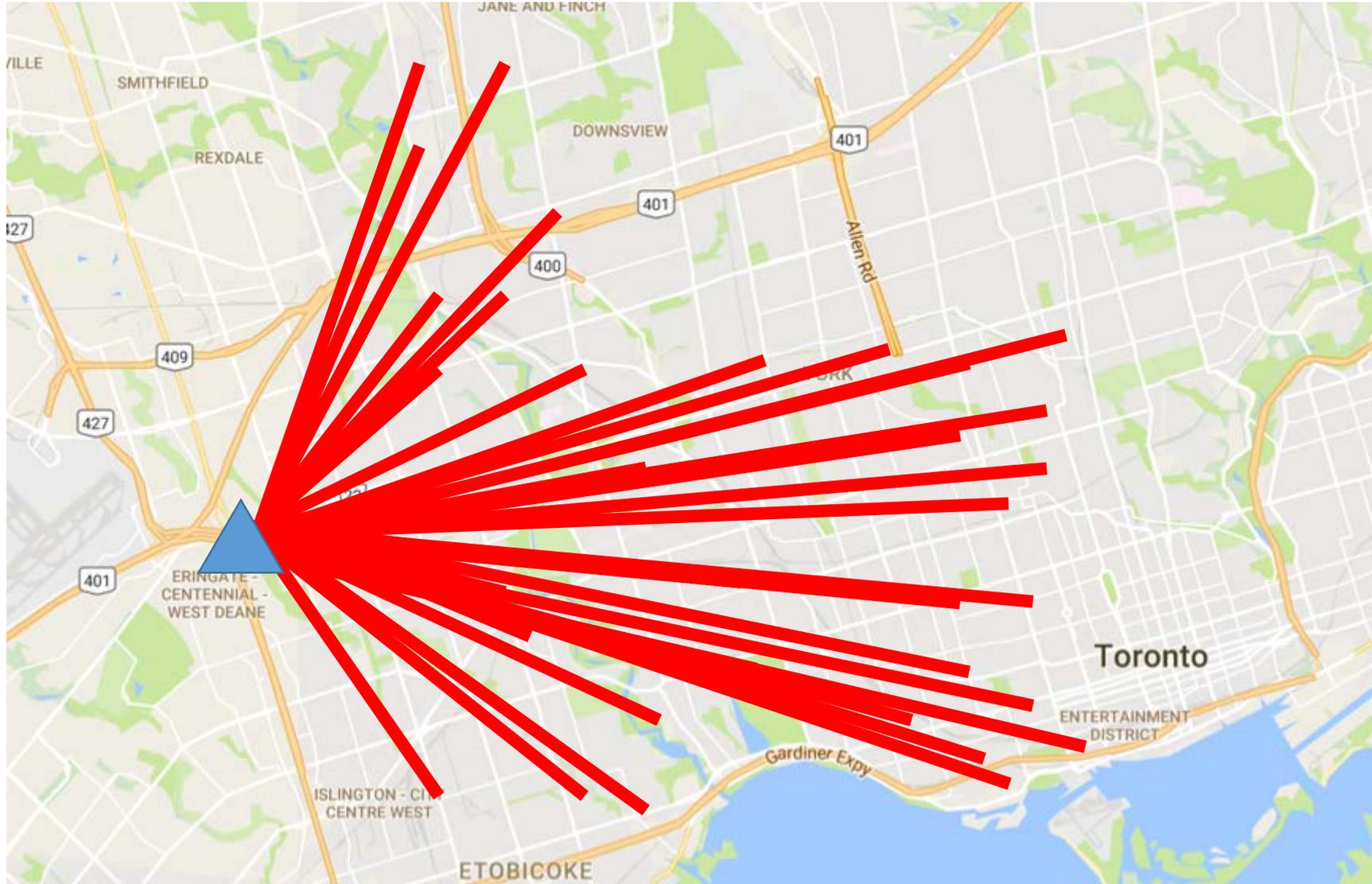
Mobile Hubs



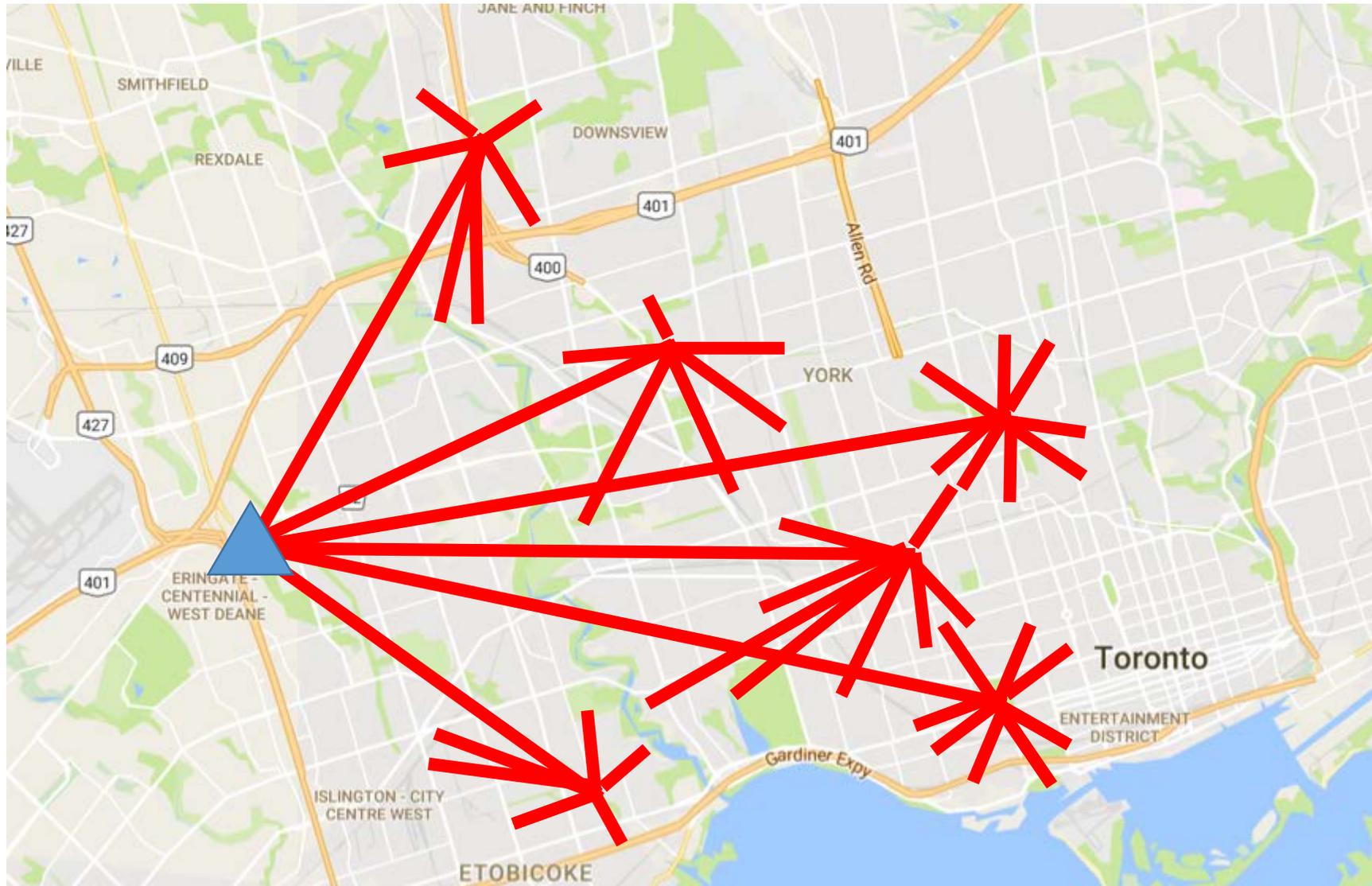
Mobile Hubs in The Distribution Network



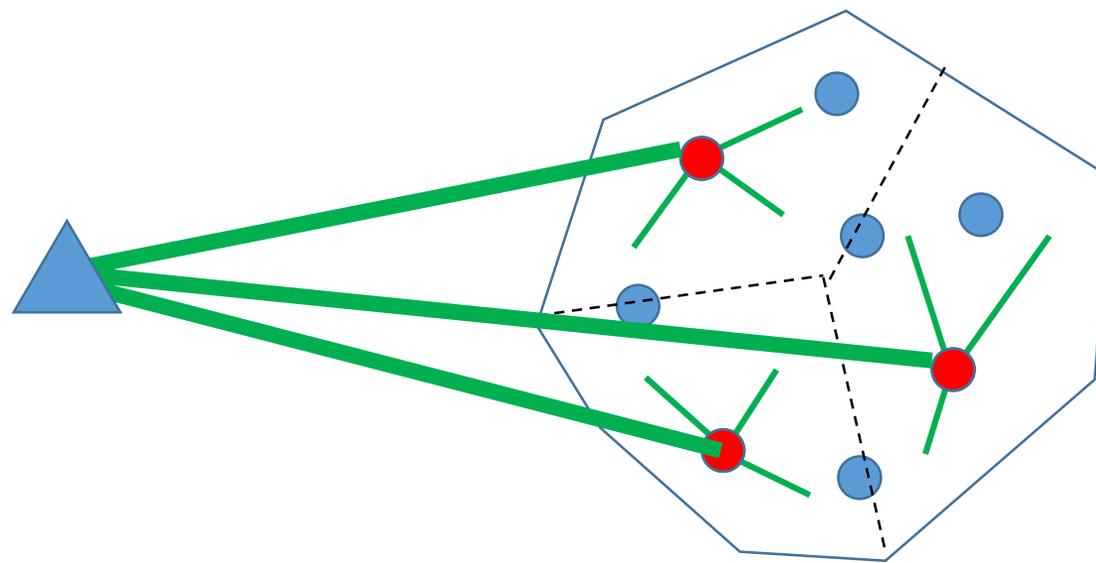
Base Case (Without Mobile Hubs)

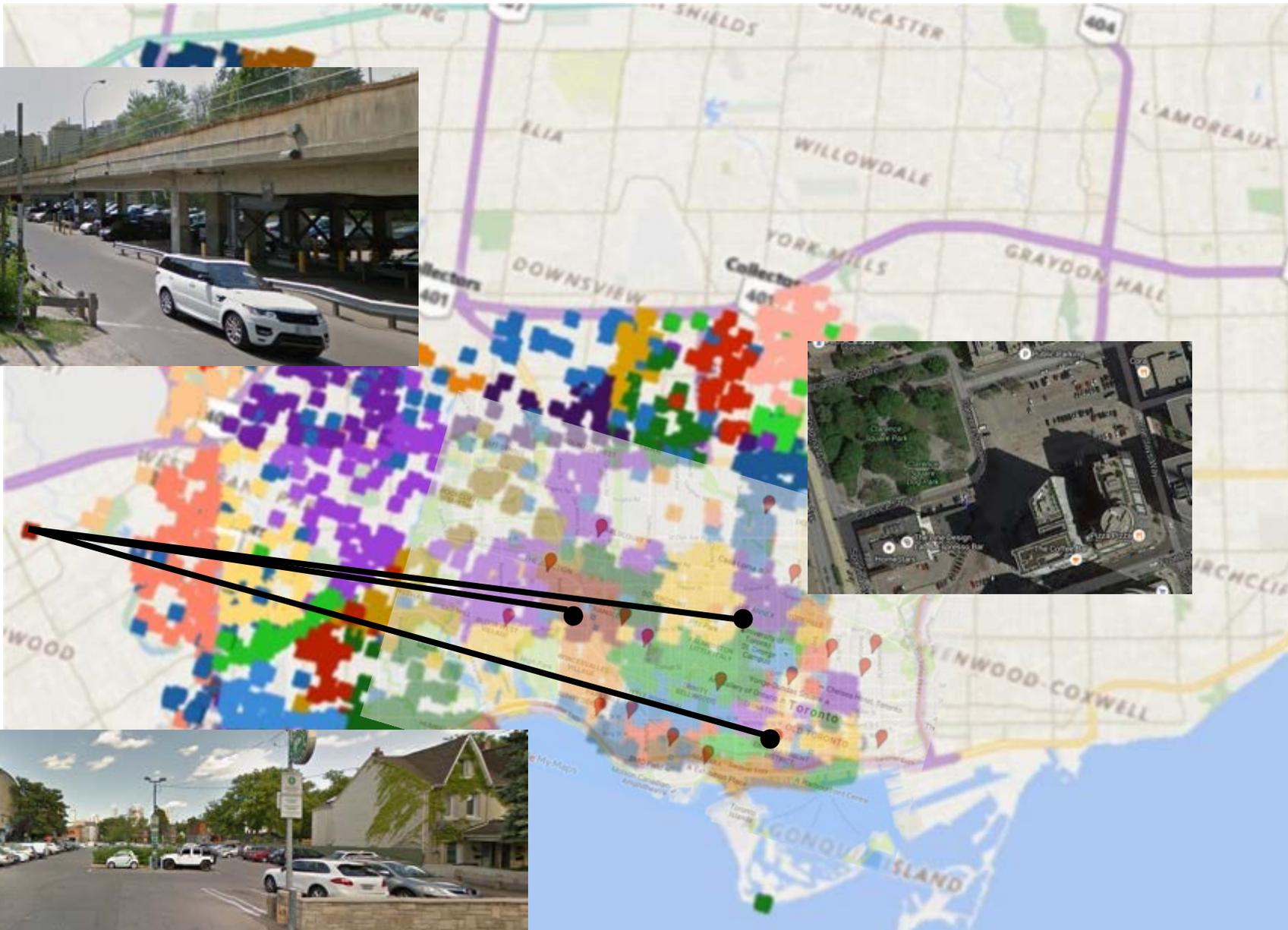


Impact of Mobile Hubs on The Line-Haul Distance



Locating Mobile Hub Locations (parking lots)



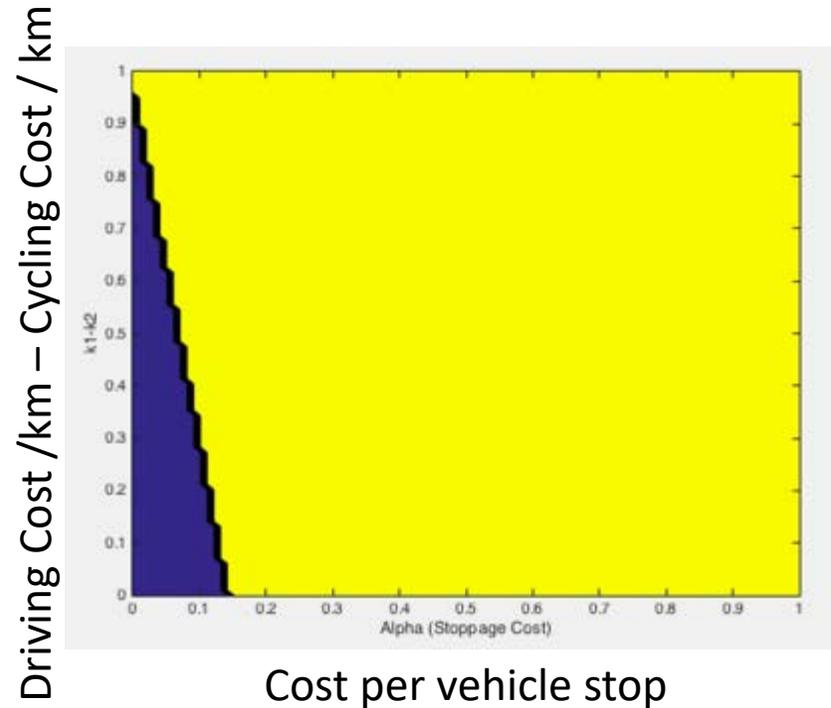


Express Tricycles

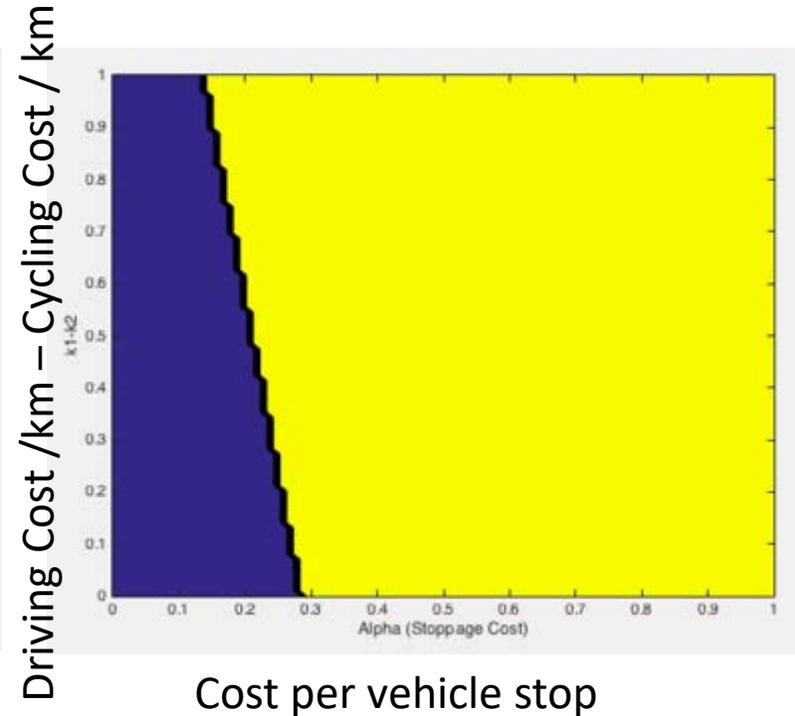


Quantitative Analysis of Eaton Centre Walk Network

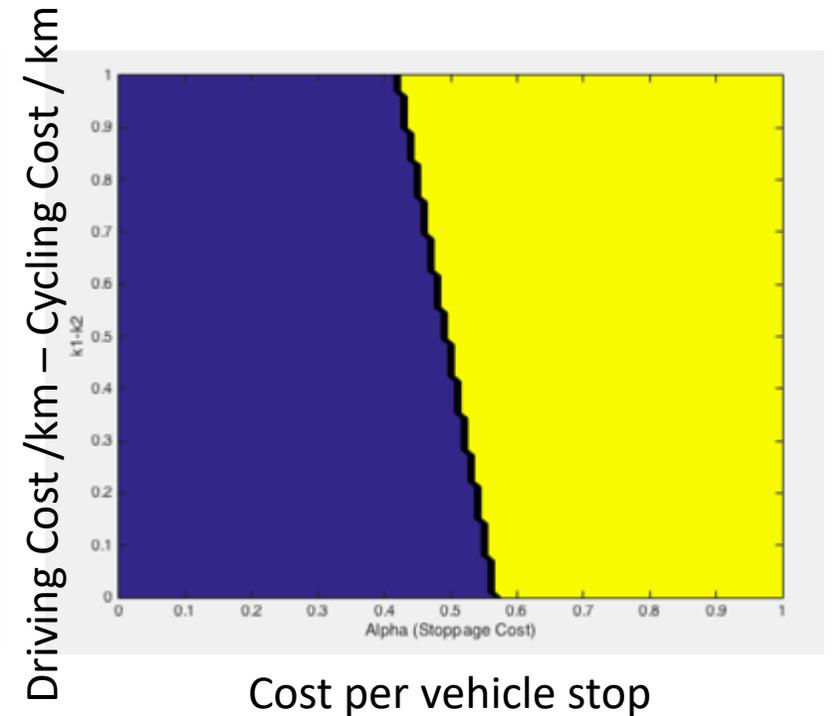
$g = \$500/day$



$g = \$1000/day$



$g = \$2000/day$



Yellow: Build the cycling facility
 Blue: Do not build the cycling facility

Key findings

- Mobile hubs reduce the line-haul cost
- Pack stations reduce the local travel cost
- The effectiveness of a mobile-hub relies on the size of the line-haul trucks and the distance between the terminal and the service area
- The effectiveness of pack stations relies on the amortized cost of operating each pack station and the delivery density around the station

Questions?