Thesis Reader

J. Meejin Yoon
Associate Professor of Architecture
THE OPPORTUNISTIC GREEN

Building on Toronto's Utility Corridor

by

Kamyar Rahimi

Submitted to the Department of Architecture on January 16, 2014 in partial fulfillment of the requirements for the Degree of Master of Architecture

ABSTRACT

The Green Line or hydro corridors of Toronto are sprawling lengths of continuous, mostly vacant land used for the primary purpose of transmitting electricity. They are unusual terrain, physically sparse but culturally intense. Stippled with electrical towers, planned in acres of mowed grass, they hold the promise of light, energy and power. Within a 125 mile radius of downtown Toronto, there are approximately 8,145 acres of land passing through a wide range of neighborhoods and fabrics—yet they currently have very little to offer beyond the transmission of electricity. The stigma of living next to these high voltage power lines—with their aging infrastructure and the health hazards associated with the hydro towers—has resulted in a dearth of development along these corridors.

This thesis investigates the opportunities created by reclaiming one of these public corridors, which is currently an underutilized urban void. The decision to bury the high voltage power lines underground creates a space for economic and social opportunities. The new programs promote potential for social and economic growth and come together in a unique narrow and linear site condition. As an urban strategy that brings together domestic culture with infrastructure and manufacturing, this project can create a radical and innovative urban fabric. By introducing a new underground transportation line and densifying the area around the stops, the new urban fabric could be organized as a sequence of urban centers, while promoting the preservation of the remaining green corridor.

The opportunistic corridor will be a series of high density to low density spaces coupled with manufacturing hubs that ultimately add cultural and real estate value to the surrounding neighborhoods. Consequently, one of the most profane areas of the city, associated with chronic toxicity, could be transformed into one of its most desirable neighborhoods.

Thesis Supervisor: Adèle Naudé Santos

Title: Professor of Architecture and Urban Planning
ACKNOWLEDGMENTS

This thesis would not be possible without the support and guidance of my thesis committee.

To Adele Santos for your tremendous assistance and support in shaping this journey. Your thoughtful insights have deeply enriched this project. I especially thank you for being simultaneously critical and supportive at all stages of this journey. This thesis would not have been possible without your support.

To Meejin Yoon for your comments, support and energy. Your comments added new layers of depth to the thesis.

To Sayjel Patel, Sam Ghantous and Alexis Sablone for your tremendous help, patience to realize this thesis.

To my family, for your unconditional love and support.

To Great friends, Iman, Kyle, Amir, Daeho for the brainstorms and share of ideas and support.
TABLE OF CONTENTS

The Green Lines/Hydro Corridors.................................................................9
  Definition
  Site images
  Current land use

The City of Toronto’s policy regarding Electromagnetic Fields (EMF)........22

Economical potential for the Green Lines................................................24

Green Line demographics........................................................................28
  Green Corridors
  Income distribution
  Industrial & commercial
  Residential
  Transportation network
  Proximity to HW & downtown core

Site conditions..........................................................................................32

The new urban proposal for the Green Line..............................................38
  Proposal
  Context
  Adjacencies
  The new parcels
  The continuous green

The new Opportunistic Green.................................................................46
  Site plan: “phase 1”
  Building: podium + tower
  Underground electricity + subway

Appendices...............................................................................................82
  Appendix A - physical models
  Appendix B - final presentation boards

Bibliography.............................................................................................98
THE GREEN LINE / HYDRO CORRIDORS

The Green Line or hydro corridors of Toronto are sprawling lengths of continuous, mostly vacant land used for the primary purpose of transmitting electricity. They are unusual terrain, physically sparse but culturally intense. Stippled with electrical towers, planned in acres of mowed grass, they hold the promise of light, energy and power. They combine immense cultural equity with an underwhelming physical existence.

Currently, Toronto is highly reliant on long-distance power transmission with just 2% of the electricity consumed within the city actually produced within its boundaries. These hydro corridors cut through a wide range of urban fabrics and neighborhoods, from residential, parks, ravines to highways and roads.

Aside from the primary use of transmitting electricity, these corridors are used by local adjacent residents for as splash pads, sports fields, allotment gardens, parking lots and children’s playgrounds. However, these spaces are mostly in poor condition and the corridor currently does not provide a continuous physical connection due to grade changes, fencing and lack of planning.

STATISTICS

Toronto’s hydro corridors offer:

- 8,145 acres in a 125 miles radius
- utility serves approximately 705,000 customers
- 24 primary switches
- 60,500 distribution transformers
- 15,000 kilometers of overhead wires supported by
- 139,900 poles
- 1 control center
GREEN LINE - CURRENT LAND USE

Established in 1911, Toronto Hydro is the largest municipal electricity distribution company in Canada. Toronto’s hydro corridors serve approximately 705,000 customers by transmitting electricity through 8145 acres of land in a radius of 125 miles. While the primary purpose of hydro corridors is to transmit electricity, the government allows access to transmission corridor lands for secondary uses, including parks and trails, road crossings, water and sewer pipelines and parking lots for transit and commercial facilities, through the Provincial Secondary Land Use Program (PSLUP).

On June 27, 2002, the Ontario government passed the Reliable Energy and Consumer Protection Act. This act, among other things, transferred ownership of approximately 50,000 acres of transmission corridor lands previously owned by Hydro One to the Ontario government. This transfer ensured that these transmission corridor lands would continue to be available for uses that benefit the public, such as infrastructure, transportation and recreation.

While the primary purpose of the hydro corridor is for transmitting electricity. Permitted secondary uses in the City of Toronto are as follows:

- Public uses on transmission corridor land include, but are not limited to, transportation (roads, transit, walking and cycling trails, parking), infrastructure (storm water management and essential
public services) and recreation uses (parks, trails, playing fields, agriculture).

- Public uses generally will have priority over private ones. Private uses may include, but are not limited to, parking lots, open storage and agriculture.

The hierarchy of secondary uses is as follows:

- New linear public uses have top priority (roadways, bus ways, walking and bike trails or water/sewer lines)
- New provincial/inter-regional linear public uses have priority over local uses
- New non-linear public infrastructure uses have priority over private uses
- Non-linear recreational uses have priority over private uses
- Multi-use corridors are preferred

Linear uses are those that run parallel to the transmission corridors while Non-linear uses are those that use only part of the transmission corridor.

(Infrastructure Ontario: http://www.infrastructureontario.ca/Templates/Lands.aspx?id=2147484017&langtype=1033)
http://cheapticketszone.com/tag/romance/
CENTRAL PARK VS. HYDRO CORRIDOR

Located in the heart of Manhattan, Central Park was designed as a contained rectangle as opposed to the narrow and zig-zagging character of the hydroline. The dimensions of central park, 1 km x 8km allow creation of a picturesque park. However, the hydro Line does not allow for creation of multiple views and picturesque park. Also Central park similar to most park is surrounded by the most expensive real estate in the city. Re-programming the Hydro Corridor as a linear and continuous park will allow the boost in real estate value adjacent to the corridor. If Central park is divided into strips with the same width of the hydro corridor, it could create 5 linear parks with the length of 45km. Thus the added value of Hydro Corridor as a park will be must greater than any central park.

1 Central Park (1km x 8 km) = 5 Hydro Lines (0.1 km x 45km)
magnetic field level

1. in hydro corridor middle
2. in hydro corridor 10 m away
3. edge of hydro corridor
4. at home adjacent to corridor
5. at work place adjacent to corridor
6. away from the corridor

30 mG
11 mG
THE CITY OF TORONTO'S POLICY REGARDING ELECTROMAGNETIC FIELDS

1970S - 2003

The potential health impact of electromagnetic fields (EMF) from power lines came to public attention in the late 1970s, when a study found a possible association between childhood leukemia and proximity to transmission lines. In 1993, based on the evidence then available, the former City of Toronto adopted a policy of prudent avoidance, which encouraged limiting exposure to EMF in public spaces where practical and feasible at Electromagnetic Fields and Hydro Corridors for little or no cost. The 1993 policy was implemented on a case by case approach, and included recommendations such as: requesting that utilities use technology to mitigate magnetic fields locating playgrounds, day care centers and schools away from power lines and transformers, and ensuring that new residential units are as far away from power lines as possible and at least as far as other residences in the same area.

2008

In a report by Toronto Public Health that was approved by the City of Toronto’s Council in 2008, the City’s position on Electromagnetic Fields (EMF) was outlined as follows:

The International Agency for Research on Cancer (IARC) classifies the magnetic component of EMF as a possible carcinogen because of the association between exposures to EMF magnetic fields in the home and childhood leukemia. Given the possible link between the exposure to EMF and an increase in the risk of leukemia in children, taking practical low or no-cost actions to reduce exposures to young children is prudent. This report proposes that the City continue with a policy of prudent avoidance and take simple steps that would minimize exposures to EMF from hydro corridors for young children. It recognizes that recreational, trail and park uses of hydro corridors have health benefits for children and adults who use them which outweigh any potential risk from EMF exposure.

NOW

The attitude toward the use of hydro corridors have changed due to the recent studies showing that the overall increase of exposure to EMF from the use of parks, recreational facilities, trails, and community gardens in or next to hydro corridors can continue without raising a user’s 24-hour average exposure level more than 1 or 2 mG if exposure assessments are used to guide the placement of amenities. Toronto Public Health concludes that under such circumstances, the benefits outweigh any potential risk that might result from the increase in exposure to EMF.

At present the City has agreements for 22 soccer fields, 5 playgrounds, 5 cricket pitches, 7 baseball diamonds, approximately 6000 meters of trails and 10 garden allotments in hydro corridors. The City also has storm water retention ponds located in hydro corridors. The City has identified additional areas within hydro corridors as suitable for potential new park and recreational uses. If all such areas were made available, this would double the amount of space devoted to such uses in hydro corridors.
In the recent years, Canada has become a noted power player in the development of the international high tech field. Canada’s large number of skilled workers, its strong economy and its close proximity to the United States are among the reasons for this development.

Within this context, Toronto, the financial capital of Canada, has a rich technology ecosystem with remarkable breadth and depth. The rising number of tech firms and startups in various subsectors—such as robotics, enterprise software, film, manufacturing and broadcasting—combine to create a dynamic and vibrant High-Tech Hub. Currently, the technology industry, representing over 11,500 firms, employs 161,000 workers in Toronto alone.
Nonetheless, at the moment high tech firms are scattered throughout the Greater Toronto Area without a concentrated hub, such as Palo Alto in Silicon Valley. As a result, positioning Toronto’s High-Tech sector for intense global competition calls for not only talent and investment, but also the development of a central and iconic hub to establish and maintain its status as a high tech power house.

The decision to bury the high voltage power lines of the Green Line would create a space to address this economic and social opportunity. As a result, from an area known for aging infrastructure within the city’s electrical grid, the possibility arises to create a desirable high tech hub combined with other types of development. As an urban strategy that brings together domestic culture with infrastructure and manufacturing, this project posits the creation of a new radical and innovative urban fabric.
funding from Canada Foundation for Innovation

Numbers of Research & Innovation (ICT) patents

High Tech. venture capital investment

funding from Canada Foundation for Innovation
The Green Line or hydro corridors of Toronto are sprawling lengths of continuous, mostly vacant land with the primary purpose of transmitting electricity. Within a 125 mile radius of downtown Toronto, there are approximately 8,145 acres of land passing through a wide range of neighborhoods and fabrics, yet which currently have very little to offer beyond the transmission of electricity. The section of the Green Line chosen for this project is unique: it cuts through regions of low and high density as well as areas zoned residential, commercial and industrial. It represents the intersection of various major urban fabrics and acts as a connection between previously discrete units, integrating and uniting different types of development and diverse communities.
The site chosen for this development offers many economic advantages. It intersects the existing subway system and is easily accessible to major highways in Toronto, thus enabling the easy flow of workers and goods into and out of the Green Line. Its close proximity to downtown is also an advantage, making it accessible to all of Toronto. Nonetheless, it also provides a social benefit, by weaving immigrant neighborhoods that have traditionally being socioeconomical disadvantaged—in part due to the vacant and undesirable nature of the undeveloped Green Line—into the broader fabric of Toronto, simultaneously spurring economic development while benefitting the surrounding communities.
transportation network
subway system

proximity to HW &
downtown core
SITE CONDITIONS

residential

retail
industrial

green
GREEN AREA: Don Ennor & Wadkr

Retail: major retail floor 40,000,000 sq ft
THE NEW URBAN PROPOSAL FOR THE GREEN LINE - PROPOSAL

The Green Line or hydro corridors of Toronto are sprawling lengths of continuous, mostly vacant land used for the primary purpose of transmitting electricity. This thesis investigates opportunities created by reclaiming one of these public corridors, which is currently an underutilized urban void. The decision to bury the high voltage power lines underground creates a space for economic and social opportunities. The new programs promote potential for social and economic growth and come together in a unique narrow and linear site condition. As an urban strategy that brings together domestic culture with infrastructure and manufacturing, this project posits the potential for a radical and innovative urban fabric. By introducing a new underground transportation line and densifying the area around the stops, the new urban fabric could be organized as sequence of urban centers, while promoting the preservation of the remaining green corridor.

The opportunistic corridor will be a series of high density to low density spaces coupled with manufacturing hubs that will ultimately add cultural and real-estate value to the surrounding neighborhoods. Consequently, one of the most profane areas of the city, associated with chronic toxicity, could be transformed into one of its most desirable neighborhoods.

Due to the large scale of the corridor and ambitions of the thesis, the development of the three urban centers occurs in multiple phases. Each phase could occur through the following steps:

1. Burying the high voltage power line.
2. Government funding to high-tech companies and startups.
3. Residential, cultural, educational and recreational development not only for the future employees of these companies but also for the neighborhoods adjacent to the corridor.
4. The new urban centers are sensitive to the adjacent neighborhoods. Thus, the height, programs and typologies of buildings are influenced by the neighboring urban fabrics.
5. A new underground subway line to be paired with the buried high voltage power line. The new subway line not only connects the urban centers along the line, but also connects the green line to the larger network of Toronto’s subway transportation system.
6. In order to maintain the continuity of green through the Hydro Corridor, a continuous band of forest/green runs through the urban centers.
7. A bike lane runs through the entire 2.5 kilometers of the corridor, connecting the already existing yet disconnected series of bike paths along the Green Line.
The new Urban Proposal for the Green Line - the new parcels

- Zone 1: commercial, residential, incubator, industrial
- Zone 2: educational, residential, recreational
- Zone 3: research facilities, housing, recreational
The new Urban Proposal for the Green Line - the continuous green

- surrounding the podium
- extending along the corridor
- positioned in-between the buildings
The new Urban Proposal for the Green Line - Context
The new Urban Proposal for the Green Line - adjacencies
The new Urban Proposal for the Green Line - continuous bike path

The new Urban Proposal for the Green Line - subway stations
The new Urban Proposal for the Green Line - parking distribution

The new Urban Proposal for the Green Line - vehicular circulation
THE NEW OPPORTUNISTIC GREEN: "PHASE 1" SITE PLAN
1. podium & tower
2. small manufacturing
3. forested green
4. med-rise residential buildings
5. low-rise residential townhouses
6. recreational outdoor space
7. bike path
8. existing midrise housing fabric
9. existing lowrise housing fabric
1. podium & tower
2. small manufacturing
3. forested green
4. water retention pond
5. low-rise residential townhouses
6. existing highrise housing fabric
7. existing lowrise housing fabric
1. indoor parking
2. educational facilities
3. sport- recreational corridor
4. bike path
5. forested green
6. low-rise residential townhouses
7. existing lowrise housing fabric
8. existing highrise housing fabric
9. existing industrial fabric
1. podium & tower
2. community gardens
3. forested green
4. low-rise residential townhouses
5. existing research facilities
6. new incubator spaces
7. bike path
8. existing lowrise housing fabric
1. podium & tower
2. forested green
3. existing research facilities
4. new incubator spaces
5. new large research facilities
6. bike path
7. existing lowrise housing fabric
BUILDING: PODIUM + TOWER

As an urban strategy that brings together domestic culture with infrastructure and manufacturing; this project can create a radical and innovative urban fabric. By introducing a new underground transportation line and densifying area around the stops, the new urban fabric could be organized as sequence of urban centers while promoting the preservation of the remaining green corridor.

The density around each subway stop is achieved by an iconic development, consisting of a podium and series of residential/commercial towers above it. To defray public investment the project offers a podium of civic space, layered with incubators, markets, culture and commerce. Thus, the podium seeks to be the destination for the residents of the towers, employees and commuters. Further, the ring-shaped podium is positioned to create a courtyard that serves as a recreational space and place of leisure for the surrounding neighborhood and the residents of the towers. Surrounded by forest in all direction, these high density developments become the defining signature of the Hydro Corridor.
residential & commercial - towers

commercial & exhibition - podium

subway & parking - underground
parks

office corridors - podium

vertical circulation
1. new mid-rise residential
2. main street
3. loading & access to parking
4. grocery store
5. highrise entrance/lobby
6. market
7. office corridor entrance
8. shopping mall
9. subway entrance
10. cultural facility
11. exhibition space
12. electronic/tech. shops
13. parking entrance
14. community garden
15. outdoor recreational facility
16. park
17. forested green
18. small manufacturing
19. bike path
20. car accessible roads
21. pedestrian roads
UNDERGROUND ELECTRICITY + SUBWAY

Each subway stop represents an iconic development, consisting of a podium and series of residential/ commercial towers surrounding it. To defray public investment the project offers a podium of civic space, layered with offices, markets, culture and commerce. Thus, the podium seeks to be a destination for the residence of the towers, their employees and commuters. Further, the ring-shaped podium is positioned to create a courtyard that serves as a recreational space and place of leisure for the surrounding neighborhood and the residence of the towers. Surrounded by the forest in all directions, these high density developments would be the defining signature of the Hydro Corridor.

The high-voltage power lines will be sunk beneath the earth but still represented physically in the space of the Green Line by the presence of water retention ponds directly above the underground structures transmitting the power. In moments, the canals will reflect and honor the original purpose of the Green Line while reminding the inhabitants of the original character of the site.

Within the subway entrances in the podiums, there will be raised sculpted concrete structures holding the high-voltage power lines, again serving to hint at the original industrial character of the site while providing a visual representation that reminds us of the power being transmitted through and beneath the current structure.
SECTION: PODIUM / TOWER
SECTION: WATER RETENTION POND / SMALL MANUFACTURING
SECTION: SUBWAY ENTRANCE / PODIUM / TOWER
APPENDICES

APPENDIX A - PHYSICAL MODELS

APPENDIX B - FINAL PRESENTATION BOARDS
APPENDIX B - FINAL PRESENTATION BOARDS
THE OPPORTUNISTIC GREEN
building on Toronto's utility corridor
BIBLIOGRAPHY


