

# Toronto Transit: BACK ON TRACK

Sheppard Subway Development  
and Financing Study



**Interim  
Report**

Toronto Transit Infrastructure Limited

**Executive Committee  
Toronto City Council**

**February 13<sup>th</sup> 2012**



# Questions Examined

---

## Three Questions *Back on Track* Examined for the Sheppard Corridor

1. **Why Subway?**
2. **What is the Cost of the Sheppard Subway Extensions (East and West)?**
3. **How to Finance the Capital Costs for the Sheppard Subway Extensions?**

**No budget provided by the TTC to undertake:** Geotechnical/Engineering Analysis, Detailed Delivery Model Analysis, Value for Money Analysis, Integrated Analysis, Procurement Analysis ...



# Why Subway?

---

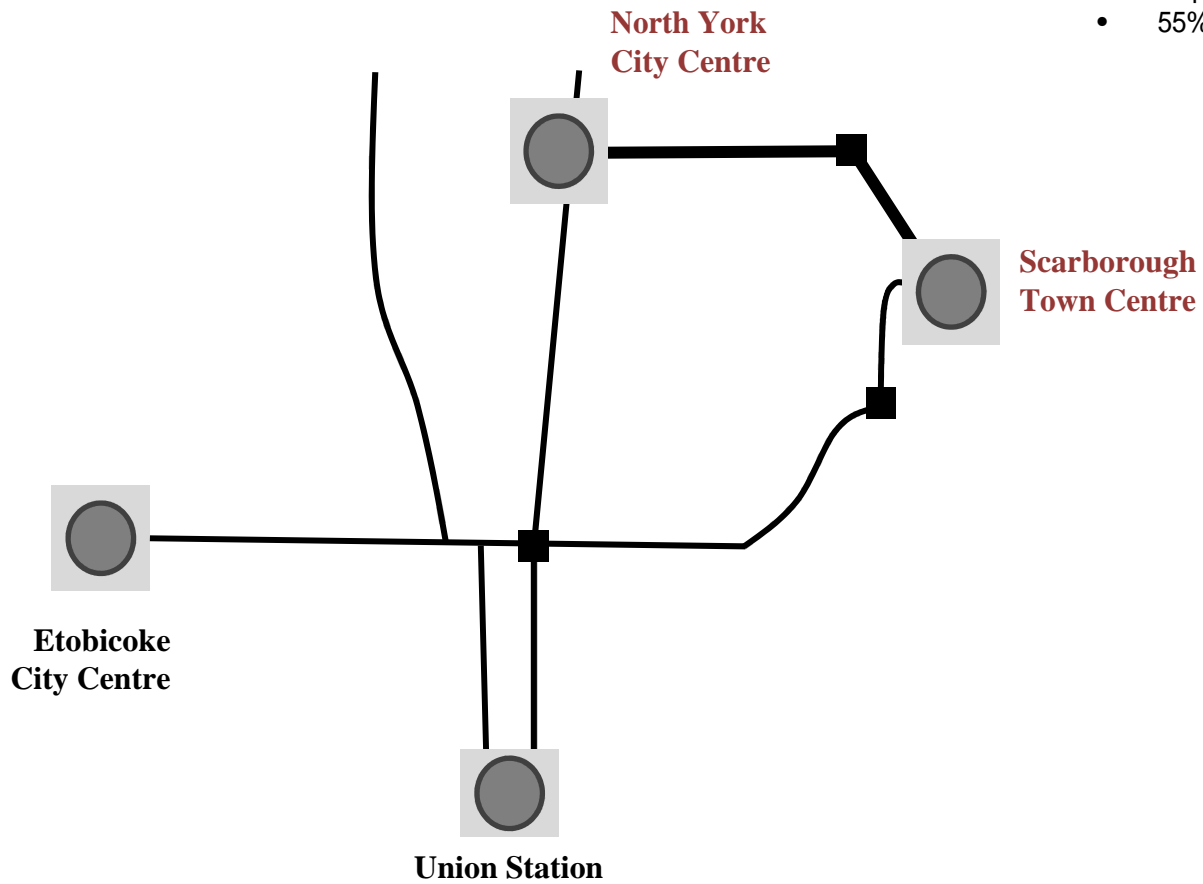
The GTA population will double from 6 million to **12 million** over the next fifty years (2012-2062)

*N Barry Lyon Consulting*



# Why Subway?

## Major Centres Plan, Metro Toronto, 1980



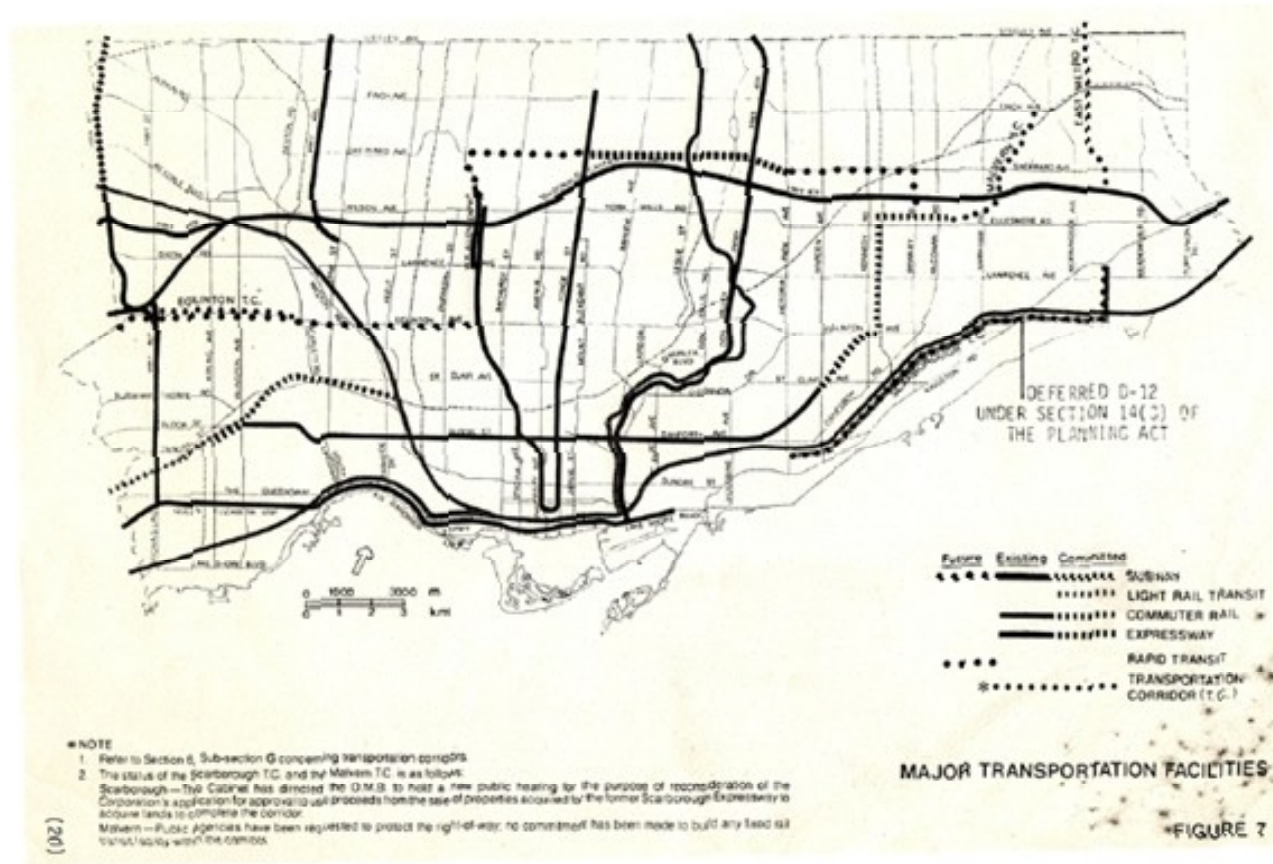
### Scarborough Official Plan

- Promote the role of the City Centre
- Rapid transit to and from City Centre
- 55% of City office workers arrive by transit



# Why Subway?

## Sheppard Subway Approval, 1986



# Why Subway?

---

## Sheppard Subway: Top Transit Priority for 30 Years (Metro Toronto/City)

- 1975** **Decision to scrap Queen Street subway and support "suburban" subway development (Metro Council)**
- 1982** Accelerated Rapid Transit Study (Metro Council/TTC)
- 1983** **Long Range Plan (TTC)**
- 1984** Sheppard Finch Rapid Transit Corridor Study (Metro Council/TTC)
- 1985** Network 2011 - A Rapid Transit Plan for Metropolitan Toronto (Metro Council/TTC)  
Scarborough Council request Metro Council establish Sheppard Subway as No. 1 Priority
- 1986** **Network 2011 – Final Report (Metro Council/TTC)**
- 1987** Future Transportation Needs in the GTA (Metro Council/TTC)  
Sheppard Subway Functional Planning Studies (TTC)
- 1988** Provincial Transit Review: Transportations Directions
- 1990** Sheppard/Finch Short Term Transit Improvement Study (Metro Council/TTC)  
Sheppard Subway Property Protection Study (Metro Council/TTC)  
**Provincial Announcement: Let's Move (April)**  
Let's Do It – A Joint Response and Implementation Study (Metro Council/TTC)
- 1991** Sheppard Subway Financing Study (TTC)
- 1992** Sheppard Subway Environmental Assessment (TTC Completed)
- 1993** Provincial Announcement: Rapid Transit Expansion Program  
Sheppard Subway Design/Construction Began (TTC)
- 1994** **Sheppard Subway Environmental Assessment (Province Approved)**  
Official Plan Adopted (Council Approved)
- 1996** Sheppard Subway - First Segment Funding Approval (Metro Council Re-Confirmed Commitment)
- 1997** Sheppard Subway Construction Begins  
Sheppard Subway DC Bylaw Approved (Metro Council)
- 1998** **Sheppard Subway Station Design Released (Designed to Accommodate Extension)**
- 1999** City: Development Charges Bylaw Approved by City of Toronto
- 2001** Sheppard Subway Extension Study Approved (TTC)
- 2002** Sheppard Subway Line, Yonge to Don Mills Segment, Opened (November)  
Official Plan Approved (protecting Sheppard for "higher order transit" (Council Approval)  
**Ridership Growth Strategy (March) (TTC Adopted)**
- 2005** Building a Transit City: Subways (TTC)
- 2006** **Comprehensive Rapid Transit Plan for Scarborough (August) (TTC)**



# Why Subway?

## Environmental Assessment, 1992

### Factors examined for Sheppard corridor:

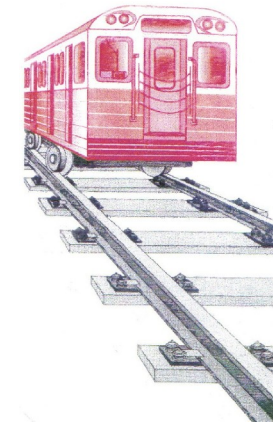
- GTA Population and Employment Forecasts
- Road System, Traffic Volumes
- Existing Transit, Modal Split
- Congestion – Surface Needs
- Inter-regional Transit Integration
- Travel Demand

### Alternatives Examined:

- Do Nothing
- Other – Road Widening ...
- **Rapid Transit**  
Guided Buses, Streetcars, Light Rail Transit at Grade,  
Light Rail Transit Grade Separated, Automated Light Rail,  
Heavy Rail Transit (Subway)

### Alternatives (Technology/Alignment ...) Examined Against:

- Social Environment
- Natural Environment
- Land Use (Metro Official Plan, Scarborough Official Plan)
- Capital and Operating Costs



Announced as part of  
“Let’s Move” program,  
1990

Approved by Premier  
Bob Rae, 1994



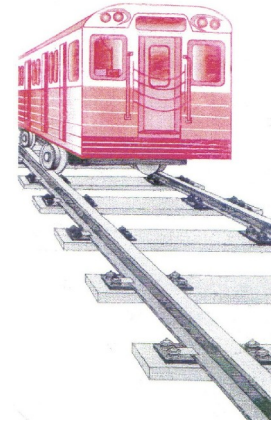
# Why Subway?

---

## Environmental Assessment Conclusion, 1992

*“While the initial capital costs for some options (e.g., busway, LRT) would be less expensive than a subway, they offer reduced quality of service, result in increased congestion on the road network, have negative environmental impacts on the local community, are unable to achieve future land use objectives, fail to respond to future ridership growth and carry increased operating costs.*”

***If Metropolitan Toronto is to fully achieve its urban structure, environmental and social goals, while at the same time choosing a technology with the most economical (capital and operating costs) performance in the long run, a subway along Sheppard Avenue is the preferred choice.”***



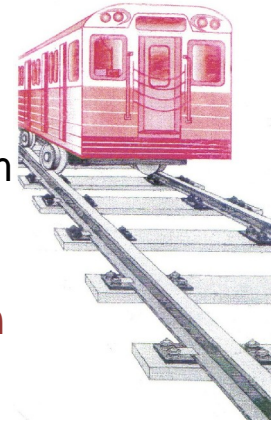


# Why Subway?

---

## Transportation

- LRT restricts more kilometres of **road** during construction, and reduces **road capacity** after – major impact on road network
- LRT has no **reserve capacity**, insufficient **carrying capacity** to meet future demand  
reduced platform size
- LRT is less **reliable**
- LRT provides less **network flexibility**, and less potential for **subway expansion**
- LRT is less appealing to the **target ridership** due to lower quality of service (speed, capacity, exposed to elements)
- LRT (2008 alignment) provides poorer quality inter-regional/rapid transit **transfers**
- LRT has greater restrictions for **persons with disabilities**
- [More transfers less attractive, fewer riders]



## Social Environment

- LRT displaces more **residential units**
- LRT displaces more **jobs**
- LRT impacts more **driveways**
- LRT restricts access to more **intersections**
- LRT affects more **heritage** resources
- LRT affects more **archaeological** resources



# Why Subway?

## Environment

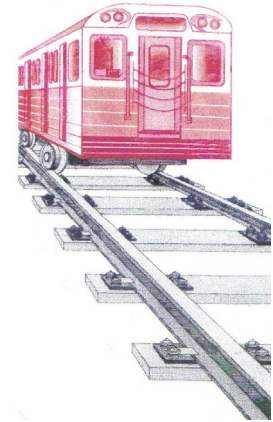
- LRT results in higher ambient **noise** levels
- LRT results in negative **visual** impacts

## Capital and Operating Costs

- LRT is less **cost effective** over the long run, and has significant **operating costs** in perpetuity
  - ✓ LRT less competitive **per passenger** carried (model - 15,000 pphpd)
  - ✓ LRT **vehicles** cost more than subway, and **storage** costs greater than subway
  - ✓ LRT **annual operating** costs greater than subway
  - ✓ LRT requires more **property acquisition**, and greater impact on municipal taxes
  - ✓ LRT **capital costs** only 15% less than subway at 15,000 pphpd
  - ✓ LRT **other costs** greater than subway – e.g. congestion, environment, social, land use, economic growth
- Comparability – LRT costs must include cost of **extending SRT** from SC

## Land Use

- LRT (2008 alignment) inconsistent with **Official Plan** (Metro and Scarborough) ; no **direct access between** North York Centre and Scarborough City Centre, increase **travel time** by 10 minutes



# Why Subway?

## Route Alignment

Network Diagrams	Description
	<ul style="list-style-type: none"> <li>- Subway directly into S.C.C.</li> <li>- SRT extension to Sheppard/Markham</li> <li>- Subway/SRT transfer at S.C.C. and at Bloor/Danforth</li> </ul>
	<ul style="list-style-type: none"> <li>- Subway along Sheppard to Sheppard/Markham</li> <li>- SRT extension to Sheppard/Markham</li> <li>- Subway/SRT transfer to Sheppard/Markham and at Bloor/Danforth</li> </ul>
	<ul style="list-style-type: none"> <li>- Subway along Sheppard to Markham and into S.C.C.</li> <li>- SRT to S.C.C.</li> <li>- Subway/SRT transfer at S.C.C. and at Bloor/Danforth</li> </ul>
	<ul style="list-style-type: none"> <li>- Subway directly into S.C.C. and extended to Sheppard/Markham</li> <li>- SRT to S.C.C.</li> <li>- Subway/SRT transfer at S.C.C. and at Bloor/Danforth</li> </ul>
	<ul style="list-style-type: none"> <li>- Subway along Sheppard to Kennedy, down Kennedy to Ellesmere SRT</li> <li>- SRT extension to Sheppard/Markham</li> <li>- Subway/SRT transfer at Ellesmere and Kennedy Station</li> </ul>

Option 2, similar to the *2007 Transit City Light Rail Plan* was screened out based on:

- **Travel time** and **number of transfers** required to access Scarborough Centre ... an additional 10 minutes travel time from Scarborough centre to North York
- **Directness of route**
- **Convenience** and access to other transit, including GO
- **By-passes** largest development and employment potential
- **Cost** (including costs of extending SRT north)
- Did not meet the **planning goals** of the Official Plan (connecting the major centres)

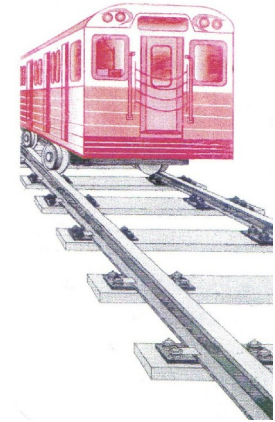


# Why Subway?

---

## Public Consultation

- “Is the Subway the most appropriate technology?” Yes **95%**
- “Is the recommended route and location of stations?” the most effective way of providing the rapid transit in the Sheppard corridor?” Yes **97%**
  
- Comments section demonstrated “**social and environmental concerns** were paramount in the public’s mind”.



# Why Subway?

## 2008 Environmental Assessment (vs 1992 EA)

Examples of social, environmental, land use and cost factors ignored by 2008 LRT EA

Category	1992 Environmental Assessment Findings	2008 Environmental Assessment Findings
Overall Cost-effectiveness	Subway (with detailed summary)	LRT (no details provided)
Carrying Capacity	Subway (LRT insufficient capacity)	LRT (Insufficient demand for Subway)
Residential Units Displaced	Subway better	not addressed
Jobs Displaced	Subway better	not addressed
Heritage Resources	Subway better	not addressed
Archaeological Resources	Subway better	not addressed
Noise Levels	Subway better	not addressed
Driveways Affected	Subway better	not addressed
Intersections Restricted	Subway better	not addressed
Road Restrictions (construction)	Subway better	not addressed
Visual Impacts	Subway better	not addressed
Ridership	Subway better	not addressed
City Plan Objectives	Subway better	not addressed



# Cost of the Sheppard Subway Extensions?

## Metrolinx Sheppard Subway Extension Construction Costs (Order of magnitude (costs million of 2011 dollars))

Options	New Tunnel (Metres)	Total Length (Metres)	New Stations	Underground Platform length (Metres)	Station Length (Metres)	Cost 2011 \$
<b>Option 1</b> Downsview - STC	12,725	18,225	11	155	165	<b>\$3.7 billion</b>
<b>Option 2</b> Don Mills - STC	8,013	13,513	7	155	165	<b>\$2.4 billion</b>
<b>Option 3</b> Don Mills- STC	9,513	15,013	8	155	165	<b>\$2.8 billion</b>
<b>Option 4</b> Don Mills- Victoria Pk	2,313	7,813	2	155	165	<b>\$803 million</b>

Costs include:

- 1) **Construction:** survey, utility relocations, road works, community relations projects, site preparation, environmental mitigation and investigation, guide way, landscaping and site restoration, power and systems structures, stations, bus loops, mainline track work, power supply and distribution, automatic train control, security and communications, revenue collection, maintenance facility;
- 2) **Design/Management:** design, management and administration, project insurance, operations preparation, security prior to opening, environmental permitting, system closure, property acquisition, contingencies of 25.83%, interest during construction;
- 3) **Vehicles:** vehicles, testing and commissioning.



# Cost of the Sheppard Subway Extensions?

## Madrid, Vancouver, and Toronto Construction Cost Comparisons

Subway Elements	Madrid	Vancouver Canada Line 2009 <sup>1</sup>	Toronto Sheppard 2002 <sup>2</sup>	Toronto Spadina 2011 <sup>3</sup>	Metrolinx Sheppard Extension 2011 <sup>4</sup>
Construction Dates	1995-2007	2005-2009	1994-2002	2009-2015	2012-2018
Construction Period	12 years	4 years	8 years	6 years	6 years
Subway Constructed	Nearly 50 km	19.2 km	5.5 km	8.6 km	6.7km
Stations	120 stations	16 stations	6 stations	6 stations	7 stations
Cost per km (CDN\$)	<\$90M/km	\$105M/km	\$170M/km	\$305M/km	\$177M/km

1. Only about half of the Canada Line is tunnelled which would have influenced average construction cost.
2. Sheppard Subway Yonge to Don Mills, completed 2002. Final cost was \$973 million (excluding vehicles)
3. Data provided by TTC. October 17<sup>th</sup> 2011. The "total budgeted cost of TYSSE= \$2.634 billion"
4. Metrolinx cost estimates including vehicles for the east extension, Don Mills to Scarborough Centre.

Question ??? LRT cost per kilometre - **\$168m/km**



# How to Finance the Capital Costs?

---

## Introducing KPMG Capital Financing Study

### KPMG Revenue Tools Focus (*Limited Study*)

- TIF Related, Development Charges, Property Rights, Other

### KPMG Financing Model Analysis

- **Traditional** Model of Financing, with Federal/Provincial *Committed Dollars*
- Partnering with the **Private Sector**, including Federal/Provincial *Committed \$*

## Information City Requires to Make Informed Public Policy Decision

- Full consideration of all **environmental factors** (social, environment, land use, transportation) for Sheppard corridor (2008 EA – extremely limited)
- **Direct and indirect costs** comparisons (social, environment, land use, transportation)
- Value for money over the **life-cycle** of the project (capital/operating)
- Optimal **risk allocation** plans for the City (inflation, cost over-runs, timing over-runs, soil conditions)
- Comparison of traditional **procurement** with P3 models

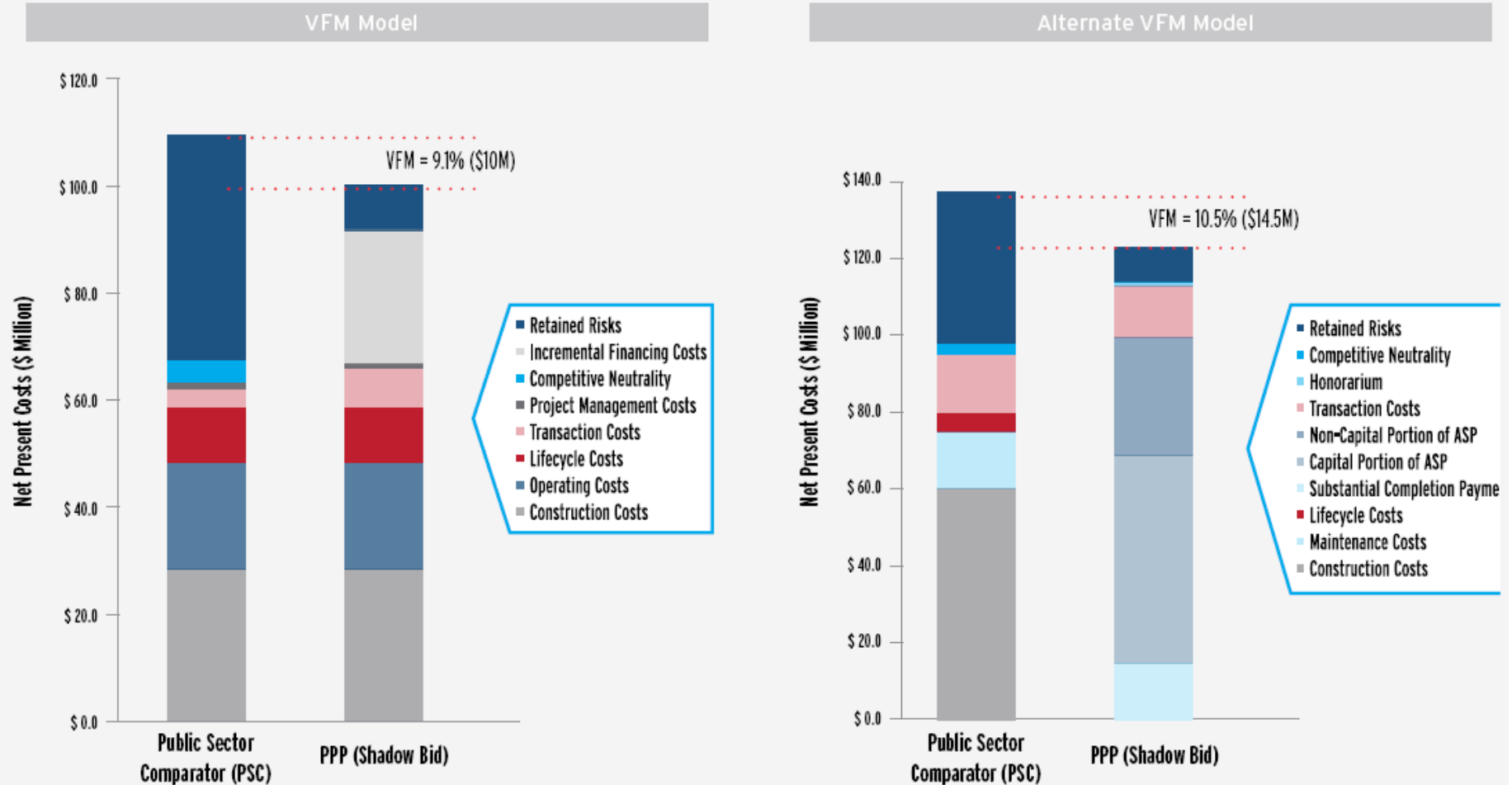
“Canadian P3s can deliver efficiency gains ranging from a few million dollars to \$751 million (from 0.8 per cent to **61.2 per cent** of the cost of a conventional procurement approach).” **Conference Board of Canada**





# Why is Value for Money Analysis Important?

FIGURE 12: ILLUSTRATIVE VFM RESULTS



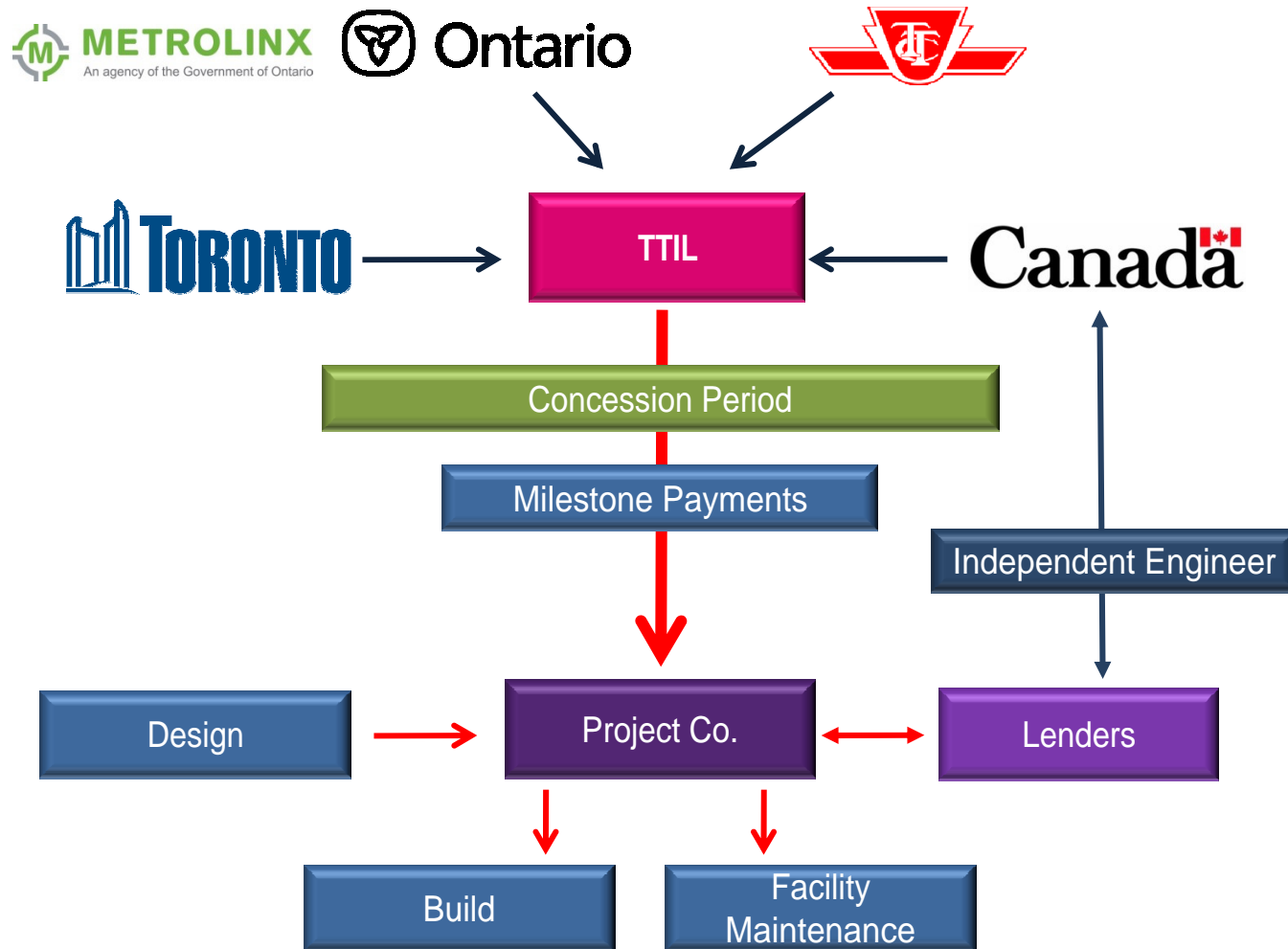
Note: The above charts have been presented for illustrative purposes only. The relative size of the individual components making up the chart can change significantly across different VFM methodologies

---

## Appendix – P3 Proposal



# Proposed Contract Structure (Sheppard)



# Proposed Procurement Schedule (Sheppard)

## Sheppard East and West

Sheppard East and West		Approvals				Functional Specs/ EA				RFP				Construction											
ID	Task Name	2011			2012				2013				2014			2015			2016			2017			2018
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Preliminary Design and Cost																								
2	Environmental Assessment /Approvals																								
2	Capital Financing/Funding Plan																								
3	Market Soundings																								
4	Request for Qualifications (RFQ)																								
5	Revised Value for Money Analysis																								
6	Request for Proposal (RFP)																								
7	RFP Evaluation/Commercial Close																								
8	Construction																								
9	Sheppard Line in Service																								

This procurement strategy is aggressive and illustrative only.



# Proposed Risk Allocation Model (Sheppard)

Risk Allocation	TTIL	Private			
Environmental/Regulatory Approvals	✓	✓			
Land/Right of Way Acquisition	✓				
Undisclosed Contaminated Soils	✓				
Inflation During Construction Period		✓			
Construction (cost and schedule)		✓			
Changed soil conditions (tunnelling)		✓			
Systems and Civil Works Integration		✓			
Utilities Relocation	✓	✓			
Systems Performance		✓			
Ridership and Revenue	✓	✓			
Operations	✓				
Maintenance		✓			
Inflation During Operating Period	✓	✓			
Change in Law	✓	✓			

This risk allocation model is illustrative only.



# Proposed Governance (Sheppard)

---

## TTIL

- Independently Governed Company
- Governance Endorsed by Main Funders

## Board of Directors

- Nine members
- No elected officials
- Project expertise
- Ex-officio (funding/transit bodies)

## Mandate

- Execution of DBFM Procurement
- Ensure clear lines between policy development/oversight and implementation



# Proposed Payment Framework (Sheppard)

---

## Construction Period

- Scheduled based – monthly
- Progress against Project Agreement as determined by Independent Engineer
- Deductions for failing to meet performance standards
- Continuous performance failures – termination of concession agreement
- Cash flows will be paid subject to partial milestone and milestones (e.g. stations)

## Operating Period

- TBD

## Facility Maintenance Period

- Scheduled based – monthly
- Progress against Project Agreement as determined by Independent Engineer
- Deductions for failing to meet performance standards
- Continuous failures – termination of concession agreement
- Cash flows will be paid subject to meeting performance standards

