Toronto Transit: BACK ON TRACK
Sheppard Subway Development and Financing Study

Executive Committee
Toronto City Council

February 13th 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

Scarborough Town Centre
North York City Centre
Etobicoke City Centre
Union Station
Why Subway?

Sheppard Subway Approval, 1986
### Why Subway?

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

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

<table>
<thead>
<tr>
<th>Network Diagrams</th>
<th>Description</th>
</tr>
</thead>
</table>
| ① | - Subway directly into S.C.C.  
- SRT extension to Sheppard/Markham  
- Subway/SRT transfer at S.C.C. and at Bloor/Danforth |
| ② | - Subway along Sheppard to Sheppard/Markham  
- SRT extension to Sheppard/Markham  
- Subway/SRT transfer to Sheppard/Markham and at Bloor/Danforth |
| ③ | - Subway along Sheppard to Markham and into S.C.C.  
- SRT to S.C.C.  
- Subway/SRT transfer at S.C.C. and at Bloor/Danforth |
| ④ | - Subway directly into S.C.C. and extended to Sheppard/Markham  
- SRT to S.C.C.  
- Subway/SRT transfer at S.C.C. and at Bloor/Danforth |
| ⑤ | - Subway along Sheppard to Kennedy, down Kennedy to E1lesmere SRT  
- SRT extension to Sheppard/Markham  
- Subway/SRT transfer at E1lesmere and Kennedy Station |

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?”  Yes  97%
  the most effective way of providing the rapid transit in the Sheppard corridor?

- 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

<table>
<thead>
<tr>
<th>Category</th>
<th>1992 Environmental Assessment Findings</th>
<th>2008 Environmental Assessment Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Cost-effectiveness</td>
<td>Subway (with detailed summary)</td>
<td>LRT (no details provided)</td>
</tr>
<tr>
<td>Carrying Capacity</td>
<td>Subway (LRT insufficient capacity)</td>
<td>LRT (Insufficient demand for Subway)</td>
</tr>
<tr>
<td>Residential Units Displaced</td>
<td>Subway better</td>
<td>not addressed</td>
</tr>
<tr>
<td>Jobs Displaced</td>
<td>Subway better</td>
<td>not addressed</td>
</tr>
<tr>
<td>Heritage Resources</td>
<td>Subway better</td>
<td>not addressed</td>
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<tr>
<td>Archaeological Resources</td>
<td>Subway better</td>
<td>not addressed</td>
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<tr>
<td>Noise Levels</td>
<td>Subway better</td>
<td>not addressed</td>
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<tr>
<td>Driveways Affected</td>
<td>Subway better</td>
<td>not addressed</td>
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<tr>
<td>Intersections Restricted</td>
<td>Subway better</td>
<td>not addressed</td>
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<tr>
<td>Road Restrictions (construction)</td>
<td>Subway better</td>
<td>not addressed</td>
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<tr>
<td>Visual Impacts</td>
<td>Subway better</td>
<td>not addressed</td>
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<tr>
<td>Ridership</td>
<td>Subway better</td>
<td>not addressed</td>
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<tr>
<td>City Plan Objectives</td>
<td>Subway better</td>
<td>not addressed</td>
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</tbody>
</table>
### Cost of the Sheppard Subway Extensions?

#### Metrolinx Sheppard Subway Extension Construction Costs

(Order of magnitude (costs million of 2011 dollars)

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

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

<table>
<thead>
<tr>
<th>Subway Elements</th>
<th>Madrid</th>
<th>Vancouver Canada Line 2009&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Toronto Sheppard 2002&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Toronto Spadina 2011&lt;sup&gt;3&lt;/sup&gt;</th>
<th>Metrolinx Sheppard Extension 2011&lt;sup&gt;4&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Period</strong></td>
<td>12 years</td>
<td>4 years</td>
<td>8 years</td>
<td>6 years</td>
<td>6 years</td>
</tr>
<tr>
<td><strong>Subway Constructed</strong></td>
<td>Nearly 50 km</td>
<td>19.2 km</td>
<td>5.5 km</td>
<td>8.6 km</td>
<td>6.7km</td>
</tr>
<tr>
<td><strong>Stations</strong></td>
<td>120 stations</td>
<td>16 stations</td>
<td>6 stations</td>
<td>6 stations</td>
<td>7 stations</td>
</tr>
<tr>
<td><strong>Cost per km (CDN$)</strong></td>
<td>&lt;$90M/km</td>
<td>$105M/km</td>
<td>$170M/km</td>
<td>$305M/km</td>
<td>$177M/km</td>
</tr>
</tbody>
</table>

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

VFM Model

Alternate VFM Model

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.

PPP Canada: P3 Business Development Guide
Appendix – P3 Proposal
### Proposed Procurement Schedule (Sheppard)

#### Sheppard East and West

<table>
<thead>
<tr>
<th>Task Name</th>
<th>2011 Q1</th>
<th>2011 Q2</th>
<th>2012 Q3</th>
<th>2012 Q4</th>
<th>2013 Q1</th>
<th>2013 Q2</th>
<th>2013 Q3</th>
<th>2013 Q4</th>
<th>2014 Q1</th>
<th>2015 Q1</th>
<th>2016 Q1</th>
<th>2017 Q1</th>
<th>2018 Q1</th>
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<tr>
<td>Preliminary Design and Cost</td>
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<td>Environmental Assessment/Approvals</td>
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<td>Capital Financing/Funding Plan</td>
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<td>Revised Value for Money Analysis</td>
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<td>Request for Proposal (RFP)</td>
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<td>RFP Evaluation/Commercial Close</td>
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<td>Sheppard Line in Service</td>
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This procurement strategy is aggressive and illustrative only.
### Proposed Risk Allocation Model (Sheppard)

- 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