Bayshore Station to Moodie Drive
LRT Extension Environmental Assessment Studies

Public Meeting 22 March 2017
Overview

- Introductions
- Background and Scope
- Network Options
- Bus Rapid Transit (BRT) conversion
- Light Maintenance and Storage Facility (LMSF)
- Bayshore Station Expanded Bus Terminal
- Schedule
- Next steps
BACKGROUND & SCOPE
Background

- BRT Transitway Extension from Bayshore Station to Moodie Drive currently under construction
- Expected revenue service in November 2017
- Conversion from BRT to LRT in the Ultimate Network but not in the Affordable Network
- Inclusion of Moodie LRT extension/LMSF within Stage 2 looking increasingly likely
- EA addenda’s initiated with this in mind
Scope of Environmental Assessments

• Bayshore to Moodie
  – City priorities for expansion to the west
  – LRT station closer to DND employment node
  – Conversion from BRT to LRT
  – Siting of an LMSF beyond Bayshore

• Bayshore Expanded Bus Terminal
  – Updated ridership – more space required
  – Not needed if Moodie is end of line
**Study Process**

- Modifications to approved EPR

<table>
<thead>
<tr>
<th>Modifications consistent with EPR</th>
<th>Insignificant modifications inconsistent with EPR</th>
<th>Significant modifications inconsistent with EPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proceed with modification</td>
<td>Prepare addendum</td>
<td>Prepare addendum</td>
</tr>
<tr>
<td></td>
<td>Update local project file</td>
<td>Notice of Environmental Project Report Addendum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Public Review</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ministerial Approval</td>
</tr>
</tbody>
</table>
LRT NETWORK OPTIONS
Network Options

Option 1

Option 2/2A

Option 3

Option 4
Preferred Network Option

- No throw away capital costs/least cost to implement
- Through riders not impacted by LRT diverting to DND
- Most direct route to serve majority of passengers who are destined west of Moodie
- DND bus shuttle less costly to operate compared to LRT service
- Consistent with previous City studies re Kanata LRT extension/alignment
BRT TO LRT CONVERSION
Reuse of Existing BRT Infrastructure

- Alignment/retaining walls/noise barriers
- BRT Station (to the extent possible)
- 417 ramp grade separation
- Stillwater Creek improvements
- Holly Acres Bridge (as designed)
- Add Kiss and Ride
- Expand Bus terminal
Conversion from Buses to LRT Vehicles

• Conversion of BRT to LRT eliminates 200,000 bus trips annually
• Existing and future air quality conditions all fall below the allowable limits of CO, HC, NO\textsubscript{x}, and PM
Noise & Vibration

- Existing background noise (Highway 417 traffic) is the predominant noise source
- Two noise barriers recommended to attenuate noise from future highway traffic to be retained
- Potential relocation of Holly Acres noise barrier to north side of new LRT bridge
- Vibration impacts not considered an issue/no mitigation needed
Storm Water Management/Drainage

• LRT impact is positive:
  – Decreased amount of impervious surfaces
  – No new SWM initiatives required
  – Maintain existing SWM initiatives implemented for BRT
Council approved the February 24 FEDCO motion as follows; THEREFORE BE IT RESOLVED that staff be directed to explore opportunities for a Park and Ride to be located at the Moodie Station with consultation among all the large landowners in the immediate vicinity including leasing opportunities with the National Capital Commission;

• THEREFORE BE IT FURTHER RESOLVED that staff report back to FEDCO by the end of 2017.
• Moved by Mayor J. Watson (on behalf of Councillor S. Qadri)

• Stage 2 staff are investigating possible options
LIGHT MAINTENANCE & STORAGE FACILITY (LMSF)
Western LMSF Options

• Belfast MSF to be expanded to full capacity
  – Will handle all heavy maintenance/inspections/overhauls of entire LRT fleet

• Three “light” MSF options in the west:
  – Utilize existing Baseline 3 cell box structure
  – Build Woodroffe LMSF as per West LRT EA
  – Build LMSF in LRT extension beyond Bayshore
LMSF Location Options

- Baseline Station cleaning/ storage facility not ideal:
  - Not designed for storage and cleaning
  - Not all LMSF work could be performed here
  - Inferior to purpose built LMSF but could be an interim facility until new LMSF is affordable
  - If built first, convert to non revenue vehicle maintenance to avoid throw away costs

- Woodroffe LMSF:
  - Requires mitigation measures due to proximity to community
  - Not ideally located in terms of deadhead mileage
  - Lengthy elevated guideway from Baseline to LMSF does not attract ridership
  - Cost to connect to Woodroffe site is high due to extremely poor soil conditions
  - City has no plans to extend LRT beyond Baseline in the foreseeable future
Preferred LMSF Location

- Moodie/Kanata LMSF Site Preferred
- Extension of LRT to the west beyond Bayshore is a City priority
  - Lower cost to connect to LMSF as revenue service
  - LRT is planned/no throw away costs
  - Purpose built facility can be implemented for all LMSF work
  - Lower deadhead mileage compared to Woodroffe site
LMSF Distance from the Main Line

Separation of an MSF from the main line affects:

• Increased labour costs to access the yard
• Increased deadhead mileage for LRT vehicles/mileage costs
• Increased maintenance costs for track, OCS, track bed, etc.
• The amount of time available for nightly maintenance of LRT infrastructure
Importance of Nightly Maintenance Window

- Nightly maintenance window is 4-5 hours
- If it takes an additional 15 minutes inbound and outbound to get from the yard to the mainline the available nightly maintenance window is reduced 10-12.5 % in perpetuity
LMSF Distance Criteria to the Main Line

- Vast majority of Canadian MSF’s (light and heavy rail) are within 200 m of the mainline including all 5 existing TTC rail yards
- Existing Belfast MSF is 525 m from main line
- Woodroffe MSF (1200 m) is excessive leading to LMSF search in Moodie LRT area
- 750 m adopted as a search criteria (50 % longer than Belfast MSF distance to main line)
Moodie/Kanata LMSF Site Alternatives

• Alternative LMSF locations identified using the following site characteristics:
  – **Topography and Grade**: Level ground
  – **Size**: Approximately 16 hectares
  – **Environment**: Avoid areas of geographical, environmental and historical importance
  – **Connections**: Connect to LRT corridor
  – **Access Redundancy**: Two tracks required for LMSF access and egress
Add figures 1 and 2.
Candidate LMSF Sites
# LMSF Screening Criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Indicator/Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social Environmental Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Effects to local residents</td>
<td>Minimizes effects on visual intrusion, noise air quality, vibration</td>
</tr>
<tr>
<td>Site safety</td>
<td>Ability to restrict access to the MSF</td>
</tr>
<tr>
<td>Agricultural capacity</td>
<td>Minimizes effects on Class 1-3 agricultural lands or land under active use</td>
</tr>
<tr>
<td>Transportation network</td>
<td>Minimizes effects on existing and future transportation network.</td>
</tr>
<tr>
<td>Pedestrian/cyclists</td>
<td>Minimizes effects on existing and future pedestrian movements</td>
</tr>
<tr>
<td>Existing land uses</td>
<td>Minimizes effects on existing and planned land uses</td>
</tr>
<tr>
<td>Heritage / Culture</td>
<td>Minimizes effects on areas identified or having potential for archaeological or cultural significance</td>
</tr>
<tr>
<td><strong>Bio-Physical Environmental Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Soil types</td>
<td>Geotechnical characteristics to support a facility of this type</td>
</tr>
<tr>
<td>Impacted Materials</td>
<td>Minimizes potential to encounter impacted materials</td>
</tr>
<tr>
<td>Key terrestrial features</td>
<td>Minimizes effects on key terrestrial systems and features</td>
</tr>
<tr>
<td>Key aquatic features</td>
<td>Minimizes effects on key aquatic systems and features</td>
</tr>
<tr>
<td>Geological faults</td>
<td>Avoids areas of active faults</td>
</tr>
</tbody>
</table>
## LMSF Screening Criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Indicator/Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facility Operations</strong></td>
<td></td>
</tr>
<tr>
<td>Expansion Capability</td>
<td>Ability to stage/expand facility</td>
</tr>
<tr>
<td>MSF Site Servicing</td>
<td>Access to Municipal Services, Utilities and Power</td>
</tr>
<tr>
<td>Existing services</td>
<td>Extent of reuse of existing infrastructure</td>
</tr>
<tr>
<td>Road access</td>
<td>Minimizes conflicts with Municipal Services, Utilities and Power</td>
</tr>
<tr>
<td>LRT Station location</td>
<td>Maximizes accessibility for, to, and from the MSF</td>
</tr>
<tr>
<td>BRT Station location</td>
<td>Ease of connection to future LRT station/mainline and BRT integration</td>
</tr>
<tr>
<td><strong>Economics</strong></td>
<td></td>
</tr>
<tr>
<td>Capital Costs</td>
<td>Minimizes class D construction cost estimate</td>
</tr>
<tr>
<td>Property Ownership and Acquisition</td>
<td>Minimizes costs based on land use types and number of property owners</td>
</tr>
</tbody>
</table>
## LMSF Evaluation

<table>
<thead>
<tr>
<th>Site 1: (East of Moodie, near Carling)</th>
<th>Local residents</th>
<th>Site safety</th>
<th>Agricultural</th>
<th>Road Network</th>
<th>Pedestrian/Cyclists</th>
<th>Existing land uses</th>
<th>Heritage/Culture</th>
<th>Soils</th>
<th>Impacted Materials</th>
<th>Terrestrial features</th>
<th>Aquatic features</th>
<th>Geological faults</th>
<th>Servicing</th>
<th>Existing Services</th>
<th>Road Access</th>
<th>LRT Station</th>
<th>BRT Station</th>
<th>Capital</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>•</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>•</td>
<td>x</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>s</td>
<td>•</td>
</tr>
<tr>
<td>Site 2: (East of Moodie, north of soccer fields)</td>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>•</td>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>$5</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site 3: (West of Moodie north of Queensway)</td>
<td>x</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site 4: (West of Moodie/Regional Road 59 south of Queensway)</td>
<td>x</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site 5: (East of Moodie/Regional Road 59, south of Queensway)</td>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site 6: (Far East of Moodie/Regional Road 59, south of Queensway)</td>
<td>x</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site 7: (West of 416, south of Queensway)</td>
<td>x</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site 8: (West of 416 near Baseline Road, south of Queenway)</td>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>•</td>
<td>• • • • • • • • • • • •</td>
<td>x</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>• • • • • • • •</td>
<td>• • • • • • • •</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Criteria
- **✓** Best Meets Criteria
- • Somewhat Meets Criteria
- ✗ Does not Meet Criteria
Screening of Shortlisted LMSF sites

- Site 1 and 6 do not meet 25% of the criteria, Site 1 has the largest number of criteria not met
- Site 7 and 8 are not affordable
- The remaining sites are feasible but will still require mitigation
- Of the four remaining sites:
  - Sites 2, 3, and 4 have the most evaluations that best meet the criteria
  - Site 5 is similar with variable soils conditions that create constructability challenges
- Sites 2, 3, and 4 will be carried forward for further design refinement, evaluation and mitigation
Moodie BRT & LRT Station Integration

- Pedestrian connection from LRT platform to bus terminal
- Redundant elevators
- Same architecture / passenger experience as Stage 1 stations
- Fare paid bus terminal
- Public washrooms
Preliminary Short-list Evaluation
Criteria

- Connectivity (pedestrians and cyclists)
- Local traffic
- Bus travel time, quality of service and bus transfers
- Views and vistas
- Noise/Air Quality/Vibration
- Groundwater

- Water quality/Stillwater Creek
- Fish habitat
- Species at Risk
- Operational flexibility
- Affordability (capital and operating)
- Existing land use
BAYSHORE EXPANDED BUS TERMINAL
Bus Facility Requirements at Bayshore

- EA concepts for bus terminal impacted by:
  - July ridership forecasts
  - Increased bus facility requirements
  - Station on a skew angle
  - Configuration of tail track

- Bus facility also impacted by possible Moodie LRT extension
# Bayshore/Moodie Bus Facility Requirements

<table>
<thead>
<tr>
<th>Source</th>
<th>Without Moodie LRT Extension</th>
<th>With Moodie LRT Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bayshore</td>
<td>Moodie</td>
</tr>
<tr>
<td></td>
<td>Bays</td>
<td>Laybys</td>
</tr>
<tr>
<td><strong>EA Concept</strong></td>
<td>9</td>
<td>10+8(3)</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>July Stage 2 Forecasts(2031)</strong></td>
<td>12(4)</td>
<td>24(4)</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Existing</strong></td>
<td>11(2)</td>
<td>8-10</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
Conceptual Layout of Expanded Bus Terminal
Noise Analysis

• Expanded bus terminal analyzed for compliance with MOECC noise guidelines (NPC-300)
• Plane of window and outdoor living space assessed for closest receptors for daytime and nighttime
• Expanded bus terminal complies with all applicable MOECC performance limits
• No mitigation required
NEXT STEPS IN EA PROCESS
Development of Short-Listed Sites

• Investigate shortlisted sites in more detail:
  – LMSF track access/grades/length of connection
  – Impact of LMSF connections on station location
  – Layout/functional planning of LMSF
  – Preliminary design of LRT terminal station
  – Impacts and mitigation measures
  – Respond to public comments and issues
  – Capital and operating cost estimates
  – Define property requirements
  – Feasibility: cost and approvals
  – Consideration of addendum requirements
Moodie LRT/LMSF
Implementation Scenarios

• With Moodie LRT/LMSF as part of Stage 2 scope:
  – Complete EA and preliminary engineering for LRT extension and LMSF
  – Include in Stage 2 RFP as recommended scope
  – EA for expanded Bayshore bus terminal to proceed to protect project if Bayshore is the terminus

• In the unlikely event Moodie LMSF site is not feasible:
  – Western LMSF location deferred to Kanata LRT EA
  – Interim storage and cleaning facility at Baseline and expanded Belfast MSF (east) in the interim
Future Public Consultation/EA Schedule

- PAC meeting held on March 6, 2017
- Initial public meeting on March 22, 2017
- Second public meeting in May/June 2017
  - Moodie LRT/LMSF preferred site and mitigation measures
- Complete preliminary engineering of preferred LMSF site and LRT extension
- Report to City Council in July, 2017 re completion of EA
- EA approval in Fall 2017
- Stage 2 contract award in May 2018 including Moodie LRT/LMSF
Questions