Could Construction Cause Consternation?
Utilizing VISSIM to Assess Construction Impacts
Agenda

- What is the BSP?
- Existing Conditions
- Construction Scenarios
- Results
What is the BSP?

- 5.7-kilometer extension of the Millennium Line
- part elevated, part underground
- intended to replace part of Route 99, an express bus that currently carries over 55,000 passengers per day
Why model construction conditions?

• “future” conditions will be the same as existing once construction is complete

• stakeholders were concerned about impacts to traffic during construction
  • particularly for bus routes
  • especially the already busy Route 99

• advantages of microsimulation modeling
  • multi-modal traffic
  • detailed volume inputs
  • flexible signal operations
• 4.7-kilometer stretch of Broadway
• 29 intersections (full signals, ped signals, unsignalized)
• included intersection at Kingsway/Main St/7th Ave
• no parallel roadways
Shoulder Lanes

- usage varies per time of day:
  - general-purpose lane
  - bus-only lane
  - on-street parking

- assignment of shoulder lane types in the model was based on
  - an inventory of signs visible in online street view imagery
  - data provided by the stakeholders
  - field visits as needed
Bus Details

- accurate vehicle lengths
- precise stop locations and lengths
- bus stop dwell times based on months of real-time historical data from TransLink

<table>
<thead>
<tr>
<th>Dwell Time Distribution</th>
<th>Mean (sec)</th>
<th>Std. Dev. (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 s ±</td>
<td>20.0</td>
<td>2.0</td>
</tr>
<tr>
<td>25 s ±</td>
<td>25.0</td>
<td>3.0</td>
</tr>
<tr>
<td>30 s ±</td>
<td>30.0</td>
<td>3.0</td>
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<tr>
<td>35 s ±</td>
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<td>3.0</td>
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<tr>
<td>90 s ±</td>
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<td>5.0</td>
</tr>
<tr>
<td>105 s ±</td>
<td>105.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>
Speed Profiles

- typically, speed profiles are coded consistently for all versions of a model
- a single speed profile represents the range of speeds that drivers will travel while observing one posted speed limit
- during calibration, each time of day required a variation from the default speed profile for a 50-kph speed limit
Construction Scenarios

- many possible lane configurations may be used during station construction
- two layouts were modeled:
  - Steady State = long-term configuration
  - Interim = “worst-case” scenario with the most turn restrictions along the corridor
Traffic Volumes During Construction

- volumes were manually redistributed to account for movements prohibited in each layout
- left turns were added at a few intersections where currently prohibited
- total volume along Broadway was reduced by 10% to account for drivers completely avoiding the corridor
- future year growth was not considered
Construction Zone Speed

- restricted speed limits of 30 kph were defined around each construction zone

- the default profile for a 30-kph posted speed ranges from 25 kph to 40 kph

- the default upper limit was determined to be too fast for the construction zones
  - narrower lanes
  - increased enforcement

- the upper limit was reduced to 35 kph
Operational Changes for Buses

• three existing bus routes on Broadway will be diverted to parallel streets

• diversion is not feasible for express Route 99 or local Route 9

• certain stops were moved or condensed around each station construction zone

• temporarily relocating stops will impact pedestrians in some locations
Yield-to-Bus Zones

- identified as a location where the shoulder bus-only lane drops upstream of any station construction area

- drivers will be required to yield to buses by provincial law, but stakeholders requested a 75% compliance rate for realism

- after many tests, YTB zone operations were successfully mimicked using virtual traffic signals
the Interim scenario shows higher delays at these intersections because WB is reduced to one through lane at Main St

although Oak St sees the highest delays along the corridor, it does not worsen during construction because no turning movements were restricted

Cambie St sees less delay in the Interim scenario only because all turning movements except the SBR are prohibited

adding left turns at Hemlock St and Fir St to account for the left turn restriction at Granville St helps the delay stay balanced for all three intersections
Impacts to Bus Travel Times

We can't completely avoid bullet points. So if we must use them, this is the layout to use:

- Keep them brief
- We want the audience to watch/listen to you, not read the screen

<table>
<thead>
<tr>
<th>Route 9 EB</th>
<th># of Stops</th>
<th>Total Dwell Time (sec)</th>
<th>Total Travel Time (sec)</th>
<th>Net Travel Time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Conditions</td>
<td>16</td>
<td>555</td>
<td>1528</td>
<td>973</td>
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<tr>
<td>Steady State</td>
<td>13</td>
<td>445</td>
<td>1502</td>
<td>1057</td>
</tr>
</tbody>
</table>
Although the exact lane alignments and turning restrictions included in these models may not be the ultimate construction staging implemented in reality, the results from this microsimulation analysis have successfully identified the major congestion hot spots. The stakeholders will be better equipped to anticipate and alleviate any consternation that may arise during the BSP station construction.