



Appendix F – Description of Route Analysis



1.1 Route Analysis

1.1.1 Dufferin Street

A variety of cross sections on Dufferin Street were considered for analysis. They are as follows:

Localized Improvements - consisting of conversion of the curb High Occupancy Vehicle (HOV) lanes to reserved bus lanes (RBL), including an extension north of Finch Avenue (in conjunction with Hydro Corridor Option). Enforcement is through the continued use of signs and specialized pavement markings and possible enhancements to visually distinguish the bus lanes from general-purpose lanes (e.g. coloured asphalt or imprinted concrete). Localized intersection improvements, including a separate Northbound right turn lane at Dufferin and Finch and a separate bus-only left turn lane either at Sheppard or directly from the Allen (half signal directly into existing bus terminal).

Curb lanes with barrier separating bus-only lanes from general-purpose traffic – Bus-only lanes in physically separated curb lanes would have similar operating parameters to the RBL described above. A raised curb or island prevents general-purpose traffic from illegally using the bus-only curb lane. However, with a barrier separated curb lane, disabled buses will block the lane unless lanes are made extra wide. This solution would require breaks in islands at all existing driveways and intersections to maintain access. Also, if the barriers are continuous up to the stop bar at signalized intersections, northbound and southbound right turns must be controlled to prevent right turning vehicles from crossing the path of buses.

Bus-only lanes in the median - Bus-only lanes in the median would have similar operating parameters to the Spadina LRT. It would reduce all driveways to right-in/right-out but cars may u-turn at signalized intersections and full moves are retained at all signalized intersections.

Bus-only lanes together on the west side – At present, there are no transit facilities in the Greater Toronto Area with a similar operating parameter. Bus-only lanes together on the west side would block all commercial driveways along the west side but leave the residential driveways on the east side unaffected. At all signalized intersections, northbound lefts and southbound rights must be controlled movements. A new signalized intersection is required on Allen to hold NB and SB traffic while the buses enter/leave the Downsview station.

Bus-only lanes together on the east side - At present, there are no transit facilities in the Greater Toronto Area with a similar operating parameter. Bus-only lanes together on east side would block all driveways along east side. These are residential driveways and TTC would be willing to consider allowing small section north of Overbrook to serve as



service road for residents. Commercial driveways on the west side are unaffected. At all signalized intersections, southbound lefts and northbound rights must be controlled movements. The bus-only facility would terminate directly in the Downsview station requiring no new signals on the Allen. Existing signals at Canadian Tire and proposed at Rimrock are Tee intersections and bus-only lanes on east side could be configured to bypass signals.

The table below summarizes the comparison of these alternatives.



Table 1 - Dufferin Street – Review of Alternative Cross Sections

<p>Localized Improvements</p>	<ul style="list-style-type: none"> • All driveway access will continue to occur from HOV/RB lane (legal use). 10 commercial driveways will be a source of conflicts and delays. 34 residential driveways cause negligible delay to transit. • Right-of-way sufficiently wide to accommodate transit queue jump lanes at signalized intersection. • General effectiveness is dependant on the rate of violation of curb HOV/RB lanes. Violation rate is anticipated to worsen over time as traffic congestion increases. • Minor impacts to the Don River valley lands associated with localized widening at the Dufferin/Finch intersection for queue jump lanes (and north to the Hydro Corridor for the Dufferin/Finch alternative). • Low cost alternative – the majority of Dufferin Street can remain as-is. <p>At present, only a limited number of violations occur in the curb HOV lanes on Dufferin Street and therefore, the current lanes do contribute to the service speed and reliability for buses. However, as witnessed by TTC in other corridors, when traffic congestion increases, violation increases and transit service and reliability decreases. Therefore, localized improvements can only moderately satisfy the objectives of the undertaking.</p> <p style="text-align: center;">Carry Forward / Retain as a staging opportunity.</p>
<p>Curb lanes with barrier separating bus-only lanes from general purpose traffic</p>	<ul style="list-style-type: none"> • Requires breaks in islands at existing driveways to maintain access – potential roadside hazard. 10 commercial driveways and 34 residential driveways. • Snow storage issue – snow from general purpose lanes must be removed off site. Also requires additional pass by plows. • Disabled bus will block lanes (unless lanes are made extra wide) • Minor impacts to the Don River valley lands associated with localized widening at the Dufferin/Finch intersection for queue jump lanes (and north to the Hydro Corridor for the Dufferin/Finch alternative). • Low cost alternative – cost to implement barriers in between general purpose and RB lanes is minor. <p style="text-align: center;">Do Not Carry forward</p>
<p>Bus-only lanes in the median</p>	<ul style="list-style-type: none"> • Reduces all driveways to right-in/right-out (10 commercial driveways and 34 residential driveways) • Cars may u-turn at signalized intersections • Full moves retained at all signalized intersections



	<ul style="list-style-type: none"> • Requires partial signal at Downsview station, thereby impacting flow of NB traffic on Allen • Requires full signal at Hydro Corridor, thereby impacting flow of NB and SB traffic on Dufferin or northbound lanes to be discontinuous through and north of Finch to allow NB left onto Hydro Corridor. • Maintenance issue – requires additional pass for snow removal. Right-of-way sufficiently wide that median separating general purpose and RB lanes can be designed to accommodate snow storage. • Impacts to the Don River valley lands and north to the Hydro Corridor for the Dufferin/Hydro alternative. • Moderate cost – requires complete reconstruction of Dufferin Street and may impact tail track ventilation structure (high cost to relocate). <p style="text-align: center;">Carry forward for further analysis</p>
<p>Bus-only lanes together on the west side.</p>	<ul style="list-style-type: none"> • Blocks all driveways along west side • Requires controlled movements for Northbound lefts and southbound rights • Requires full signal at Downsview station, thereby impacting flow of NB and SB traffic on Allen. • Direct movement to/from Hydro Corridor or Finch Avenue • Maintenance issue – requires additional pass for snow removal. Right-of-way sufficiently wide that median separating general purpose and RB lanes can be designed to accommodate snow storage. • Significant operational/safety issues at major intersections of Dufferin at Sheppard and Dufferin at Finch associated with conflicting general purpose southbound right turns and bus movements. • Impacts to the Don River valley lands and north to the Hydro Corridor for the Dufferin/Hydro alternative. • Moderate cost – requires partial reconstruction of Dufferin. <p>Greater overall impact to general traffic without offering any different benefits over median option</p> <p style="text-align: center;">Do Not Carry forward</p>
<p>Bus-only lanes together on east side</p>	<ul style="list-style-type: none"> • Blocks all driveways along east side. These are only residential driveways and TTC willing to consider allowing small section north of Overbrook to serve as service road for residents • Requires controlled movements for Southbound lefts and Northbound rights • Requires full signal at Hydro Corridor, thereby impacting



	<p>flow of NB and SB traffic on Dufferin.</p> <ul style="list-style-type: none"> • Direct movement at Downsview station requiring no new signals on the Allen • Maintenance issue – requires additional pass for snow removal. Right-of-way sufficiently wide that median separating general purpose and RB lanes can be designed to accommodate snow storage. • Significant operational/safety issues at major intersections of Dufferin at Sheppard and Dufferin at Finch associated with conflicting general purpose northbound right turns and bus movements. • Impacts to the Don River valley lands and north to the Hydro Corridor for the Dufferin/Hydro alternative. • High cost – requires partial reconstruction of Dufferin Street and will impact tail track ventilation structure (high cost to relocate). • Existing signals at Canadian Tire and proposed at Rimrock are Tee intersections. Bus-only lanes on east side could be configured to bypass signals <p>Greater overall impact to general traffic without offering any different benefits over median option</p> <p style="text-align: center;">Do Not Carry forward</p>
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It was recommended that Dufferin Street Bus-only lanes in the median be carried forward to detailed analysis and evaluation.

1.1.2 Finch Avenue

Within a 36 m right of way, Finch Avenue provides two through lanes per direction through the study area. Finch Avenue is grade separated with the CN rail corridor and the existing structure can accommodate three lanes per direction. Alternative cross sections on Finch Avenue considered for analysis include:

Curb Reserved Bus lanes – Reserved Bus lanes would have similar operating parameters to HOV lanes utilized throughout the City. Right turns in and out of driveways are permitted from the RB Lanes.

Curb lanes with barrier separating bus-only lanes from general-purpose traffic were also identified but this solution would require breaks in islands at all existing driveways and intersections to maintain access. Given the 46 driveways and 4 signalized intersections between Dufferin and Keele, the sections of barrier would be so short that this alternative would not be practical.



Bus-only lanes in the median - Bus-only lanes in the median would have similar operating parameters to the Spadina LRT. It would reduce all driveways to right-in/right-out but cars may u-turn at signalized intersections and full moves are retained at all signalized intersections.

Bus-only lanes together on the north side or south side - Bus-only lanes together on the one side or the other would block all commercial driveways along the same side. At all signalized intersections, lefts and rights must be controlled movements. Recognizing that a median solution is the preferred cross section for Dufferin, a separate transit only phase is required at the Finch Avenue / Dufferin Street intersection in order to allow buses to transfer from the median to one side of the other.

The table below summarizes the comparison of these alternatives.

Table 2 - Review of Alternative Cross Sections

Reserved Bus Lanes - curb	<ul style="list-style-type: none"> • 46 commercial driveways will introduce a high volume of general-purpose traffic, including trucks for the petrochemical businesses, into the Reserved Bus Lanes. This legal use of the reserved bus lanes will reduce the effectiveness of the lane. • General effectiveness is also dependant on the rate of violation of curb RB lanes. Violation rate is anticipated to worsen over time as traffic congestion increases. • Moderate cost alternative – alternative can be implemented through a widening of Finch Avenue. No changes are required to the rail underpass. <p>Based on similar experiences with HOV lanes along highly active commercial arterials, this alternative is anticipated to provide very little benefit to transit operations.</p> <p style="text-align: center;">Do Not Carry Forward</p>
Bus-only lanes in the median	<ul style="list-style-type: none"> • Reduces all driveways to right-in/right-out (46 commercial driveways). • Cars may u-turn at signalized intersections. • Full moves retained at all signalized intersections. Sunoco and Esso retain full movements at signalized driveway. • Buses can transfer from Dufferin (in median) to Finch at the same time as the NB / SB advanced left turn phase. Some reduction in capacity at the Dufferin / Finch intersection. • Maintenance issue – requires additional pass for snow removal. Median solution will reduce boulevard width and require the disposal of snow off-site. • Barriers between general purpose lanes and bus lanes will be discontinuous through the grade separation



	<ul style="list-style-type: none"> Moderate cost – requires complete reconstruction of Finch Avenue. <p style="text-align: center;">Carry forward for further analysis</p>
<p>Bus-only lanes together on either the north or south side.</p>	<ul style="list-style-type: none"> High business impacts - Bus-only lanes together on either the north or south side would block all commercial driveways along one side of the other. Many properties along Finch Avenue rely solely on this arterial for vehicular access (3 on the north side and 10 on the south side). Many of these properties support a multiple number of businesses. Required separate phase at Dufferin and Finch would significantly impact the capacity of this constrained intersection. Safety Issues – since there are only three lanes per direction under the rail bridge, one of the two directions of general-purpose traffic would have to travel on either side of the centre pier. Maintenance issue – requires additional pass for snow removal. Solution will reduce boulevard width and require the disposal of snow off-site. <p>Greater overall impact to general traffic without offering any different benefits over median option</p> <p style="text-align: center;">Do Not Carry forward</p>

It was recommended that Finch Avenue Bus-only lanes in the median be carried forward to detailed analysis and evaluation.

1.1.3 Sheppard Avenue / New Road to Keele

Within a 30 m right of way, Sheppard Avenue provides two through lanes per direction through the study area. Sheppard Avenue is grade separated with the CN rail corridor and the existing structure can accommodate two lanes per direction. At Tuscan Gate, the proposed bus-only facility would follow an existing east-west road right-of-way that aligns with Grandravine Boulevard (west of Keele). Alternative cross sections on Sheppard Avenue considered for analysis include:

They are as follows:

Curb Reserved Bus lanes – Reserved Bus lanes would have similar operating parameters to HOV lanes utilized throughout the City. Right turns in and out of driveways are permitted from the RB Lanes. The reserved bus lanes would be implemented through a widening of the existing road. In order to accommodate the widened road, an additional 6 metres of right-of-way are required (consistent with the 36 m Right of way in Toronto’s official plan). Also, given the current configuration of the grade separation at the CN Rail line, a completely new structure would be required.



Curb lanes with barrier separating bus-only lanes from general-purpose traffic – Bus-only lanes in physically separated curb lanes would have similar operating parameters to the RBL described above. A raised curb or island prevents general-purpose traffic from illegally using the bus-only curb lane. However, with a barrier separated curb lane, disabled buses will block the lane unless lanes are made extra wide. This solution would require breaks in islands at all existing driveways and intersections to maintain access. At present, there are 6 driveways (all on the north side). Also, if the barriers are continuous up to the stop bar at signalized intersections, eastbound and westbound right turns must be controlled to prevent right turning vehicles from crossing the path of buses.

Bus-only lanes in the median – As described for Finch and Dufferin, this option would reduce all driveways (6 on north side of Sheppard) to right-in/right-out but cars may u-turn at signalized intersections and full moves are retained at all signalized intersections. The existing grade separation would be utilized and supplemented with a new portal on the south side of Sheppard Avenue (2 westbound GP lanes through north span, 2 bus-only lanes through south span and 2 eastbound lanes through new portal). A new road, parallel to Tuscan and across to intersect with Keele opposite Grandravine is required to connect to Keele Street. Existing right-of-way is 30 m wide. To develop desired cross-section, a 45 m right-of-way is required. However, median solution can be developed using a minimum right-of-way of 36 metres. A localized widening to a 45 m right-of-way at the CN grade separation will be required to accommodate the new portal.

Bus-only lanes together on the north side – At present, there are no transit facilities in the Greater Toronto Area with a similar operating parameter. Bus-only lanes together on the north side would block all commercial driveways (6) along the north. A new portal on the north side of Sheppard Avenue is required to accommodate the bus-only lanes. At all signalized intersections, eastbound lefts and westbound rights must be controlled movements.

Bus-only lanes together on the south side - At present, there are no transit facilities in the Greater Toronto Area with a similar operating parameter. There are no driveways on the south side of Sheppard that would be affected by Bus-only lanes together on the south side. A new portal on the south side of Sheppard Avenue is required to accommodate the bus-only lanes. At all signalized intersections, westbound lefts and eastbound rights must be controlled movements.

Bus-only lanes together on the south side, through Downsview Park - Similar to the alternative described above but the bus-only facility would be in a separate right-of-way sufficiently separated from Sheppard Avenue so that the control of eastbound lefts and westbound rights is no longer required.

The table below summarizes the comparison of these alternatives.



Table 3 - Sheppard Avenue / New Road – Review of Alternative Cross Sections

<p>Curb Reserved Bus Lanes</p>	<ul style="list-style-type: none"> • All driveway access will continue to occur from HOV/RB lane (legal use). 6 commercial driveways will be a source of conflicts and delays. • General effectiveness is dependant on the rate of violation of curb HOV/RB lanes. Violation rate is anticipated to worsen over time as traffic congestion increases. • Additional 6 metres of right-of-way widening are required along Sheppard Avenue. • High cost alternative – complete reconstruction of Sheppard / CN grade separation. <p>Given the high cost and lack of exclusivity that RB lanes provide this option is inferior to other cross-sections possible along Sheppard Avenue.</p> <p style="text-align: center;">Do Not Carry Forward</p>
<p>Curb lanes with barrier separating bus-only lanes from general purpose traffic</p>	<ul style="list-style-type: none"> • Requires breaks in islands at existing driveways to maintain access – potential roadside hazard. 6 commercial driveways. • Snow storage issue – snow from general purpose lanes must be removed off site. Also requires additional pass by plows. • Disabled bus will block lanes (unless lanes are made extra wide) • High cost alternative – complete reconstruction of Sheppard / CN grade separation. <p>Given the high cost and safety issues, this option is inferior to other cross-sections possible along Sheppard Avenue.</p> <p style="text-align: center;">Do Not Carry forward</p>
<p>Bus-only lanes in the median</p>	<ul style="list-style-type: none"> • Reduces 6 commercial driveways to right-in/right-out • Cars may u-turn at signalized intersections • Full moves retained at all signalized intersections • Moderate cost – requires new portal at CN crossing. <p style="text-align: center;">Carry forward for further analysis</p>
<p>Bus-only lanes together on the north side.</p>	<ul style="list-style-type: none"> • Blocks all driveways along north side • Significant operational/safety issues at major intersection of Dufferin at Sheppard associated with conflicting general purpose westbound right turns and bus movements. • Requires full signal at Downsview station, thereby impacting flow of EW and WB traffic on Sheppard. • Direct movement to/from Hydro Corridor or Finch Avenue • Maintenance issue – requires additional pass for snow removal. Right-of-way sufficiently wide that median separating general purpose and RB lanes can be designed to



	<p>accommodate snow storage.</p> <ul style="list-style-type: none"> • Significant property impacts associated with securing additional road right-of-way along north side of Sheppard Avenue. • Moderate cost – requires construction of new road and portal under CN tracks. <p>Greater overall impact to general traffic without offering any different benefits over median option</p> <p>Do Not Carry forward</p>
<p>Bus-only lanes together on south side</p>	<ul style="list-style-type: none"> • No impacts to driveways • Significant operational/safety issues at major intersection of Dufferin at Sheppard associated with conflicting general purpose eastbound right turns and bus movements. • Direct connection into Downsview station. • Maintenance issue – requires additional pass for snow removal. Right-of-way sufficiently wide that median separating general purpose and RB lanes can be designed to accommodate snow storage. • Significant property impacts associated with securing additional road right-of-way along south side of Sheppard Avenue. • Moderate cost – requires construction of new road and portal under CN tracks. <p>Greater overall impact to general traffic without offering any different benefits over median option</p> <p>Do Not Carry forward</p>
<p>Bus-only lanes together on south side, through Downsview Park</p>	<ul style="list-style-type: none"> • No impacts to driveways • Bus movements across the Allen - Requires full signal at Downsview station, thereby impacting flow of NB and SB traffic on Allen. • Maintenance issue – requires additional pass for snow removal. Right-of-way sufficiently wide that median separating general purpose and RB lanes can be designed to accommodate snow storage. • Significant property impacts associated with securing additional road right-of-way through Downsview Park, with possible impacts to development aspirations. • Moderate cost – requires construction of new road and portal under CN tracks. <p>Greater overall impact to general traffic without offering any different benefits over median option</p> <p>Carry forward – subject to discussions with Downsview Park</p>



It was recommended that Sheppard Avenue Bus-only lanes in the median be carried forward to detailed analysis and evaluation.

1.1.4 Keele Street

Within a 36 m right of way, Keele Street provides two through lanes per direction through the study area. Alternative cross sections on Keele Street considered for analysis include:

Curb Reserved Bus lanes – Reserved Bus lanes would have similar operating parameters to HOV lanes utilized throughout the City. Right turns in and out of driveways are permitted from the RB Lanes.

Curb lanes with barrier separating bus-only lanes from general-purpose traffic were also identified but this solution would require breaks in islands at all existing driveways and intersections to maintain access. Given the 54 driveways and 5 signalized intersections between Grand Ravine and Murray Ross Parkway, the sections of barrier would be so short that this alternative would not be practical.

Bus-only lanes in the median - Bus-only lanes in the median would have similar operating parameters to the Spadina LRT. It would reduce all driveways to right-in/right-out but cars may u-turn at signalized intersections and full moves are retained at all signalized intersections.

Bus-only lanes together on the east side or east side - Bus-only lanes together on the east side would block all commercial driveways. Along the west side, a combination of commercial and residential (apartments) would be blocked. At all signalized intersections, northbound lefts and southbound rights must be controlled movements.

The table below summarizes the comparison of these alternatives.

Table 4 - Keele Street – Review of Alternative Cross Sections

Reserved Bus Lanes - curb	<ul style="list-style-type: none"> • 48 commercial driveways plus 6 high-density residential driveways will introduce a high volume of general-purpose traffic, into the Reserved Bus Lanes. This legal use of the reserved bus lanes will reduce the effectiveness of the lane. • General effectiveness is also dependant on the rate of violation of curb RB lanes. Violation rate is anticipated to worsen over time as traffic congestion increases. • Moderate cost alternative – alternative can be implemented through a widening of Keele Street. • Hydro line along west side and all trees scheduled for planting this fall are subject to removal/relocation. <p>Based on similar experiences with HOV lanes along highly active</p>
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	<p>commercial arterials, this alternative is anticipated to provide very little benefit to transit operations.</p> <p style="text-align: center;">Do Not Carry Forward</p>
<p>Bus-only lanes in the median</p>	<ul style="list-style-type: none"> • Reduces all driveways to right-in/right-out (48 commercial driveways and 6 residential driveways). This will affect a number of fast food restaurants (Wendy’s, Taco Bell) that rely on pass-by traffic for business. • Cars may u-turn at signalized intersections. • Maintenance issue – requires additional pass for snow removal. Median solution will reduce boulevard width and require the disposal of snow off-site. • Moderate cost – requires complete reconstruction of Keele Street. • Hydro line along west side and all trees scheduled for planting this fall are subject to removal/relocation. <p style="text-align: center;">Carry forward for further analysis</p>
<p>Bus-only lanes together on either the west or east side.</p>	<ul style="list-style-type: none"> • High business impacts - Bus-only lanes together on east side would block all commercial driveways. High-density residential driveways would be affected on the west side. Many properties along Keele Street vehicular rely solely on this arterial for vehicular access (18 commercial driveways and 2 apartments). Many of these properties support a multiple number of tenants. • Maintenance issue – requires additional pass for snow removal. Solution will reduce boulevard width and require the disposal of snow off-site. • Significant operational/safety issues at major intersection of Keele at Finch associated with conflicting general purpose right turns and bus movements. <p>Greater overall impact to general traffic without offering any different benefits over median option</p> <p style="text-align: center;">Do Not Carry forward</p>

It was recommended that Keele Street Bus-only lanes in the median be carried forward to detailed analysis and evaluation.

1.1.5 Summary of Short Listed Routings / Configurations

Based on the above analysis, the alternatives to be carried forward for a more detailed review are:

- Dufferin / Hydro Corridor – Bus-only lanes in the median along Dufferin, plus a new bus-only road within the Hydro Corridor



- Dufferin / Hydro Corridor – Bus-only lanes in the curb along Dufferin, plus a new bus-only road within the Hydro Corridor
- Dufferin / Hydro Corridor – Bus-only lanes in the median or curb (hybrid) along Dufferin, plus a new bus-only road within the Hydro Corridor
- Dufferin / Finch – Bus-only lanes within the median of both roads
- Sheppard / Keele – Bus-only lanes within the median of both roads

Dufferin/Finch Corridor

- Finch has two traffic lanes in each direction and a high number of driveways.
- There is no practical way to have bus-only lanes along the curb.
- The only design that would work on Finch is to widen the road and build bus-only lanes in the two centre (median) lanes
- Islands would be built on either side of the bus-only lanes, with breaks at signals.
- The design on Dufferin must also be in the median in order to facilitate safe and efficient operation at the Dufferin / Finch intersection.

Sheppard/Keele Corridor

- As with Finch, Keele would require a major widening and, because of the high number of driveways, bus-only lanes would have to be located in the median.
- A new 2-lane bus-only roadway would connect Keele to Sheppard.
- Sheppard would also require a major widening. Bus-only lanes in the median is the only solution that can be accommodated without a complete reconstruction of the CN Rail bridge.