

16 AVENUE NE - DEERFOOT TRAIL TO BARLOW TRAIL FUNCTIONAL PLANNING STUDY UPDATE

EXECUTIVE SUMMARY

This report is an update to the 16 Avenue NE Functional Planning Study between Deerfoot Trail and Barlow Trail presented to Council in 2015. In the 2015 report, recommendations were made to build a new tight diamond interchange at 19 Street NE and reconfigure the existing Barlow Trail interchange to a modified diamond interchange. The Barlow Trail interchange design respected the limited space between 19 Street NE and Barlow Trail. In June 2015, Council approved the 19 Street NE interchange plans and directed Administration to investigate alternative design solutions for the 16 Avenue NE and Barlow Trail interchange.

As part of the investigation a total of six design alternatives for the 16 Avenue NE and Barlow Trail interchange that retained the free flow conditions provided by the current full cloverleaf interchange were investigated at the conceptual level. Three of these interchange design options were selected for further review and analysis. As a second part of this investigation, three additional infrastructure scenarios were also investigated for comparative purposes, to help assess the value of the additional cost of maintaining the free flow interchange at Barlow Trail.

ADMINISTRATION RECOMMENDATIONS

That the SPC on Transportation and Transit recommends that Council:

1. Receive this Report for information;
2. Reconfirm its June 15, 2015 approval of the 16 Avenue NE – Deerfoot Tr. to Barlow Tr. Functional Planning Study as summarized in Attachment 1; and
3. Direct Administration to include the widening of 16 Avenue NE from 36 Street NE to Stoney Trail, the widening of Barlow Trail from Memorial Drive to 16 Avenue NE and the 16 Avenue/ 68 Street NE interchange as candidate projects for evaluation with the next update of Investing in Mobility.

RECOMMENDATION OF THE SPC ON TRANSPORTATION AND TRANSIT, DATED 2017 APRIL 19:

That the Administration Recommendations contained in Report TT2017-0041 be approved.

PREVIOUS COUNCIL DIRECTION / POLICY

At the June 15, 2015 combined meeting of Council, Council approved the following recommendations with report TT2015-0224, 16 Avenue NE – Deerfoot Trail to Barlow Trail Functional Planning Study:

1. Approve the 16 Avenue NE – Deerfoot Tr. To Barlow Tr. Functional Planning Study as summarized in Attachment 1.

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2. Direct Administration to acquire the additional right-of-way required for Stage 3 construction on an opportunity basis as shown in Attachment 2, funded using the Transportation Infrastructure future land account or similar appropriate funding sources; and
3. Direct Administration to investigate alternative design solutions at 16 Avenue NE and Barlow Trail NE which would support the intersection at 16 Avenue NE and 19 Street NE and also improve safety.

BACKGROUND

16 Avenue NE is an important road in the City transportation network and serves as part of the Trans-Canada Highway. It is classified as a skeletal road and is a goods movement corridor. The section of 16 Avenue NE from Deerfoot Trail to Barlow Trail is currently constructed as a 6 lane roadway with a signalized intersection at 19 Street NE. There are existing interchanges along 16 Avenue NE at both Deerfoot Trail and Barlow Trail. The segment of 16 Avenue NE between Deerfoot Trail and 19 Street NE is the busiest section of the Trans-Canada Highway within Calgary and currently carries over 80,000 vehicles per day of which the percentage of trucks is about 4.2%.

Barlow Trail NE also an important road in the City transportation network. It is classified as an arterial street and a goods movement corridor. It serves as the central access corridor of the NE commercial/industrial areas of Franklin, Horizon, Mayland, Meridian, North and South Airways, Pegasus and Sunridge as well as the south access for the Calgary International Airport. Barlow Trail carries approximately 54,000 and 40,000 vehicles per day north and south of 16 Avenue respectively.

In the early 1960's, the road known today as Barlow Trail NE was part of the Highway 2 corridor and the 16 Avenue and Barlow Trail interchange, was constructed at the crossroads of Highway 1 and Highway 2. Due to the expansion of Calgary International Airport and the initial construction of Deerfoot Trail in the early 1970's, which saw the connection of Barlow Trail to Highway 2 severed, the need to maintain Barlow Trail as a future freeway was lessened.

The 2009 Calgary Transportation Plan recognized that the nature and function of Barlow Trail had changed since the 1960's by reclassifying Barlow Trail NE from a Skeletal Road to an Arterial Street. This reclassification served to reinforce the service function of Barlow Trail as a key corridor for goods movement and commercial access and not as a future freeway. The prominence of Barlow Trail as a regional road was further reduced in 2011 with the permanent closure of Barlow Trail from 48 Avenue NE to Airport Trail NE to allow from the construction of the new runway at the Calgary International Airport.

Prior to the 2015, 16 Avenue NE – Deerfoot Trail to Barlow Trail Functional Planning Study, The City completed three previous studies that recommended improvements to 16 Avenue NE between Deerfoot Trail and Barlow Trail; the Trans-Canada Highway – East Functional Planning Study (1978), the Barlow Trail North Functional Study (1986), and the Deerfoot Trail Corridor Study (1998).

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In the 2015, 16 Avenue NE – Deerfoot Trail to Barlow Trail Functional Planning Study, it was recommended to build a new tight diamond interchange at 19 Street NE and reconstruct the existing Barlow Trail interchange to a modified diamond interchange due to the limited space between 19 Street NE and Barlow Trail. Council approved the 16 Avenue NE – Deerfoot Trail to Barlow Trail Functional Planning Study and subsequently directed Administration to investigate alternative design solutions the 16 Avenue NE and Barlow Trail interchange to keep both 16 Avenue NE and Barlow Trail free flow. As such, Administration initiated a review of alternative design solutions along with a value for money assessment of comparable infrastructure investments.

INVESTIGATION: ALTERNATIVES AND ANALYSIS

Barlow Trail Free Flow Interchange Alternatives

In the 2015, 16 Avenue NE Functional Planning study, the recommended plan included the conversion of the full cloverleaf Barlow Trail interchange into a modified diamond interchange and the additional of two signalized intersections along Barlow Trail. As part of the investigation of alternative design solutions for the 16 Avenue NE and Barlow Trail interchange, Administration completed an internal review of several alternative interchange options that would maintain the free flow conditions that currently exist along Barlow Trail and 16 Avenue NE without the provision of any additional traffic signals.

The first step in this review was to generate a set of free flow interchange conceptual configurations that would properly work with and support the approved 19 Street NE interchange in this area. The second step was to assess the ability of the concepts to accommodate the forecasted traffic demands and assess the constructability of each configuration to ensure that the options could be implemented. The third step was to create a short list of the preferred configurations and assess the advantages and disadvantages of each concept. The last step was to provide a high level cost estimate for each conceptual configuration.

The three alternative design solutions that were selected for further review and analysis are included in Attachment 2 (Pages 7 to 9). These three concepts all maintain free flow operations for all vehicular movements at the 16 Avenue NE and Barlow Trail Interchange. However, each of the options requires additional infrastructure (ranging from two to six extra structures) in order for these free flow movements to be maintained. While each of these options is compatible with the approved 16 Avenue NE Functional Plan from a vehicular perspective, none of the options were found to be able to accommodate the east-west and the north-south multi-use pathways that were included in the approved plan. The supplementary costs for the additional infrastructure required to maintain free flow traffic along Barlow Trail are summarized as follows:

Table 1: Free Flow Barlow Trail Interchange Supplementary Costs

Scenario	Description	Estimated Cost*
Concept 1	Cloverleaf Interchange Configuration	Additional \$31 million
Concept 2	Modified Parclo A Interchange Configuration	Additional \$43 million
Concept 3	Modified Cloverleaf Interchange Configuration	Additional \$34 million

* – the estimated costs as presented here are at a Class 5 cost estimate level (-50% - +100%)

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In order to assess the value of these possible additional investments, a benefit/cost assessment was completed whereby the estimated annualized weekday travel time savings for the AM and PM peak periods were calculated and quantified over a 25 year period. The methodology and analysis completed by Administration for this exercise are included in Attachment 3 (pages 8-11). Within this analysis, the derived benefit of each of the three concepts was estimated to be \$10.2 million as each scenario provides the same travel time savings to the vehicular network. The value of this incremental benefit was then compared against the supplementary costs associated with the concepts. As shown in the table below, none of the free flow interchange concepts possesses a benefit cost ratio exceeding 0.33.

Table 2: Free Flow Barlow Trail Interchange Benefit / Cost Summary

Scenario	Benefit	Estimated Cost*	Benefit / Cost Ratio
Concept 1	\$10.2 million	\$31 million	0.33
Concept 2	\$10.2 million	\$43 million	0.24
Concept 3	\$10.2 million	\$34 million	0.30

* – the estimated costs as presented here are at a Class 5 cost estimate level (-50% - +100%)

Additional Infrastructure Improvement Scenarios

For comparative purposes, three alternative network level infrastructure scenarios were investigated to help assess the value of the potential additional cost of maintaining the free flow interchange at Barlow Trail. The three alternative scenarios included widening 16 Avenue NE from four core lanes to six core lanes from 36 Street NE to Stoney Trail; widening Barlow Trail from four lanes to six lanes from Memorial Drive to 16 Avenue NE; and building a new interchange at 16 Avenue / 68 Street NE. All of these alternative infrastructure scenarios are for identified network level improvements within the same geographic area of Calgary and would serve to provide concurrent and complementary network level benefits along with the approved 16 Avenue NE Functional Plan.

A high level benefit cost analysis was completed on each of these three scenarios along with combinations of the approved 16 Avenue NE Functional Plan and the alternative scenarios to provide a value for money assessment.

Table 3: Additional Infrastructure Scenarios Benefit / Cost Summary

Scenario*	Description	Benefit	Estimated Cost**	B/C Ratio
1	Widen 16 Avenue NE	\$2.6 million	\$9.2 million	0.28
2	Widen Barlow Trail	\$10.5 million	\$5.5 million	1.91
4	68 Street NE Interchange	\$49.5 million	\$51.5 million	0.96

* - Scenario numbering is maintained from Attachment 2

** – the estimated costs as presented here are at a Class 5 cost estimate level (-50% - +100%)

From this analysis, it was found that widening Barlow Trail from four to six lanes would provide a significantly better return as independent infrastructure investments than any of the three Barlow Trail interchange options. The analysis found that the combination of widening 16 Avenue NE and Barlow Trail provided the most cost effective additional investment at approximately \$15

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million. The analysis also showed that the 16 Avenue / 68 Street NE interchange would also provide a better return on investment when compared to the additional costs required to keep the Barlow Trail interchange free flow.

Based on the analysis and evaluation of alternative design solutions and alternative infrastructure scenarios, it is recommended that the 16 Avenue NE – Deerfoot Trail to Barlow Trail Functional Planning Study be maintained as previously approved and that all three of alternative network level infrastructure scenarios that were evaluated as part of this study update be included as candidate projects for evaluation with the next update of Investing in Mobility.

Stakeholder Engagement, Research and Communication

Six public open houses and two external stakeholder meetings were held as part of the approved 2015 functional planning study. No subsequently engagement was undertaken as part of the internal technical review of the alternative design solutions. It is anticipated that additional public engagement will be undertaken as part of the detailed design work prior to construction.

Strategic Alignment

The study objectives for the 16 Avenue NE Functional Planning Study were in alignment with Calgary Transportation Plan (CTP), Complete Street Guidelines, and the 2020 Sustainability Direction including:

- Transportation Goal #1 by providing better connectivity for major City roadways;
- Transportation Goal #5 to promote economic development by providing smooth and efficient movement of people and goods (CTP 3.4);
- CTP Objective 3.6 by improving quality of service along the Trans-Canada Highway by reducing travel times;
- 'Improving Goods Movement' 2020 objective by providing free-flow operations on the Trans-Canada Highway; and
- Triple Bottom Line (TBL) and 'Green House Gas (GHG) Emission Reduction' 2020 Objective by easing congestion through the removal of a bottleneck.

Social, Environmental, Economic (External)

The recommendations will improve auto and goods movement, improve the connectivity and accessibility for all transportation modes including pedestrians, cyclists and public transit, and remove the bottleneck areas. The benefits include travel time reduction, congestion reduction, safety improvements and reduced vehicular emissions.

Financial Capacity

Current and Future Operating Budget:

There are no current of future operating budget impacts associated with this report. However, future operating budgets would require incremental increases as a result of the additional infrastructure investments that were studied in this report should future capital be allocated to these projects. The additional operating costs of the proposed upgrades have not been quantified.

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Current and Future Capital Budget:

There are no current or future capital budget impacts associated with this report. However, with the assessment of alternative design solutions and alternative infrastructure scenarios, Administration is recommending that the three potential future projects be added as candidate projects for evaluation with the next update of Investing in Mobility, with a possible future capital investment ranging between of \$45 million and \$120 million (based on the class 5 cost estimates prepared for this study).

It should be noted that the 16 Avenue NE and 19 Street NE Interchange project is currently on the unfunded list within the 2015-2024 investing in Mobility (IIM) plan and as such is outside the current Action Plan and Capital Budget timeframe.

Risk Assessment

Cost estimates for the proposed recommendations are based on the current land value and construction costs. The estimates for ultimate horizon should be reviewed if the construction funding will only be available in the future. Maintaining the free flow nature of both 16 Avenue NE and Barlow Trail NE at the 16 Avenue/Barlow Trail Interchange would establish an infrastructure scenario that would see a design solution implemented that does not match the classification and function of the roadways that it is serving (i.e. the interchange would be overbuilt). This would establish a precedent related to the provision of interchange infrastructure that would not be financially sustainable.

REASON(S) FOR RECOMMENDATION(S):

The recommendation enables Administration to proactively program a suite of transportation network improvements that could be implemented in conjunction with the planning and implementation of the 16 Avenue / 19 Street NE interchange. These improvements will improve auto and goods movement, remove the bottleneck areas, and improve the accessibility and connectivity for pedestrians, cyclists, and public transit. These collective projects provide for the most cost effective enhancement of this section of the NE transportation network with a high return on investment. Once built out, the improvements have the potential to reduce greenhouse gas emissions and improve safety.

ATTACHMENT(S)

1. 16 Avenue NE – Deerfoot Trail to Barlow Trail Functional Planning Study Executive Summary
2. Functional Planning Study 16 Avenue NE – Deerfoot Trail to Barlow Trail: Barlow Trail/16 Avenue Free Flow Interchange Concept Development, February 2016
3. Functional Planning Study 16 Avenue NE – Deerfoot Trail to Barlow Trail: Additional Infrastructure Improvement Scenarios, October 2016