Stantec

North Central BRT Functional Study

Summary Report

May 12, 2021

Table of Contents

1.0 PROJECT OVERVIEW 1

2.0 IMPROVEMENTS REVIEWED 5
2.1 DOWNTOWN 5
2.1.1 Routing 6
2.1.2 Downtown Bus Only Lanes 7
2.2 DOWNTOWN TO 16 AVENUE N 8
2.2.1 6 Avenue S to the Centre Street Bridge 8
2.2.2 Centre Street South Public Realm and Streetscape Improvements 8
2.2.3 Centre Street Bridge to 16 Avenue N 10
2.3 16 AVENUE N TO MCKNIGHT BOULEVARD N 11
2.3.1 Active Modes 14
2.4 MCKNIGHT BOULEVARD N TO BEDDINGTON TRAIL N 14
2.4.1 Active Modes 15
2.5 BEDDINGTON TRAIL N TO NORTH POINTE BUS TERMINAL 15
2.5.1 Active Modes 18
2.6 NORTH POINTE BUS TERMINAL TO 160 AVENUE N 19
2.6.1 Active Modes 19
2.7 STATIONS 19

3.0 GREEN LINE OPENING DAY (2028) TRAFFIC ANALYSIS 20

4.0 BENEFIT-COST ANALYSIS 21

5.0 COSTING AND TIMING OF IMPLEMENTATION 21

6.0 COMMUNICATIONS AND ENGAGEMENT 23

7.0 NEXT STEPS 23

LIST OF TABLES

Table 1 – Opinion of Probably Cost Summary for Recommended Improvements 22

LIST OF FIGURES

Figure 1-1 Existing Bus Rapid Transit Network 1
Figure 1-2 Future Rapid Transit Network 2
Figure 1-3 Study Area 3
Figure 1-4 Recommended Improvements 4
Figure 2-1 Average Bus Speeds 5
Figure 2-2 Downtown Routing Options 6
Figure 2-3 Downtown Bus Lanes 7
Figure 2-4 Centre Street Bridge 8
Figure 2-5 Centre Street N (Bow River Bridge to 16 Avenue N) BRT Options 10
Figure 2-6 Centre Street N (16 Avenue N to McKnight Boulevard N) Options 12
Figure 2-7 Right-Turn Across Bus Only Lane 13

Figure 2-8 Bus Only Crossing Improvements....16
Figure 2-9 Existing Bus Route and Stops....17
Figure 2-10 Existing Active Modes Connections....18

LIST OF APPENDICES

APPENDIX A TRANSIT TERMS....24

APPENDIX B DRAWINGS....26

APPENDIX C STATION TIERING RECOMMENDATIONS....41

1.0 PROJECT OVERVIEW

The Centre Street N / Harvest Hills Boulevard N corridor in north central Calgary is Calgary Transit's busiest bus corridor. Historically, the corridor has carried just under 1,000 buses per day in its highest volume section between Beddington Boulevard N and 64 Avenue N and over 800 buses per day in and out of downtown Calgary. The corridor supports a peak transit ridership of approximately 30,000 customers per day with approximately 20,000 of those customers traveling in and out of downtown Calgary. The Route 301 has connections to the existing MAX Orange, MAX Purple, MAX Yellow, Red Line LRT, Blue Line LRT as shown in **Figure 1-1**. The strong transit ridership in this corridor has and will continue to support mode progression to LRT to continue to expansion of the Green Line LRT towards its northern terminus. Ultimately the future Airport Transit Link and 144 Avenue N BRT will tie into the rapid transit corridor along Harvest Hills Boulevard N as shown on **Figure 1-2**. A list of transit terms can be found in **Appendix A.**

With Stage 1 of the Green Line LRT having an initial terminus at 16 Avenue N, there is a need to continue to build upon the existing Route 301 service to continue to provide robust transit service to the communities of north central Calgary while recognizing the changes that Green Line will bring to the corridor. To that end, this project has examined a series of improvements along the existing route connecting Downtown Calgary to the North Pointe Bus Terminal and the future extension to 160 Avenue N that not only provide for improved transit service today, but also help to establish some of the future infrastructure for the expansion of Green Line towards its northern terminus. The improvements include optimizing the existing network to improve transit travel time and reliability, improving access to the BRT system along the corridor, and transitioning the existing BRT service to a future MAX BRT service with supporting station and roadway upgrades.

Figure 1-1 Existing Bus Rapid Transit Network

NORTH CENTRAL BRT FUNCTIONAL STUDY

1.0 Project Overview

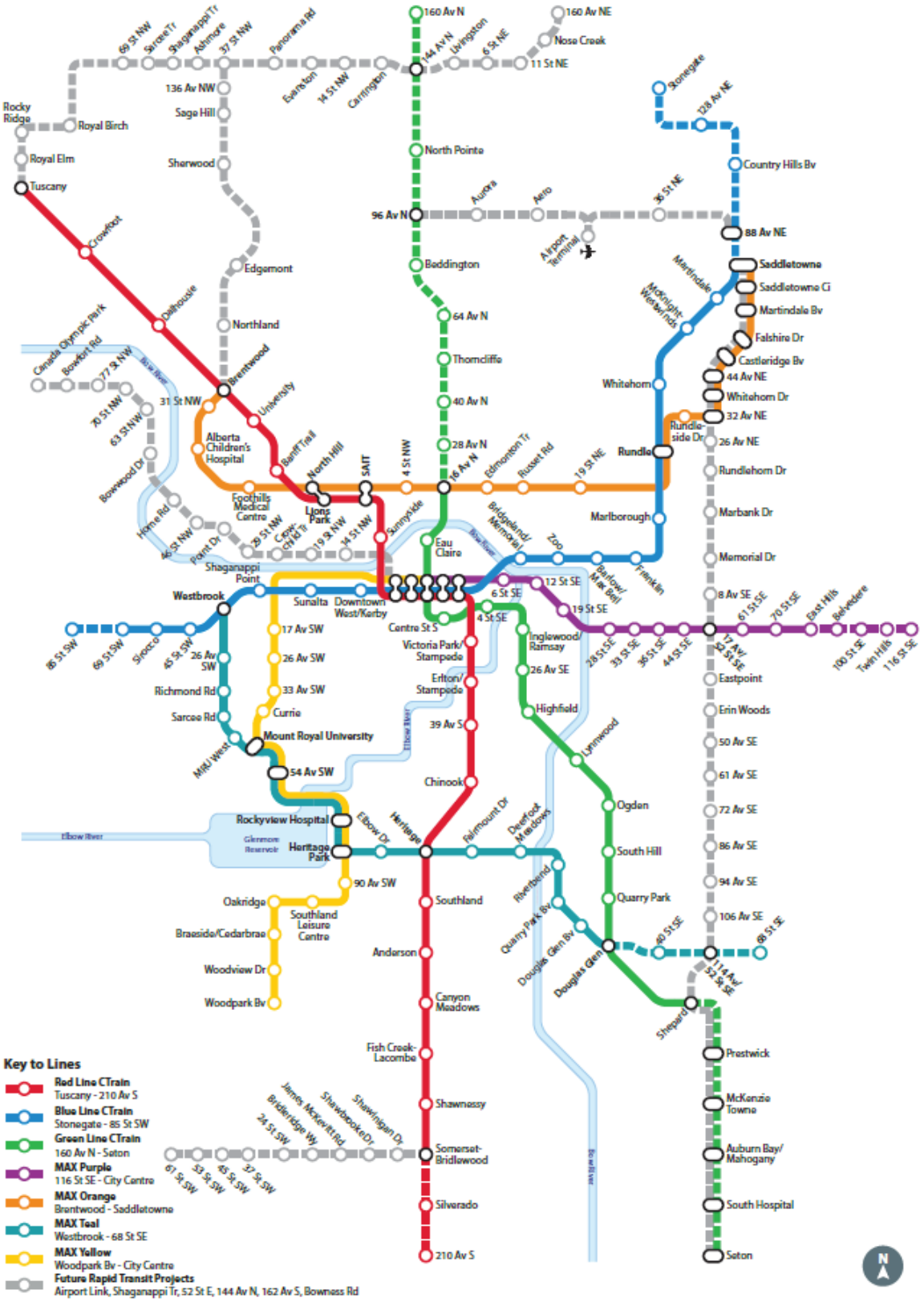


Figure 1-2 Future Rapid Transit Network

NORTH CENTRAL BRT FUNCTIONAL STUDY

1.0 Project Overview

The North Central BRT Functional Study (NCBRT Study) is closely linked with the work that is being completed as part of the North Central Mobility Study. The study areas for each of these studies is illustrated on **Figure 1-3**. The North Central BRT study generally follows the existing BRT route in downtown and then follows the Centre Street N / Harvest Hills Boulevard N corridor to the North Pointe Bus Terminal and then north across Stoney Trail to an assumed ultimate northern terminus of the BRT at 160 Avenue N.

The North Central Mobility Study is examining the impacts to the mobility network resulting from the changes to Centre Street N caused by the implementation of Green Line as well as any improvements proposed as part of this study. Stage 1 of Green Line will include a surface running Light Rail Transit (LRT) along Centre Street N south of 16 Avenue N to Samis Road that reduces the road to a single lane in each direction and removes the existing lane reversal that provides a bus and 2+ passenger HOV curb lane in the southbound direction during the AM Peak and in the northbound direction in the PM Peak. The implementation of Green Line will result in a significant reduction in traffic on Centre Street N due to the reduction in the capacity of the roadway.

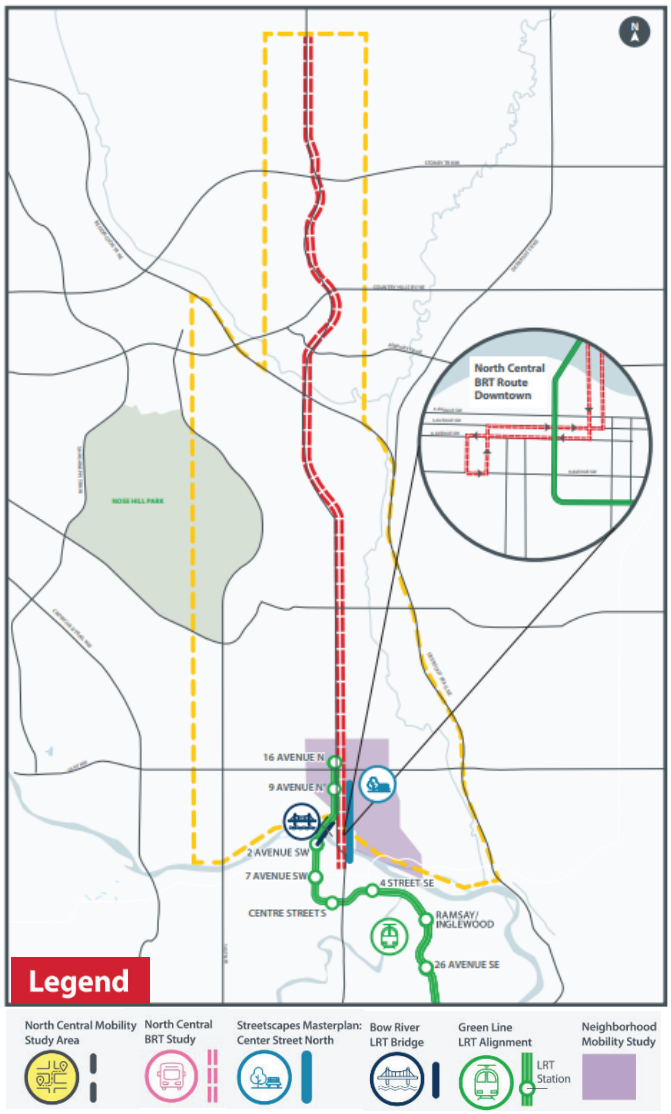


Figure 1-3 Study Area

Before reviewing any potential improvements for the BRT, the first step in this project was to review and analyze the existing conditions and establish where operational deficiencies may exist within the study area. Since this study was initiated amid the COVID-19 pandemic, traffic volumes and patterns were not at their typical pre-COVID levels or patterns. Therefore, existing traffic data was utilized for this study. The Centre Street N / Harvest Hills Boulevard N corridor and downtown were analyzed based on these “pre-COVID” traffic volumes to identify locations with existing congestion and delay issues and provide a basis of comparison for the analysis of contemplated improvements. Beyond the traffic analysis component of the existing conditions analysis, the study took into account past work conducted by the Green Line project team that had reviewed the bus operations along the Centre Street N / Harvest Hills Boulevard N corridor and throughout downtown

as well as feedback received from stakeholder meetings which included both the public and Calgary Transit staff and operators. These observations are discussed in detail in the segment-by-segment review of the improvement options considered. This review culminated in a series of short (0-5), medium (5-10) and long-term (10+) years recommendations that are graphically illustrated in **Figure 1-4** below. It is important to note that when the Green Line LRT extends north, the BRT service will be decommissioned at some point when the LRT reaches far enough north along the corridor to make BRT service no longer an essential service for the transit system.

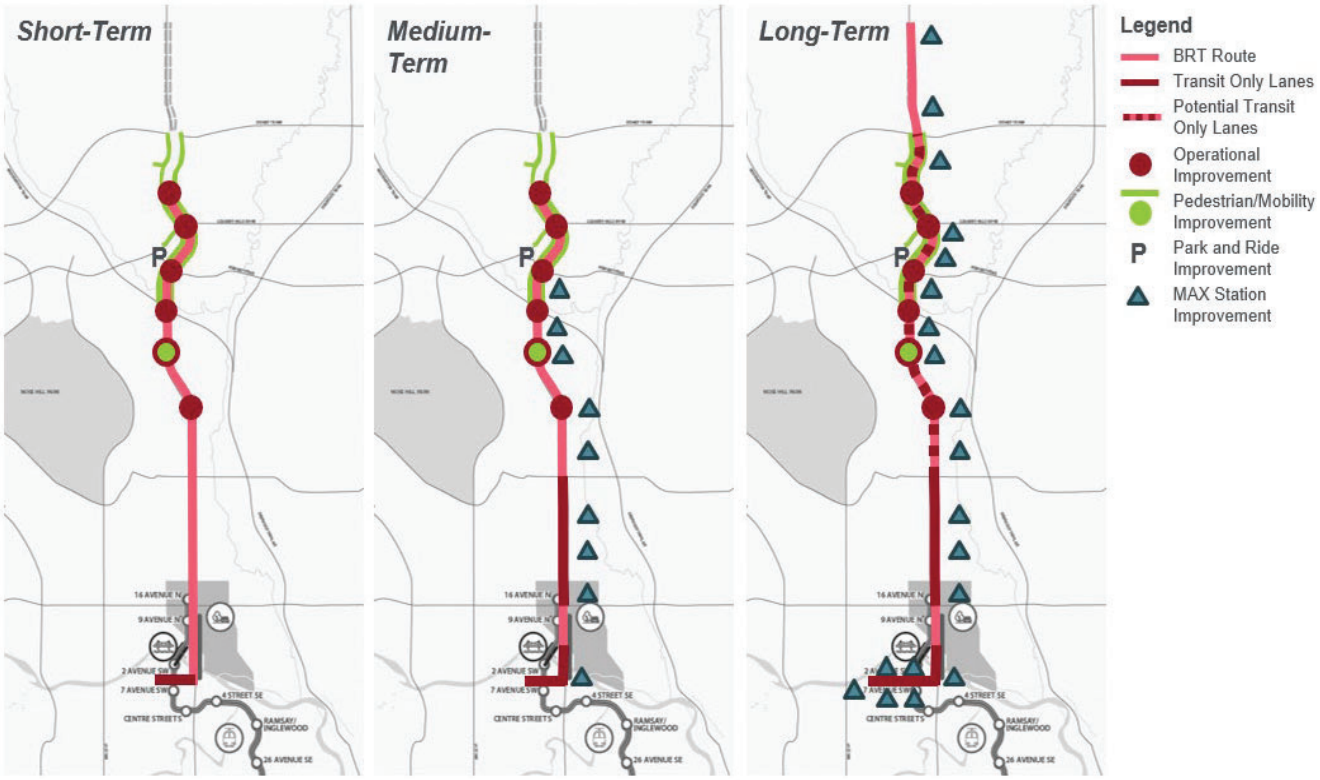


Figure 1-4 Recommended Improvements

2.0 IMPROVEMENTS REVIEWED

2.1 DOWNTOWN

Based on the previous work completed by the Green Line team, the existing downtown bus loop illustrated in **Figure 2-1** shows that downtown is one of the slowest portions of the existing BRT route. The below pictures illustrate some of the challenges with the existing downtown bus operations, which contribute to lower bus speeds. There is significant vehicular congestion throughout downtown. While buses generally overtake the right curblane during peak periods at stop locations, they have to merge into the adjacent lane while also navigating turning traffic at intersections, parkade entrances and alleyways. This turbulance contributes to the slow operating speeds through the downtown portion of the BRT route.

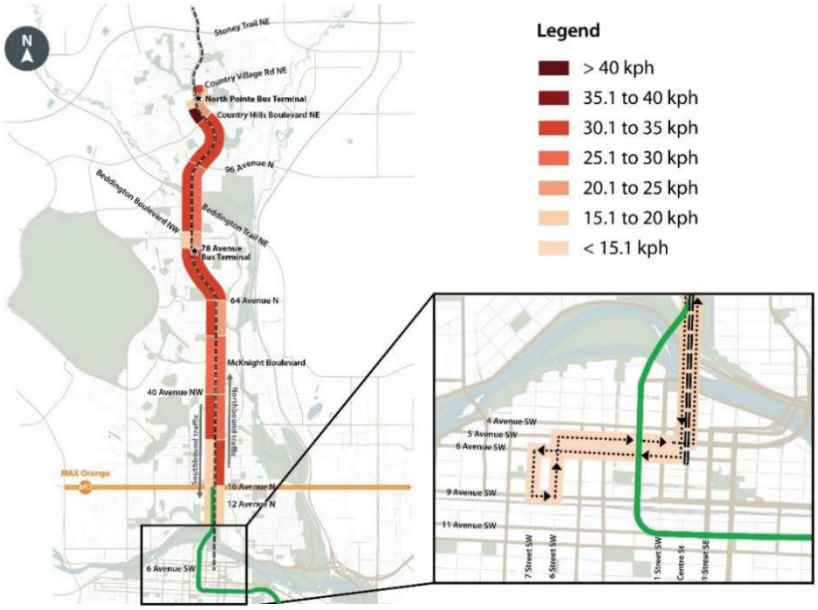


Figure 2-1 Average Bus Speeds

2.1.1 Routing

The current routing of the BRT through downtown has the bus travel from Centre Street S, west on 6 Avenue SW and then do a southern loop along 7 Street SW and 6 Street SW to provide a direct connection for BRT customers to the Red and Blue line LRT stations along 7 Avenue SW. This southerly loop is approximately one third of the 3km route that the BRT takes through downtown after departing Centre Street S. The existing BRT routing through downtown as well as the rerouting options considered are illustrated on **Figure 2-2** below.

Option A for the routing through downtown would see the westbound buses travel north on 6 Street SW rather than making the southernly loop and thus reducing the distance that the BRT would travel through the congested downtown environment by approximately 1 km. This routing option would require transit customers that are destined to the Red and Blue LRT lines to walk approximately 1 block to make these connections as opposed to the direct connections provided by the southerly loop.

Option B increases the distance the BRT travels through downtown by approximately 0.8 km, by having the bus continue west along 6 Avenue SW to a point west of 11 Street SW where a new bus terminal would be created and then back to the east along 5 Avenue SW. This routing option requires the buses to cross the Red Line LRT just east of 9 Street SW in both the westbound and eastbound direction which would impact the reliability of this route. However, this route provides two key benefits which include better coverage of downtown and the ability to create operator's washrooms at the new bus terminal located west of 11 Street SW. The lack of facilities for operators in the downtown environment is a major challenge for Calgary Transit within the downtown environment.

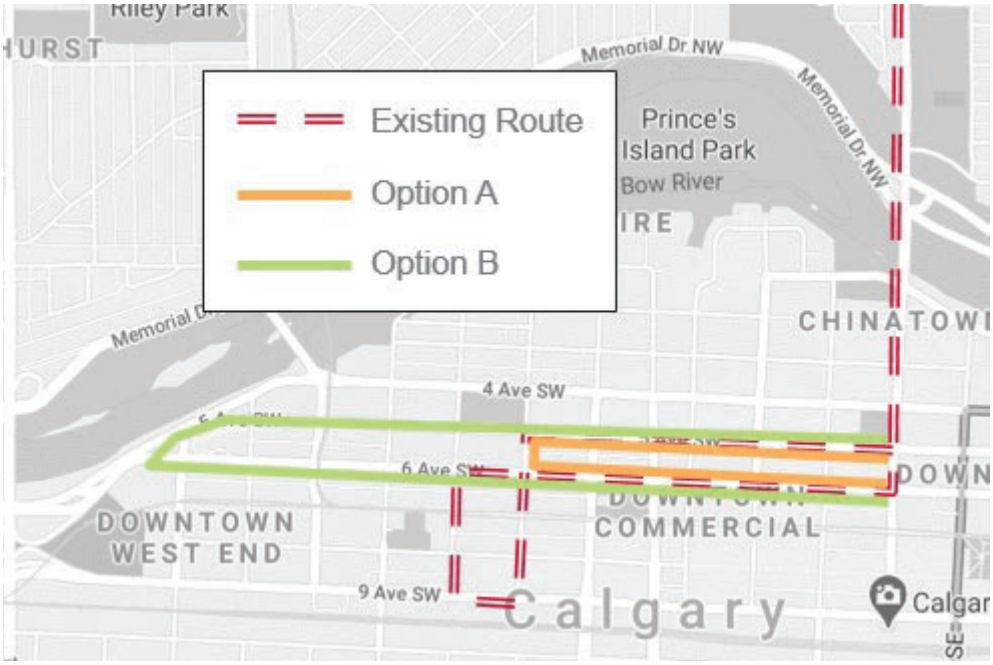


Figure 2-2 Downtown Routing Options

2.1.2 Downtown Bus Only Lanes

Along with the routing options described above, this study has also looked at the potential of creating downtown bus only lanes. As noted above in the description of the existing operations in the downtown, one of the key issues for bus operations in the downtown environment are the challenges associated with buses moving in and out of the stop locations that are located along the curb lane and into a general-purpose travel lane where the buses are also competing with turning traffic at intersections, parkade entrances and alleyways. Building on previous concepts generated by Calgary Transit for bus only lanes on 5 Avenue SW and 6 Avenue SW, we developed the concepts included in **Appendix B** to provide bus only lanes for each of the routing options described in the previous section. This would mean that peak hour traffic on 5 Avenue SW and 6 Avenue SW would be reduced to three lanes of traffic for general purpose traffic with the option of creating off-peak parking in the left curb lane. It should be noted that under today's operating conditions, the right most lane on both 5 and 6 Avenues SW is effectively not a travel lane given the frequent bus stops and right turn lanes. **Figure 2-3** below conceptually illustrates the proposed bus only lanes. It should be noted that as part of the implementation of the City's Greater Downtown Plan, multiple routes may utilize the downtown lanes and there may be additional modifications incorporated during the design phase along the proposed BRT route and coordination will continue into the design phases of the improvements.

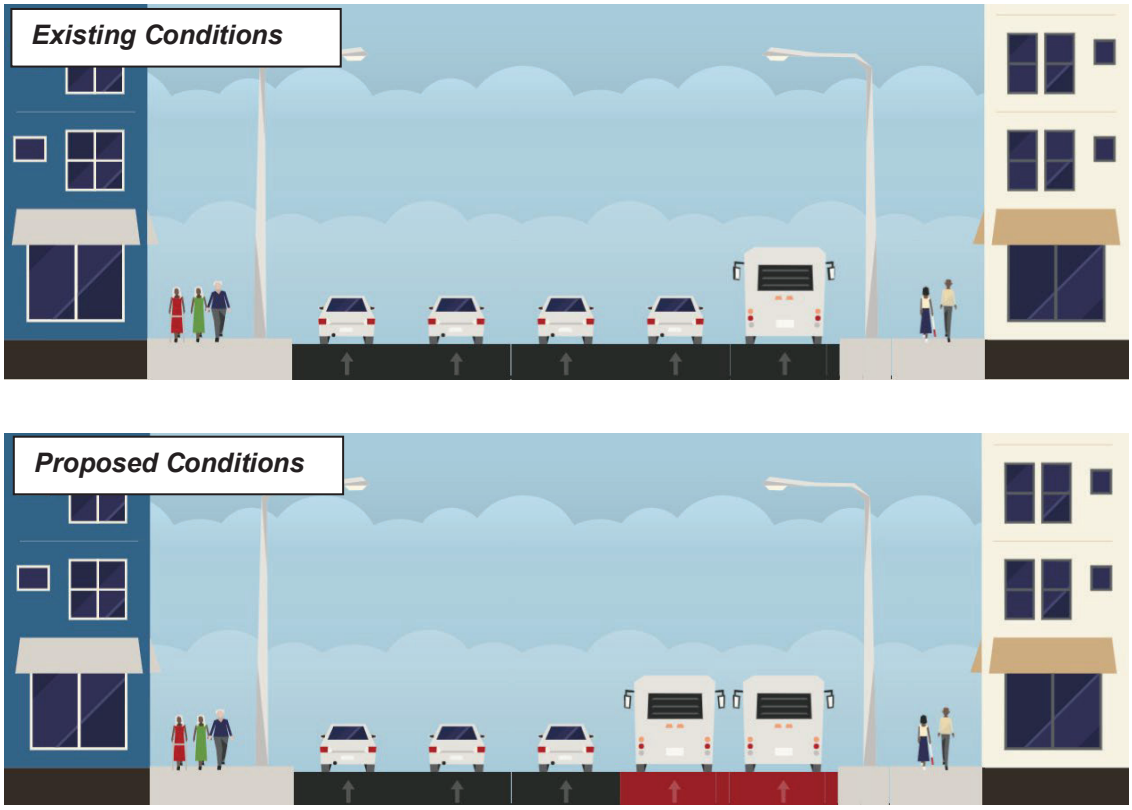


Figure 2-3 Downtown Bus Lanes

*Images created with StreetMix.

2.2 DOWNTOWN TO 16 AVENUE N

With the introduction of a surface running LRT along Centre Street N in Stage 1 of the Green Line, the traffic volumes along Centre Street will be significantly reduced when compared with the volumes that have historically been carried in and out of downtown during the AM and PM peak periods by the lane reversal. This change in traffic patterns will allow more flexibility with how the lanes along the Centre Street Bridge and into downtown can be utilized.

2.2.1 6 Avenue S to the Centre Street Bridge

Options of running the BRT in the middle lanes or in the curb lanes of Centre Street S were reviewed as part of this study. When considering the operations of the avenues south of the Centre Street Bridge, it became apparent that there would be challenges with accommodating left turn movements with a centre-running BRT. Additionally, if the BRT operated in the centre lanes across the bridge and into downtown, they would ultimately have to transition into the curb lanes before the stop locations and then to travel to and from the west on 5 and 6 Avenues SW. Therefore, as we proceeded to the analysis of the downtown bus only lanes, we conducted the analysis with the bus lanes provided in the curb lanes as shown in **Figure 2-4**. The review of the cross section of Centre Street S south of the Bow River Bridge did not reveal any opportunity to appreciably reduce the lane widths, therefore it is assumed that the curb lanes will generally be kept in the same location as today.

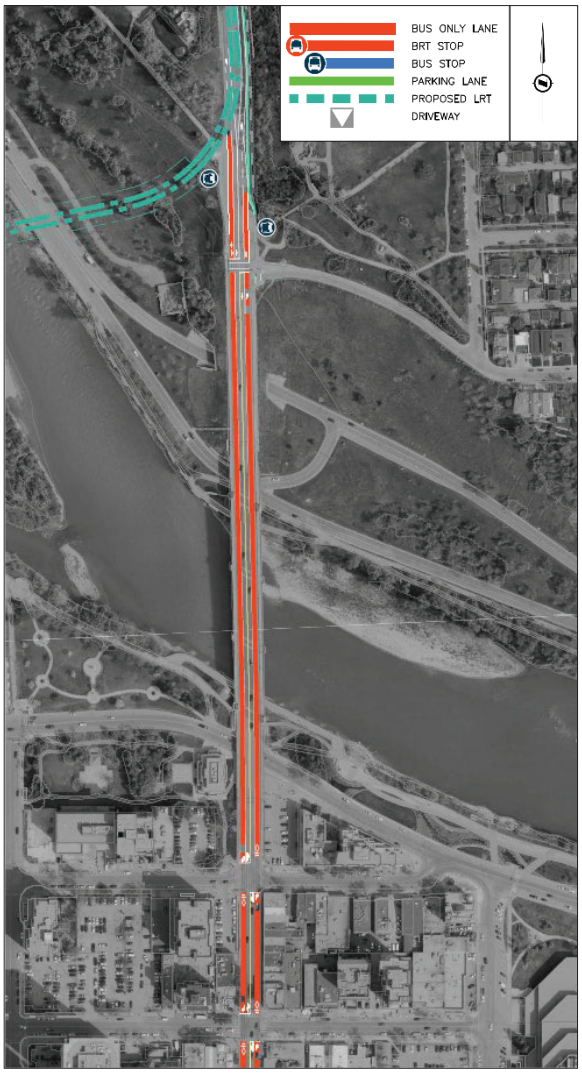


Figure 2-4 Centre Street Bridge

2.2.2 Centre Street South Public Realm and Streetscape Improvements

A Notice of Motion was brought forward for the Chinatown area to develop a streetscape masterplan on Centre Street between the Centre Street bridge and 4 Avenue S. Phase 1 is focused on the NCBRT Study to ensure that any infrastructure or stations being proposed are integrated into and promote the public realm, enhance pedestrian movement and safety and do not hinder any potential future improvements. Phase 2 will be undertaken by Urban Initiatives and will

develop the concepts from Phase 1 and complete a comprehensive streetscape master plan once funding and resources are available.

The project kicked off with a series of community and stakeholder engagement sessions aimed to better understand how the community uses Centre Street S today, what the existing trouble spots are and what opportunities the community sees for the street in the future. The team gathered insights from the community and stakeholders that along with the ongoing engagement for Tomorrow's Chinatown and the Green Line will help guide the design recommendations moving forward. Key insights included:

- The intersection of Centre Street S & 2 Avenue S is currently a safety hazard in the winter due to the poor drainage at the intersections and the build-up of ice and snow on the corners creating a dangerous pedestrian condition.
- Any design interventions proposed for the stretch of Centre Street S between 2 and 3 Avenue S would be well received by the community.
- Gathering/meeting places designed around the future BRT stations (most notably at Dragon City Mall at 4 Avenue S) will help improve the community's connection to transit and create destinations within the neighbourhood as is the case with the existing bus stop.
- Improved east/west linkages and wayfinding will help to better connect Chinatown and improve the public realm condition throughout the neighbourhood.
- An improved design and interface for the north section of Sien Lok Park will help better connect Centre Street S to the Bow River, creating an exciting link between Chinatown and the Riverfront.

The team has used these insights to help outline a series of design recommendation for the Centre Street S public realm. The major design changes being explored include:

- Increasing the pedestrian space and improving the public realm on Centre Street S between 2 and 3 Avenues S by eliminating the jersey barrier on the west side of the street by constructing a retaining wall to the west of the sidewalk replacing the jersey barrier on the east side of the street with a narrower wall and narrowing the centre lanes on Centre Street S. If the Canton block redevelops in the future, then the sidewalk can be raised to a typical elevation along with the entrances to the buildings along the east side of the roadway.
- Reviewing the existing utility alignments to determine where new street trees can be planted, and pedestrian lighting added within the corridor.
- Examining the removal of the parking layby on the northwest corner of Centre Street S and 4 Avenue S to increase the public realm and potentially provide a location for a new BRT station.
- Reviewing the road grading to ensure the new BRT stations are designed for the future of Centre Street S.

In addition, as part of the Eau Claire Area Improvements project, the existing pedestrian ramps at Centre Street and the river pathway will be upgraded in 2021.

2.2.3 Centre Street Bridge to 16 Avenue N

Following the opening of Green Line Stage 1, Centre Street will continue to support a high volume of north-south bus traffic. While some customers will likely transfer to the Green Line at the 16 Avenue N station, a forced transfer was not proposed due to the high volume of passengers still traveling on the bus and the inability of the opening day headways of Green Line to handle all of the additional passenger volume. In the areas where this high opening day bus traffic overlaps with the Green Line, special considerations are required to balance the needs of all users. Where the BRT overlaps Green Line Stage 1 on Centre Street N south of 16 Avenue N there are significant challenges associated with accommodating all modes of movement efficiently. Centre Street N will be reduced to a single lane of vehicular traffic in each direction, will include a median running LRT and will have limited left turning opportunities. Consideration had been given to allowing the BRT to operate with the LRT in the median (See **Figure 2-5)**. However, due to the limited distance that the BRT and LRT could operate in a shared right-of-way (ROW) (approximately 5 blocks), the potential operational challenges for both BRT and LRT operations and impacts to the urban realm required to facilitate bus access into the LRT ROW, the recommendation is that the BRT will operate in the general-purpose travel lanes. As a method to improve operations, no BRT stops have been proposed south of 16 Avenue N to minimize additional impacts to vehicular flows, which is the same as the existing BRT operations.

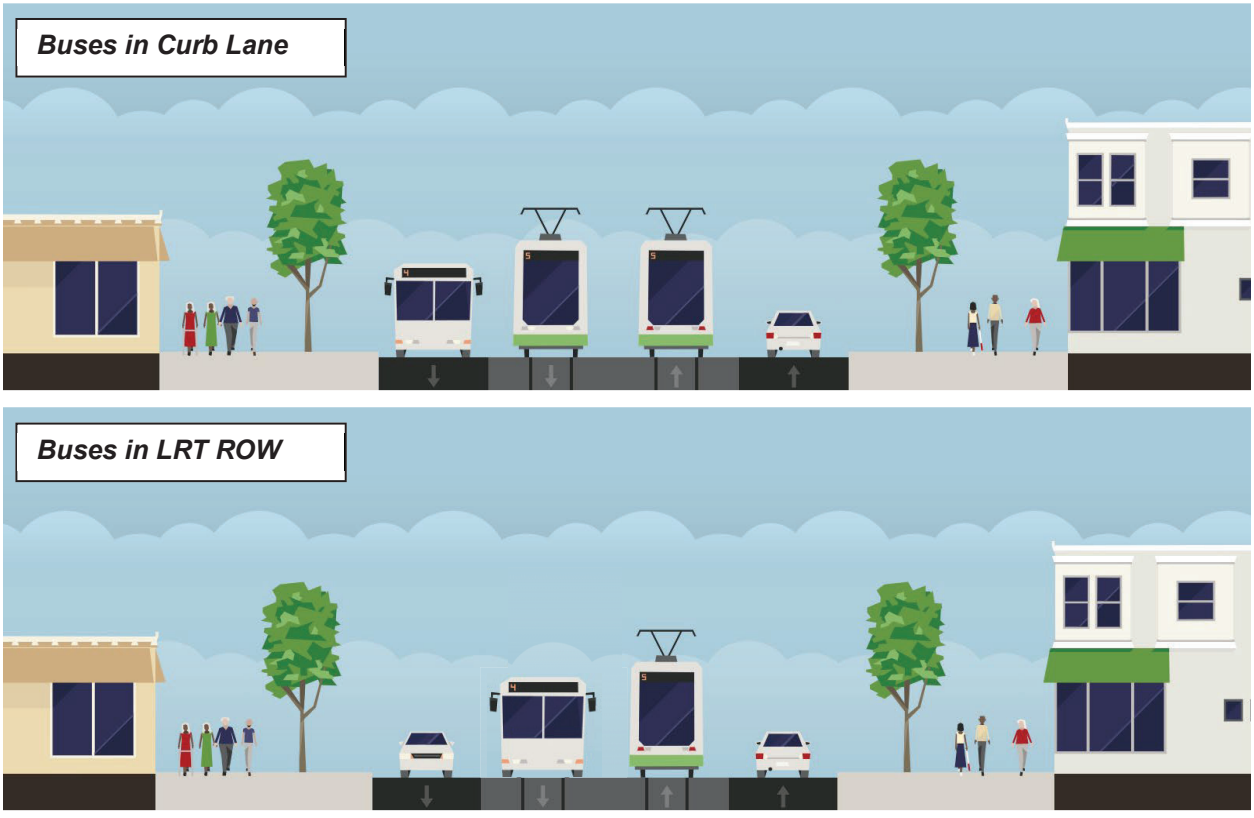


Figure 2-5 Centre Street N (Bow River Bridge to 16 Avenue N) BRT Options

*Images created with StreetMix

The intersection of 16 Avenue N and Centre Street N is a key location where the lane configuration is important to maintain efficient BRT operations. Significantly increased pedestrian volumes are anticipated at this intersection due to passengers boarding and alighting the Green Line's 16 Avenue Station and transferring to and from the MAX Orange stations. Therefore, through discussions with the Green Line team, right turn lanes have been provided in the northbound and southbound directions to ensure that buses traveling north-south through this intersection do not get stuck behind right turning traffic that is waiting for pedestrians to cross the north-south crosswalks. Buses will also have the option of travelling straight through the intersection in the right turn lanes if no right turning traffic is present.

It is also important to note that Green Line is developing a streetscape master plan for this portion of Centre Street N that provides significant enhancements to the urban realm to improve the environment for pedestrians. Additionally, improved cycling infrastructure has been proposed for both 1 Street NE and 2 Street NW.

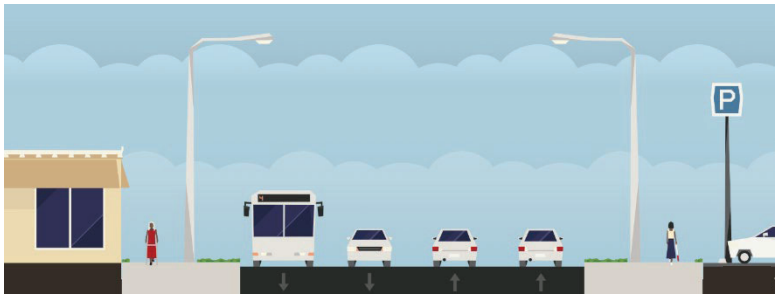
2.3 16 AVENUE N TO MCKNIGHT BOULEVARD N

When Green Line is extended north of its initial Stage 1 terminus just south of 16 Avenue N, it will reduce Centre Street N to a single lane of travel in each direction. Therefore, as the project team examined options for improving BRT service in this portion of the corridor, we took into account that much like the portion of the corridor south of 16 Avenue N, this area will also ultimately be reduced to a single travel lane in each direction. Therefore, the options that were initially considered included:

- The BRT continuing to run on the roadway in mixed traffic as it does today.
- Dedicating the curb lanes to bus traffic either during peak travel times or throughout the day (this option would allow off-peak parking to be provided in the curb lane).
- Providing a median transitway if Green Line's extension to the north of 16 Avenue N does not occur in the near term.

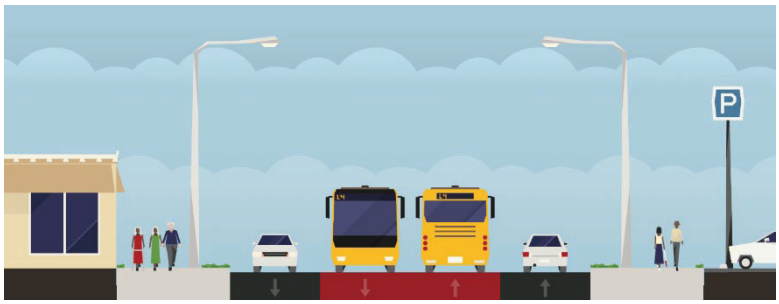
Should there be a delay in extending the Green Line north of the river, consideration could be given to extending the lane reversal further north along the corridor and redesignating the peak hour HOV lane as a bus only lane.

Figure 2-6 below provides a graphical representation of the above noted options.



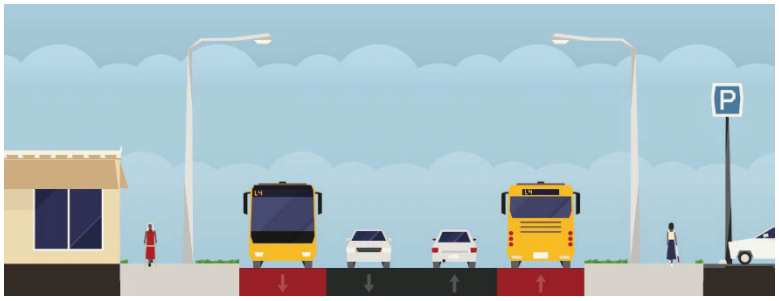
BRT Running on the Roadway (Mixed Traffic):

Maintain bus operations in the shared curb lane.



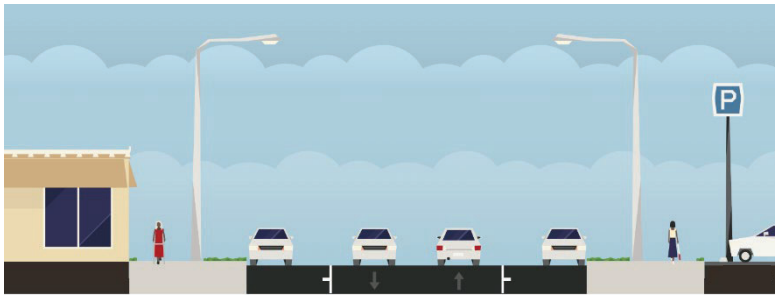
BRT Running in Median Transitway:

Buses would operate in median. Stations would also be located in the median.



BRT Running in Dedicated Curb Lane:

Buses would operate in curb lanes that could either be dedicated to bus operations during the AM and PM peak periods or 24 hours a day.



Off-Peak On-Street Parking:

On-street parking could be maintained in the Mixed-Traffic or BRT Running in Dedicated Curb Lane options.

*Images created with StreetMix

Figure 2-6 Centre Street N (16 Avenue N to McKnight Boulevard N) Options

During the initial evaluation of a potential median running option, it became apparent that this option would require a significant amount of ROW be acquired, particularly since left turn movements across the median would need to be made on a protected signal phase and the stations would need to be located in the medians. This along with the challenges that an implementation of a median BRT would have for the northerly extension of the LRT led us to not examine this option in a significant amount of detail.

Therefore, the study then focused on examining the three options of: maintaining the existing operations (without the lane reversal in place), providing dedicated curb lanes throughout the day or only providing curb bus lanes during the peak periods. The lanes would start just north of 16 Avenue N and continue north in both directions up to 43 Avenue N. At this point, in the northbound direction the bus only lane would tie into the existing bus only lane that continues up to the queue jump at McKnight Boulevard N. In the southbound direction, the existing businesses along the west side of Centre Street N south of McKnight Boulevard N prevent the further extension of the existing bus only lane further to the south. Dedicated left turn lanes are provided in the northbound and southbound directions at the intersection of Centre Street N with 40 Avenue NW / 41 Avenue NE. Drawings of the bus lane configuration can be found in **Appendix B.**

The bus only lanes help provide for bus priority throughout the corridor. The buses will need to share the lane with right turning vehicles accessing the east-west Avenues as well as driveways along the corridor. While this won't be as beneficial as a fully exclusive lane, it will provide notable benefits for buses during the peak periods. During public engagement, there was general support for the peak period bus only lanes, but also a noted desire to continue to provide off-peak parking along the corridor prior to the implementation of the LRT. This led the team towards considering how best to accommodate the bus only designation, right turning traffic and the off-peak parking designation. A signage only approach was considered, which is how the existing 2+ HOV and bus lanes are designated along Centre Street N during the lane reversal or how the bus only lanes are designated along 9 Avenue SE through Inglewood. However, there were concerns that a signage only approach would lead to compliance issues, therefore a combination of signing and striping was reviewed to reinforce the usage of the lanes (See **Figure 2-7** below from the NACTO Transit Street Design Guide). Painting the lanes will provide improved compliance but will also introduce ongoing maintenance and operations cost. This recommendation will continue to be revied during the design phase.

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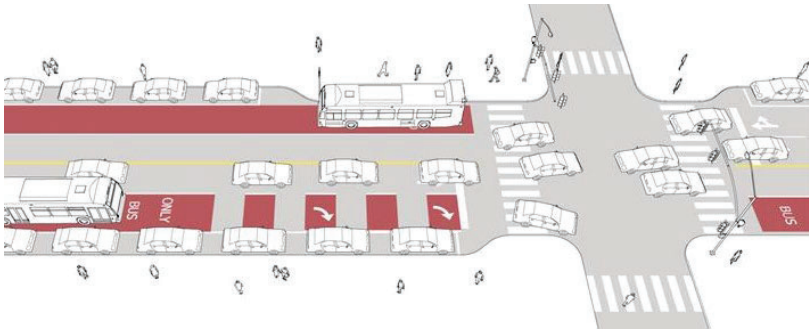

NACTO Transit Street Design Guide

Figure 2-7 Right-Turn Across Bus Only Lane

2.3.1 Active Modes

The previous referenced North Central Mobility Study has done a detailed review of the active modes connections along the Centre Street N corridor from 16 Avenue N to McKnight Boulevard N. Please reference that study for a detailed list of active modes recommendations within this area. Some of the key recommendations of the Mobility Study include:

- Construct sidewalk along 41 Avenue NE to the east of Centre Street N
- Construct a shared used pathway along 40 Avenue NW to the west of Centre Street N
- Install neighbourhood greenway features along 30 Avenue N from 4 Street NW to Edmonton Trail NE
- Enhance the pedestrian crossings at up to 9 locations along Centre Street N

2.4 MCKNIGHT BOULEVARD N TO BEDDINGTON TRAIL N

With the reduction in traffic volumes along Centre Street N associated with the reduction of the travel lanes along Centre Street N south of 16 Avenue N to a single lane in each direction and with the potential of that configuration carrying through to just south of McKnight Boulevard N no significant changes were noted as being required to improve the operation of the existing bus queue jump at McKnight Boulevard N. However, assuming the curb side bus lanes are implemented along Centre Street N south of McKnight Boulevard N, consideration could be given to painting the bus lane and better defining where northbound and southbound right turning traffic is allowed to enter the right turn lanes.

In both the existing and future conditions analysis operational deficiencies are anticipated at the intersections of Centre Street N with 64 Avenue N and Beddington Boulevard N. At 64 Avenue N, it is recommended that the southbound left turn lane be extended to accommodate the anticipated queue. At Beddington Boulevard N, a conceptual design of a roundabout was developed to address the anticipated queuing issues anticipated on the northbound left turn movement during the PM peak. However, since no significant issues had been noted pre-COVID at this location, it is recommended that this location continues to be monitored prior to the implementation of any significant intersection modifications. In the short-term, it is recommended that a smart right turn be implemented in the eastbound to southbound direction due to the high volume of right turning traffic in the AM peak period and the concerns expressed by citizens about crossing this movement as a pedestrian.

The area surrounding the 78 Avenue N bus terminal has the highest concentration of bus traffic along the Centre Street N / Harvest Hills Boulevard N corridor with just under 1,000 buses per day. Based on the high volume of buses and transit customers in this area, it is recommended that the space for pedestrians be expanded on both the northwest and southwest corners of the intersection. On the northeast corner of the intersection, where the bus terminal is located, it is recommended that the pedestrian crossing of the driveway to the terminal be better defined for each user. On an operational basis, due to the high volume of buses, it is recommended an additional layby be added south of the intersection with 78 Avenue N.

The northerly extension of Green Line is the long-term transit enhancement for Centre Street N. However, consideration was given to how bus operations could be more significantly enhanced through this portion of the corridor in advance of Green Line construction. One option considered was the utilization of the curb lane for peak hour bus only operations as is being proposed further south along Centre Street N. While this option would have operational benefits for buses, it would cause more significant operational issues for general traffic as there are fewer parallel routes for traffic to divert onto north of McKnight Boulevard N. This option was included as optional in the long term as additional analysis would be needed prior to implementing this change. A second option reviewed considered the long-term vision for Centre Street N with the extension of the Green Line through this area, which is to maintain two travel lanes in each direction through the intersection with Beddington Boulevard N. Since two general purpose traffic lanes need to be maintained in each direction, in order to improve bus operations in advance of the construction of Green Line, the similar significant land acquisition required for Green Line would need to be advanced. This option would only be considered if the northerly extension of Green Line takes longer than currently anticipated.

2.4.1 Active Modes

The City is moving towards the implementation of an Always Available for All Ages and Abilities (5A) network which supports community connections and providing Calgarians of all ages and abilities with safe and accessible year-round opportunities to walk and wheel throughout Calgary. As this study was under development, the 5A network was approved as part of the update to the CTP. Through this portion of the corridor, we have identified the need to develop an implementation strategy for the 5A network so that the implementation can address how the network is achieved and aligns with the continued northerly extension of Green Line.

2.5 BEDDINGTON TRAIL N TO NORTH POINTE BUS TERMINAL

As the bus travels north towards Harvest Hills Boulevard N, it travels through a bus only crossing just south of Beddington Trail N. On the east side, there is a vehicle trap that only allows buses to pass through and on the west side there is a gate that is used by shuttle buses and emergency vehicles. If a passenger vehicle tries to drive through the vehicle trap it will be stuck in the trap and unable to proceed. The configuration of this bus only crossing means that both the east and west sides are used for northbound and southbound movements with buses primarily using the east side of the crossing.

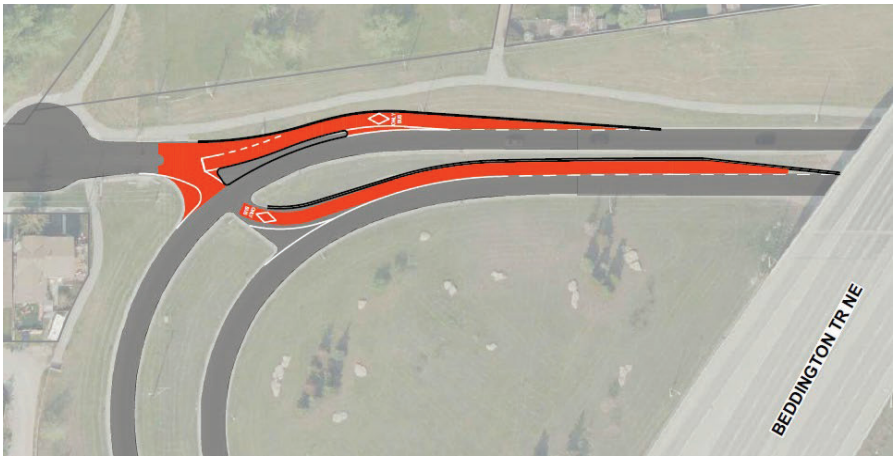

Figure 2-8 Bus Only Crossing Improvements

The configuration of this bus only crossing presents several operational issues. Despite the signage located on either side of the vehicle trap, vehicles often get stuck in the trap. Additionally, the configuration of the northbound exit from the bus only crossing means that northbound buses will at times block the southbound to eastbound ramp as they wait for a gap in the eastbound to northbound ramp traffic. Similarly, in the southbound direction, when a northbound bus is traveling through the vehicle trap, a southbound bus needs to wait for the northbound bus to clear the vehicle trap before proceeding through the vehicle trap. When this happens, the southbound bus will block the southbound to eastbound ramp. Therefore, the reconfiguration shown in **Figure 2-8** has been proposed to address the above noted issues. Prior to the implementation of the southbound improvements additional consideration may be given to the removal of the vehicle trap and the installation of two new gates and/or camera enforcement. The full plans for this improvement and the balance of the improvements discussed in this section can be found in **Appendix B**.

Operational issues have been observed with the northbound left turn at the intersection of Harvest Hills Boulevard N with 96 Avenue NE/Country Hills Road NW. During the PM peak, the queue on the northbound left turn exceeds the available storage, thus creating operational issues for both general northbound traffic and the northbound BRT. The left turn lane has been proposed to be lengthened to accommodate the anticipated queue lengths.

The future Green Line LRT park and ride lot and bus turn terminal is proposed on the northwest corner of the intersection of Harvest Hills Boulevard N with 96 Avenue NE/Country Hills Road NW. Consideration was given to the construction of the park and ride lot in support of the BRT and for continued use as the Green Line extends north. An initial layout of the park and ride lot indicated that the lot could support over 220 stalls in a configuration that supports the future bus terminal and the allotment of a portion of the site for affordable housing.

As Green Line extends north in the future, the LRT is proposed to be located along the east side of Harvest Hills Boulevard N (north of 96 Avenue NE/Country Hills Road NW) and the northbound lanes are proposed to be constructed in the median of Harvest Hills Boulevard N. The project reviewed the potential of prebuilding the northbound lanes in the median and initially using the lanes for BRT purposes. The review of this option revealed that there would be significant throw-away costs associated with this option

as the ultimate LRT plans also require that the southbound lanes be reconstructed in order to provide the space required for the future LRT construction.

Similar to other sections of the corridor, consideration was given to converting the curb lanes of Harvest Hills Boulevard N to either bus only lanes or bus plus HOV lanes. A high-level review indicated that there would be operational issues at the intersections along the corridor caused by limiting the general-purpose traffic to a single lane. Additionally, outside of the intersections addressed in this section of the report, there were not significant existing operational issues observed along this portion of the corridor. The traffic volumes in this stretch are anticipated to remain relatively constant in the future as has been the case for much of the past decade. However, recognizing that significant development is continuing north of Stoney Trail, it is recommended that this continue to be monitored going forward to determine if the need for dedicated lanes increases in the future prior to the construction of Green Line. Should the lanes be determined to be required, the recommended approach is to provide curb bus lanes by widening into the median and reconfiguring the left turn lanes and intersections as required.

The existing BRT stops located between 96 Avenue NE and Country Hills Boulevard N at Harvest Oak Gate NE and Harvest Oak Drive NE will not become LRT stations in the future. However, recognizing the existing ridership at these stations, we have maintained these stop locations and have recommended that BRT stations be considered in these locations in the long-term depending on the timing of the northerly extension of Green Line.

The intersection of Harvest Hills Boulevard N with Country Hills Boulevard N is a location with observed congestion during peak periods. Therefore, a reconfiguration of this intersection was reviewed to add a third northbound and southbound lane through this intersection that could be used exclusively for buses. The existing BRT operations at the North Pointe Bus terminal (illustrated in **Figure 2-9**) see northbound buses stop just north of the intersection of Harvest Hills Boulevard N with Country Village Way NE / Panamount Gate NW. The bus then continues north to the next intersection and turns right onto County Village Road NE where it has a stop and then right onto Country Village Link NE where it has a third stop. As Green Line extends north, the North Pointe bus terminal is proposed to be reconfigured to create an east-west road

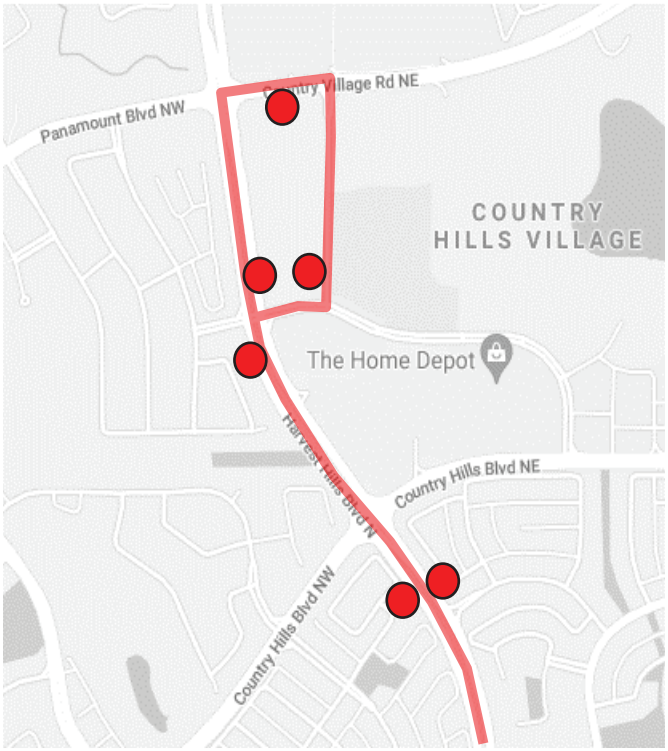

Figure 2-9 Existing Bus Route and Stops

through the site. Building on this future configuration, the team examined the potential to build the east west road now to shorten the distance traveled by the BRT by over 0.5km and provide a single stop. This reconfiguration would result in the loss of approximately 75 stalls. However, this would also create the opportunity to create a southbound left turn into this new bus only road to provide greater routing flexibility for Calgary Transit as the development and subsequent transit services evolve and expand north of the site.

2.5.1 Active Modes

The multimodal review through this section also revealed a number of potential improvements that could be made for active modes to promote better access to the BRT service and generally improve active modes connections along the corridor. The west side of Harvest Hills Boulevard N has been designated as a pathway from Beddington Trail north to Stoney Trail. However, as illustrated in **Figure 2-10**, there are portions of this area designated as pathway between Harvest Oak Gate NE and Panamount Gate NW that are actually standard 1.4m wide sidewalks with a yellow line painted down the middle. Similarly, along the north side of Country Hills Boulevard NW between Harvest Hills Boulevard N and Panorama Hills Boulevard NW, the sidewalk carries a pathway designation but lacks the required width. Therefore, the ultimate recommendation was to provide separated pedestrian and cycling facilities on each side of the Harvest Hills Boulevard N corridor between Stoney Trail and Beddington Trail N and to upgrade the sidewalk on the north side of Country Hills Boulevard N to a pathway.

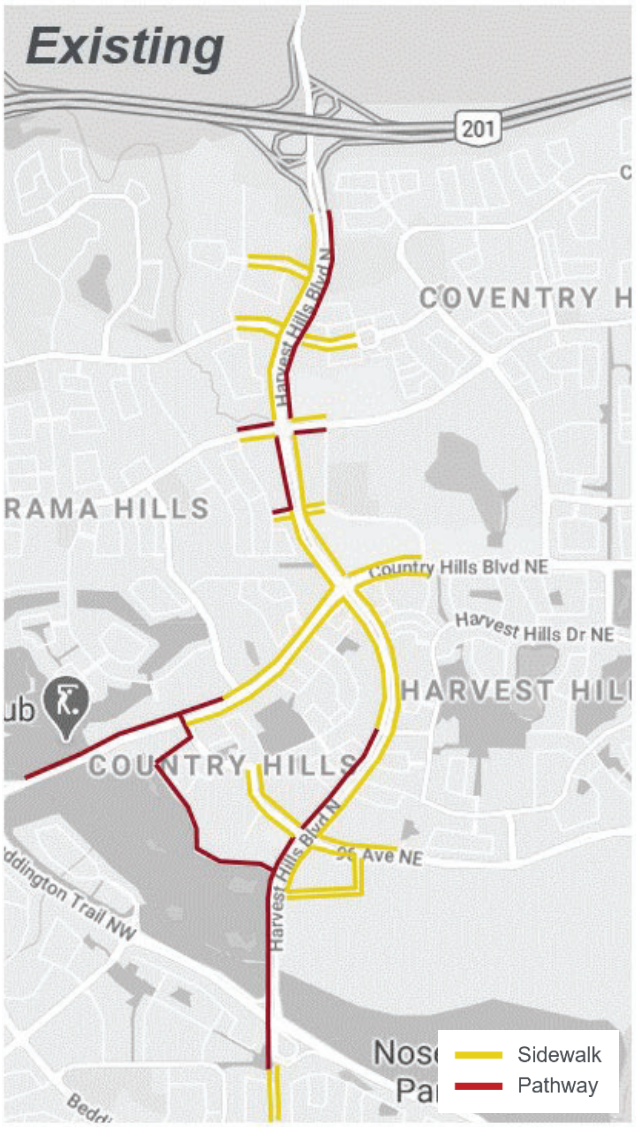

Figure 2-10 Existing Active Modes Connections

Jay-walking concerns were identified across Harvest Hills Boulevard N between the existing stop located north of the Panamount Gate NW/Country Village Way NE intersection and the multifamily development on the west side of the roadway. Therefore, as the design of the changes to the park and ride (including the southbound left turn) advances, additional measures to address the jay-walking concern will be considered.

2.6 NORTH POINTE BUS TERMINAL TO 160 AVENUE N

As the development continues to grow north of Stoney Trail there will be continued pressure to expand primary transit service to the north. A trial on-demand transit service has recently been provided to these areas. Therefore, the study examined how service could be extended north along Harvest Hills Boulevard N from the North Pointe Bus Terminal and across Stoney Trail to the new communities. As illustrated on the image shown in **Appendix B** the route is proposed along the 1 Street NE and 1 Street NW couplet. This allows for easy expansion of the service to the north as the development continues to expand in a northerly direction.

2.6.1 Active Modes

From an active modes perspective, there is a missing pathway connection along Panatella Gate NW between Panatella Drive NW and Harvest Hills Boulevard N that would not only provide a potential connection to the future north-south bus service along Harvest Hills Boulevard N, but also provide an improved connection to the school being constructed on the east side of the intersection. The need for a north-south pathway connection over Stoney Trail was identified as part of this study and is being included in the current City project that is adding the second bridge deck at the Stoney Trail NW and Harvest Hills Boulevard N interchange. These pathways on both sides of the interchange tie to the previously noted active modes improvements through the corridor to provide a direct connection to the Rotary/Mattamy Greenway on the north side of Stoney Trail which is a 145km urban pathway system that encircles the City of Calgary. Once the area north of Stoney Trail fully develops, the 1 Street NE and 1 Street NW couplet is anticipated to see significant traffic volumes, however in the near term there is the potential to provide improved cycling infrastructure along these roadways. This will continue to be explored with the area developers as the project advances.

2.7 STATIONS

The existing Route 301 BRT stop locations have generally been aligned with the future Green Line LRT stations with a few exceptions along Harvest Hills Boulevard N south of Country Hills Boulevard N. While the study conducted review of the overall station locations, much of the review was around establishing the appropriate size and scale of the station. An in-depth site analysis was conducted for each station location that considered:

- Major destinations
- Connections to existing and future transit network
- Ridership
- Population density
- Adjacent land use
- Walkability

Station tiers with variable amenities were then assigned to different station locations based on the above noted review with sites that score high in those categories being assigned a station tier with more amenities than sites that score low. The BRT stations are proposed to be designed as a “Kit of Parts”

where station elements can be repeated at all site locations in varying arrangements. This strategy allows for the flexibility to address unique site constraints and opportunities. This is the same approach that was used for the existing MAX stations. Differing configurations of station elements and amenities form different tiers. All stations will have enclosed heated shelters. Examples of variable amenities include:

- Size of shelter
- Length of station platform
- Pedestrian lighting along station platform
- Number of benches
- Advertising requirements

A recommended list of tiers by location has been included in **Appendix C.**

3.0 GREEN LINE OPENING DAY (2028) TRAFFIC ANALYSIS

For purposes of the Green Line, the North Central Mobility Study and the North Central BRT study, the opening day horizon was considered to be the 2028 horizon which is the horizon from the City's Regional Transportation Model (RTM) that most closely aligns with the anticipated opening day of Stage 1 of the Green Line. The North Central Mobility Study used information from the RTM along with a Dynamic Traffic Assignment (DTA) model to establish the anticipated traffic volumes along Centre Street N and Harvest Hills Boulevard at the opening day horizon. Forecasts for several scenarios in the 2028 opening year were prepared.

The analysis included the LRT and the new geometry south of 16 Avenue N and includes a modified roadway cross-section between 16 Avenue N and McKnight Boulevard N to include one general purpose lane and one bus-only lane in each direction. The enhanced BRT route, therefore, has its own travel lane for approximately 3.5 km of the overall corridor, shared only with local buses and right-turning vehicles. Additional roadway improvements identified as part of the NCBRT study were also incorporated north of McKnight Boulevard, such as added or lengthened turn pockets, added bus lanes, and transit specific improvements. A second scenario was also analyzed that maintained the existing roadway configuration of two lanes each way between 16 Avenue N and 43 Avenue N. In this scenario, the NCBRT travels in mixed traffic along the entire route from downtown to the North Pointe Park and Ride. Based on the analysis, the provision of the BRT Lanes north of 16 Avenue was found to result in a savings of approximately 3 minutes for the BRT versus not providing the peak hour dedicated bus lanes. The improvements north of McKnight Boulevard result in travel time savings of approximately 1-2 minutes.

For the downtown analysis, information from the DTA model about the anticipated changes to key points in and out of downtown (i.e. significant reduction of traffic in and out of downtown on Centre Street N) was used to make manual adjustments to estimate the future traffic conditions. The analysis completed estimated that the travel time for Option A (6 Street Loop) was 9-10 minutes during the peak periods and the travel time for the Option B (11 Street Loop) was approximately 17 minutes (excluding dwell time at the terminal station), compared to existing travel time of 13-14 minutes.

4.0 BENEFIT-COST ANALYSIS

The below methodology was applied to the slate of potential improvements. The purpose of this analysis was to:

- Provide a high-level or 'strategic' understanding of the range of benefits that each proposed improvement can generate to passengers and the broader community;
- Define benefits qualitatively – and where possible – quantitatively and in monetary terms to compare the relative social value of each improvement to the costs required to deliver it; and
- Support evidence informed decision making on the scope and extent of capital improvements for the BRT service in advance of Green Line LRT North delivery.

The high-level Benefit Cost Analysis approach that was developed aligns with the tools, models, and approaches employed for the Green Line LRT Business Case and is flexible to the wide array of potential BRT improvements proposed for the downtown core and the Centre Street N and Harvest Hills Boulevard N corridor.

The analysis took into consideration travel time savings, operating cost savings, vehicle kilometers travelled savings, ridership, station and urban realm/walking ambience benefits based on guidelines developed by Transport for London, a park and ride lot benefit and collision cost savings. In the case of the downtown bus loop a multiple account evaluation was conducted to evaluate the benefits of the proposed bus only lanes.

Overall, the proposed station improvements had a Benefit Cost Ratio (BCR) of 2.7 with only one of the locations falling significantly below a value of 1.0. When a transit route is upgraded to a MAX standard, all the stations are upgraded to the MAX style, but locations with a lower BCR are the locations where lower tiered stations would be installed. While some of the more minor operational improvements have a BCR that falls below 1.0, the improvements recommended generally are above the 1.0 threshold and on a segment-by-segment basis, the suite of short and medium term improvements recommended to proceed collectively are above a BCR of 1.0 even when considering the low BCR scenario.

5.0 COSTING AND TIMING OF IMPLEMENTATION

The recommended improvements identified in this report were categorized into short (0 – 5 years), medium (5 – 10 years) and long (10+ years) term investments based on their alignment with Green Line Stage 1 operations and when the immediate return on investment can be realized. High level Opinion of Probable Cost (OPCs) Class 5 Estimates were developed for each of the recommended improvements summarized in **Table 1** below. This costing includes 30% contingency, internal City costs and engineering costs of 22% and excludes GST.

Table 1 – Opinion of Probably Cost Summary for Recommended Improvements

Timing	Improvement Description	Cost
Short-Term	Pedestrian Improvements (Connections to Harvest Hills Boulevard N)	$0.80 M
	Provide widened sidewalk and cycling facilities along Harvest Hills Boulevard N (Stoney Trail to Beddington Trail)	$11.50 M
	Bus Only Crossing Improvements (Bus Trap)	$1.30 M
	Transit Signal Priority	$0.20 M
	Lengthen Left Turn Lane @ 64 Avenue N	$0.40 M
	Pedestrian/Transit Improvements @ 78 Avenue Bus Terminal	$0.60 M
	Lengthen Left Turn Lane @ 96 Avenue NE	$0.90 M
	Downtown Bus Lanes (to 6 Street SW)	$3.40 M
	Bus Only Lane @ North Pointe Park and Ride and Lot Adjustments	$3.30 M
	Harvest Hills Blvd N @ Country Hills Blvd N Bus Only Lanes	$3.40 M
	Centre Street S Streetscaping Improvements	$2.60 M
	Chinatown 4 Ave - Public Realm/Plaza Improvement	$1.95 M
	Sub-Total	**$30.35 M**
Medium-Term	Stations – 16 Avenue N to North Pointe Bus Terminal	$24.7 M
	Centre Street BRT Lanes (16 Avenue N to McKnight Boulevard N)	$11.8 M
	Sub-Total	**$36.50 M**
Long-Term	Downtown Bus Lanes (extension from 6 to 11 Street SW)	$1.60 M
	11 Street SW Bus Terminal	$3.10 M
	Additional Downtown Stations (4 Stops)	$7.30 M
	Beddington Blvd N – Roundabout	$3.90 M
	Harvest Hills Blvd. BRT Lanes from Nose Creek to North Pointe:	
	Option 1: Widening in to median, add additional BRT Lane	$17.50 M
	Option 2: Convert existing curb lane to BRT lane	$5.50 M
	Centre St. BRT lane: convert lane from McKnight Blvd. to Stoney Tr.	$4.90 M
	Park and Ride Lot @ 96 Avenue NE	$6.20 M
	Stations – South of Country Hills Boulevard N (2)	$4.00 M
	Stations - North of North Pointe (3 locations)	$4.80 M
	Sub-Total	**$41.30 – $53.30 M**
	Total	**$108.15 - $120.15 M**

6.0 COMMUNICATIONS AND ENGAGEMENT

As part of Green Line's segment 2 functional planning, the project team took part in an integrated communications and engagement program from October 2020 through to April 2021 over two phases of engagement and one phase of information sharing. Throughout the project, we engaged with residents and Calgarians at-large, community associations, business improvement areas, local business owners, special interest groups and ward offices through a variety of engagement and communications tactics. We also took extra care to ensure that our approach was meaningful, inclusive and removed barriers to participation including translation into traditional and simplified Chinese.

Our first phase of engagement included listening to Calgarians and exploring their perspectives on opportunities and challenges related to an enhanced BRT service. The feedback from the first phase was used to inform initial concepts and improvements, which were presented back to the community for two rounds of evaluation in the second phase of engagement. The final phase included sharing the final project recommendations and reporting back on how community input has informed our work.

For the North Central BRT Study, we participated in 29 public sessions and stakeholder meetings, and conducted 6 online surveys. In total over 60,000 people were made aware of the project through our communications campaigns, we connected with over 11,000 participants through our engagement opportunities (online portal and sessions) and received over 750 ideas and contributions across all phases.

The high-level themes we heard from the public through engagement included:

- A keen interest in an improved Bus Rapid Transit service and station amenities.
- Preference for options that would provide fast and reliable BRT service during peak traffic hours.
- People felt more likely to use BRT with the addition of more stations or with minor relocations to station locations if it improved accessibility.
- Concerns were shared about overcrowding on existing bus routes and an interest in express service.
- An interest for missing pathway connections to be completed within the community for improved access to transit services.

The input received through engagement has been used to inform and refine the recommended improvements and next steps outlined in this document.

7.0 NEXT STEPS

Moving forward, the project team will be presenting the findings and recommendations of the report to the Green Line Committee.

Appendix A TRANSIT TERMS

NORTH CENTRAL BRT FUNCTIONAL STUDY

Appendix A Transit Terms

Bus Rapid Transit (BRT)
A bus based public transit service designed to have better frequency and reliability than a conventional bus system. A BRT typically has infrastructure in place to give priority to buses at intersections and in traffic to provide an enhanced service.

BRT Lane/Bus Only Lane
Dedicated lanes within the roadway that are reserved for the use of bus rapid transit vehicles or other Transit vehicles either throughout the day or for defined periods of time.

Road Right of Way (ROW)
The road right-of-way is an area that gives The City space to operate the roadway and to maintain facilities such as utilities, street light poles and tree plantings. The City of Calgary uses the term road right-of-way to describe all aspects of the physical space of roads, lanes and boulevards, including but not limited to:

- City streets and sidewalks
- Driveway crossings and wheelchair ramps
- Back lanes/alleys, and engineered walkways
- The area between the property line and the sidewalk
- The area separating roadway lanes, such as medians and islands
- The greenspace adjacent to closed/gated roads/lanes
- The area within traffic circles and roundabouts

Transit Signal Priority (TSP)
Traffic signals along the route are modified to provide an extended green signal when buses are approaching.

MAX Service/Max BRT
The Calgary Transit's brand of BRT service is a rapid transit service that provides direct, efficient connections for customers. MAX provides riders with maximum convenience, maximum reliability, maximum comfort, and maximum efficiency to get transit riders where they need to go.

MAX Stations
Calgary Transit facilities located at the MAX BRT station locations where enhanced shelters are provided with: improved lighting, CCTV, heating, real time bus information signage, seating,

High Occupancy Vehicle (HOV) Lanes
These identified lanes are intended to move more people in fewer vehicles than normal lanes. They are dedicated lanes usually reserved for two or more passengers, carpools, or busses. They are typically located in the curb lane, and on higher speed roads can also be located in the median lane.

Bus Queue Jumps
Queue jumps are reserved for buses at signalized intersections. Buses enter their own lane, and in some cases get an advanced green light before other vehicles at the intersection, allowing them to get ahead of traffic and avoid congestion delays. Calgary already has a number of transit queue jumps, including MAX Orange and MAX Teal.

Appendix B DRAWINGS

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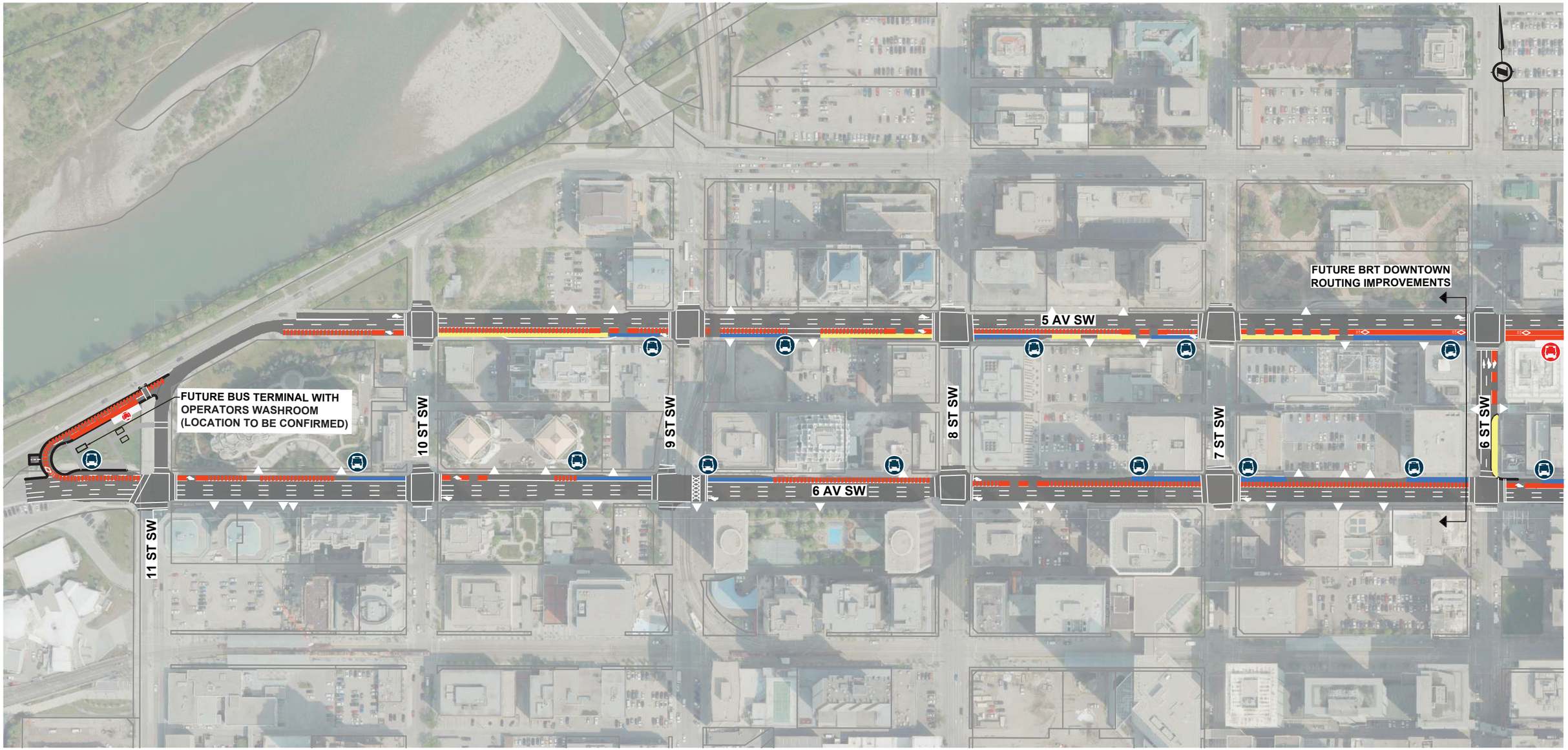
Attachment 2



FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE
WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP
(UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK
OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 50 100 m
1:2500

NOT FOR CONSTRUCTION

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PROJECT
THE CITY OF CALGARY
NORTH CENTRAL BRT STUDY

FIGURE TITLE
NORTH CENTRAL BRT
FUTURE WEST DOWNTOWN LOOP

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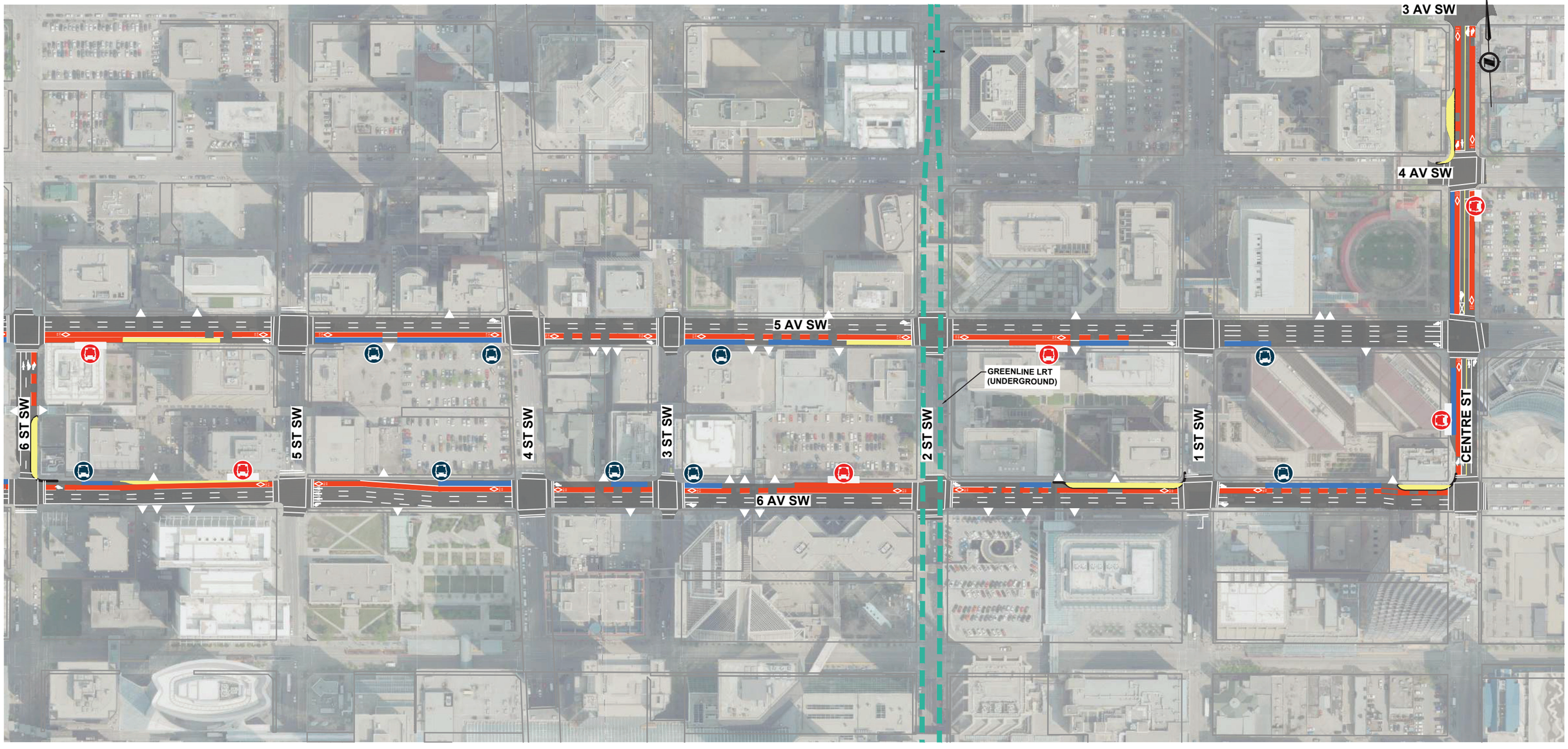

FUTURE BRT SERVICE

BUS ONLY LANE

DOWNTOWN BUS STOP AREA

PEAK HOUR ONLY LANE
WITH OFF PEAK PARKING

EXISTING BUS STOP

EXISTING BRT STOP
(UNLESS NOTED OTHERWISE)

BUS ONLY LANE

PROPOSED LRT

PROPOSED CONCRETE SIDEWALK
OR URBAN REALM

PROPOSED 2.5m CYCLE FACILITY

PROPOSED 3.0m MULTI-USE PATH

EXISTING DRIVEWAY

0 50 100 m
1:2500

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PROJECT
THE CITY OF CALGARY
NORTH CENTRAL BRT STUDY

FIGURE TITLE
NORTH CENTRAL BRT
DOWNTOWN LOOP

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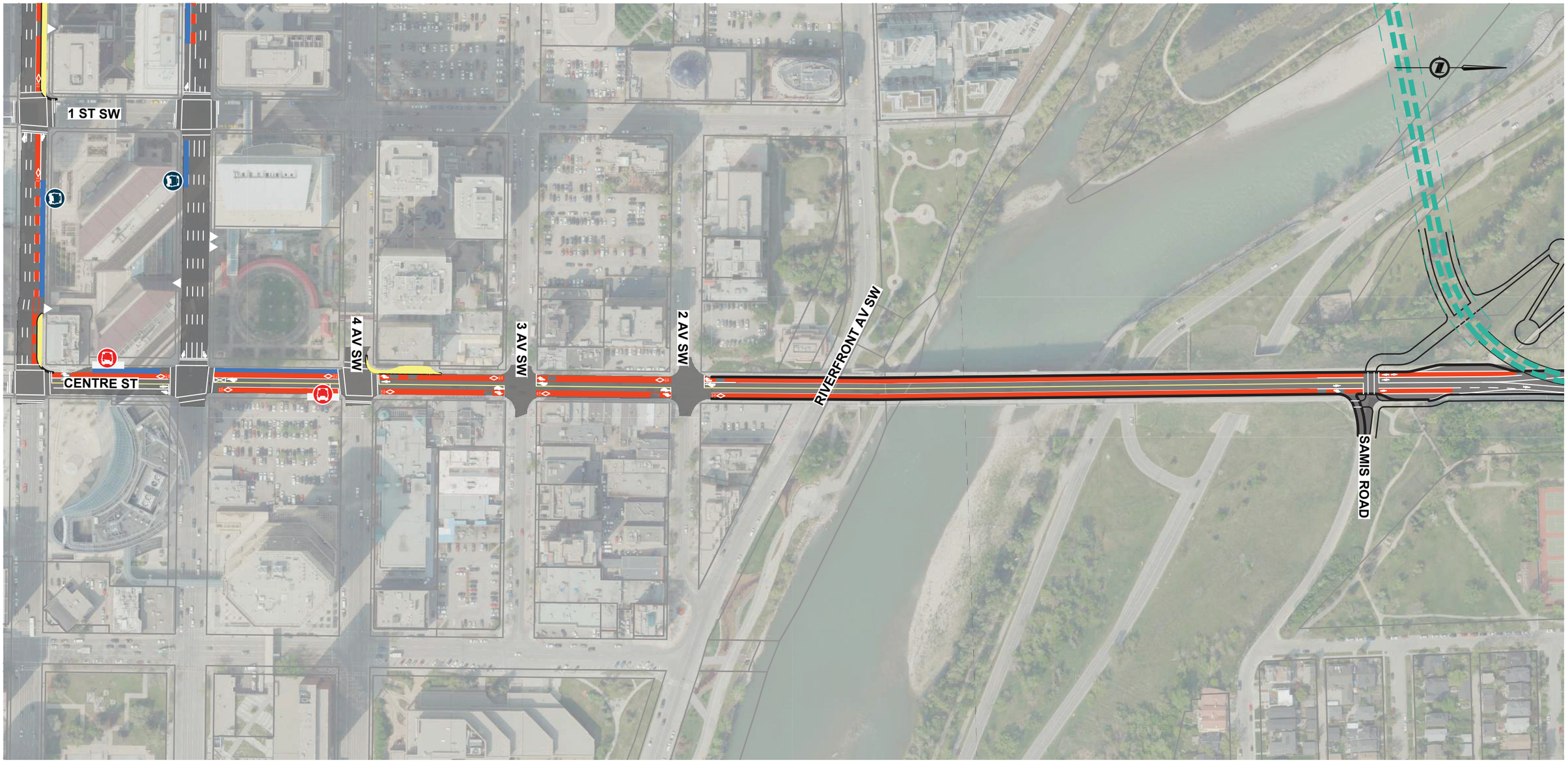

FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP (UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 50 100 m
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PROJECT
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NORTH CENTRAL BRT STUDY

FIGURE TITLE
NORTH CENTRAL BRT
5 AV TO SAMIS ROAD

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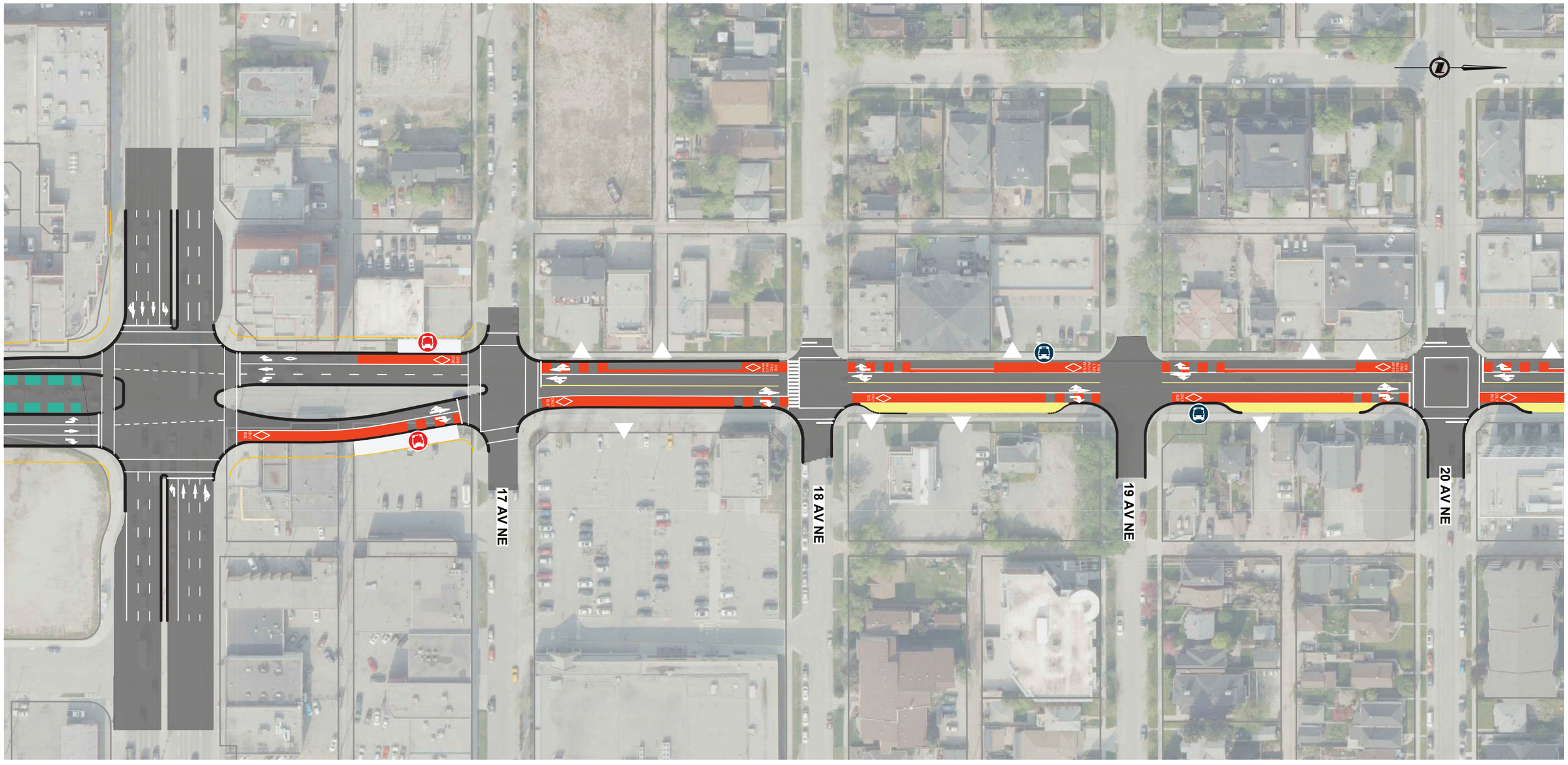

FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP (UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 25 50 m
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PROJECT
THE CITY OF CALGARY
NORTH CENTRAL BRT STUDY

FIGURE TITLE
NORTH CENTRAL BRT
16 AV N TO 20 AV N

FILE No.	SCALE	FIGURE No.
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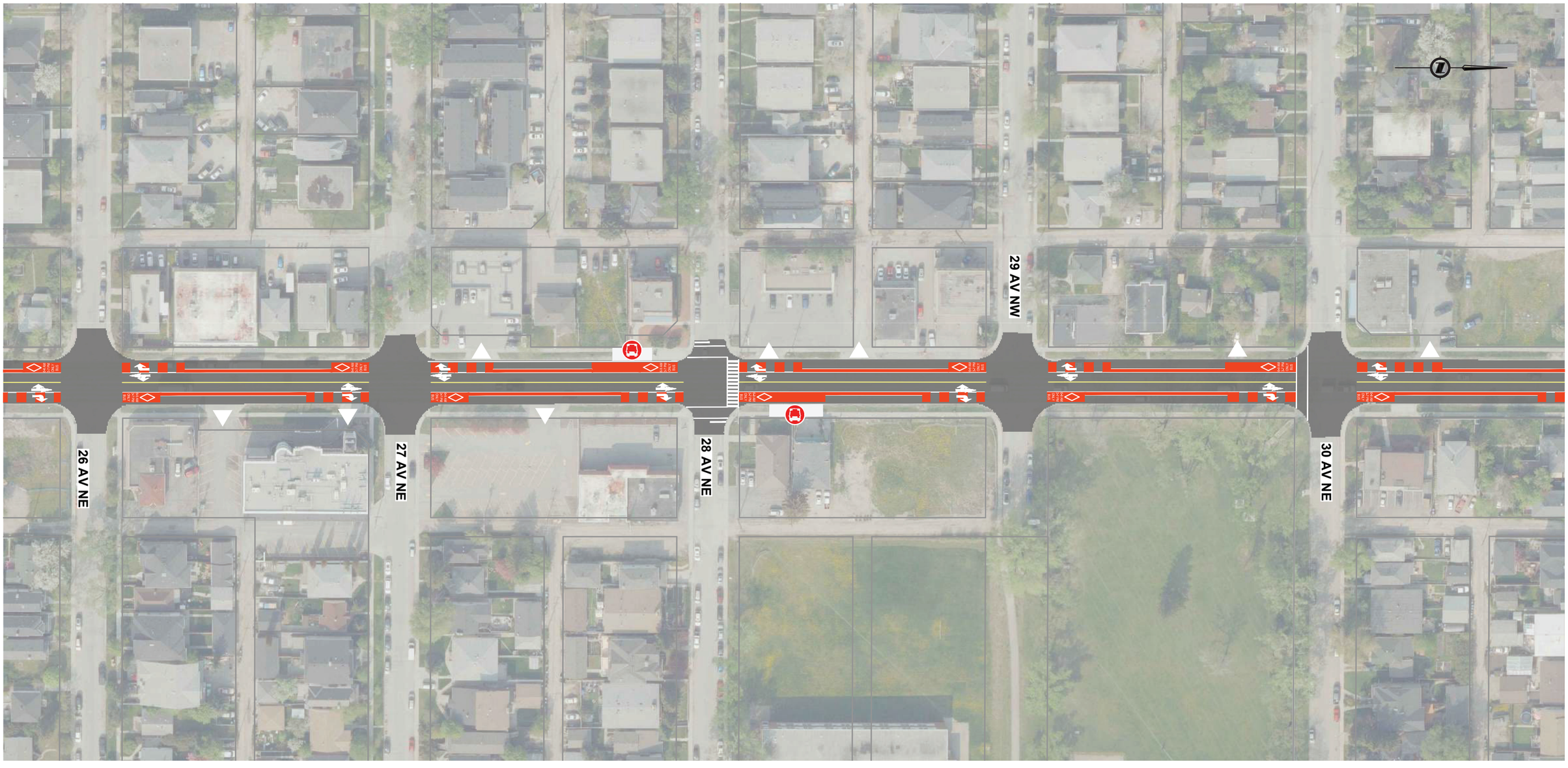

FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP (UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 25 50 m
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PROJECT
THE CITY OF CALGARY
NORTH CENTRAL BRT STUDY

FIGURE TITLE
NORTH CENTRAL BRT
26 AV N - 30 AV N

FILE No.	SCALE	FIGURE No.
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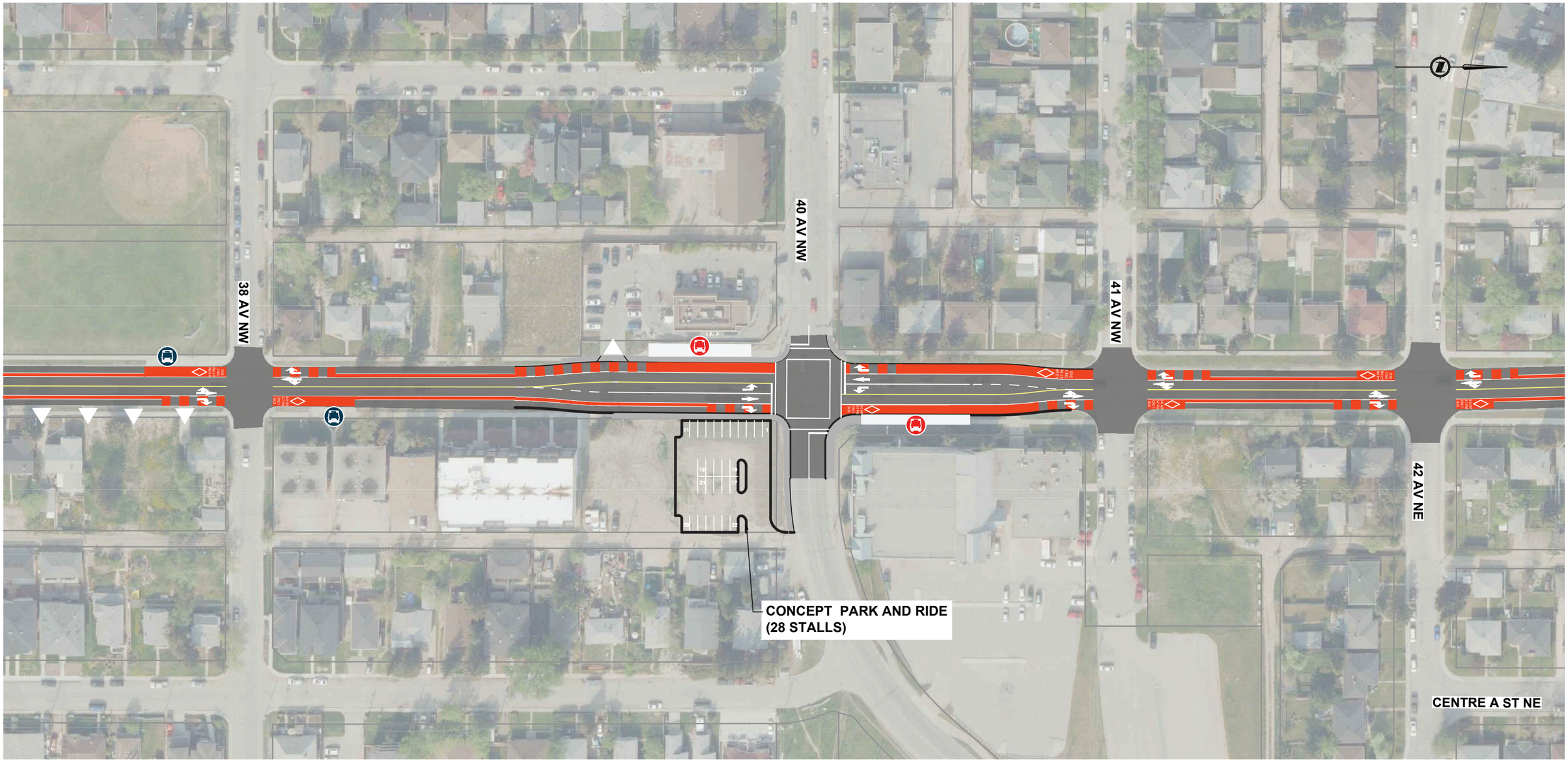

FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP (UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 25 50 m
1:1250

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PROJECT
THE CITY OF CALGARY
NORTH CENTRAL BRT STUDY

FIGURE TITLE
NORTH CENTRAL BRT
38 AV N - 41 AV N

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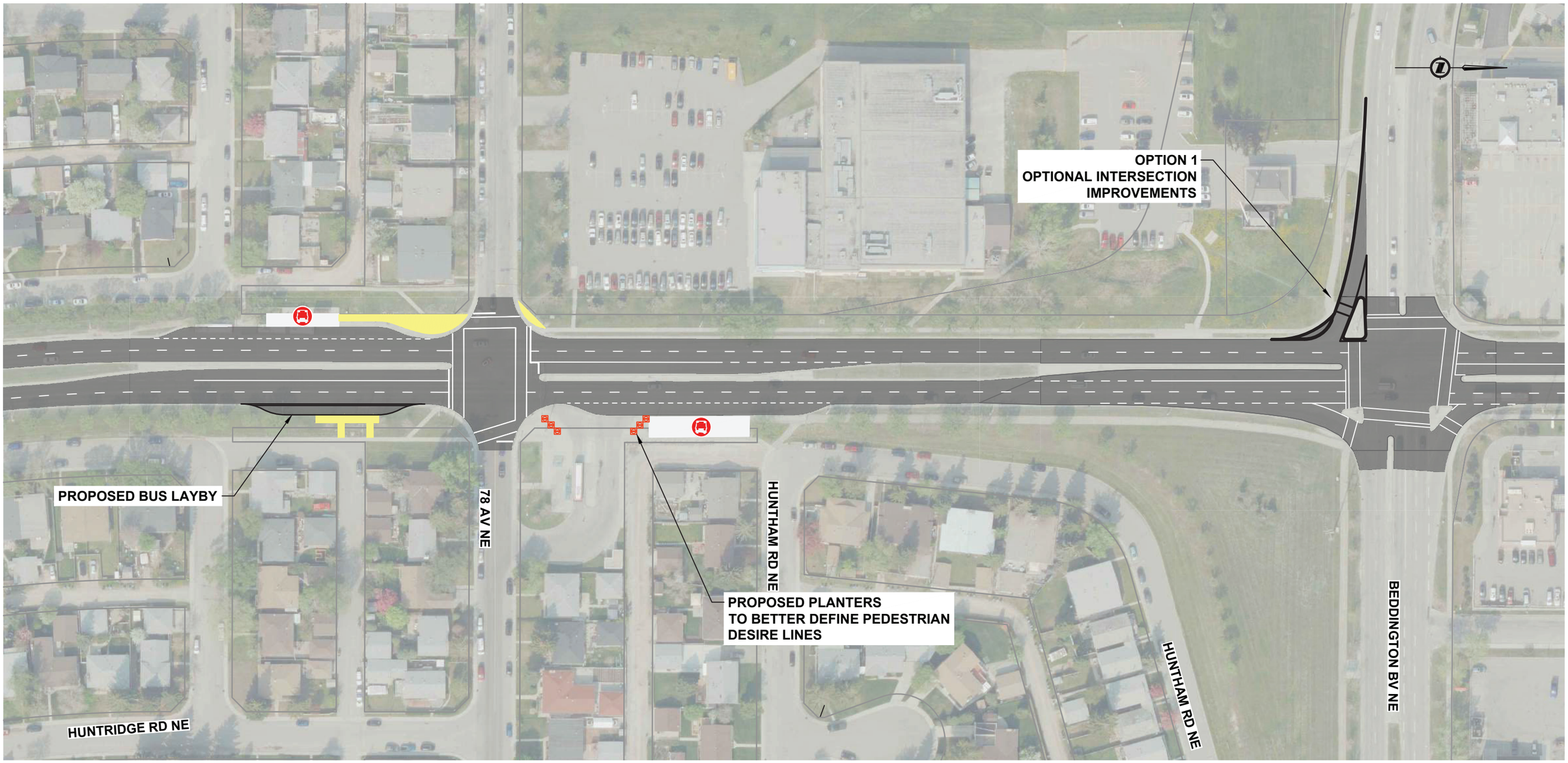

FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE
WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP
(UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK
OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 25 50 m
1:1250

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NORTH CENTRAL BRT STUDY

FIGURE TITLE
NORTH CENTRAL BRT
78 AV N - BEDDINGTON BV

FILE No.	SCALE	FIGURE No.
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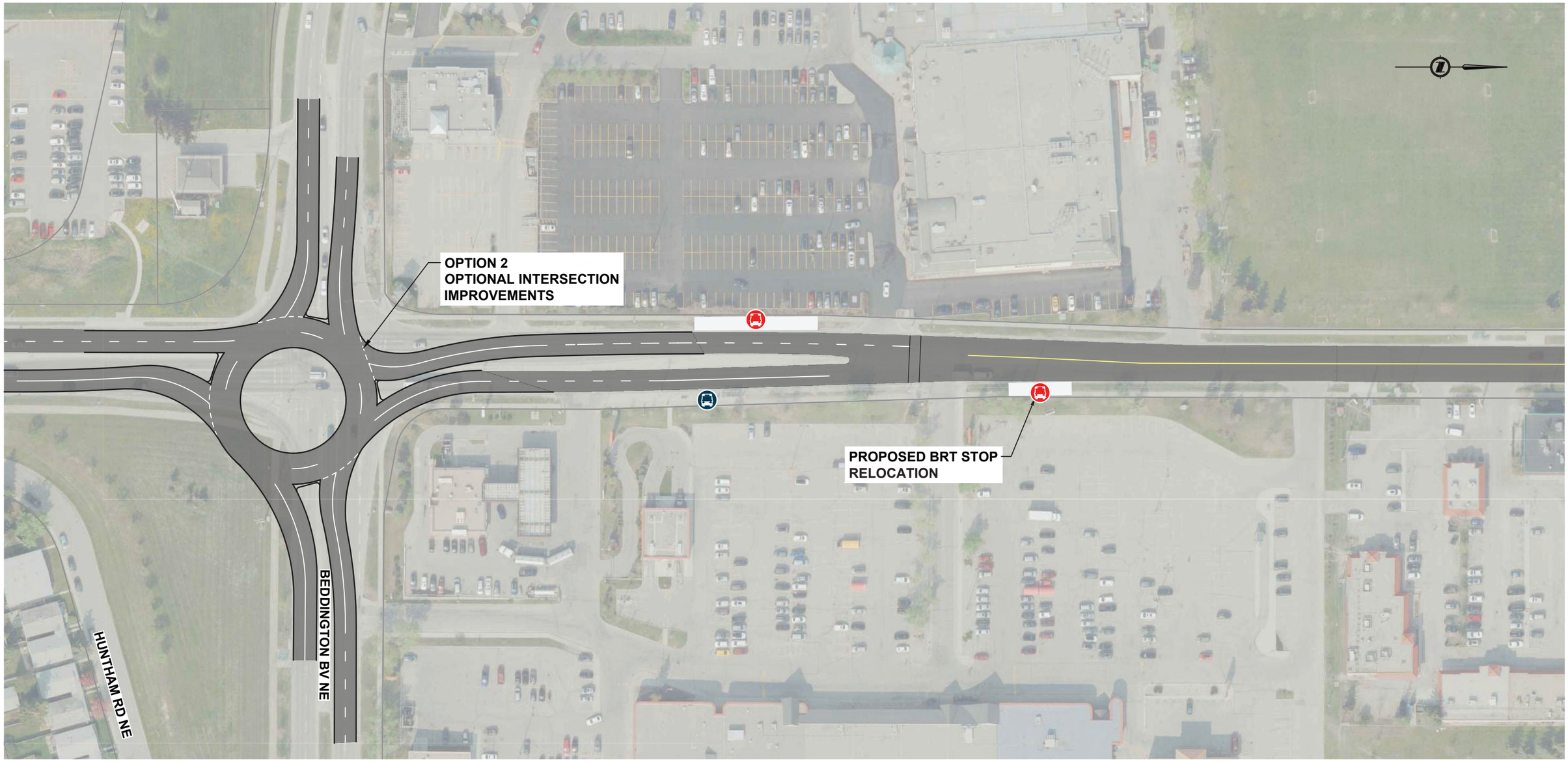

FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE
WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP
(UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK
OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 25 50 m
1:1250

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NORTH CENTRAL BRT STUDY

FIGURE TITLE
NORTH CENTRAL BRT
BEDDINGTON BV ROUNDABOUT OPTION

FILE No.	SCALE	FIGURE No.
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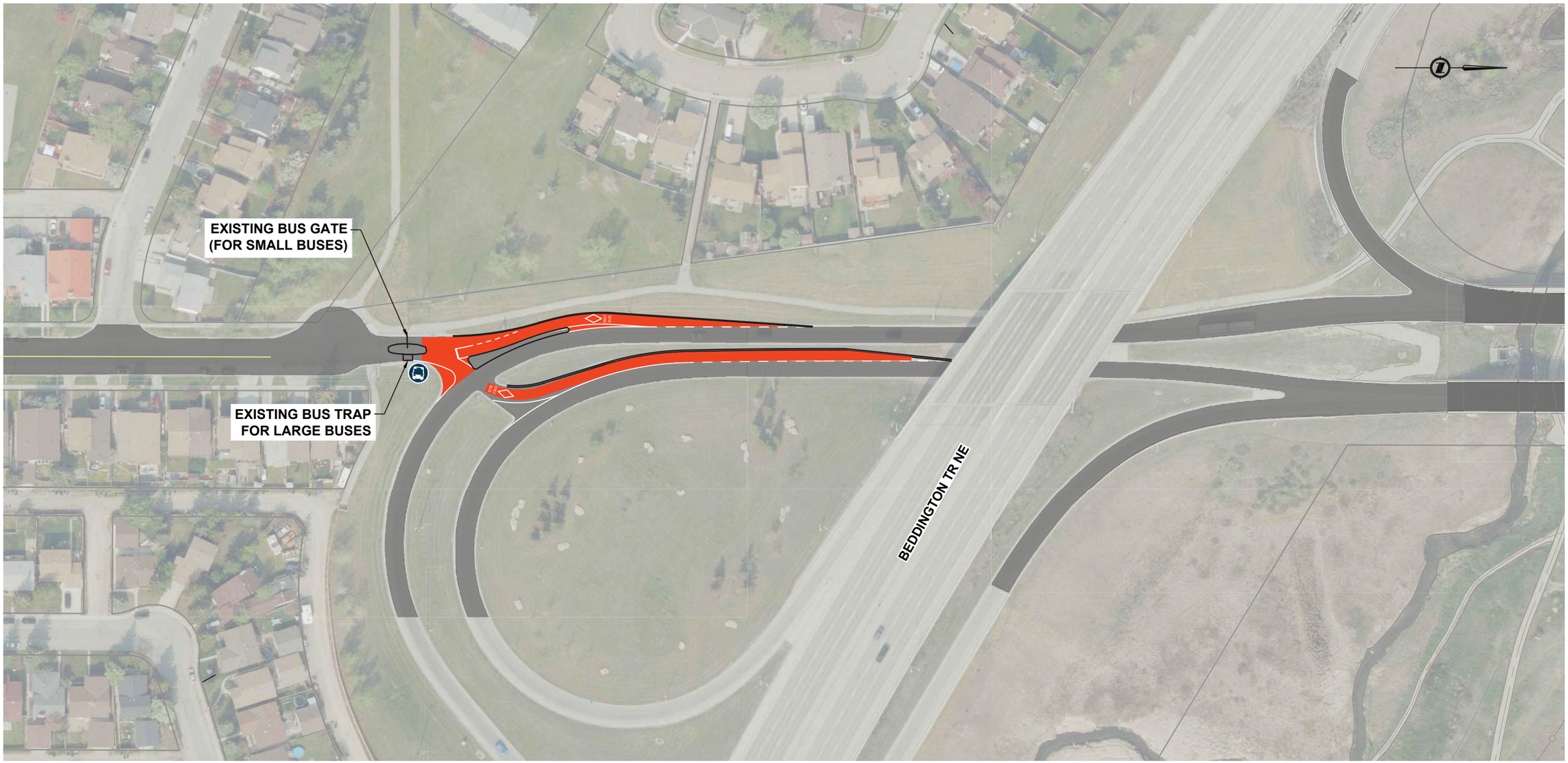
FILE: \\CD1002-F04\SHARED_PROJECTS\113678360_CADD3_SHEET_FILES\91_SKETCH\02_ROADS_2000-2999\SK-2007_PRESENTATION_MAY.DWG | DATE: Wednesday, May 12, 2021 3:04:39 AM



FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE
WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP
(UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK
OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 25 50 m
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FIGURE TITLE
NORTH CENTRAL BRT
BEDDINGTON LOOP RAMP

FILE No.	SCALE	FIGURE No.
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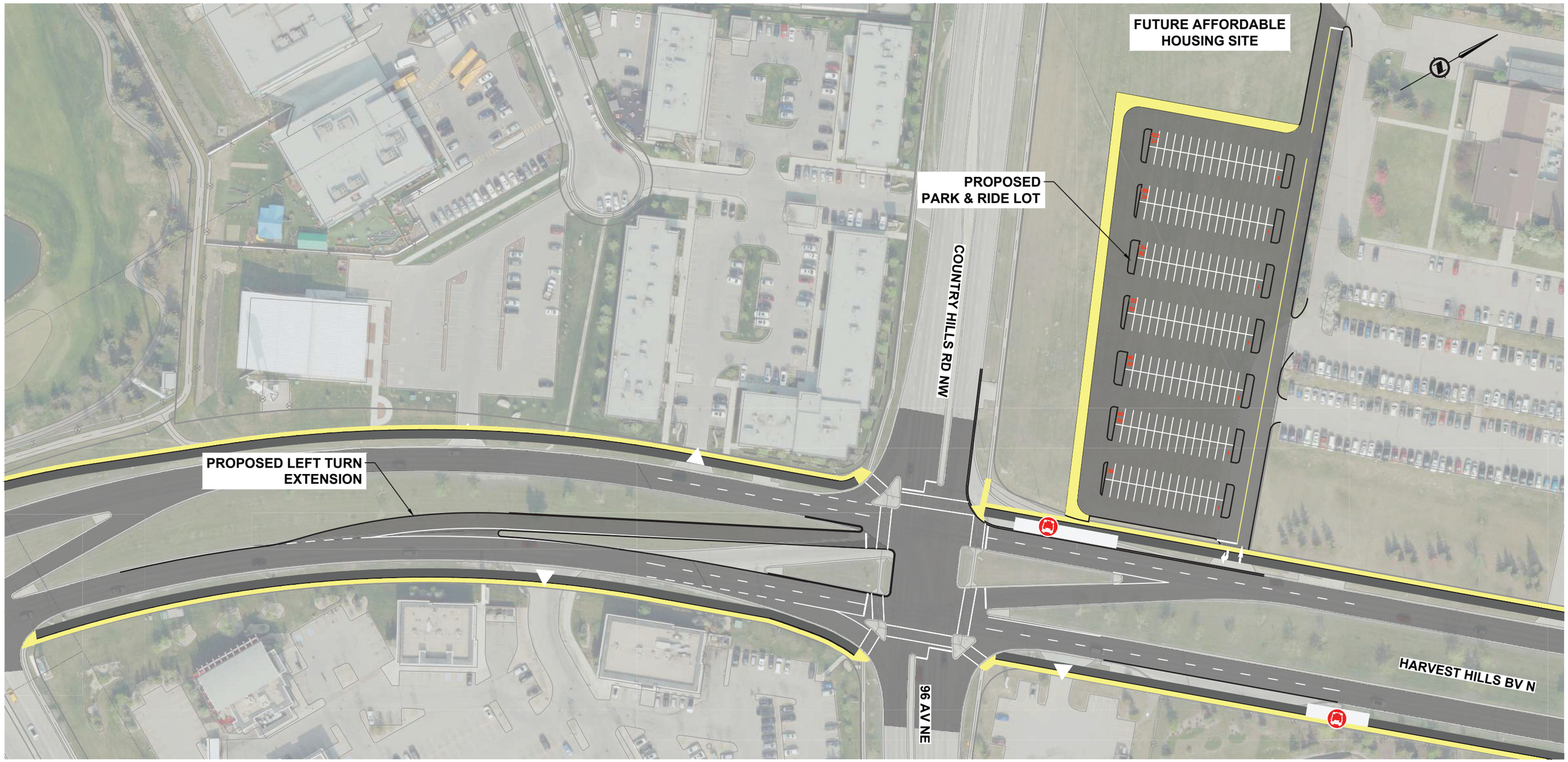

FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP (UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 25 50 m
1:1250

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FIGURE TITLE
NORTH CENTRAL BRT
HARVEST HILLS - 96 AV NE

FILE No.	SCALE	FIGURE No.
sk-2007_presentation_may.dwg	AS SHOWN	SK-2007K

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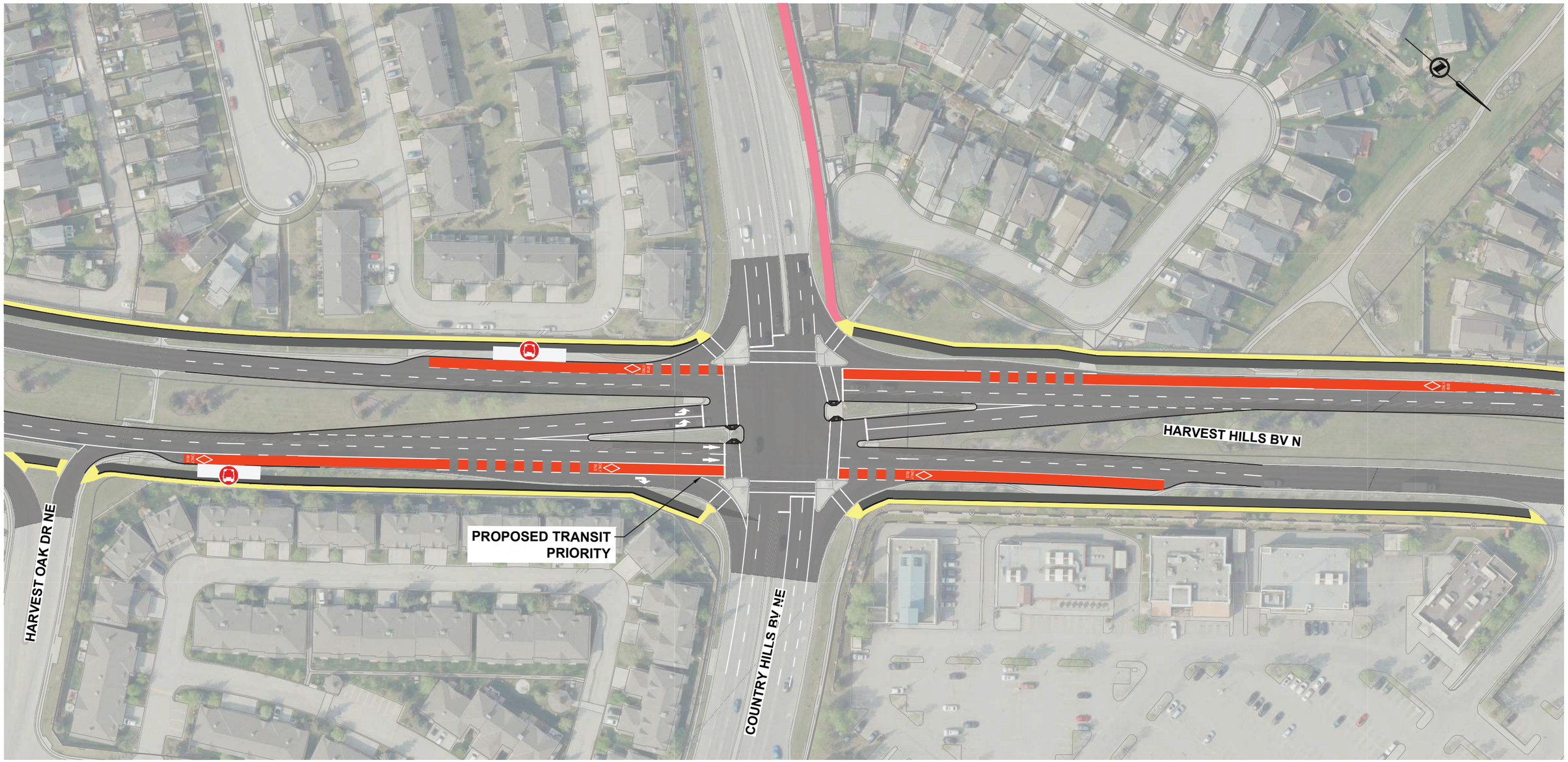
FILE: \\CD1002-F04\SHARED_PROJECTS\113678380_CAD\03_SHEET_FILES\91_SKETCH\02_ROADS_2000-2999\SK-2007_PRESENTATION_MAY.DWG | DATE: Wednesday, May 12, 2021 3:46:19 AM



FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP (UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 25 50 m
1:1250

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FIGURE TITLE
NORTH CENTRAL BRT
HARVEST HILLS - COUNTRY HILLS BV

FILE No.	SCALE	FIGURE No.
sk-2007_presentation_may.dwg	AS SHOWN	SK-2007L

ISC: SHEET SIZE ANSI B 20 mm 0

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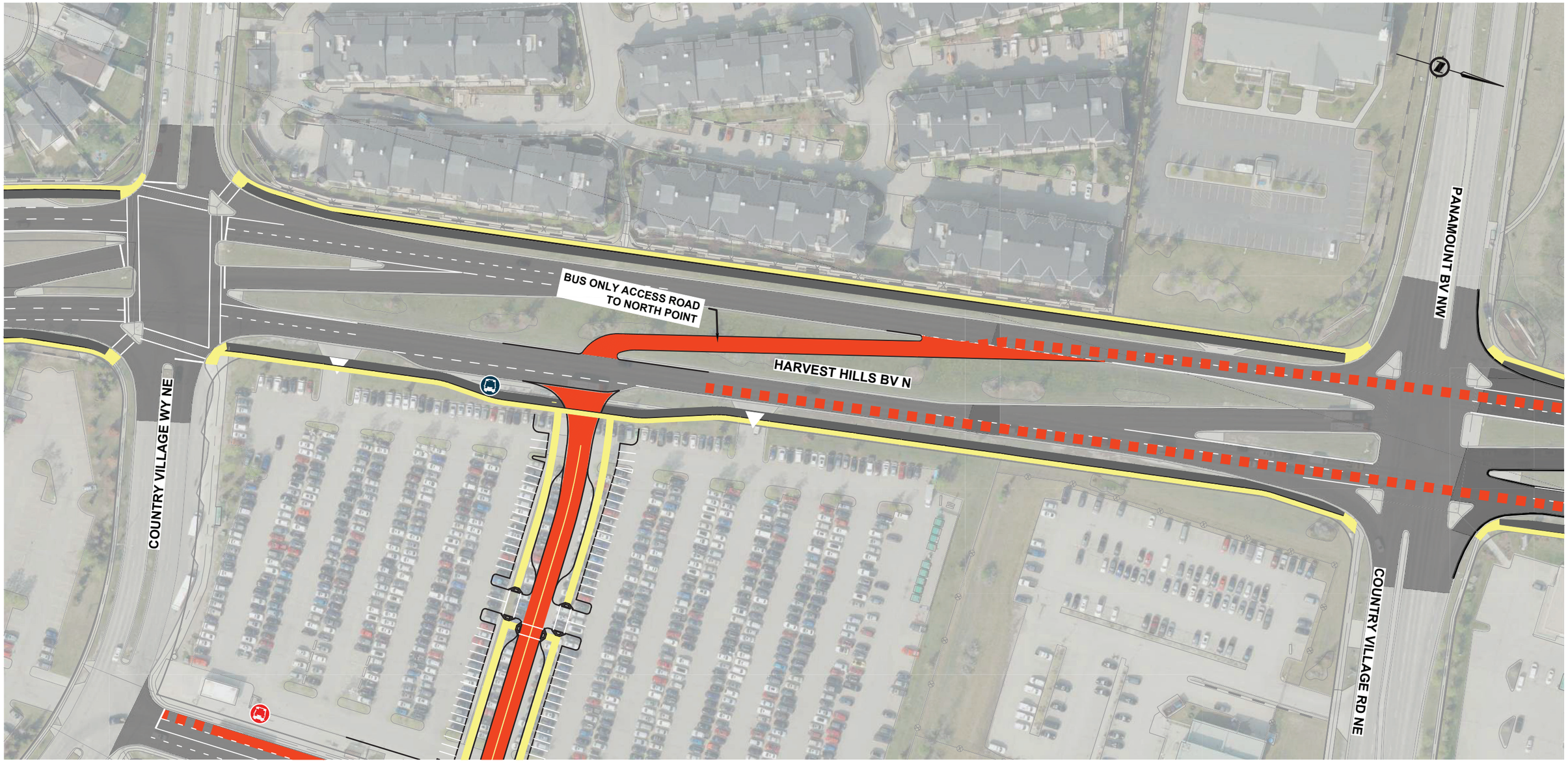

FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE
WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP
(UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK
OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 25 50 m
1:1250

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FIGURE TITLE
NORTH CENTRAL BRT
HARVEST HILLS - COUNTRY VILLAGE WAY

FILE No.	SCALE	FIGURE No.
sk-2007_presentation_may.dwg	AS SHOWN	SK-2007M

ISC: SHEET SIZE ANSI B 20 mm 0

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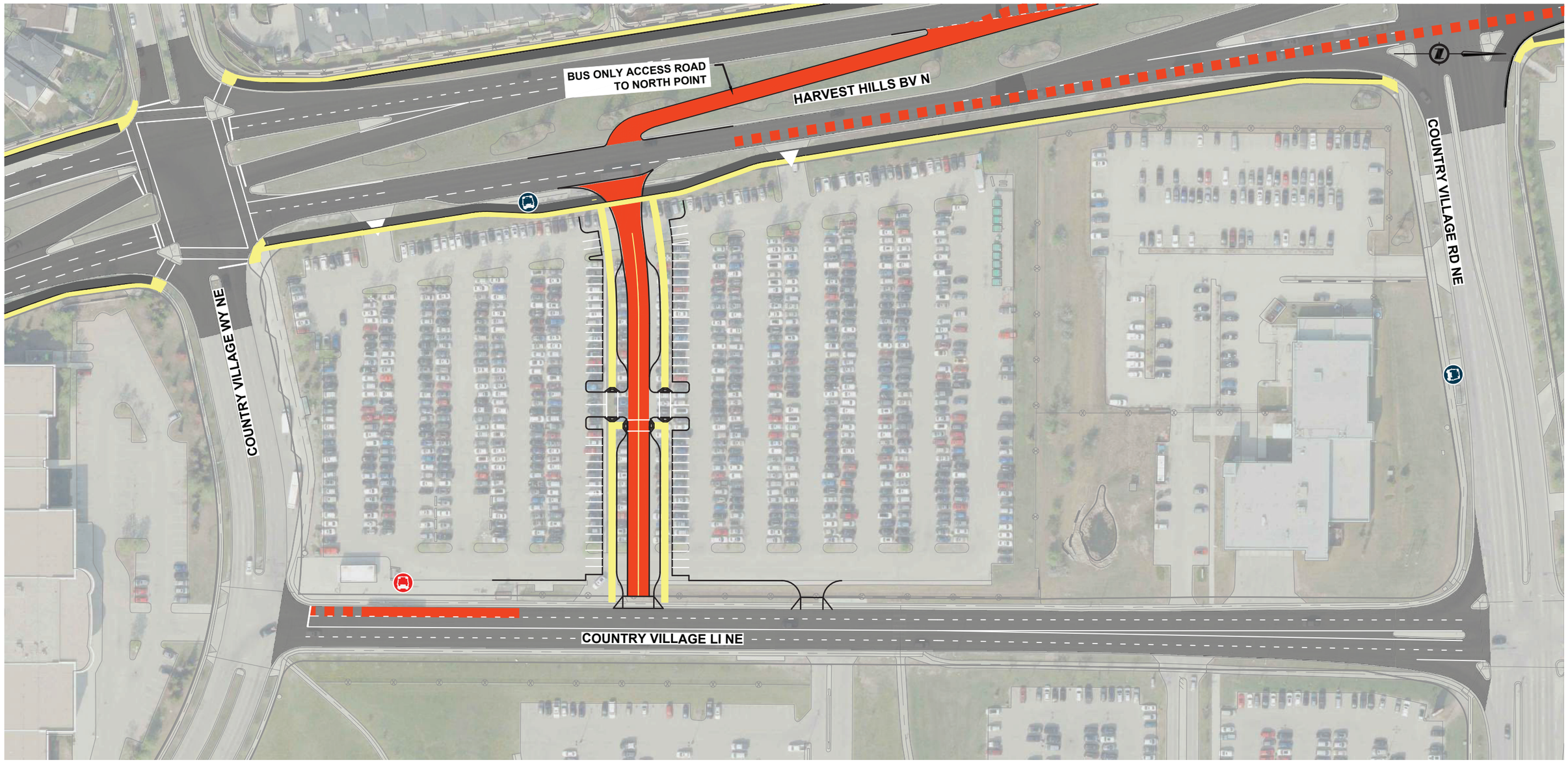

FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP (UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 25 50 m
1:1250

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FIGURE TITLE
NORTH CENTRAL BRT
HARVEST HILLS - NORTH POINT PARK AND RIDE

FILE No.	SCALE	FIGURE No.
sk-2007_presentation_may.dwg	AS SHOWN	SK-2007N

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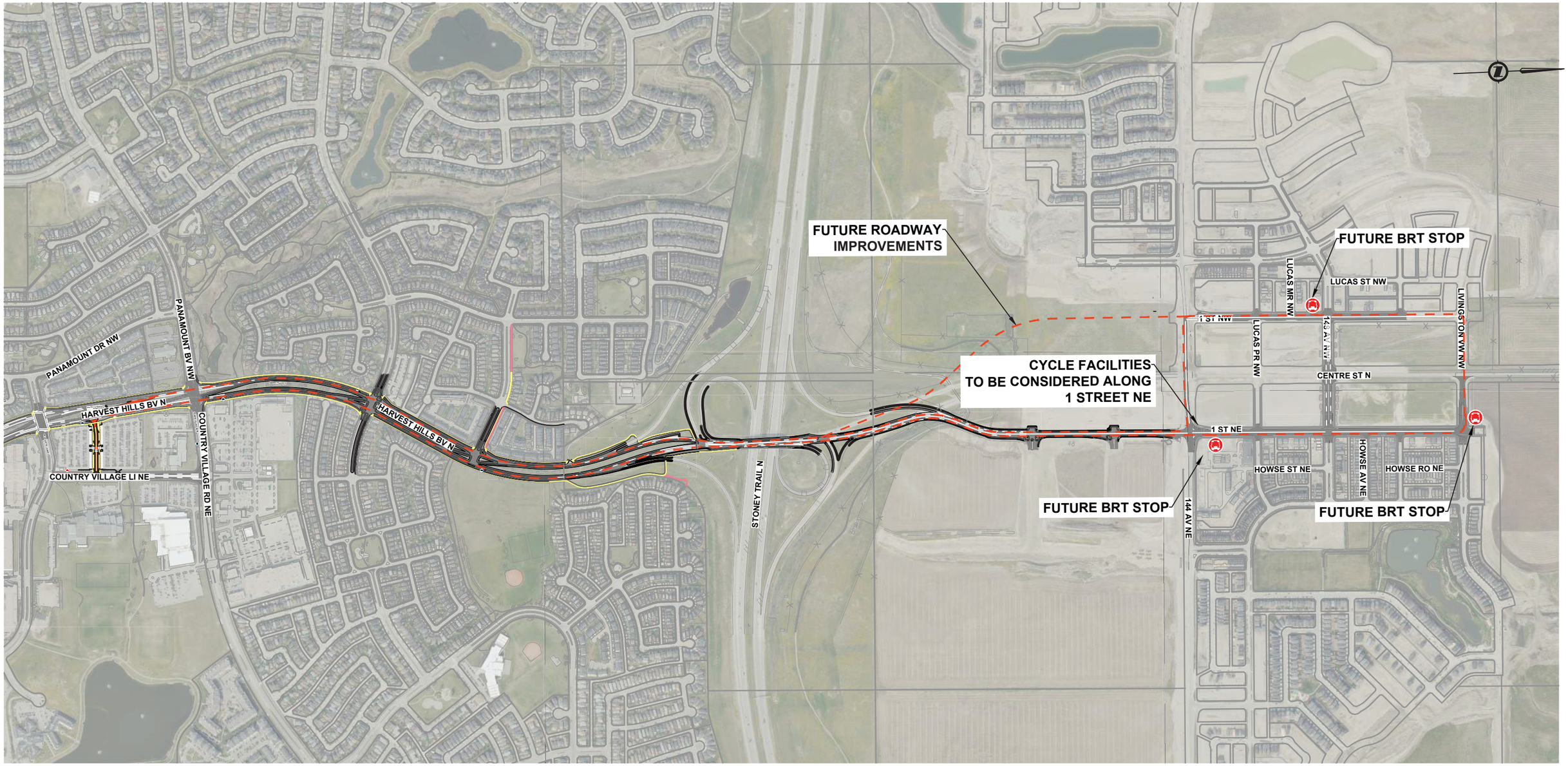
Attachment 2



FUTURE BRT SERVICE
BUS ONLY LANE
DOWNTOWN BUS STOP AREA
PEAK HOUR ONLY LANE WITH OFF PEAK PARKING
EXISTING BUS STOP
EXISTING BRT STOP (UNLESS NOTED OTHERWISE)
BUS ONLY LANE

PROPOSED LRT
PROPOSED CONCRETE SIDEWALK OR URBAN REALM
PROPOSED 2.5m CYCLE FACILITY
PROPOSED 3.0m MULTI-USE PATH
EXISTING DRIVEWAY

0 200 400 m
1:10000

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FIGURE TITLE
NORTH CENTRAL BRT
FUTURE LIVINGSTON ROUTE LOOP

FILE No.	SCALE	FIGURE No.
sk-2007_presentation_may.dwg	AS SHOWN	SK-2007A

ISC: SHEET SIZE ANSI B 20 mm 0

FILE: \\CD1002-F04\SHARED_PROJECTS\113678300_CADD\3_SHEET_FILES\91_SKETCH\02_ROADS_2000-2999\SK-2007_PRESENTATION_MAY.DWG | DATE: Wednesday, May 12, 2021 2:52:58 AM

Appendix C STATION TIERING RECOMMENDATIONS

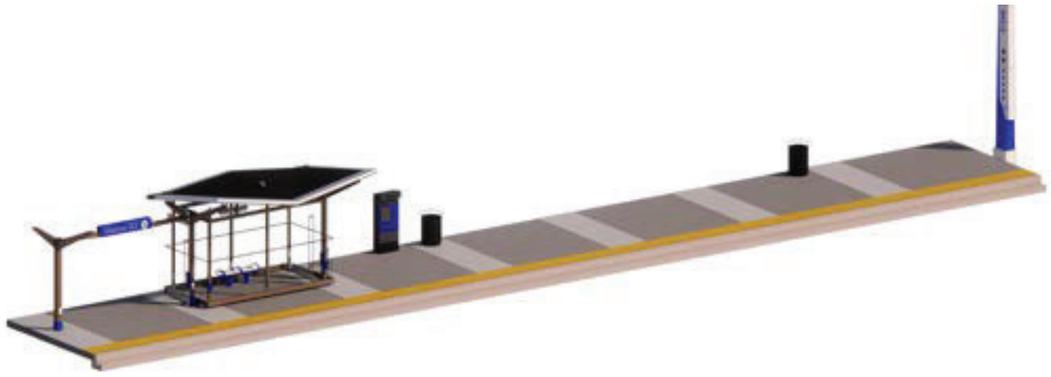
BRT Tiers | Configuration

Each proposed stop was assigned a Tier based on the configuration of the existing MAX BRT facilities. Stops are to be designed using a repeatable 'kit-of-parts' to allow for maximum flexibility to address unique site constraints and opportunities. Based on the location, and the criteria described previously, each tier features a different configurations / capacity, variable levels of passenger amenity and specific equipment quantities. Differing configurations of station elements and amenities form different tiers. The proposed tiers are described in Table 1. The Examples of variable passenger amenities include:

- Amount of canopy coverage
- Length of station platform
- Pedestrian lighting along station platform
- Number of benches
- Advertising requirements
- Public art

Tiers also feature different platform lengths and widths. This is to accommodate the expected capacity and required level of amenity, such as shelter size. However, other variables have been considered as well, including pedestrian flow and circulation, available space within the public right-of-way, and the size of the bus zone (refer to BRT stop plans). The following diagram illustrates how two different stops can be created using a kit-of-parts and the same 4-metre-wide platform. The scenarios feature different sizes of canopies, alternative shelter configurations, available circulation space and passenger amenities.

TIER 2



TIER 6

TIER 10

BRT Station Tiering Matrix -Table 1

	Bus Stop	Major Destination /15	Connecting Bus/LRT Routes /15	Ridership /30	Population Density /15	Land-Use/ Transit Oriented Development /10	Walkability /15	Total Score /100	Tier	Notes
									Tier 2 = >50 Tier 6 = 30-49 Tier 10 = <30 (Refer to tier types for more information)	
MEDIUM TERM Downtown / Chinatown	5 Ave & 6 Street - EB	-	-	-	-	-	-	-	N/A	Downtown BRT Stop
	6 Ave & 5 Street - WB	-	-	-	-	-	-	-	N/A	Downtown BRT Stop
	5 Ave & 2 Street - EB	-	-	-	-	-	-	-	N/A	Downtown BRT Stop
	6 Ave & 2 Street - WB	-	-	-	-	-	-	-	N/A	Downtown BRT Stop
	4 Ave S - SB	-	-	-	-	-	-	-	N/A	Chinatown BRT Stop
	4 Ave S - NB	-	-	-	-	-	-	-	N/A	Chinatown BRT Stop
MEDIUM TERM Centre Street / Harvest Hills Blvd Corridor	16 Ave	11	15	24	9	8	12	79	Tier 2	Temporary Terminal
	28 Ave	6	0	6	6	4	15	37	Tier 6	
	40 Ave	7	12	18	6	4	15	62	Tier 2	Existing Park n Ride-52 stalls 450m away from stop
	Northmount Drive	7	3	6	6	0	9	31	Tier 6	
	64 Ave	10	9	12	3	10	3	47	Tier 6	
	78 Ave	10	15	24	3	0	9	61	Tier 2	Existing Park n Ride - 51 stalls. High transfer and service activity
	Beddington Blvd	10	12	18	9	0	6	55	Tier 2	
	96 Ave	11	12	12	6	6	6	53	Tier 2	Major transfer to future Airport Connector. **Future Park and Ride**
	Country Hills Blvd	10	6	12	6	4	6	44	Tier 6	
	North Pointe Terminal	0	0	0	0	0	6	6	Tier 2	Terminal Existing Park n Ride-927 stall
FUTURE / LONG TERM New Communities and Infill	Additional Downtown Stop – 11 Street Downtown Bus Terminal	-	-	-	-	-	-	-	Tier 2+	Tier 2+ to include a washroom
	Additional Downtown Stop – 5 Avenue (Location TBD)	-	-	-	-	-	-	-	N/A	Downtown BRT Stop;
	Additional Downtown Stop – 6 Avenue (Location TBD)	-	-	-	-	-	-	-	N/A	Downtown BRT Stop;
	Harvest Oak Gate	4	6	6	6	0	6	28	Tier 10	Future infill stop
	Harvest Oak Drive	3	3	6	6	0	6	24	Tier 10	Future infill stop
	Panatella Boulevard	3	0	0	6	0	6	15	Tier 10	Extension
	Panatella Boulevard	-	-	-	-	-	-	-	Tier 10	Extension.
		-	-	-	-	-	-	-		
	144 Ave	-	-	-	-	-	-	-	Tier 10	Extension.
	160 Ave	-	-	-	-	-	-	-	Tier 10	Extension.