
Report

Northwest Light Rail Transit Downtown to the Northwest City Limits

Prepared for



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Prepared by



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1. Introduction

1.1 Report Purpose

This report details the decision-making process conducted by the City of Edmonton (the City) to determine the recommended corridor for the Northwest Light Rail Transit (NW LRT). This report explains the project structure, alternatives identification process, screening process, evaluation criteria, and a summary of the technical analysis key points that resulted in the recommended NW LRT corridor extending from downtown Edmonton to the northwest city limits.

1.2 Project Background

The approach taken to determine the recommended NW LRT corridor follows the process set by the Southeast (SE) and West LRT corridors. The process is directly aligned with City policies encouraging sustainable development with a multi-modal transportation network. Transit, specifically LRT transit, is a significant element in the implementation of these City policies. The NW LRT study began in June 2009, with a directive to identify an appropriate LRT corridor that moves citizens efficiently, helps to shape the land use and form of the City in a more sustainable fashion, and integrates into established neighbourhoods with less impact.

The NW LRT study was led by the City of Edmonton Transportation Department (Transportation Department) to determine a recommended LRT corridor. The Transportation Department developed a cohesive project team. The team included internal decision makers from the wide range of City departments, as well as a representative from the City of St. Albert. City team members were selected to represent the positions of each of their departments. Given the diverse perspectives of the team members, the objective was to reach consensus among the project team members on key decisions. Consensus refers to concurrence and not unanimous agreement. The team included representatives from the following departments/branches/organizations:

- Transportation Planning
- Transportation Operations
- Planning and Development
- Office of Natural Areas
- Parks and Recreation
- Edmonton Transit: Light Rail Transit, Service Development
- Capital Construction: LRT Design and Construction, LRT Expansion
- City of St. Albert

The Transportation Department engaged CH2M HILL Canada Limited (CH2M HILL) as a transportation consultant to facilitate the group through its decision-making process and to provide technical analysis. This blended group of City department representatives and consultants formed the “project team.”

The project team and its alternatives analysis process was one piece in a triad of influences that would ultimately determine the NW LRT corridor recommended to City Council. **Figure 1** graphically displays the relationship of the following three key elements:

- **Technical Studies** – The work by the internal City project team. Project team representatives were responsible for conveying this work to their respective organizations and obtaining input from their departments at each decision milestone.
- **Public Input** – Information obtained from the public consultation process. This process was conducted in parallel with the technical studies to understand the position of local stakeholders and the public at large.
- **LRT Network Plan** – The plan that defines the type of LRT system in Edmonton, the number of lines, and their ultimate destination and the system design & technology. The NW LRT is one component of this larger system.

The NW LRT project began by first developing consensus on the process the team would follow to identify a recommended NW LRT corridor. The project team agreed to a multi-step process with team decisions at each key milestone. The process served to identify the full range of potential corridors from the downtown to the northwest city limits. Multiple criteria were applied that represented the guiding principles of the project. The criteria were adapted from those previously reviewed, weighted and approved by City Council for the SE and West LRT projects in October, 2008. The criteria became increasingly more detailed as the screening advanced. The criteria helped to screen out those corridors that did not compare favorably and to advance the most promising corridors for additional consideration. Details on the decision-making process are provided in Section 2 of this document.

1.3 Project Study Area and Purpose Statement

Project Study Area

The NW LRT study area includes the entire northwest quadrant of Edmonton from the downtown area to the northwest city limits (generally the transportation utility corridor). In general, the boundaries of the study were 167 Avenue to the north, Stony Plain Road to the south, 97 Street to the east, and approximately 156 Street to the west. **Figure 2** provides a map of the study area and constituent neighbourhoods.

The study area included major commercial and business centres along 118 Avenue, Lakeside Landing/Castle Downs, Christy’s Corner, Skyview Centre (137 Avenue), the Westmount Centre, and the North Town Centre. The project study area includes the Edmonton City Centre Airport (ECCA) and the redeveloping Greisbach neighbourhood. Major parkland and recreational landmarks in the area included Grand Trunk Park, Castle Downs Park, Henry Singer Park, and multiple smaller parks serving individual neighbourhoods. Significant education and transportation facilities are also located within the study area. These facilities

included the Northern Alberta Institute of Technology (NAIT), the Canadian National (CN) railway facilities, Yellowhead Trail, the planned North LRT extension to NAIT, and the future extension of Anthony Henday Drive.

Purpose Statement

The project purpose statement identifies the key elements and reasons for completing the project. The statement also includes a series of supporting principles that address specific issues or objectives. The statement is also intended to be specific enough to include the key project elements, while being broad enough to ensure that the team can develop a reasonable range of corridor options. The resulting project purpose statement for the NW LRT study was reached with the consensus of the entire project team.

The purpose of the Northwest LRT Project is to establish an LRT connection between downtown and northwest Edmonton (with a feasible future connection to the City of St. Albert).

The guiding principles supporting this purpose include:

- Maximize cost effectiveness
- Maximize transit system ridership
- Maximize use of existing transportation corridors
- Protect goods movement corridors (road and rail)
- Connect existing and future activity centres
- Provide consistency with the Transportation Master Plan (TMP), Municipal Development Plan (MDP), the City's strategic direction, LRT Network Plan, St. Albert's TMP and integrated land use framework, as well as the Capital Region Plan
- Provide opportunities for future system expansion
- Increase transit system effectiveness
- Shape land use to promote a more compact urban form
- Respect neighbourhoods
- Respect parklands
- Promote economic development/redevelopment

1.4 LRT Network Plan

The City's Strategic Vision, the "Way Ahead," identifies strategic goals to be accomplished over a ten-year plan that provides the guidance for the long term development of a sustainable City.

To support the City's Strategic Vision, Administration staff members have developed policy documents that provide direction on how the City should grow and how citizens should

move around the City. The MDP, known as the “Way We Grow,” and the TMP, known as the “Way We Move,” offer the framework for developing a sustainable and livable City. Both plans identify that, for the City to grow in a sustainable way, LRT is a key tool to help in creating compact urban centres while offering a premium transit service and promoting a mode shift to transit.

To supplement the TMP, an LRT Network Plan (see **Figure 3**) has been developed for a long term LRT system serving the City of Edmonton and the region. The Network Plan creates a plan for the City and region over the next century. The key elements of the LRT Network Plan, which were endorsed by City Council and that assist in the corridor LRT definition, include the following:

- **LRT Network** - A six line LRT system with the proposed service extending to the Northwest, Southeast, West, Northeast, East and South.
- **System Style** - The LRT system would ultimately evolve into an urban-style system with shorter stop spacing and more community-based stops.
- **Technology** - New LRT lines with direct connections to the existing LRT system would be developed with the existing high-floor LRT vehicles.
- **Central Area Circulation** - All corridors would serve the downtown hub allowing centralized transfers connections to other areas of the City.

Similar to all new LRT corridors, the NW LRT would be implemented with urban-style LRT operations. This is characterized by greater visibility through surface track along existing transportation corridors. The urban style of operations seeks to provide enhanced transit access to multiple activity centres and mature communities with shorter stop spacing.

The City has made significant progress on two issues which bear significantly on the NW LRT corridor. First, the City Council initiated a phased closure of the ECCA. Second, City Council has adjusted the location of the temporary station serving the NAIT campus.

City Council decided to complete a phased closure of the airport with a portion closing in 2010. Planning is also underway for the full closure of the ECCA in the future. With this decision, City Council provided direction to evaluate the transit oriented development potential of the ECCA lands. As such, all future corridor options were designed to integrate with ECCA redevelopment plans.

Additionally, City Council approved the final North LRT corridor alignment and a Transportation Bylaw amendment to relocate the temporary NAIT station across Princess Elizabeth Avenue, on land directly adjacent to NAIT and the ECCA. This temporary station adjustment set a logical connection for the NW LRT. Given City Council’s direction, and the potential opportunities at the ECCA, all NW LRT corridor options connected directly with the temporary NAIT station. All NW LRT corridors were assumed to be high-floor LRT vehicles to interline directly with the existing system and connect to the downtown efficiently. The central area, including the downtown and University, is the most transit-supportive area of the City, as it is a high density activity zone for both population and employment. All of the new LRT routes serve the central area and interconnect there to provide multiple transfer and destination opportunities.

2. Alternative Development and Evaluation Process

2.1 Process Overview

The Transportation Department chartered the project team to implement a multi-step decision-making process. **Figure 4** depicts the decision-making process milestones. The project team met in a series of three team workshops during 2009 and 2010. Each workshop focused on specific steps or decision milestone in the process of identifying the recommended corridor.

The process included identifying all reasonable corridor options for linking LRT from downtown to the northwest city limits. **Figure 5** illustrates the initial corridors considered. Criteria were adopted for two levels (Level 1/Level 2) of screening the corridor options. The criteria were based on the criteria grouping and weightings previously adopted by City Council for the SE and West LRT corridors. However, criteria were refined to reflect the unique characteristics of the NW LRT corridor.

Screening involves comparing each of the corridors against one another. In many cases, initial corridor comparisons were very close based on the criteria, and one corridor was just incrementally better than another. The criteria became increasingly more detailed as the screening advanced. The criteria helped to screen out those corridors that did not compare favorably and advanced the most promising corridors for additional consideration.

The project team's screening was guided by its Purpose Statement and the ultimate goal to identify a recommended NW LRT corridor. Through the screening process, the project team worked to balance the key public and technical issues. The key issues included technical feasibility and cost; moving goods and people; using land use to promote a more compact urban form; impacts to parks and the river valley; and impacts to the natural and social environment. These issue areas are expressed by the Purpose Statement's guiding principles and the City Council approved criteria used to evaluate each corridor option.

Prior to each workshop, the project team further developed its technical analysis and presented the findings to the group for feedback and direction. Following the major decision milestones, the results were provided to the public for their consideration and to further shape the process. Major project decisions were not finalized until public input was received to inform the project team's direction. The public consultation process included individual stakeholder surveys, on-line comment opportunities, and two rounds of public information workshops. The first public workshops were held on March 23 and 24, 2010, to present and describe the Level 1 analysis and the Level 2 corridor options. A second round of public information meetings are planned for June 9 and 10, 2010, to present and describe the recommended corridor.

As noted previously, the recommended corridor was influenced by other studies and policy documents, such as the LRT Network Plan. The City has also conducted studies involving the desired future development patterns and the land use benefits of Transit Oriented Development (TOD). The potential land use effects and TOD opportunities were considered in the decision-making process and the evaluation criteria. Other key policy documents, including the MDP and the TMP, established the City's strategic vision on how citizens of Edmonton will live in and move throughout the City in the future. The bullets below provide specific excerpts from these plans that were considered in the decision-making process.

Municipal Development Plan

- Accommodate a 2040 population of over 1 million people
- Manage growth to become a sustainable, healthy, and compact City
- Grow within an evolving regional context
- Design complete, healthy, and livable communities
- Align medium and higher density development with key transit node and corridor locations including LRT
- Protect, preserve, and enhance the natural environment

Transportation Master Plan

- Provide a comprehensive transit system as a cornerstone of the transportation system, offering travel choice and encouraging a shift in the public's mode of transportation
- Expand LRT to all sectors of the City to increase ridership and spur the development of compact, urban communities
- Integrate transportation and land use to optimize transportation investment and create an accessible, efficient, and urban form
- Provide an effective regional transportation system, including transit, for the movement of people and goods

2.2 Level 1 Screening

Level 1 screening refers to the initial fatal flaw analysis. The goal at Level 1 is to remove from consideration those corridors that simply do not meet the purpose of the project or those corridors where the high level of impact or cost makes them simply not viable. **Figure 5** identifies the initial corridors examined in Level 1 screening. For organizational purposes, the criteria were grouped under the general categories of feasibility, community, and environment. The categories and a few examples of the Level 1 criteria examined under each are provided below. This list does not include all criteria used in the analysis.

Feasibility

- Is the corridor technically feasible?
- Is the terminus aligned appropriately to permit a future extension to St. Albert?
- Does the corridor maximize ridership?

Community

- Does the corridor require significant purchase of private property?
- Is the corridor consistent with the Transportation Master Plan (TMP), Municipal Development Plan (MDP), the City's strategic direction, LRT System Network Plan, St. Alberts TMP and integrated land use framework, the Capital Region Plan, and accommodate Council direction on ECCA
- Does the corridor connect to current and/or future activity centers?

Environment

- Does the corridor present potential for significant environmental impacts (i.e. impacts to water crossings, natural habitat areas, etc.)?
- Is the corridor consistent with City plans, bylaws, provincial and federal regulations addressing parks and open space?
- Does the corridor require significant purchase of park or open space property?

The project team compared each potential corridor to the Level 1 criteria. The project team also debated the challenges and benefits related to each corridor. The consultant was directed by the project team to conduct additional research regarding the technical viability of using the CN freight rail corridor; interactions with the high voltage power line near 153 Avenue; potential property impacts along the 127 Street corridor options; and, potential impacts to Grand Trunk Park. Additional research revealed no fatal flaws associated with these issues.

The team also analyzed the merits of NW LRT options along the 97 Street corridor. The team examined the existing transit ridership along 97 Street and in northwest Edmonton. While overlap does exist, it was determined that the 97 Street corridor was a distinct travel market, separate from the northwest Edmonton travel market. Both corridors have significant transit ridership and require transit service. Given that the project purpose identified a terminus at the northwest city limits, it was determined that the out of direction travel necessary to follow 97 Street as a NW LRT option was not viable. Therefore, 97 Street was removed from consideration at Level 1 screening. The team did give additional consideration to whether a separate central North LRT (along 97 Street) would be part of the ultimate transit network. The LRT network analysis did not rule out future potential for an additional North LRT alignment. However, the connection of the NAIT station to St. Albert is the priority corridor. This does not preclude an additional North extension, should future demand necessitate it. The 97 Street corridor has been identified as a premium transit corridor.

Ultimately, consensus was reached by the project team to advance three key corridors including a variety of potential design options to these corridors. **Figure 6** depicts the corridors that advanced from Level 1 to Level 2 screening.

2.3 Level 2 Evaluation

Figure 6 illustrates the corridors carried forward for refined definition and detailed evaluation as Level 2 alternatives. All Level 2 alternatives were grouped by their major north/south roadway.

Corridor Descriptions

St. Albert Trail Corridor

The corridor would initiate at the temporary NAIT station. The corridor would then travel northwest across the ECCA turning along one of the following design options:

- West, along the Yellowhead Trail right-of-way, turning northwest to St. Albert Trail. (or)
- West along existing freight rail ROW parallel to Yellowhead Trail, turning northwest to St. Albert Trail. (or)
- West along 118 Avenue to Groat Road and then to St. Albert Trail.

The corridor then follows one of the following design options:

- Northwest along St. Albert Trail. (or)
- North along existing freight rail right-of-way, ultimately transitioning into the right-of-way for 142 Street. Plans are in place to realign 142 Street further west and would allow the LRT to use the previous road right-of-way. At 153 Avenue, the corridor would turn west following the planned alignment of 153 Avenue.

The corridor terminates at the proposed Park and Ride within the Transportation Utility Corridor (TUC) at St. Albert Trail and Campbell Road.

127 Street Corridor

The corridor would initiate at the temporary NAIT station. The corridor would then travel northwest across the ECCA turning along one of the following design options:

- West, along the Yellowhead Trail right-of-way, turning north on 127 Street. (or)
- West along existing freight rail ROW parallel to Yellowhead Trail, turning north on 127 Street. (or)
- West along 118 Avenue to Groat Road, turning north on 127 Street.

The corridor then proceeds along 127 Street to one of the following design options:

- West along 137 Avenue, to St. Albert Trail. (or)
- West along 153 Avenue. At 142 Street, the corridor would follow the planned 153 Avenue alignment.

The corridor terminates at the proposed Park and Ride within the Transportation Utility Corridor (TUC) at St. Albert Trail and Campbell Road.

113A Street Corridor

The corridor would initiate at the temporary NAIT station. The corridor would then travel northwest across the ECCA turning north on a new LRT crossing of Yellowhead Trail and the CN rail yards. Both a bridge crossing over, and a tunnel under, are under consideration. The corridor would meet grade along Grand Trunk Park and 113A Street. The corridor would then follow 113A Street north to one of the following design options:

- West along 137 Avenue, to St. Albert Trail. (or)
- West along 153 Avenue. At 142 Street, the corridor would follow the planned 153 Avenue alignment.

The corridor terminates at the proposed Park and Ride within the Transportation Utility Corridor (TUC) at St. Albert Trail and Campbell Road.

Level 2 Evaluation Criteria

The comparative evaluation criteria for Level 2 were grouped into six weighted categories to reflect the strategic direction inherent in the City's policies. City Council approved the weightings for each category of criteria. **Figure 7** illustrates the Council-approved evaluation criteria categories and weightings.

For the NW LRT study area, there were numerous specific criteria to compare corridors against one another. The categories and a few examples of the criteria examined under each are provided below.

Feasibility and Constructability (Weighting = 2)

- What are the estimated capital and operating costs per kilometre (km) for the corridor?
- How complex would it be to expand the system north into St. Albert in the future?
- How many km does the corridor require of track at grade, on structure, on retained fill, and in tunnel?
- How many at grade crossings (surface road crossings) are located along the corridor?

Movement of People and Goods (Weighting = 3)

- What percentage of the corridor is within existing public and railroad rights-of-way?
- What is the projected ridership for the corridor?
- What is the projected travel time for the corridor?
- Does the corridor include existing and future bicycle and pedestrian facilities?

Land-use and Promoting Compact Urban Form (Weighting = 4)

- What is the existing/future population density (population per hectare [ha]) within 800 metres (m) of the station?

- What is the future mix of land use types within 800 m of stations?
- Number of existing and future activity centres, transit centres, and park-n-rides within 800 m of the proposed stations?
- Is the corridor- consistent with the TMP, MDP, the City's strategic direction, LRT System Network Plan, St. Albert's TMP and integrated land use framework, the Capital Region Plan, and does it accommodate City Council direction on the ECCA?

Parks, River Valley, and Ravine System (Weighting = 2)

- What are the impacts and benefits to parks, open space, and river valley accessibility (pedestrian, bike, vehicle, and other)?
- How many ha of public lands would be acquired for the corridor?

Natural Environment (Weighting = 2)

- How many ha of valuable riparian habitat would be acquired for the corridor?
- What is the number of stream and river crossings along the corridor?
- What are the total ha of area disturbed during construction?

Social Environment (Weighting = 2)

- How many ha of private property (residential - single family/multifamily, commercial, and industrial) would be acquired for the corridor?
- What are the temporary construction impacts along the corridor?
- Does the corridor create physical barriers for neighbourhood residents?

Ridership Projections

Level 2 ridership projections were undertaken using an approach that considers three components to LRT patronage: the ability of adjacent land uses to support direct, walk-on trips; transfers from bus to LRT; and, park-n-ride users. The technique is well suited to corridor selection studies where a comparative evaluation of alternatives is required.

Usage patterns from Edmonton's existing LRT system, along with experience from other similar cities, were used to estimate bus transfer and Park and Ride usage. To estimate the direct walk-on patronage, future (2041) population and employment forecasts from the City's TMP were used. In consultation with City staff, population and employment growth from the relevant "zones" or communities within the City were concentrated around the potential stations, to reflect development patterns in the presence of LRT and supportive land use policies. To provide a conservative yet reasonable estimate, no induced population or employment growth was assumed beyond that already anticipated in the TMP (i.e. the numbers from the City's 2041 TMP growth forecasts were not increased, they were just redistributed).

Existing population and employment were also considered to approximate the ridership that could be expected on opening day. This analysis resulted in a similar relative ranking of ridership among the corridor alternatives.

2.4 Level 2 Evaluation Results

Level 2 evaluation was completed for the St. Albert Trail, 127 Street, and 113A Street corridors. The Level 2 criteria were applied to each corridor and the results compared the merits and challenges of each corridor. The section below presents many of the key considerations and criteria results that served as discriminators among the corridors options.

St. Albert Trail, 127 Street, and 113A Street Corridors

The table in Exhibit 2-1 (at the end of section 2.4) provides a summary of the key findings from the Level 2 screening comparing the St. Albert Trail, 127 Street, and 113A Street corridors. While all corridors performed sufficiently well based on the Level 2 analysis, the 113A Street corridor performed strongest under several highly weighted criteria. The Level 2 evaluation was considered along with the public input, received through the on-line consultation and the first series of public workshops. This analysis and input resulted in the 113A Street corridor being selected by the project team as the recommended corridor for City Council consideration.

The 127 Street corridor was a strong contender; however, higher property acquisition impacts offset many of the potential benefits. The St. Albert Trail corridor performed significantly worse than the 113A Street and 127 Street corridors, primarily due to its inability to connect populations and activity centres in northwest Edmonton.

Feasibility/Constructability

All corridors analyzed in Level 2 were determined feasible alternatives. The criteria in this category attempted to compare the corridors to see which performed incrementally better based on cost and complexity of construction. The St. Albert Trail corridor performed well under these criteria because it is the shortest corridor connecting the NAIT station and the future Park n Ride station. The 127 Street corridor (with the 118 Avenue design option) is the longest. The estimated costs for all corridors range from \$700 million to \$1.1 billion.¹ The St. Albert Trail corridor is the least expensive, ranging from \$700 million to \$800 million. The 127 Street corridor costs range from \$800 million to \$1 billion. The 113A Street corridor crossing of the Yellowhead Trail and CN rail yard would require either a structure over or tunnel under the CN property. To be conservative from a cost and complexity perspective, the analysis included the more substantial costs and impacts of a tunnel. Because of this crossing, the 113A Street corridor is the most expensive ranging from \$1 billion to \$1.1 billion.

Various options included using CN right-of-way or crossing the CN rail yard. During initial discussions with CN, they indicated operating LRT in their right-of-way and placing LRT in the CN freight yard was not desired. This removed from consideration the St. Albert Trail option which ran along the west portion of the CN Walker Yard and through the Dunvegan Yard. The corridors crossing over or under the CN rail yard were retained. Options were examined to span the CN rail yard or to tunnel under it. Discussions with CN are ongoing.

¹ Cost estimates are preliminary (+/- 50%) and for Level 2 comparative purposes only. As design advances on a preferred corridor, detailed cost estimates will be completed.

Movement of People and Goods

The 113A Street corridor performed best on this, the second most highly weighted criterion - movement of people and goods. The 113A Street corridor had the highest opening day and future boardings (ridership). The 113A Street corridor is unique when compared to the other corridors, as it would create a transportation connection to neighbourhoods north of the Yellowhead Trail and the CN rail yard. Providing this access may generate significant mobility options and land use opportunities that do not exist today.

Traffic impacts would result from the implementation of all three corridors. The St. Albert Trail corridor options that utilized exclusive Yellowhead Trail right-of-way and CN rail right-of-way had few traffic impacts, because they avoided interactions with many roadways. However, these options served primarily industrial areas or areas of limited (or no) populations. The 113A Street corridor also performed well in relation to potential traffic impacts. Comparatively, the roadway network along the 113A Street corridor would incur less impact. The 113A Street corridor would include an exclusive LRT crossing of the Yellowhead Trail and CN rail yard, and would not interfere with the existing roadway crossings along 127 Street or St. Albert Trail. Additionally, south of 137 Avenue, the 113A Street transportation network serves primarily local traffic. Because there are so few north/south crossings of the Yellowhead Trail and the CN rail yards, the similar stretches of 127 Street and St. Albert Trail serve significant regional traffic that would be disrupted by the introduction of LRT.

Land Use/Promoting Compact Urban Form

When examining the most highly weighted criterion (which involves land use and promoting a more compact urban form), the 113A Street and 127 Street corridors were the strongest performers. The project team's analysis of the land use criteria examined land use plans, aerial photography, growth and employment patterns, and future land use opportunities.

The 113A Street corridor performed strongest based on future population densities and future land use opportunities; while the 127 Street corridor was strongest in existing population densities and existing activity centres. The 113A Street corridor is also the only corridor providing direct access to the Greisbach redevelopment. All corridors received equal benefit for the redevelopment potential associated with the ECCA. Therefore, the ECCA was not a discriminator and development of LRT crossing the ECCA, connecting to the NAIT station was a strong benefit to all corridors. Outside of the ECCA, the St. Albert Trail corridor generally follows industrial and commercial corridors. These corridors have limited activity centres and low existing and future population densities.

A key insight drawn from the results was that corridors providing direct service to the northwest Edmonton neighbourhoods (113A Street/127 Street) performed significantly better than the St. Albert Trail corridor. This was true regardless of the directness and speed of the St. Albert Trail corridor. Access by populations surrounding the stations is critical to the success of LRT. A significant portion of the 113A Street and 127 Street corridors include mature neighbourhoods, and areas where future population growth is anticipated. These corridors draw from a larger area of population (current and future), and the existing and planned land uses best support LRT. Providing LRT service to established areas and to potential TOD or infill areas also better achieves the land use goals of the City's policy

documents. Serving established communities may also result in impacts to these neighbourhoods. This corridor will utilize high-floor LRT vehicles; however, to minimize impacts, this corridor will operate differently than the existing LRT system. The NW LRT corridor is being planned to integrate into neighbourhoods using the urban style operations, travelling at lower speeds (generally the speed of traffic or less), with minimal barriers other than raised curbs, and provide the opportunity for a less intrusive LRT system.

Parks, River Valley, and Ravine System

The study area includes various regional and smaller neighbourhood focused parks, trails, and recreation facilities. The majority of these facilities are located along the more populated, 113A Street and 127 Street corridors. Because of its limited population, the St. Albert Trail corridor performed well in this category with limited impacts to park properties. The 127 Street corridor included some impacts to smaller neighbourhood focused parks, due to LRT and roadway reconstruction. The 113A Street corridor would result in impacts to the Grand Trunk Park where it crosses (over or under) the CN rail yard. The potential benefits of new access to park facilities and adjacent neighbourhoods were taken into account under these criteria.

Natural Environment

All three corridors are located within urbanized/developed areas or within areas planned for roadway development. No riparian areas are known to be present within the potential impact (construction) footprints of the corridors. While the shorter corridors would result in less physical disturbance; the natural environment criteria category was determined to be a non-discriminator and generally equal for all corridors. The preferred corridor will be subject to further environmental and geotechnical investigations.

Social Environment

The social environment category works to capture the potential impacts and corresponding benefits to the populations along the corridors. This category examined criteria such as property acquisition, temporary and permanent impacts to businesses, etc. The 113A Street corridor performed best on these criteria. The St. Albert Trail corridor was also strong under these criteria, but this was primarily due to the lack of population that would be impacted along the corridor.

The 113A Street would result in the benefit of LRT access to a neighbourhood that is relatively isolated due to the location of the CN rail yard. This new access would significantly change mobility options for local residents and businesses. The 113A Street corridor would also result in less impact to business properties, in comparison to the other highly commercial corridors.

The St. Albert Trail corridor includes a limited number of business parcel acquisitions along St. Albert Trail between 128 Avenue and 132 Avenue. The 127 Street corridor would result in the most significant property acquisition of all parcels for ten blocks on the west side of 127 Street (Yellowhead Trail to 137 Avenue). Additional acquisitions would be necessary for this corridor to accommodate a new interchange (including LRT) at 127 Street and Yellowhead Trail. The 113A Street corridor is not without impacts. Based on the current design

assumptions, the parcels along the east side of 113A Street for one block (129 Avenue to 130 Avenue) would require acquisition.

Design Options

Various design options (alternative routes on specific segments of each corridor) were evaluated during Level 2. The summary of key points in the analysis of each design option is presented below.

137 Avenue or 153 Avenue

All corridors include some variation of design options using either 137 Avenue or 153 Avenue. Ultimately, the 153 Avenue option rose to the top as a component of the recommended corridor (113A Street corridor). Both 137 Avenue and 153 Avenue performed well under the various criteria categories; however, the 153 Avenue option was incrementally better with service to more existing and future population density. The 153 Avenue service to Greisbach provided a major benefit to this design option. The established commercial areas along 137 Avenue initially appeared ripe for some redevelopment. However, upon further consultation with area developers and real estate professionals, it was determined there is significant value in the current land uses along 137 Avenue. The commercial centres along 137 Avenue serve a wide market from Northwest Edmonton to St. Albert.

Yellowhead Trail, CN Right-of-Way, and 142 Street

The St. Albert Trail and 127 Street corridors included design options:

- Within the Yellowhead Trail right-of-way
- Within the CN right-of-way
- Following 142 Street

The corridor design options located within the Yellowhead Trail right-of-way benefit from limited impacts to traffic and surrounding properties. However, these benefits were not sufficient enough to carry the St. Albert Trail corridor. These benefits were also not significant enough to offset the potential property acquisitions required for the 127 Street corridor.

As previously noted, the design options using significant portions of the CN rail yard were ultimately removed from consideration. However, a St. Albert Trail corridor option following 142 Street (from St. Albert Trail) was examined in place of railroad right-of-way adjacent to 142 Street. Plans are in place to ultimately relocate 142 Street further west of its current location. This opens the existing road right-of-way for potential use as the LRT corridor. This option would be between industrial areas and the existing railroad line, with difficult access to any population centres.

118 Avenue

A design option was also considered along 118 Avenue. The commercial areas and adjacent residential areas proved beneficial to the St. Albert Trail and 127 Avenue corridors including

this design option. However, these benefits were not sufficient enough to raise these corridors over the 113A Street corridor in the final analysis.

St. Albert Trail, 127 Street, and 113A Street Corridors Summary

Based on the detailed analysis of the specific criteria, the Level 2 findings were presented to the project team and at the public workshops. **Exhibit 2-1** provides a high level summary of key considerations during the Level 2 screening process. This exhibit provides only a summary and does not include the full analysis. A graphic summary of the Level 2 scoring by criteria category is depicted in **Figure 8**.

EXHIBIT 2-1
Summary of Key Considerations

Criteria Group	Advantage	St. Albert Trail Corridor	127 Street Corridor	113A Street Corridor
Feasibility/ Constructability	St. Albert Trail	<ul style="list-style-type: none"> Estimated cost: \$700 million to \$800 million. 	<ul style="list-style-type: none"> Estimated cost: \$800 million to \$1 billion. 	<ul style="list-style-type: none"> Estimated cost: \$1 billion to \$1.1 billion.
Movement of People/Goods	113A Street	<ul style="list-style-type: none"> Estimated travel time: 13 to 15 minutes. Projected future daily boardings 30,000 to 31,000 (year 2041). Traffic impacts range from minor to significant. (Based on comparison to other corridor.) 	<ul style="list-style-type: none"> Estimated travel time: 16 to 19 minutes Projected future daily boardings 33,000 to 40,000 (year 2041) Traffic impacts range from moderate to significant. (Based on comparison to other corridor.) This is the longest corridor option. 	<ul style="list-style-type: none"> Estimated travel time: 16 to 18 minutes. Projected future daily boardings 42,000 to 45,000 (year 2041). Traffic impacts are categorized as minor. (Based on comparison to other corridor.)
Land Use/Promoting Compact Urban Form	127 Street & 113A Street	<ul style="list-style-type: none"> Generally follows industrial and commercial corridors. Existing and future land use is unresponsive of LRT. Corridor includes limited activity centres and low existing and future population densities. 	<ul style="list-style-type: none"> Corridor does a better job of serving existing commercial and residential areas (Strong existing population density around stations.) Directly penetrates Northwest Edmonton neighbourhoods. 	<ul style="list-style-type: none"> Corridor does a better job of serving areas of future population growth. (Strong future population density around stations.) Directly penetrates Northwest Edmonton neighbourhoods. Provides access to Greisbach redevelopment.
Parks, River Valley and Ravine System	St. Albert Trail & 113A Street	<ul style="list-style-type: none"> Limited parkland impacts. 	<ul style="list-style-type: none"> Would result in impacts to smaller neighbourhood parks due to roadway reconstruction. 	<ul style="list-style-type: none"> Would result in impacts (and potential access benefits) to Grand Trunk Park.
Natural Environment	All corridors equal	<ul style="list-style-type: none"> Minimal impact to natural areas. 	<ul style="list-style-type: none"> Minimal impact to natural areas. 	<ul style="list-style-type: none"> Minimal impact to natural areas.

EXHIBIT 2-1
Summary of Key Considerations

Criteria Group	Advantage	St. Albert Trail Corridor	127 Street Corridor	113A Street Corridor
Social Environment	113A Street	<ul style="list-style-type: none"> All corridors maximize the use of existing City owned right-of-way (property). No corridor can be accomplished entirely within existing roadway right-of-way and would require some acquisition of private property. Corridor requires acquisition of select business parcels along St. Albert Trail between 128 Avenue and 132 Avenue. Corridor would result in greater impacts to businesses during construction, including visibility and access issues. 	<ul style="list-style-type: none"> All corridors maximize the use of existing City owned right-of-way (property). No corridor can be accomplished entirely within existing roadway right-of-way and would require some acquisition of private property. Corridor would result in significant property acquisition. Parcels would be acquired for ten blocks on the west side of 127 Street between the Yellowhead Trail and 137 Avenue. Corridor would result in greater impacts to businesses during construction, including visibility and access issues. 	<ul style="list-style-type: none"> Both corridors maximize the use of existing City owned right-of-way (property). No corridor can be accomplished entirely within existing roadway right-of-way and would require some acquisition of private property. Corridor requires acquisition of residential parcels along the east side of 113A Street between 129 Avenue and 130 Avenue. Corridor provides significant new mobility options.

2.5 The Recommended Corridor

The technical studies, public input, LRT Network Plan, and City Council direction on the ECCA all influenced the recommendation of the 113A Street corridor (using 153 Avenue design option) as the preferred NW LRT corridor. This is a recommendation to City Council for consideration.

Based on the analysis completed by the Network LRT Plan and to maximize connectivity/land use opportunities at the ECCA, it is proposed that the NW LRT use high-floor LRT vehicles implemented with urban-style operations. The urban-style operations are characterized by shorter distances between stations, limited physical barriers between the track and surrounding development and streets, and the ability to better integrate into existing developed neighbourhoods. The urban style operations differ from the method of operations of the current LRT system in Edmonton. The existing LRT lines operate at higher speeds with full physical separation.

The recommended 113A Street corridor would be directly interlined with the North LRT to NAIT line. The corridor would initiate at the NAIT station. The corridor would then travel northwest (on the surface) across the ECCA. A station is anticipated within the ECCA redevelopment; however, its exact location would be determined based on future ECCA planning. The corridor would turn north, either rising up on a bridge structure, or tunneling down, to cross Yellowhead Trail and the CN rail yard. This crossing would be exclusive to LRT and would not include a road crossing. If a bridge were selected for the crossing, pedestrian access would be provided as well. The corridor would meet grade along Grand Trunk Park and 113A Street. The corridor would then travel on the surface along 113A Street north. At 153 Avenue, the corridor would turn west. At 142 Street, the corridor would be grade separated at the CN rail line and continue along the planned future alignment of 153 Avenue. The corridor terminates at the proposed Park and Ride facility within the TUC northeast of St. Albert Trail and west of Campbell Road. **Figures 9a and 9b** display maps of the recommended corridor, with renderings and additional details.

The exact location of the future Park and Ride is currently under consideration. Additional engineering and analysis will determine the ultimate terminus point during the next phase of engineering design. The recommended corridor is primarily on the surface, potentially in the median of existing roadways.

Given the potential residential property acquisition needed on the east side of 113A Street, between 129 Avenue and 130 Avenue, the team is continuing to examine options to minimize the impact. Additional engineering and analysis will determine the ultimate alignment through this segment during the next phase of engineering design.

Through the process of evaluation, the team has developed an initial set of station locations for further study. The stations were developed by examining existing and future land use patterns, existing transit and roadway infrastructure, existing and future activity centres, and potential redevelopment opportunities. **Figures 9a and 9b** show maps of the recommended corridor with station locations that will be carried forward for further evaluation. If the recommended corridor is advanced, additional analysis and public consultation will be necessary to finalize the number and locations of stations.

This recommendation was supported by strong rationale-based decision making and extensive analysis and debate by the project team. The process included examining both the benefits and the impacts of the 113A Street corridor in relation to the evaluation criteria and the City's strategic goals. In summary, the 113A Street corridor was recommended (over other corridors) for the following reasons:

- The corridor is consistent with LRT Network Plan.
- The corridor provides significant new mobility options for neighbourhoods north of the CN rail yard. The corridor would provide a direct transit (and potentially bike/pedestrian) connection with the downtown and the ECCA redevelopment.
- The proposed urban-style operations integrates well with and supports the mature and established neighbourhoods along the corridor.
- The corridor does the best job of directly serving areas of greater density, as well as established neighbourhoods, potential infill opportunities, and planned redevelopment areas (ECCA and Greisbach).
- The corridor provides the best potential ridership of all the corridors analyzed.

The project team reached consensus in support of the recommended 113A Street corridor as the draft recommendation for the June 2010 public meetings and for consideration by City Council in June 2010.

3. Next Steps

Structured future actions are necessary for the project to proceed successfully. These actions include the need to continue to engage stakeholders, advance the alignment definition engineering, address environmental issues, and further develop the rail operating scenarios. Four key next steps are described below

1. Work with community to refine station locations, area plans, access needs, and design elements to ensure efficient operations, community integration, and maximized ridership. This will entail further specific public involvement efforts to continue to build on dialogue with key stakeholders.
2. Evaluate potential environmental, geotechnical, noise and vibration, and historical resource impacts. Mitigation measures will be context specific and based on industry best practices in response to results of technical analysis.
3. Further develop engineering to define the detailed alignment, identify land requirements, refine capital costs, and continue discussions with CN. Future cost estimates will include more engineering details and assessments of risks associated with implementation methods. Additional traffic studies will be performed to ensure a balanced transportation system integrated within existing conditions.
4. Conduct development planning to ensure maximum return on transit investment. Economic analysis at appropriate levels of scale will be key to ensuring infrastructure framework is conducive to stimulate desired further development.

Figures

FIGURE 1
LRT Corridor Planning Process

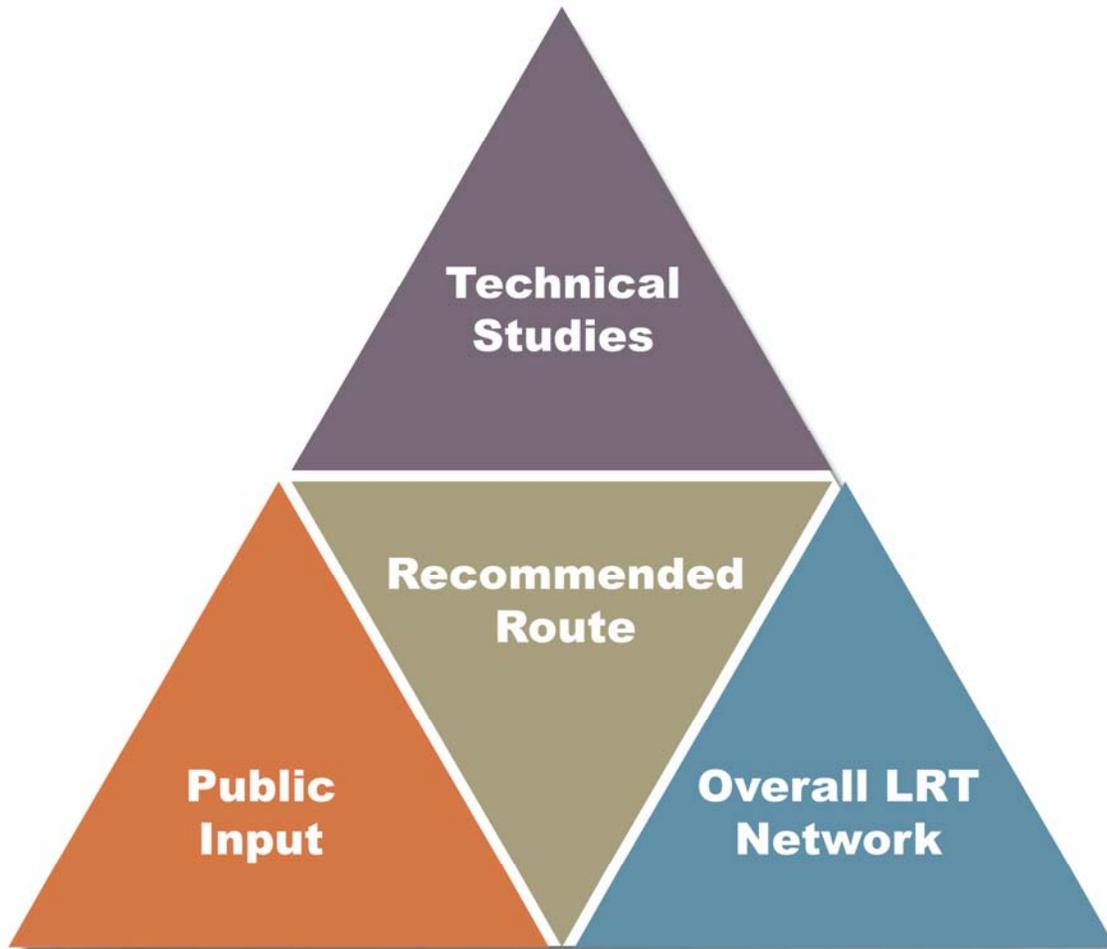


FIGURE 2
Study Area Overview

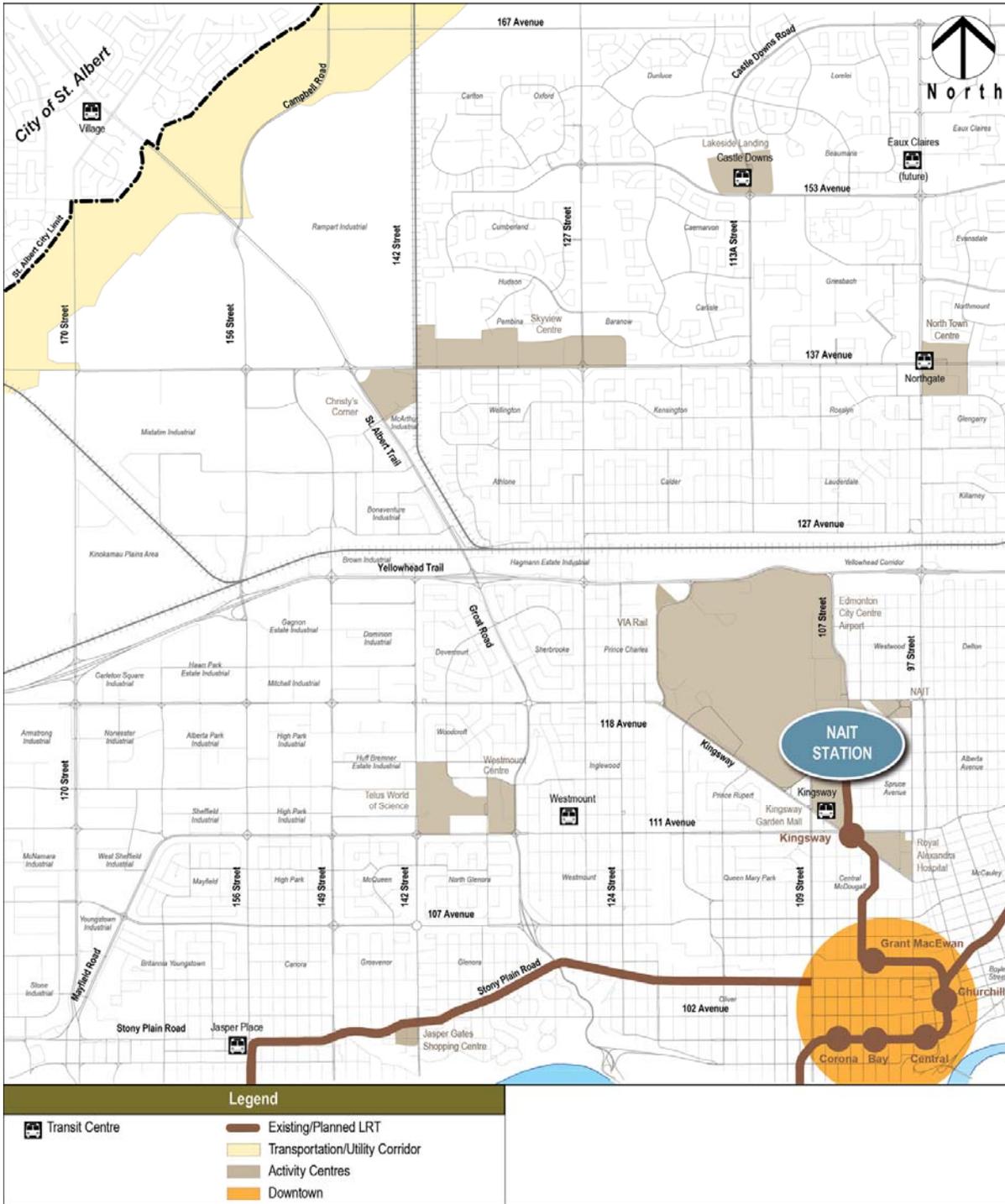


FIGURE 3
LRT Network Plan Findings

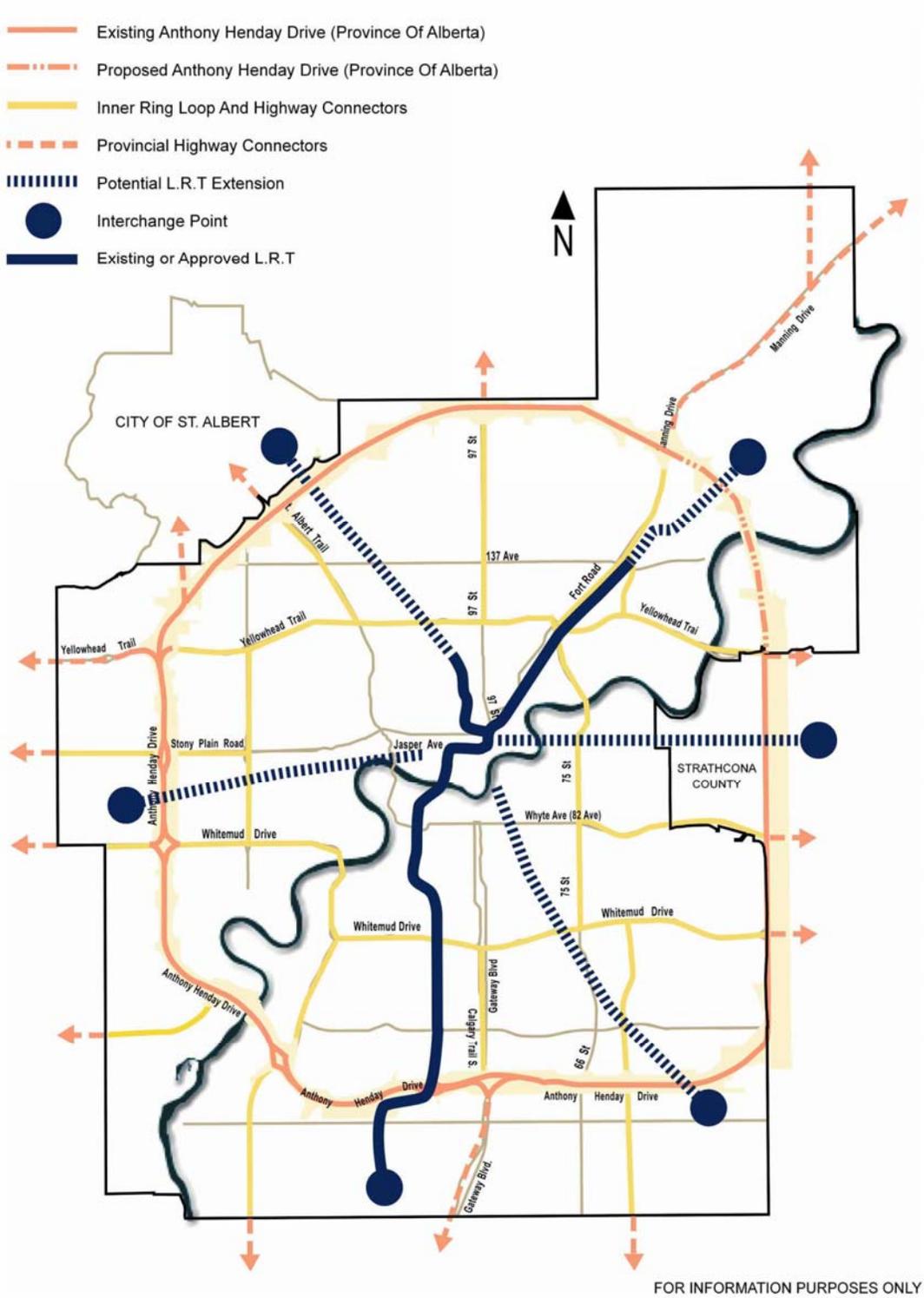


FIGURE 4
Alternatives Analysis Process

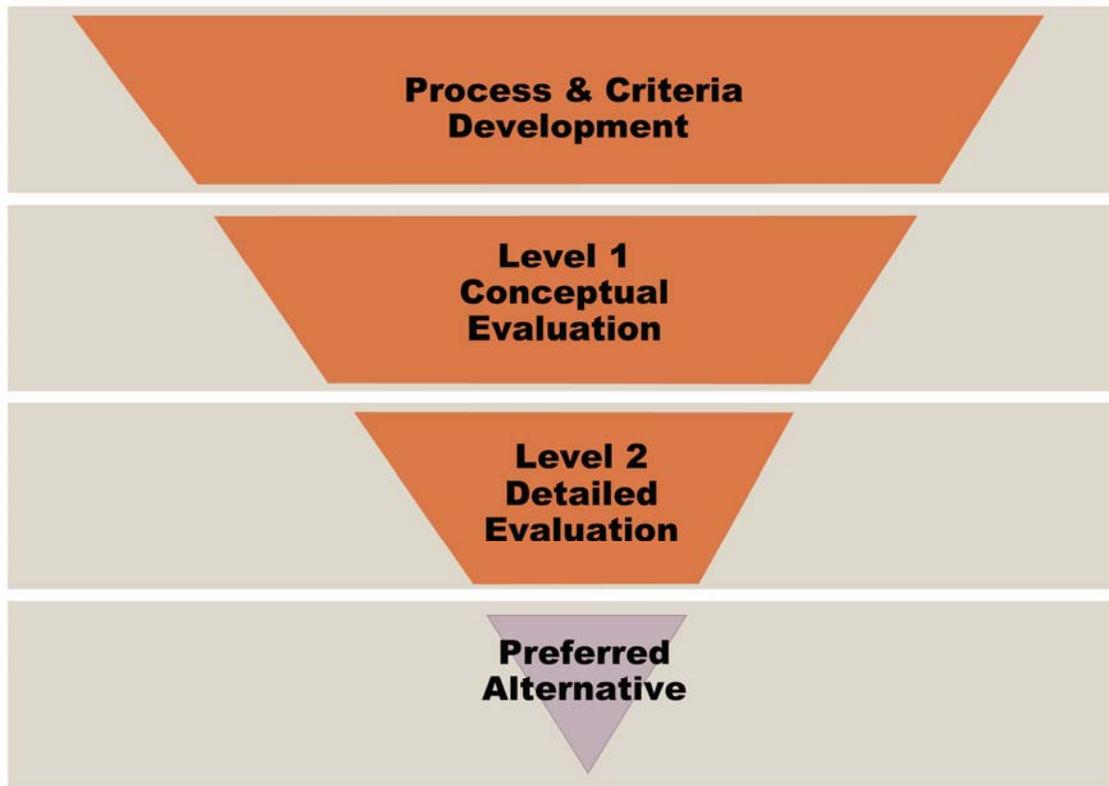


FIGURE 6
Northwest LRT Level 2 Corridor Options

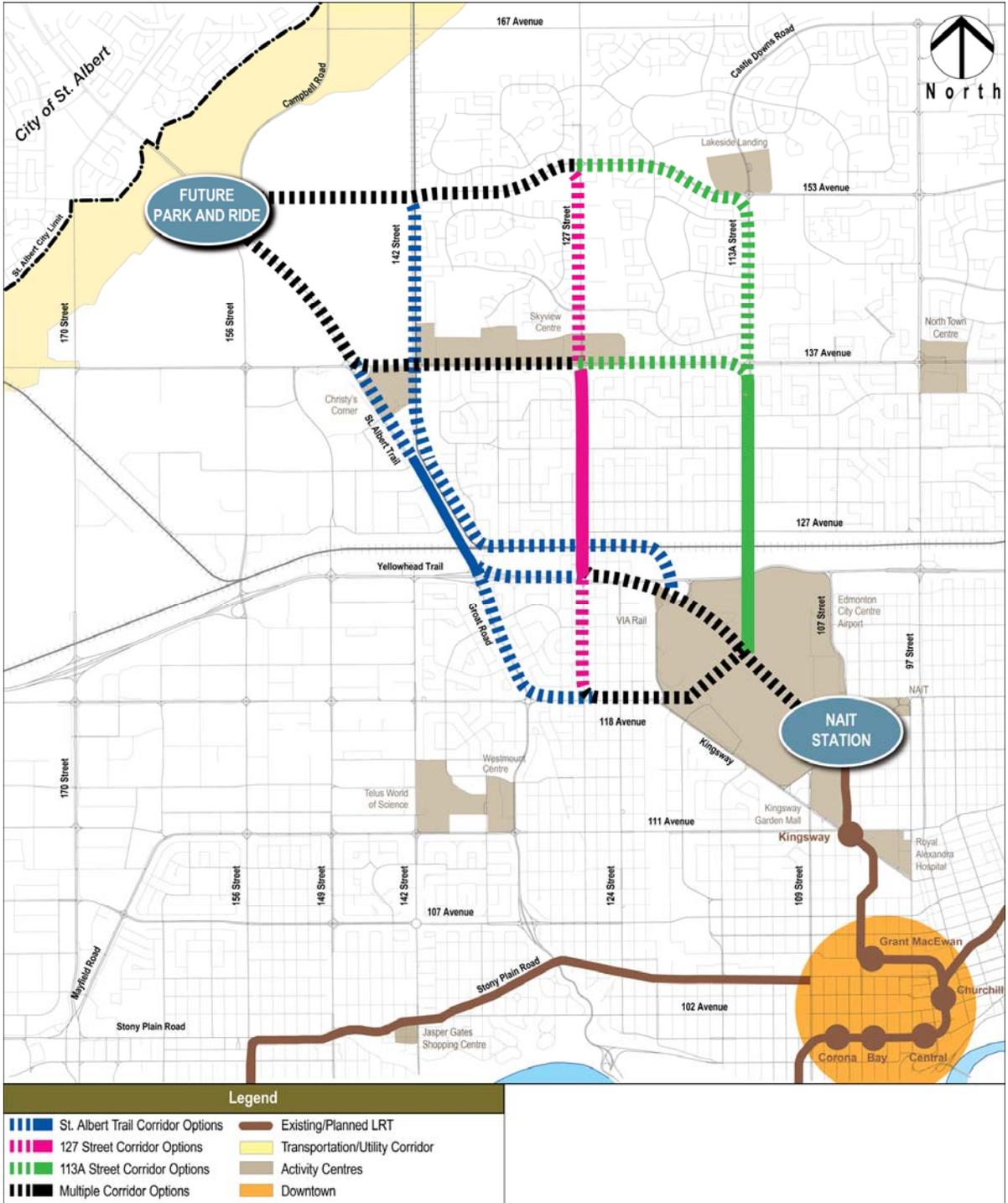


FIGURE 7
Level 2 Evaluation Criteria

Level 2 Screening Criteria – Detailed Evaluation
Feasibility/Constructability – 2
<i>Does the corridor meet the project purpose statement?</i>
<i>What is the estimated capital cost for the corridor?</i>
<i>What is the estimated annual operating cost for the corridor?</i>
<i>How many new grade separations would be required?</i>
<i>To what extent is the corridor likely to impact the cost of supporting bus operations?</i>
<i>What is the estimated cost per net new system rider for the corridor?</i>
<i>How many km does the corridor require of track at grade, on structure, on retained fill, and in tunnel?</i>
<i>How many at grade crossings are located along the corridor?</i>
<i>Does the corridor provide a reasonable crossing of CN rail yards?</i>
Movement of People/Goods – 3
<i>What percentage of the corridor within existing public and railroad ROW?</i>
<i>What are the projected opening day boardings (peak hour/daily/new riders)?</i>
<i>What are the projected 2041 boardings (peak hour/daily/new riders)?</i>
<i>What is the projected travel time for the corridor (downtown to/from Northwest Edmonton)?</i>
<i>What are the impacts to traffic – especially goods movement corridor?</i>
<i>How does the corridor maximize transit integration?</i>
<i>Does the corridor include existing and future bicycle and pedestrian facilities?</i>
<i>How complex would it be to expand the system into St. Albert in the future?</i>
<i>Does the corridor provide convenient travel to concentrated activity centers, employment centers and post secondary institutions?</i>
Land Use/Promoting Compact Urban Form – 4
<i>What is the existing/future population density (population per ha) within 800 m of the station locations?</i>
<i>What is the existing/future employment density (jobs per ha) within 800 m of the station locations?</i>
<i>What is the housing density (housing units per ha) within 800 m of the station locations?</i>
<i>What is the existing mix of zoning types within 800 m of stations and would the existing zoning support transit?</i>
<i>What is the potential future mix of land use types within 800 m of stations and would the land use mix support transit?</i>
<i>Number of existing and future activity centres, transit centres, and park-n-rides within 800 m of the proposed stations?</i>
<i>How many future new or redeveloped activity centres have been identified as realistic</i>

<i>priorities by the City and would these occur within a reasonable time frame (10 to 20 years)?</i>
<i>Is the corridor consistent with the TMP, MDP, the City's strategic direction, LRT System Network Plan, St. Albert's TMP and integrated land use framework, the Capital Region Plan, and accommodate Council direction on ECCA?</i>
Parks, River Valley, and Ravine System – 2
<i>Is the corridor consistent with City plans, bylaws, provincial and federal regulations addressing parks and open space?</i>
<i>What are the benefits to active parks and open space accessibility (pedestrian, bike, vehicle, etc.)</i>
<i>How many ha of public park lands would be acquired for the corridor?</i>
<i>To what extent would impact be likely to undisturbed vs. programmed/disturbed parkland or open space areas?</i>
Natural Environment – 2
<i>How many ha of valuable riparian land would be acquired for the corridor?</i>
<i>What is the number of stream/river crossings along the corridor?</i>
<i>Is the corridor consistent with City plans, bylaws, provincial and federal regulations addressing natural areas?</i>
<i>What is the total ha of area disturbed during construction?</i>
Social Environment – 2
<i>How many hectares (ha) of private property (residential - single family/multifamily, commercial, and industrial) would be acquired for the corridor?</i>
<i>What are the potential temporary employment opportunities related to construction?</i>
<i>What are the temporary construction impacts along the corridor?</i>
<i>What are the permanent business impacts along the corridor?</i>
<i>Does the corridor create physical barriers for neighbourhood residents?</i>
<i>How many sensitive receptors are within 150 m of the corridor alignment that may be impacted by noise or vibration impacts?</i>
<i>How many known cultural resource/heritage sites are adjacent to the corridor?</i>
<i>What is the post secondary student population within 800 m of proposed station sites?</i>
<i>What is the high school student population within 800 m of proposed station sites?</i>
<i>What is the number of low income, no car, and senior households within 800 m of proposed station sites?</i>

FIGURE 8
Level 2 Evaluation Summary Graphic

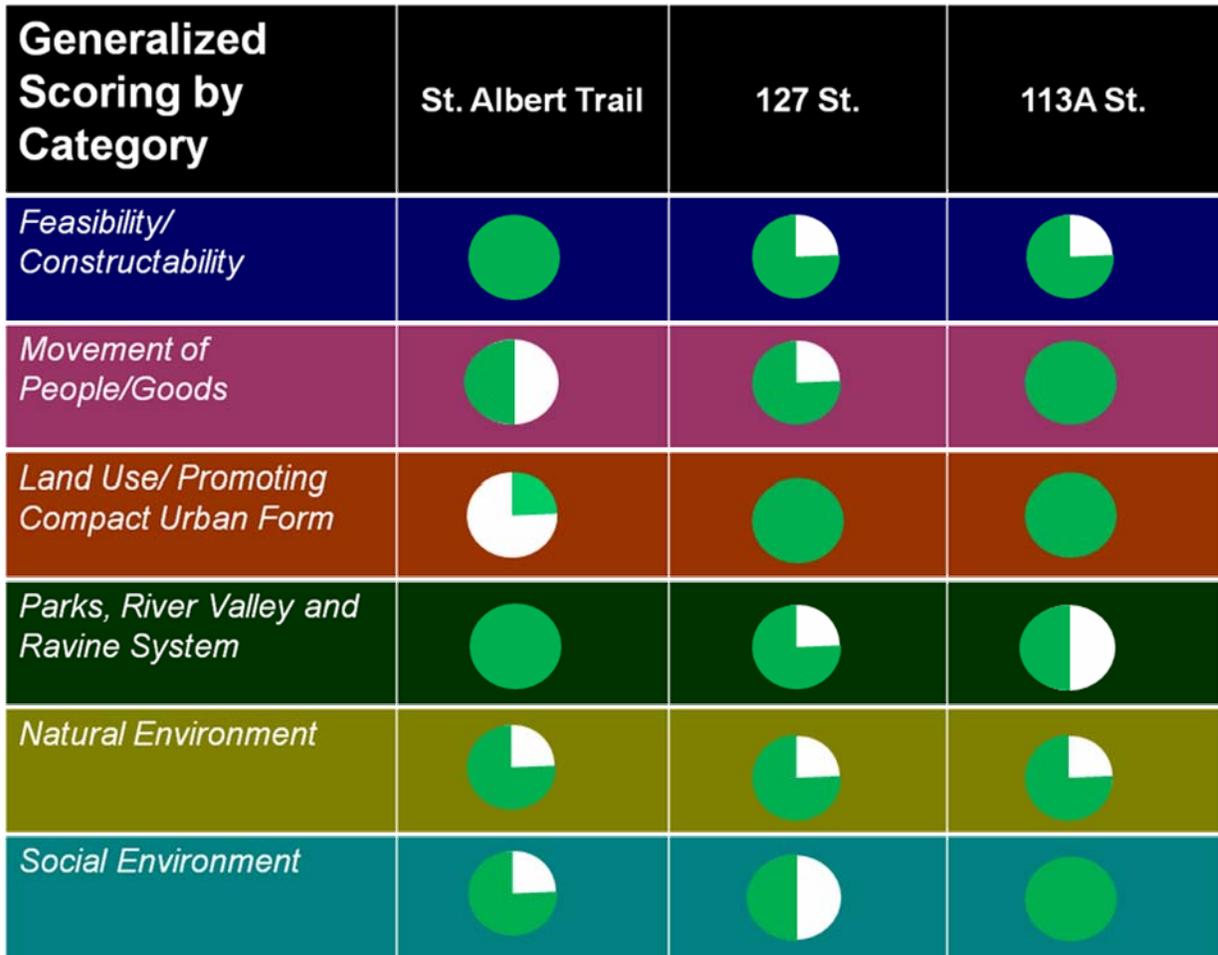


FIGURE 9a
Northwest LRT Recommended Corridor

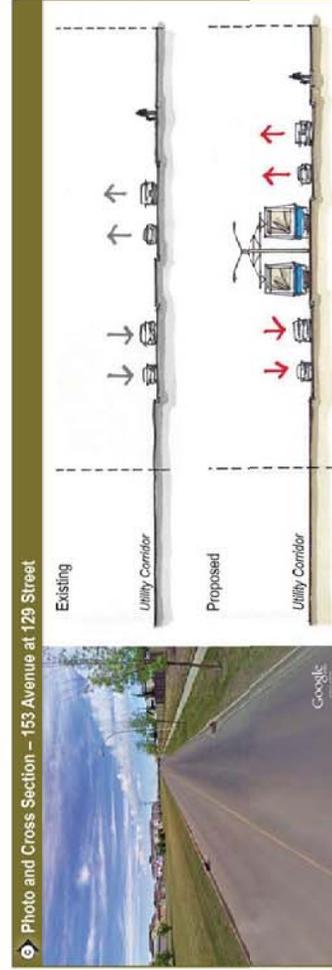
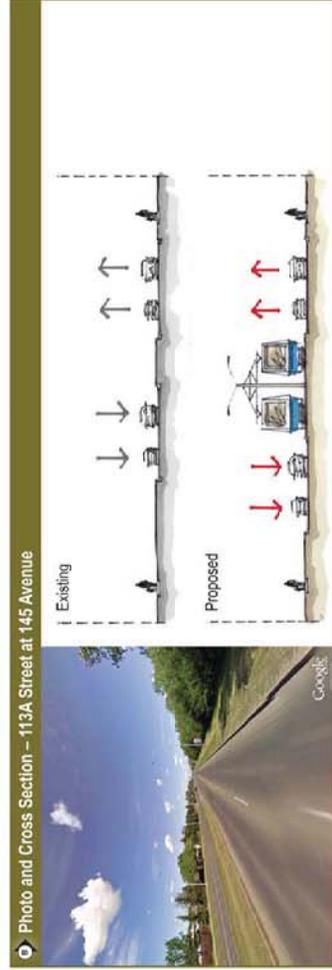
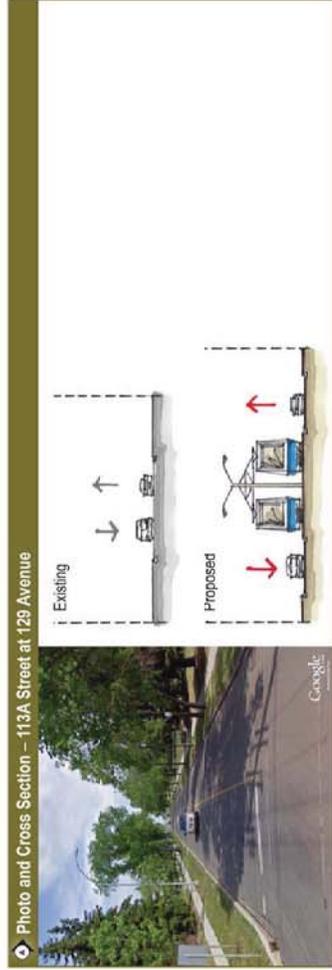
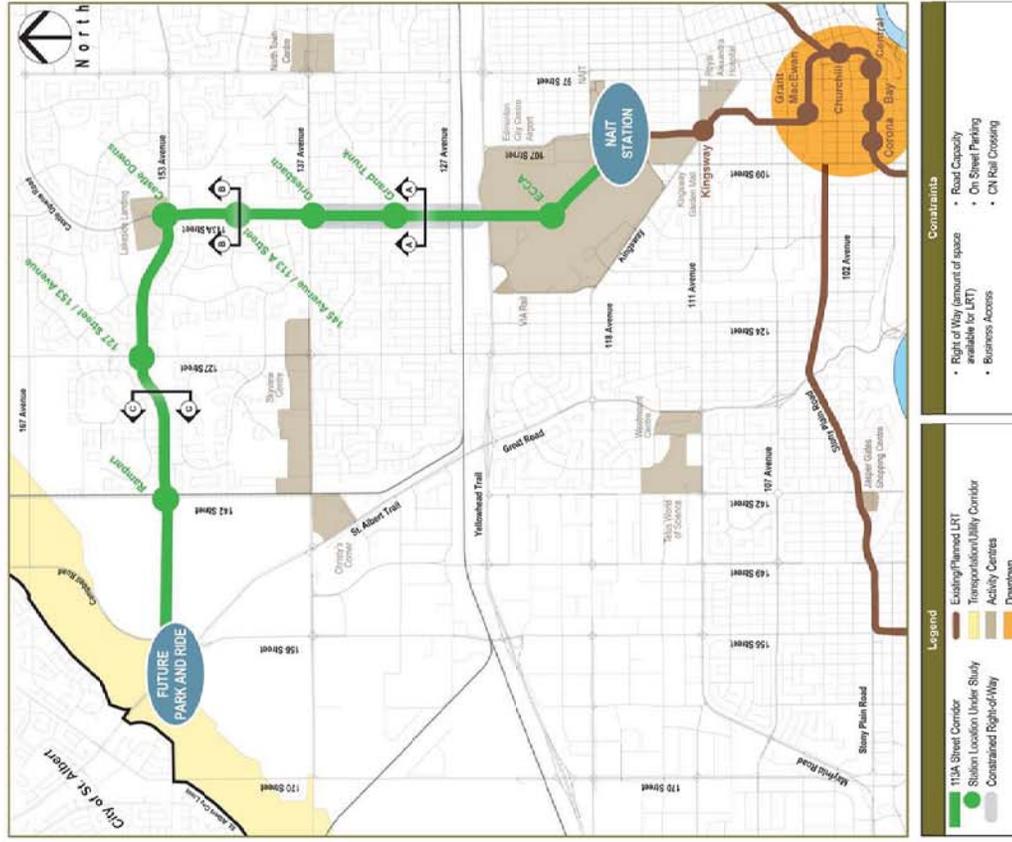
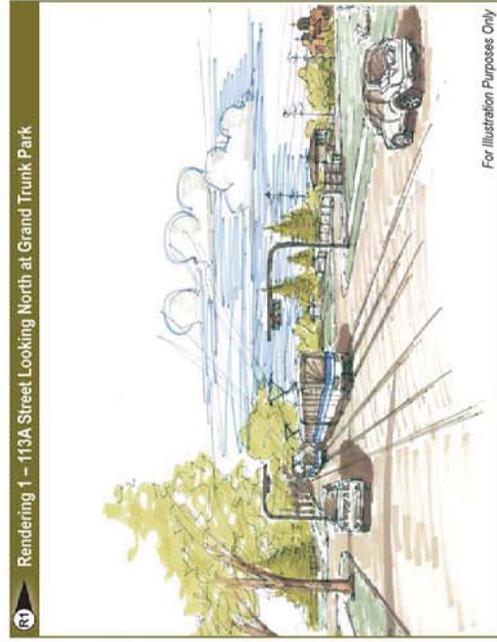
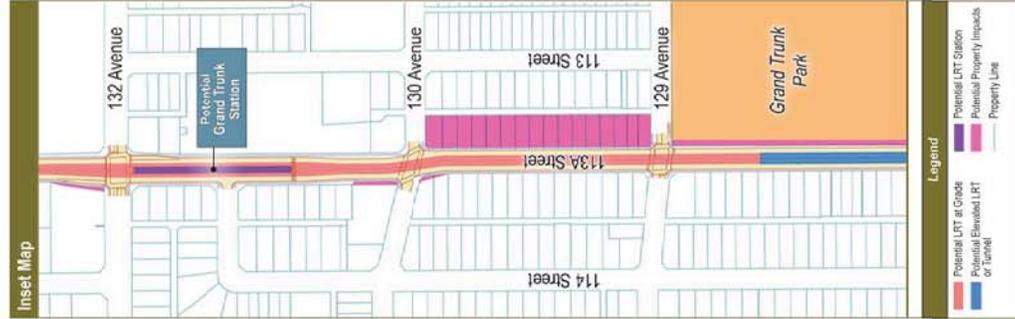
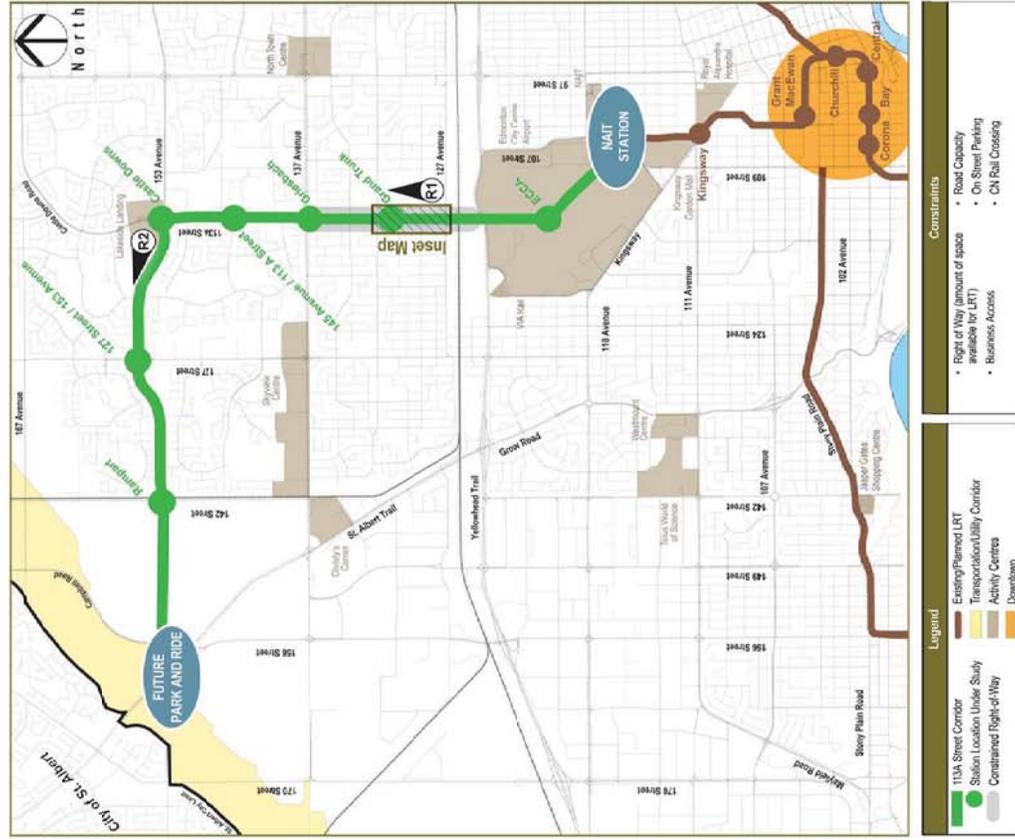
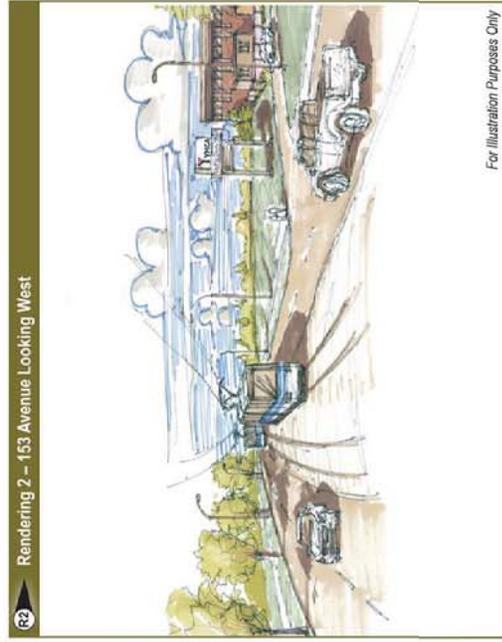


FIGURE 9b
Northwest LRT Recommended Corridor



For Illustration Purposes Only



For Illustration Purposes Only