

Scoping and Options Feasibility Report.  
West LRT – Mount Royal University Rail Connection



Scoping and Options Feasibility Report

# WEST LRT – MOUNT ROYAL UNIVERSITY RAIL CONNECTION

The City of Calgary

# 1 Executive Summary

This study was initiated to provide a high level examination of the progression of bus and rail transit service options that could evolve over time to provide transit service between the Route 202 Blue Line (WLRT) and Mount Royal University and the Currie Barracks area (MRU).

It was noted that the existing Calgary Transit bus routes, and the future South Crosstown BRT and Southwest Transitway BRT will provide a high level of service to the MRU area.

Several corridors are evaluated for feasibility in terms of available right of way and community integration. To physically connect a rail line to the WLRT, a rail turnout in an appropriate location is required. Technical and engineering criteria required for a turnout is specified, which is then applied to determine suitable location options for a physical connection. A brief description of the two general types of rail vehicle technologies which could be used for the possible route connection and alignment is provided. Alternative service concepts are also discussed, including the provision of an entirely independent stub rail line that would require a new depot and maintenance facility.

Most of the corridor route options will not supply adequate right of way or support the integration of high-floor LRT technology, such as the current CTrain. The technology may be applicable on 37 Street; however, this would require a more detailed investigation and optimal maximization of the available right of way. Most of the corridor route options are supportive and provide adequate right-of-way for a low-floor mixed traffic streetcar service concept. Providing turnout connections for any of the route options is problematic. To overcome this issue, a potential solution would be to provide a single-track connection which is used to connect to the WLRT mainline for transit vehicle maintenance and storage purposes only. Given this information, current conditions and understanding it was determined that the **most feasible option for a WLRT to MRU rail connection would be a low-floor mixed traffic**

**streetcar type service aligned on 37 Street SW connecting to the WLRT at 25A Street via 17 Avenue SW.**

## 2 Introduction

This study was initiated to provide a high level examination of the progression of bus and rail transit service options that could evolve over time to provide transit service between the Route 202 Blue Line (WLRT) and Mount Royal University and the Currie Barracks area (MRU).

As well, this report is intended to address the following Council Motion:

*... that Council direct the Administration to undertake a long-range alignment investigation to bring a spur line of Calgary Transit Route 202 (Blue Line) to Mount Royal University and the Currie Barracks ..*

The study area and key activity nodes are illustrated in **Figure 1**. The north boundary of the study area is that portion of Route 202 that is directly north of the Mount Royal University and the Currie Barracks lands (Crowchild Trail to 37 Street SW) and the south boundary follows the

Mount Royal Gate / 50 Avenue SW alignment immediately south of Mount Royal University and the Currie Barracks lands. Crowchild Trail and 37 Street SW define the east and west boundaries of the study area, respectively.

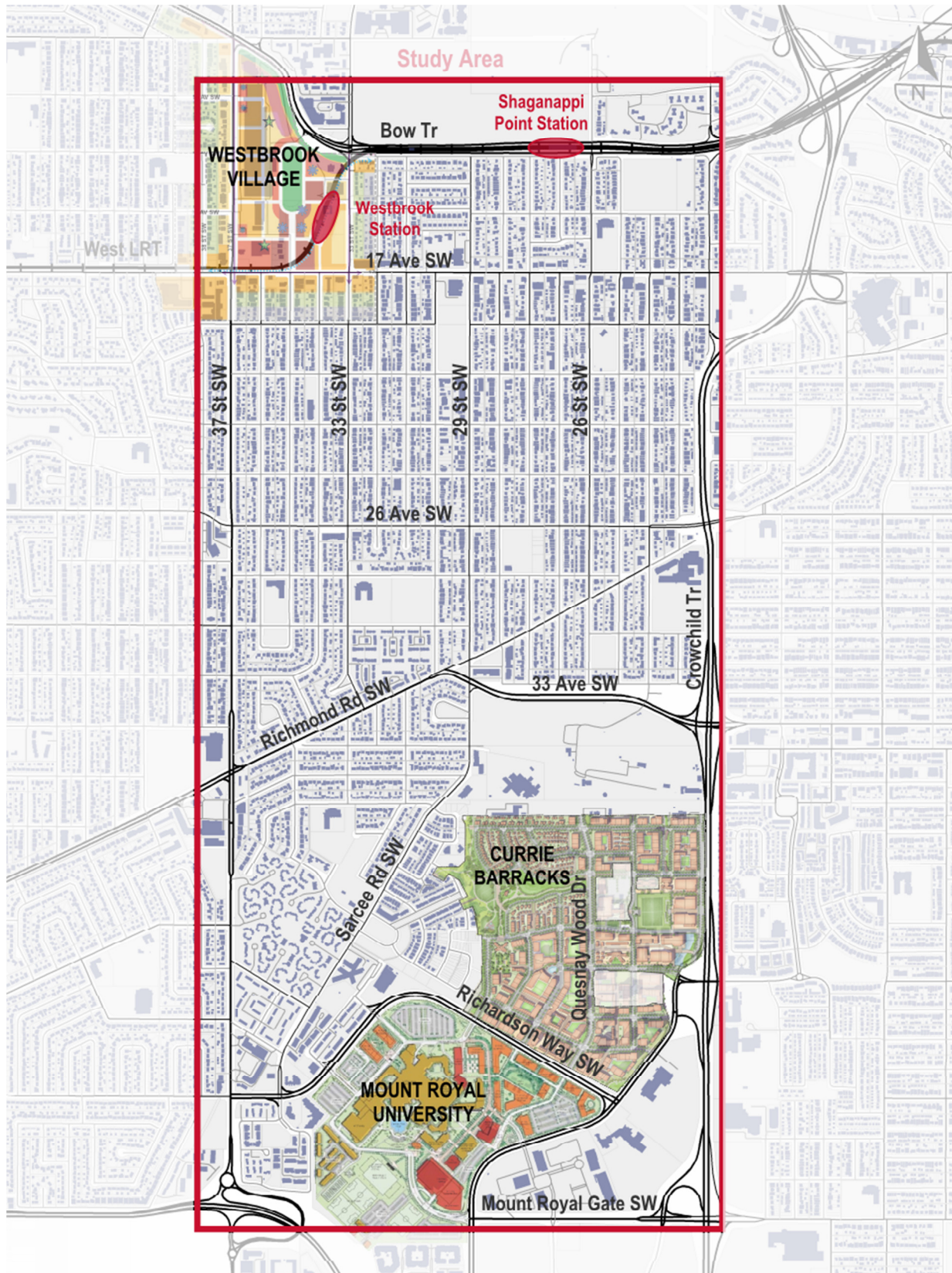
Route 202 (Blue Line) provides a crosstown LRT connection from Saddletowne Station in the northeast through the downtown and west to 69 Street Station. There are two LRT stations, Westbrook Station and Shaganappi Point Station, along the north edge of the study area.

In comparison to a crosstown LRT line, a corridor linking Mount Royal University (MRU) with the west leg of the Blue Line, herein referred to as WLRT, would be relatively short (about 3200 m) with finite opportunities to be extended beyond 50 Avenue South. The study area covers a population of about 25,700, with about 15,200 jobs as well as 28,400 students.

The study considers a progression of bus and rail modes that could evolve over time to provide suitable north-south transit services to link the WLRT with the MRU Area.



Figure 1: Study Area and Key Activity Nodes





### 3 Mode Progression

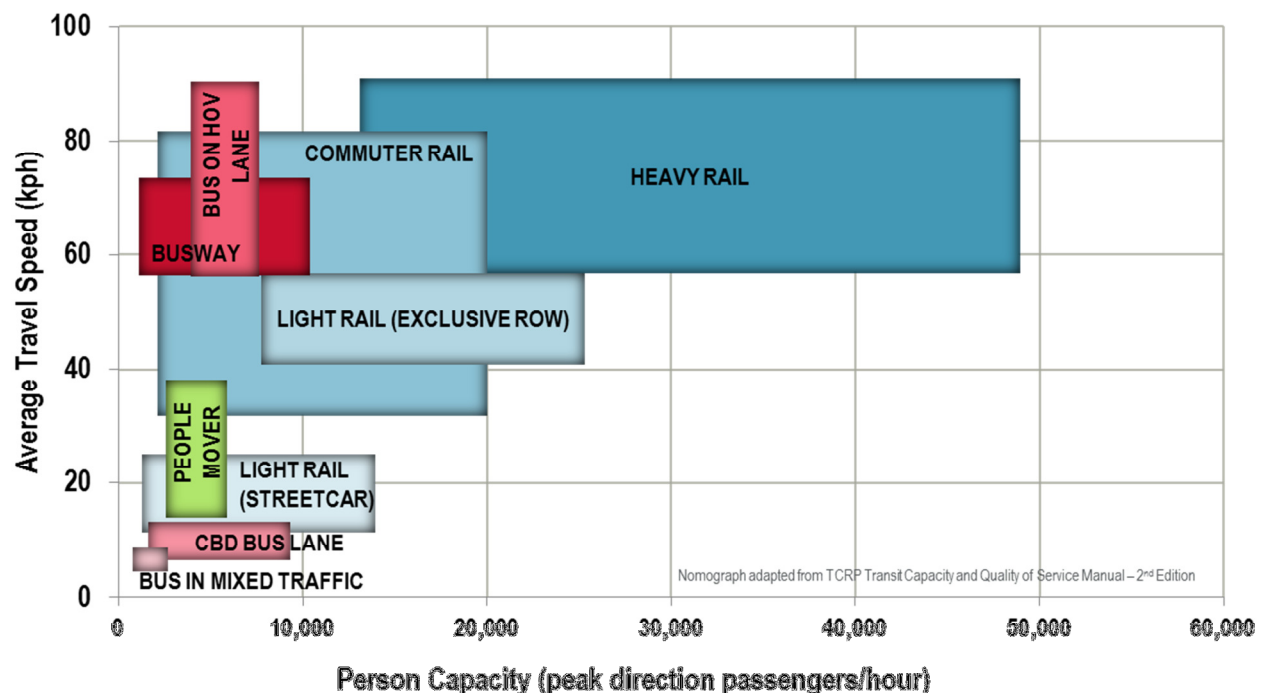
Current transit service to MRU includes Routes 13, 18, 20, 72, 73, 181, 182 and 306 BRT. Planned improvements include the Southwest Transitway BRT between Downtown and Woodbine Community in SW Calgary, and the South Crosstown BRT service between the Blue Line at Westbrook Station and the Douglas Glen Green Line station in south east Calgary.

As the MRU area grows and planned urban intensification occurs throughout the city, the transit ridership is expected to increase. This increase could also be spurred on by changes in the use of transportation modes due to value issues such as global climate concerns or cultural considerations for healthy lifestyles, and also technological innovations.

The concept of Transit Mode Progression is that transit services adapt to changes in customer needs and preferences, and technological change. Typically this involves transition from on-street bus service to higher quality and capacity service such as mixed traffic BRT, transitway BRT, streetcar, LRT, metro or commuter rail.

**Figure 2** outlines the characteristics of these various types of service and the typical level of capacity that each can provide before the need to transition to a higher service.

**Figure 2: Transit Service Mode Speed and Capacity Characteristics**



Today the current bus service from WLRT at Westbrook Station to MRU (Routes 72/73 and 306) adequately accommodates the ridership volumes; however, the services do generate some customer concerns. The South Crosstown BRT, which is to be implemented in 2018, is a positive next step in developing higher quality connections to MRU from the WLRT at Westbrook Station, the Red Line at Heritage Station and the future Green Line at Douglas Glen

Station. As well, the Southwest Transitway which is be implemented in the next few years will also provide service improvements to the study area. The progression of bus service improvements have been defined within RouteAhead and are being implemented. This study examines the next phases of transit mode progression with consideration of a rail connection between WLRT and MRU.

## 4 Rail Service

The rail service options have been developed by examining the feasible rail corridors between WLRT and MRU; the type and location of technically feasible rail connections to WLRT; and rail vehicle technology options:

- North-south rail route options were examined on Crowchild Trail, 26 Street, 29 Street, 33 Street and 37 Street;
- Rail spur connections to WLRT which meet rail design and operating standards were identified; and
- Calgary's existing high floor 2.65m wide LRT vehicle and low floor 2.4m wide streetcar vehicles were compared within the corridors.

Investigation of these rail service options will provide guidance on possible rail alignment and service options to connect the WLRT with the MRU and Currie Barracks area.

### 4.1 Rail Route Options

The residential communities of Shaganappi, Killarney, Richmond and Rutland Park are located between the WLRT line and the MRU area. The Shaganappi community contains mainly single family homes while the Killarney, Richmond and Rutland Park communities are a mixture of single and multi-family residences. These communities are undergoing widespread infill redevelopment. Crossing the study area between Shaganappi and Killarney communities is the 17 Avenue neighbourhood boulevard corridor comprising of low density commercial and retail development. South of Killarney the Richmond Road/33 Avenue arterial street passes through the study area.

These communities are bounded by 37 Street SW on the west side and 24 Street W/Crowchild Trail on the east while within the community area there are three north-south collector streets – 33 Street W, 29 Street W and 26 Street W. These continuous north-south streets as well as several other corridors as shown in **Appendix A** were investigated as possible routes for a rail connection between the WLRT and MRU.

#### 4.1.1 Crowchild Trail

Crowchild Trail is designated as a Skeletal Roadway in the Calgary Transportation Plan (CTP) and accommodates three lanes of traffic and a shoulder bus-only lane in each direction. The shoulder bus-only lane is planned to become the SW Transitway for Bus Rapid Transit connecting Downtown Calgary to the Mount Royal College/Currie area and beyond to SW Calgary. The available right-of-way is fully utilized by the existing roadway and there is no opportunity to add an independently operating LRT line in the Crowchild Trail corridor. As well,

Crowchild Trail and WLRT intersect at a point considerably east of the study area and a rail service on Crowchild would duplicate the SW Transitway BRT. **The Crowchild Trail corridor is not considered a feasible option for a future WLRT to MRU connection.**

#### 4.1.2 North-South Collector Streets

There are three north-south collector streets that can provide potential route continuity between the WLRT and the MRU area:

- **33 Street SW**
- **29 Street SW**
- **26 Street SW**

These streets generally have a 20m right-of-way and contain one traffic lane in each direction plus on street parking. Located along these streets are traffic calming speed humps, mid-block pedestrian crossings, schools, and playground zones. Also, 29 Street is signed as a shared lane bikeway. Adjacent land use is primarily low-density residential, with some retail and commercial uses at the intersections of 17 Ave SW, 26 Ave SW, Richmond Road SW, and Richardson Way SW. The figure below shows a typical view on these streets and typical cross-section arrangement.

Accommodating rail service on these streets may require removal of the on-street parking and providing station platform space would be difficult. Also, a high floor 2.65m wide LRT vehicle is considered incompatible with the community context. A low floor 2.4m wide streetcar may be more compatible.

#### Typical Collector Street Cross-section

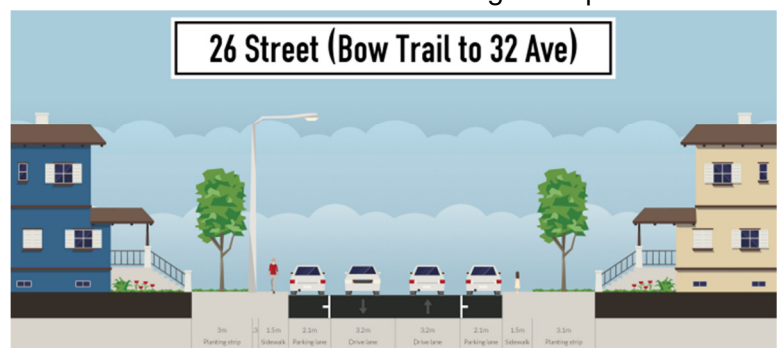
Right-of-way = 20m

Building setback = ~6m

Existing pavement width = 10.6m

Description:

- 1 lane in each direction
- On-street parking on both sides
- Sidewalk on both sides
- Power poles / streetlighting on sidewalk and green space



West

East





### Typical Cross-section: 28 Avenue to 33 Avenue

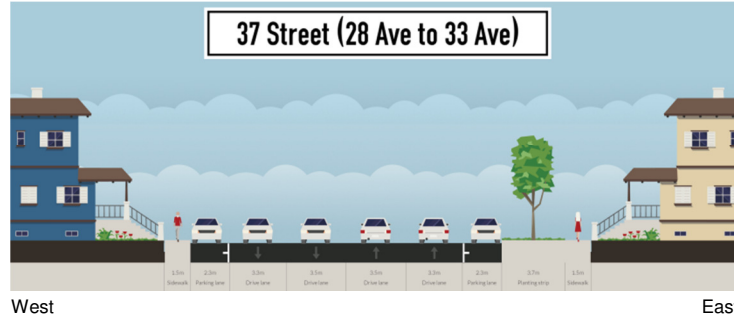
Right-of-way = 25m

(some areas are 30m)

Building setback = ~7m

Existing pavement width = 18.2m

- 2 lanes in each direction
- On-street parking on both sides
- Sidewalk on both sides



### Typical Cross-section: 33 Avenue to Richardson Way

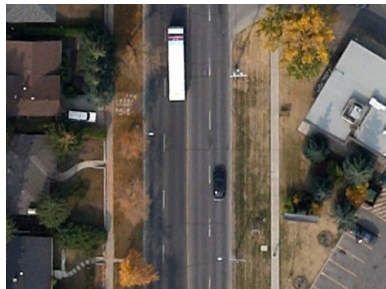
Right-of-way = 30m

(pinchpoint on east side from 44 to 45 Ave of 25m ROW)

Building setback = 0-7m

Existing pavement width = 14m

- 2 lanes in each direction
- No on-street parking
- Centre median (3.5-4.5m) from 33 Ave to 150m north of 41 Ave
- Sidewalk on both sides



A rail service could be accommodated along 37 Street SW by replacing the two central traffic lanes with rail tracks. This would retain one traffic lane in each direction and allow curb parking to remain along most of the route. Both a standard 2.65m and 2.4m rail vehicle could operate within the 37 Street right of way; however, a narrower low floor 2.4m streetcar would be more compatible with the surrounding built environment and road operation. **Appendix B** shows representative cross-sections of this arrangement with the track in the centre of the roadway, and a typical cross-section for a station area where on-street parking cannot be accommodated. As well, the low floor streetcar option could operate on mixed traffic shared lanes along 37 Street.

Between 37 Street SW and MRU the rail service could operate on Richardson Way. Richardson Way is an arterial street with a 37 m right-of-way in most locations and has two lanes of traffic in each direction. A rail service could operate in the median and displace one

traffic lane in each direction. A terminal station could be located on Richardson Way to the west of Richard Road SW.

## 4.2 Options Summary

Several north-south corridors were assessed to determine the most feasible routing for a potential spur line connection between the existing WLRT and the MRU area, including Crowchild Trail, 33 Street SW, 29 Street SW, 26 Street SW and 37 Street SW. In terms of service to future corridor development, community compatibility and transit operations, **the 37 Street SW corridor is considered the most feasible route option.** This corridor would be particularly suited to low-floor streetcar operations.

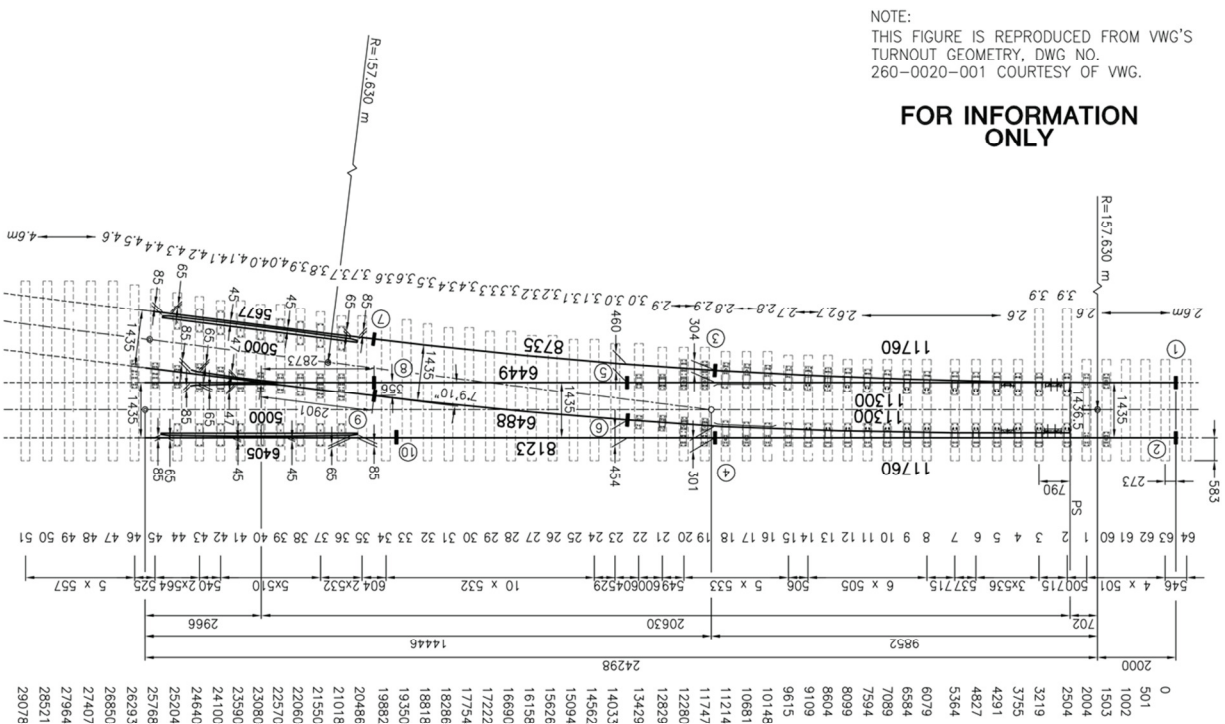
## 4.3 Rail Spur Connection Options

### 4.3.1 Design Criteria

To allow trains to operate both east-west on the existing WLRT and accommodate rail vehicle movements from the WLRT mainline to a north-south connection to MRU, a turnout for a spur connection would need to be inserted along the WLRT. The spur track or turnout must meet certain technical design and operating criteria. The general requirements for the turnout location are:

1. A turnout should be located on tangent track with a constant profile grade.
2. A minimum tangent length of at least 30m is required.
3. Turnouts must not be located on vertical curves.
4. Turnouts should not be located in superelevated track areas. Note: There may be exceptional circumstances where a turnout may be located on superelevated track; however, there are no locations within our study area where this would help develop a feasible alternative.
5. Vertical grade limitations of 3% on direct fixation and 2.5% on ballasted track; however, operation is possible on grades up to 6%.
6. The turnout used in Calgary West LRT mainline is No. 8 with a length of 24m, shown below

**Figure 3: No. 8 Turnout UIC Standard**



Source: City of Edmonton LRT Design Guidelines



#### 4.3.2 Identified Options

Three options that meet the above criteria for the spur turnout from the WLRT were identified as follows and are shown in **Appendix A**.

1. East of 31 Street SW at station 215+450 there is a 39m section of tangent track on a 3% grade. However, the track is 4 to 5 metres below the adjacent Bow Trail eastbound lanes and would require significant reconstruction of Bow Trail. This turnout would connect to 31 Street SW which is a local residential street south of Bow Trail. Given the significant grade difference between the LRT and Bow Trail **this option is not considered a feasible alternative.**
2. East of 28 Street SW at station 215+100 there is a 33m section of tangent track on a 1.2% grade at approximately the same elevation as eastbound Bow Trail. This turnout would connect to 28 Street SW which is a local residential street south of Bow Trail.
3. East of 25A Street SW at station 214+700 there is a 58.9m section of tangent track on a grade of 5.8% at approximately 1.5m lower than eastbound Bow Trail. This turnout could connect to 25A Street which is a local street south of Bow Trail. While 25A Street SW is a local residential street there is residential property on one side only between Bow Trail and 17 Avenue SW. The tracks could be located on the non-residential sides of the street somewhat mitigating the impact of the transit service on the residential properties but having greater impact on the opposite park and school areas. The 25A Street route is approximately 100m east of the Shaganappi Point CTrain station.

The preferred location for a turnout connecting WLRT to 37 Street SW would be from the tunnel section west of the Westbrook Station. However, there is a 224m vertical curve in this location that precludes installation of a turnout. Accommodating a turnout at this point would entail reconstruction of the existing tunnel section of the LRT, a lengthy, disruptive and expensive proposition. The existing LRT tunnel box would have to be exposed and the track grade would need to be re-profiled from west of Westbrook Station to about 39 Street. This construction disruption would likely be in excess of one year and cost over \$100 million.

The possibility of directing the turnout to the north of Bow Trail SW and crossing Bow Trail at 33 Street was also considered. This route option is noted on the Route Option drawing in the **Appendix**. This could accommodate a station on 33 Street SW, adjacent to the Westbrook Station that would facilitate transfers between the WLRT and the MRU Line. However, this would involve crossing through the Bow Trail & 33 Street SW intersection at grade and require land from the Shaganappi Golf Course.

## 4.4 Options Summary

None of the identified rail spur alternatives could be considered a satisfactory solution for a full service rail spur operation from the WLRT to MRU. As such, the preferred rail route on 37 Street SW does not match well with the available turnout connections to the WLRT line. Connecting a 37 Street SW LRT Spur to the WLRT would be expensive, disruptive and intrusive to the residential community.

This conclusion led to the further investigation of streetcar service between the WLRT and MRU utilizing low floor 2.4 meter wide streetcar technology. With a streetcar service the rail spurs identified above would only be used for out of service vehicle access to the WLRT mainline. The link from 17 Avenue to the WLRT Mainline could be a single track connection, which would be less disruptive to the adjacent communities and Bow Trail traffic and operate independently of the WLRT service.

# 5 LRT System Technologies

## 5.1 High-Floor LRT (2.65m vehicle)

A high-floor LRT, such as the trains that comprise Calgary's current CTrain fleet, are 2.65m in width. To have full interoperability between a spur line and the WLRT high floor 2.65m LRT vehicles would be required.



## 5.2 Low-Floor Streetcar LRT (2.4m vehicle)

A low-floor vehicle may be 2.65m or 2.4m wide. When operating in mixed traffic, this type of vehicle is typically referred to as a Streetcar. For the purposes of this investigation a 2.4m vehicle is specified. Given the narrower and lower profile, and minimal station requirements a streetcar may be more fully integrated into a mixed traffic urban corridor. As well, the vehicle scale is more compatible with adjacent land uses and an active urban streetscape.



# 6 Alternative Rail Service Concepts

## 6.1 Unconnected Rail Stub Streetcar Option

Although the 37 Street corridor has been identified as the most feasible option for a north-south connection from a community compatibility and transit service perspective, connecting a full service operating track directly to the WLRT at 37 Street would be problematic. This dilemma led to the consideration of a service scenario that could transfer passengers between the WLRT and a separate rail line to MRU.

It would be possible to build a separate or stub streetcar line from the south Westbrook Station access along the north edge on 17 Avenue to 37 Street, and south on 37 Street and Richardson Way to MRU. A 2.4m wide low floor streetcar could be integrated within the 37 Street and Richardson Way right-of-way and could be judged to be fully compatible with the current and developing nature of the adjacent communities. However, with no connection to West LRT an alternate vehicle maintenance facility would be required for vehicle cleaning, storage and maintenance. This facility could be located south of Mount Royal Gate / 50 Avenue; however, it could not be judged to be compatible with the current planned development of this area.

## 6.2 Connected Rail Streetcar Options

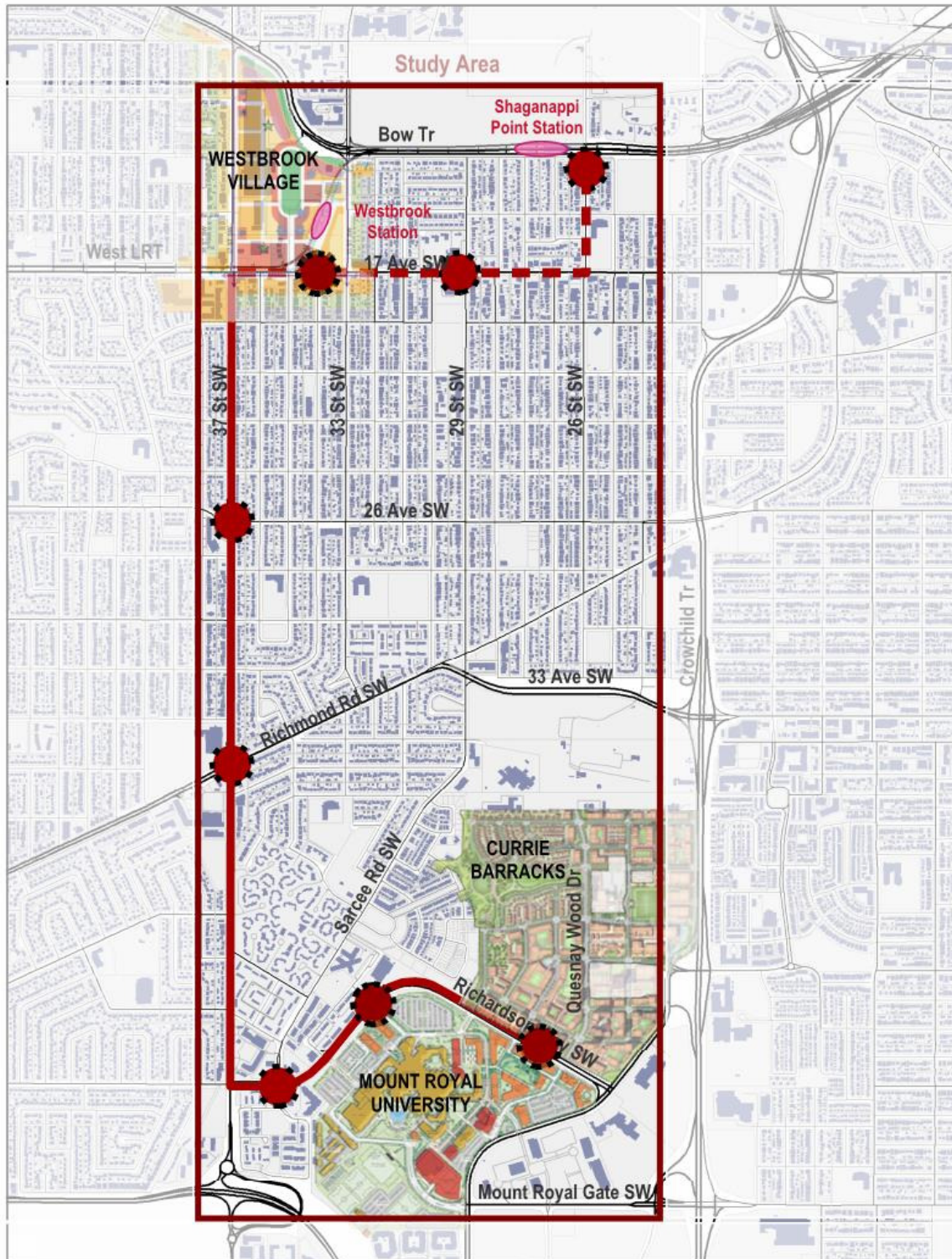
As noted above a direct rail spur connection with West LRT at 37 Street is not feasible; however, there are two feasible locations to insert a single track out-of-service rail spur connection. This would be used to allow transit vehicle access to maintenance and storage facilities elsewhere in Calgary's rail network.

The examination of possible rail corridor connections from the WLRT to the MRU area identified 37 Street SW/Richardson Way as the most suitable route option and determined feasible locations where track turnouts along the West LRT could be considered. Both the 28 Street and 25A Street turnout locations are considered feasible for a single track connection from West LRT to 37 Street via 17 Avenue SW.

A 37 Street streetcar line could start from 17 Avenue west of 33 Street adjacent to the south entrance of Westbrook Station. It would then turn south onto the 37 Street and Richardson Way corridor to Mount Royal University and the south edge of Currie Barracks. A terminal station could be located on Richardson Way west of Richard Road. Intermediate stations would be located along 37 Street SW, possibly at 26 Avenue, Richmond Road, Richardson Way. The streetcar line could also start as far east as 25A Street and provide service along 17 Avenue prior to the transfer station at Westbrook, as shown in **Figure 4**.



Figure 4: 37 Street SW Alignment and Potential Stations



As well, the turnout to 25A Street SW located east of the Shaganappi Point Station provides an alternative route and station access point. A passenger transfer station could be located on the west side of Shaganappi Park south of Bow Trail, a short distance from the Shaganappi Point station. The route could follow 25A Street, 17 Avenue, 26 Street and the Quesnay Drive SW central spine road within the Currie Barracks development area. The line would turn onto Richardson Way SW where a terminal station could be located to serve Mount Royal College. The route concept is shown in **Appendix A Route Options**. This alignment would not provide a connection to Westbrook Village and would duplicate the SW Transitway BRT service on Quesnay Drive.

## 7 Conclusion

This high level review investigated the transit mode progression from existing bus services, future BRT services and a possible future rail service from the WLRT (Blue Line) to Mount Royal University and the Currie Barracks Area. It was determined that the preferable route between the WLRT and Mount Royal University and Currie Barracks would be along 37 Street SW and Richardson Way, however, connecting the WLRT directly to 37 Street SW is problematic. To connect near Westbrook Station would require reconstruction of the existing LRT tunnel. As well, routing Calgary's standard LRT vehicles (high floor 2.65m wide LRT cars) along the identified north-south corridors would create design, operational and community compatibility issues.

Other options examined a standalone or stub low floor streetcar line on 17 Avenue and 37 Street SW connecting Westbrook Village to MRU, or a streetcar spur line connection to West LRT at 28 Street or 25A Street. Passenger transfer stations from West LRT could be located adjacent to the Shaganappi Point and/or Westbrook Stations. North-south routes could follow the 25A / 26 Street / Quesnay Drive corridor or 17 Avenue and 37 Street.

The study concludes that a rail service connection between the WLRT and the Mount Royal University and Currie Barracks area is feasible. It also concludes that a low floor streetcar service along 17 Avenue, 37 Street and Richardson Way with a track connection at 25A Street would be compatible with the nature of the community and service needs within the study area.

For the foreseeable future the existing Calgary Transit routes and the future South Crosstown BRT service on 37 Street SW/Richardson Way and the Southwest Transitway BRT on Crowchild Trail and Quesnay Wood Drive will provide a high level of transit service to the MRU/Currie Barracks Area. As the area redevelops, intensifies and transit demand increases the identified rail service connections between WLRT and MRU should be explored in greater detail.

### West LRT to Mount Royal University Rail Options

| LRT<br>(High Floor, 2.65 m wide)       |   |                  |   | Streetcar<br>(Low Floor, 2.4 m wide)                  |    |                  |    |
|----------------------------------------|---|------------------|---|-------------------------------------------------------|----|------------------|----|
| ROUTES                                 |   | CONNECTIONS      |   | ROUTES                                                |    | CONNECTIONS      |    |
| Crowchild Trail                        | X | 37 Street Tunnel | X | Crowchild Trail                                       | X  | 37 Street Tunnel | X  |
| 26 Street                              | X | 31 Street        | X | 26 Street                                             | ✓  | 31 Street        | X  |
| 29 Street                              | X | 28 Street        | ✓ | 29 Street                                             | ✓  | 28 Street        | ✓  |
| 33 Street                              | X | 25A Street       | ✓ | 33 Street                                             | ✓  | 25A Street       | ✓✓ |
| 37 Street                              | ? |                  |   | 37 Street                                             | ✓✓ |                  |    |
| Routes and Connections<br>Not Feasible |   |                  |   | 37 Street Route and 25A Street Connection<br>Feasible |    |                  |    |

# Appendix A

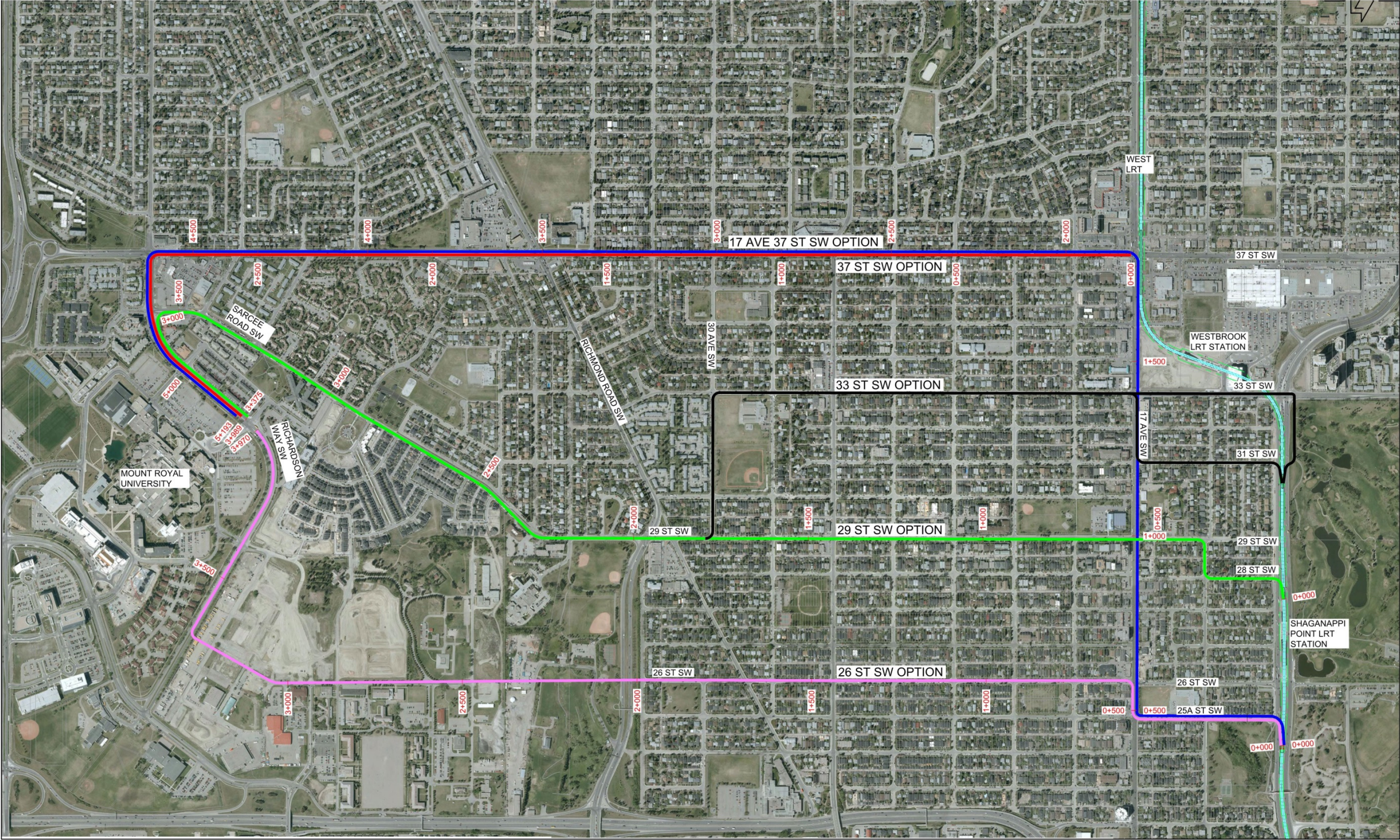
## Route Options

## Rail Turnout Options



Route Options

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- NOT FOR CONSTRUCTION
- CONCEPTUAL
- ISSUED FOR DISCUSSION

The City of Calgary

THE CITY OF CALGARY  
LRT MRU CONNECTION  
CORRIDOR OPTIONS

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SK-002



## Rail Turnout Options



**THE CITY OF CALGARY**  
**LRT MRU CONNECTION**  
**OPTIONS**

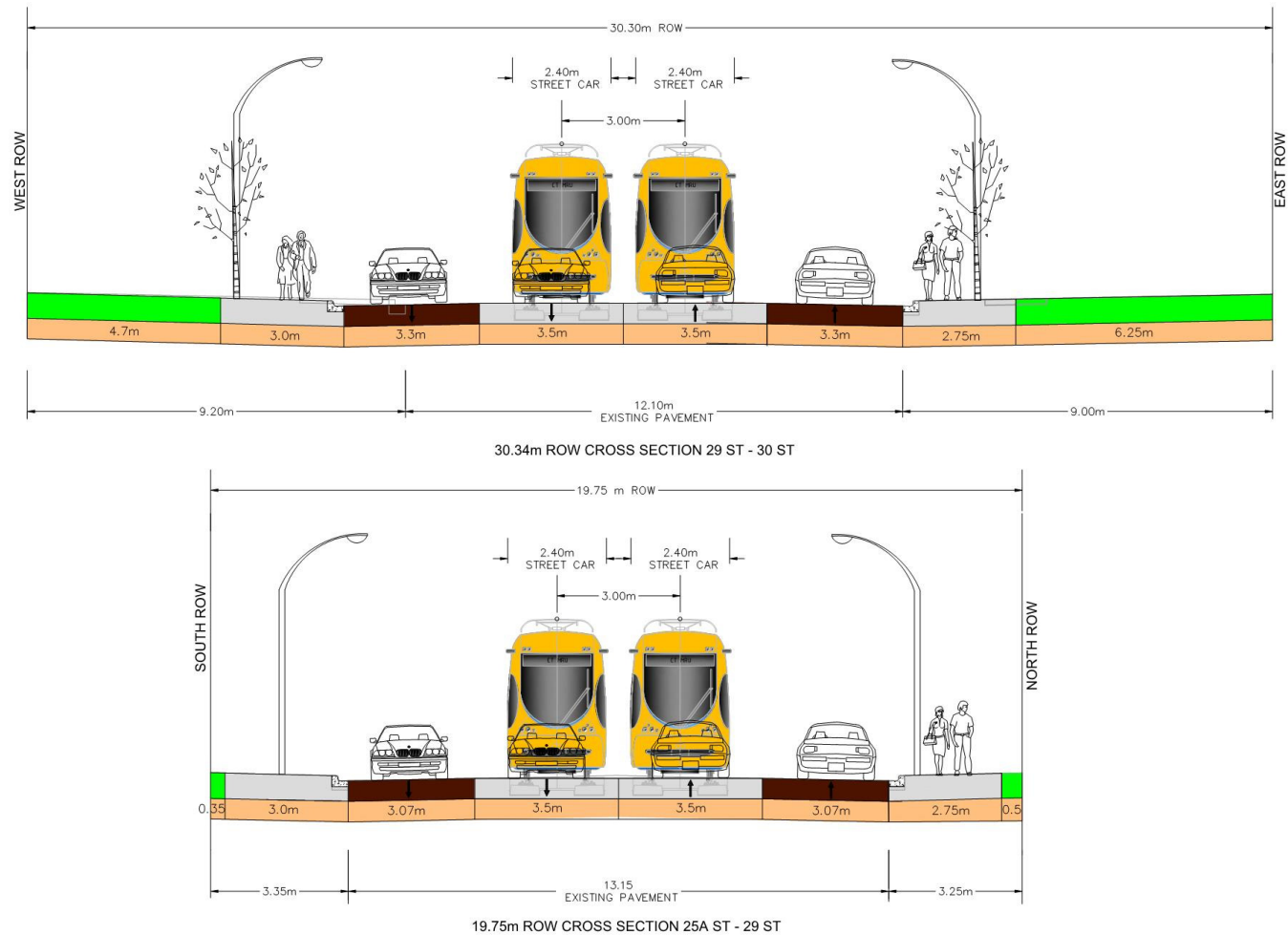




## Appendix B

### Typical Cross Sections

# Scoping and Options Feasibility Report. West LRT – Mount Royal University Rail Connection



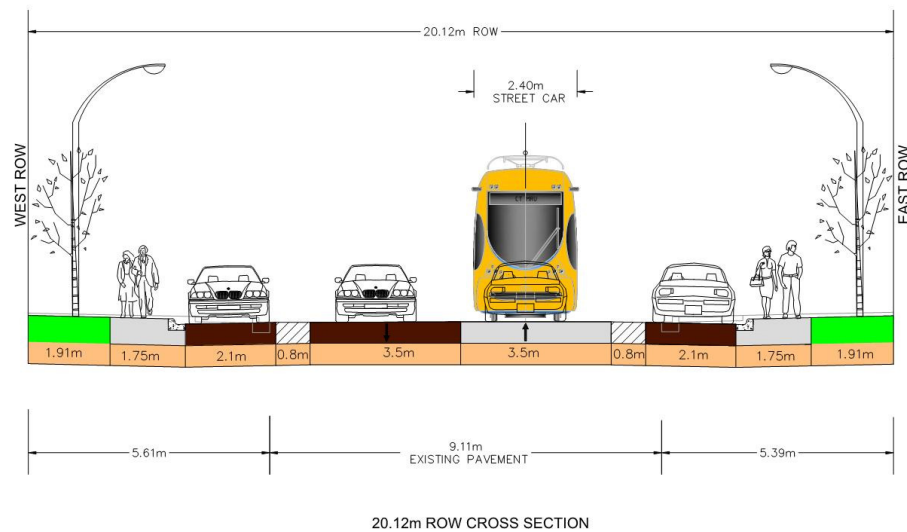
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LRT-MRU CONNECTION  
17 AVE SW  
TYPICAL SECTIONS



SHEET  
SK-003





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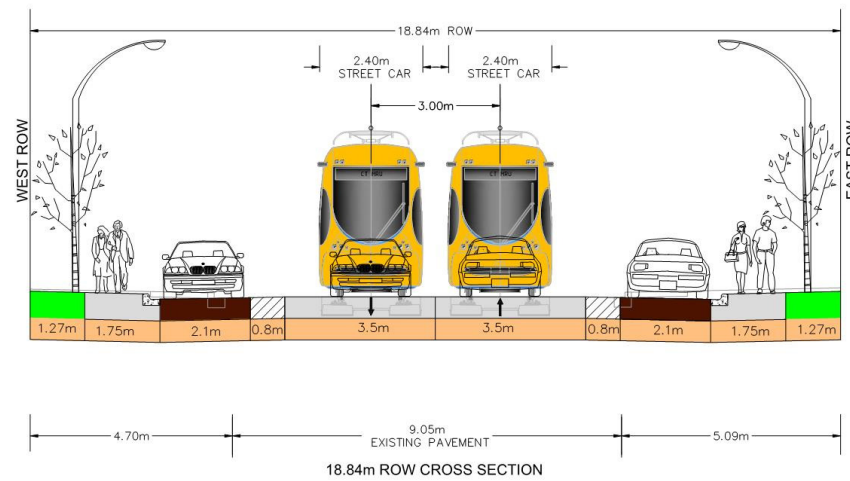
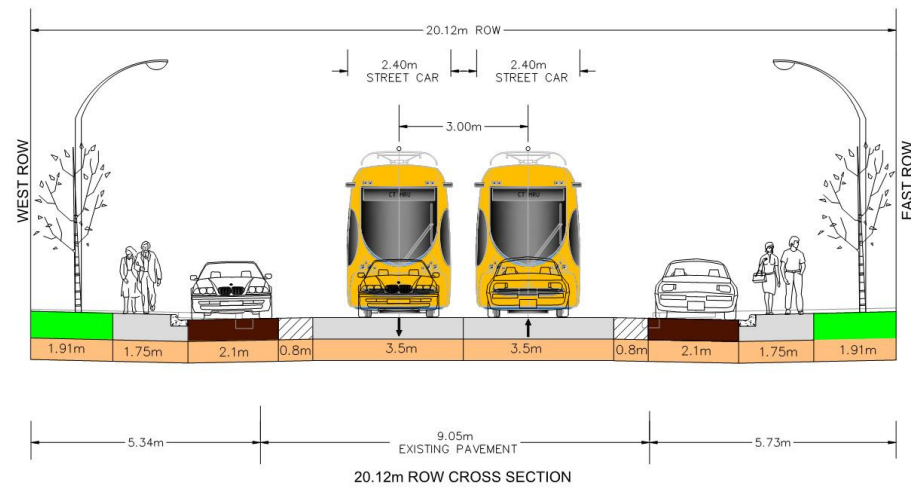


THE CITY OF CALGARY  
LRT-MRU CONNECTION  
25 A ST SW  
TYPICAL SECTIONS



SHEET  
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# Scoping and Options Feasibility Report. West LRT – Mount Royal University Rail Connection



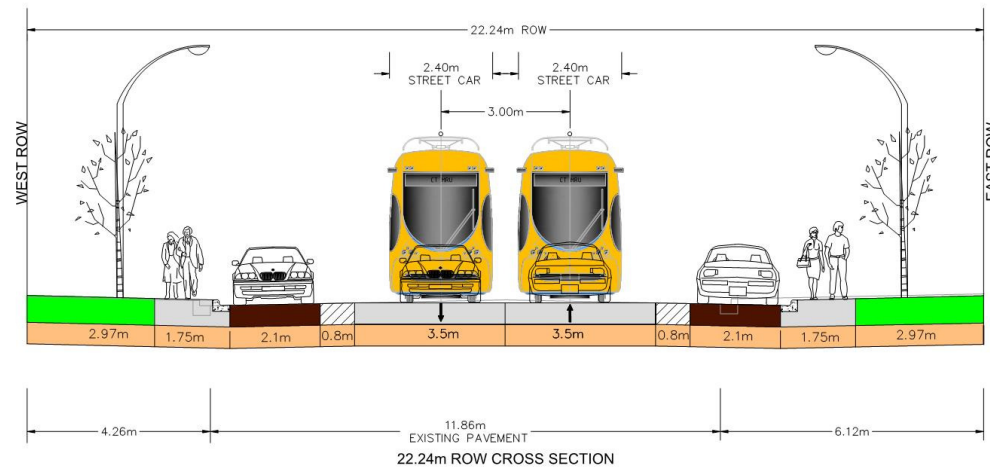
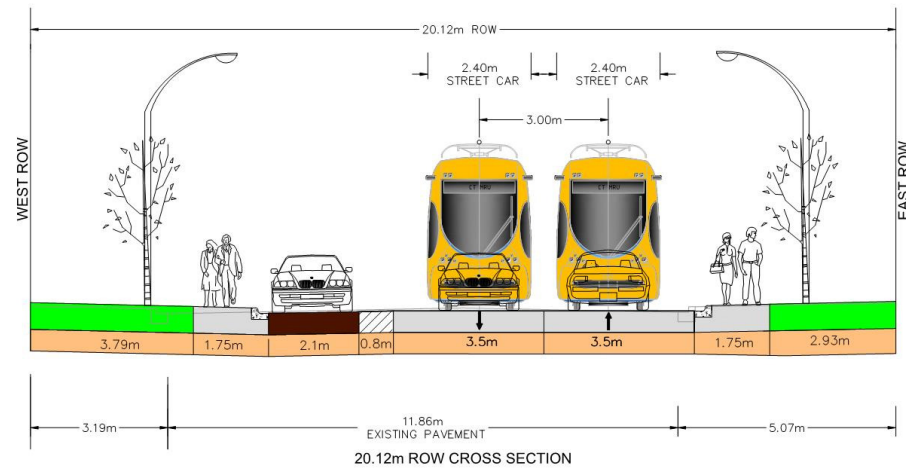
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26 ST SW  
TYPICAL SECTIONS



SHEET  
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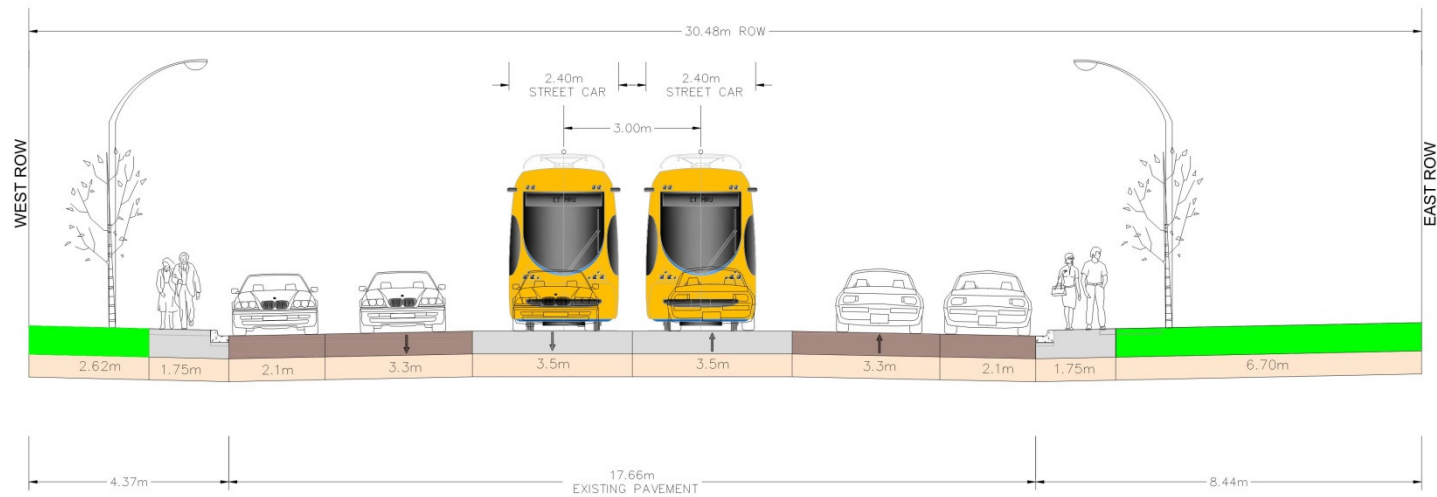
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29 ST SW  
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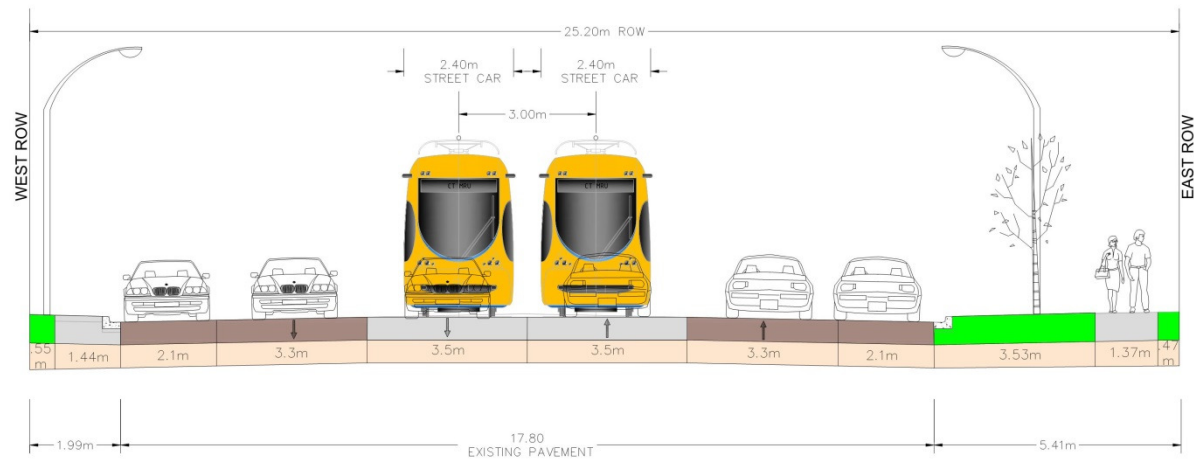
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30.48m ROW CROSS SECTION

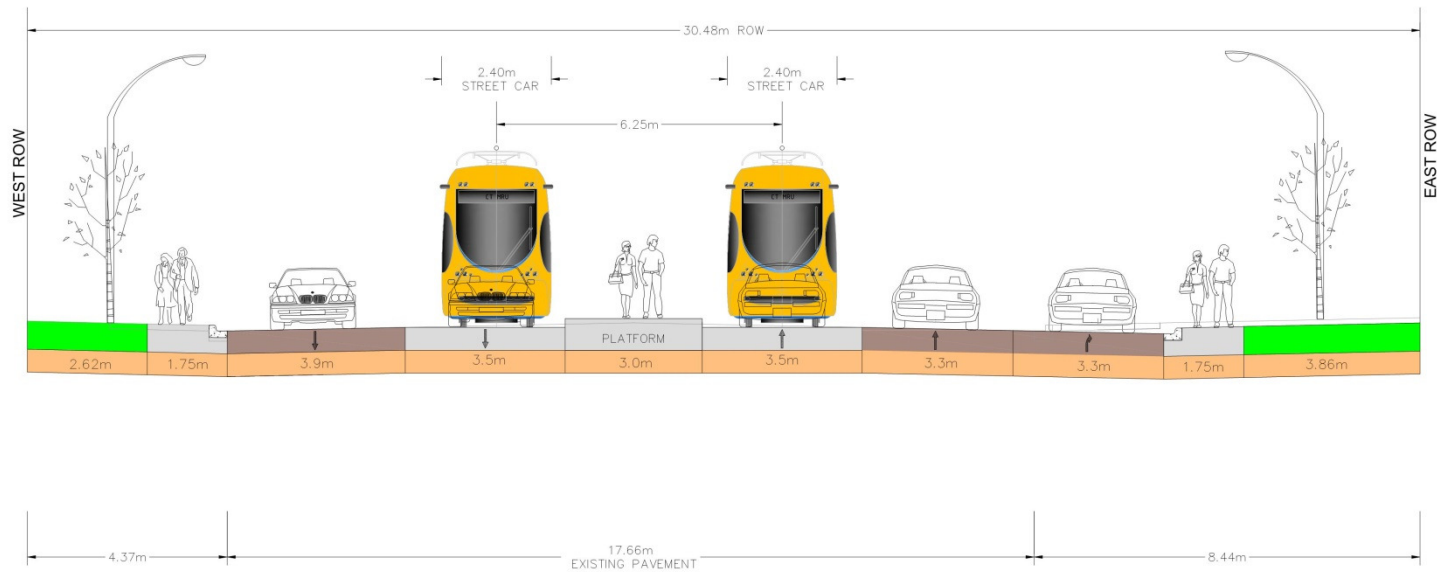


25.20m ROW CROSS SECTION



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# Scoping and Options Feasibility Report. West LRT – Mount Royal University Rail Connection



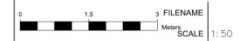
30.48 ROW CROSS SECTION WITH CENTRE PLATFORM



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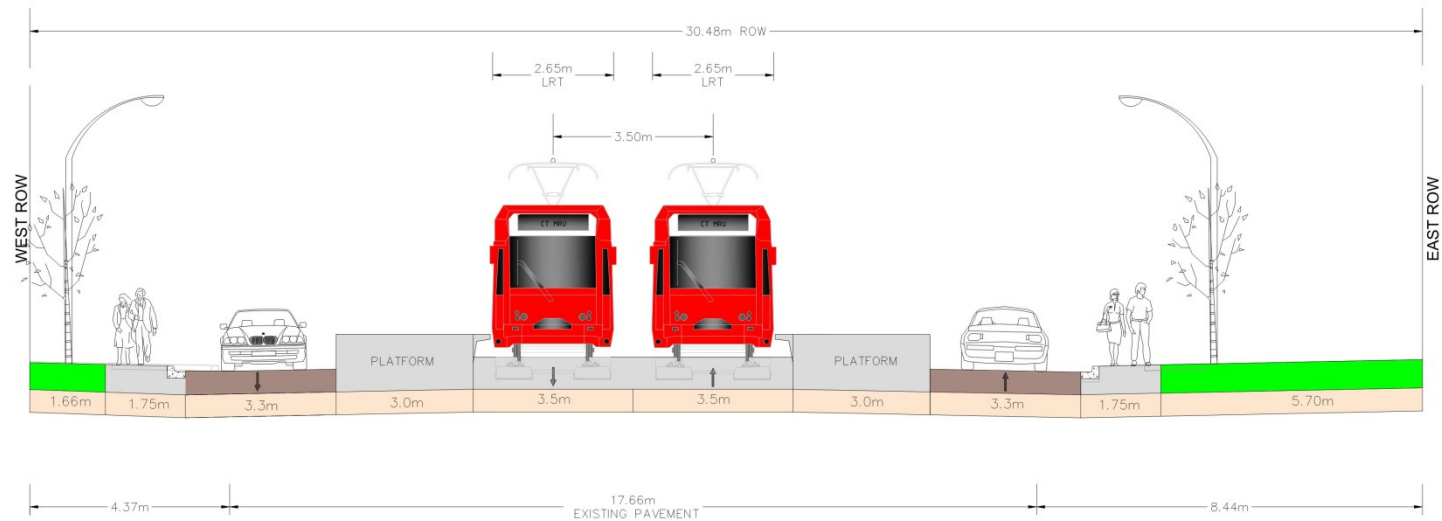


THE CITY OF CALGARY  
LRT-MRU CONNECTION  
37 ST SW STREET CAR OPTION  
TYPICAL SECTIONS 2

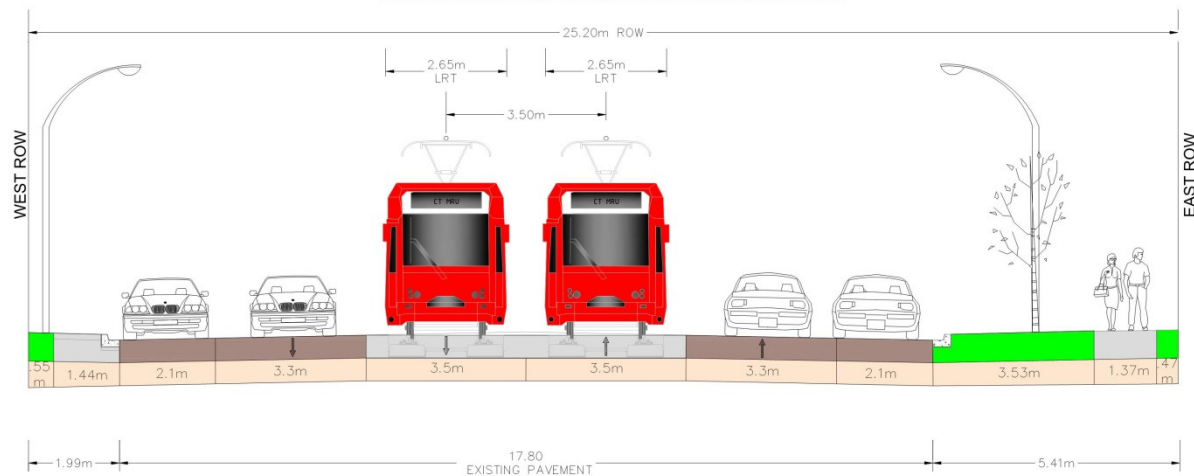


SHEET  
SK-010

# Scoping and Options Feasibility Report. West LRT – Mount Royal University Rail Connection



30.48m ROW CROSS SECTION WITH SIDE LOAD PLATFORMS



25.20m ROW CROSS SECTION WITHOUT PLATFORM



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Calgary

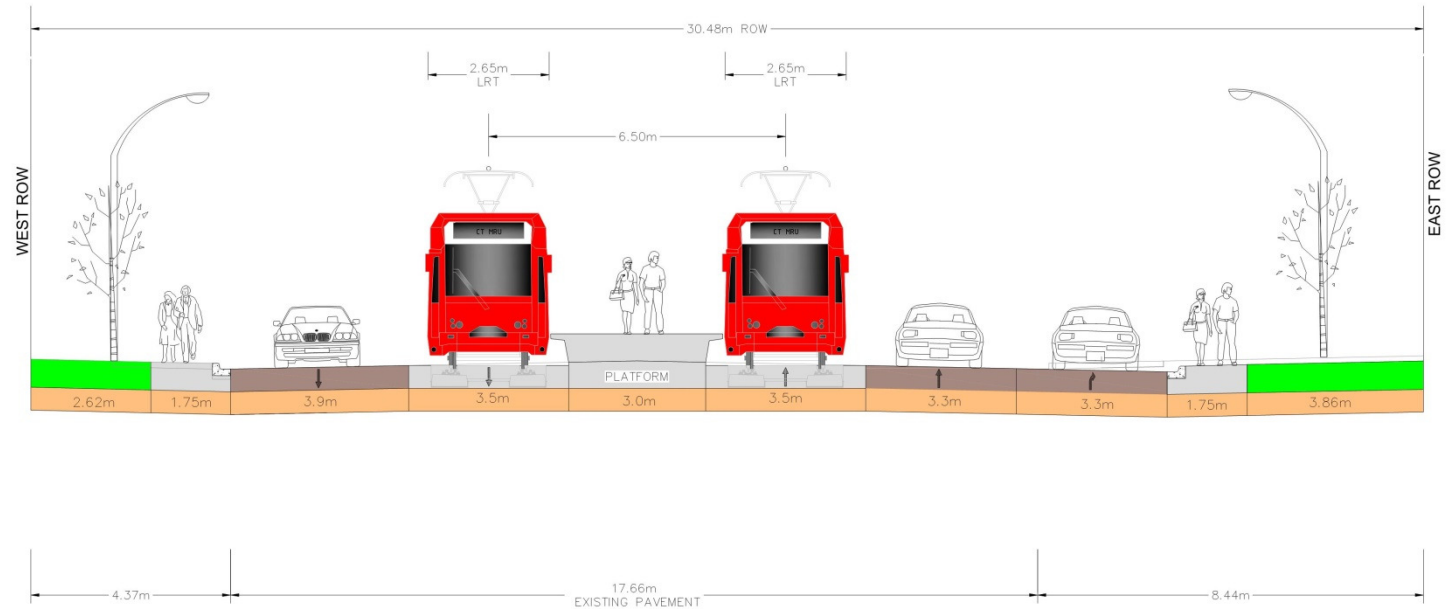
THE CITY OF CALGARY  
LRT-MRU CONNECTION  
37 ST SW HIGH FLOOR LRT OPTION  
TYPICAL SECTIONS 1



SHEET  
SK-011



# Scoping and Options Feasibility Report. West LRT – Mount Royal University Rail Connection



30.48 ROW CROSS SECTION WITH CENTRE LOAD PLATFORM



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| ISSUE | DATE | DESCRIPTION | PROJECT NUMBER  |  |

Calgary

THE CITY OF CALGARY  
LRT-MRU CONNECTION  
37 ST SW HIGH FLOOR LRT OPTION  
TYPICAL SECTIONS 2



SHEET  
SK-012

# Scoping and Options Feasibility Report. West LRT – Mount Royal University Rail Connection



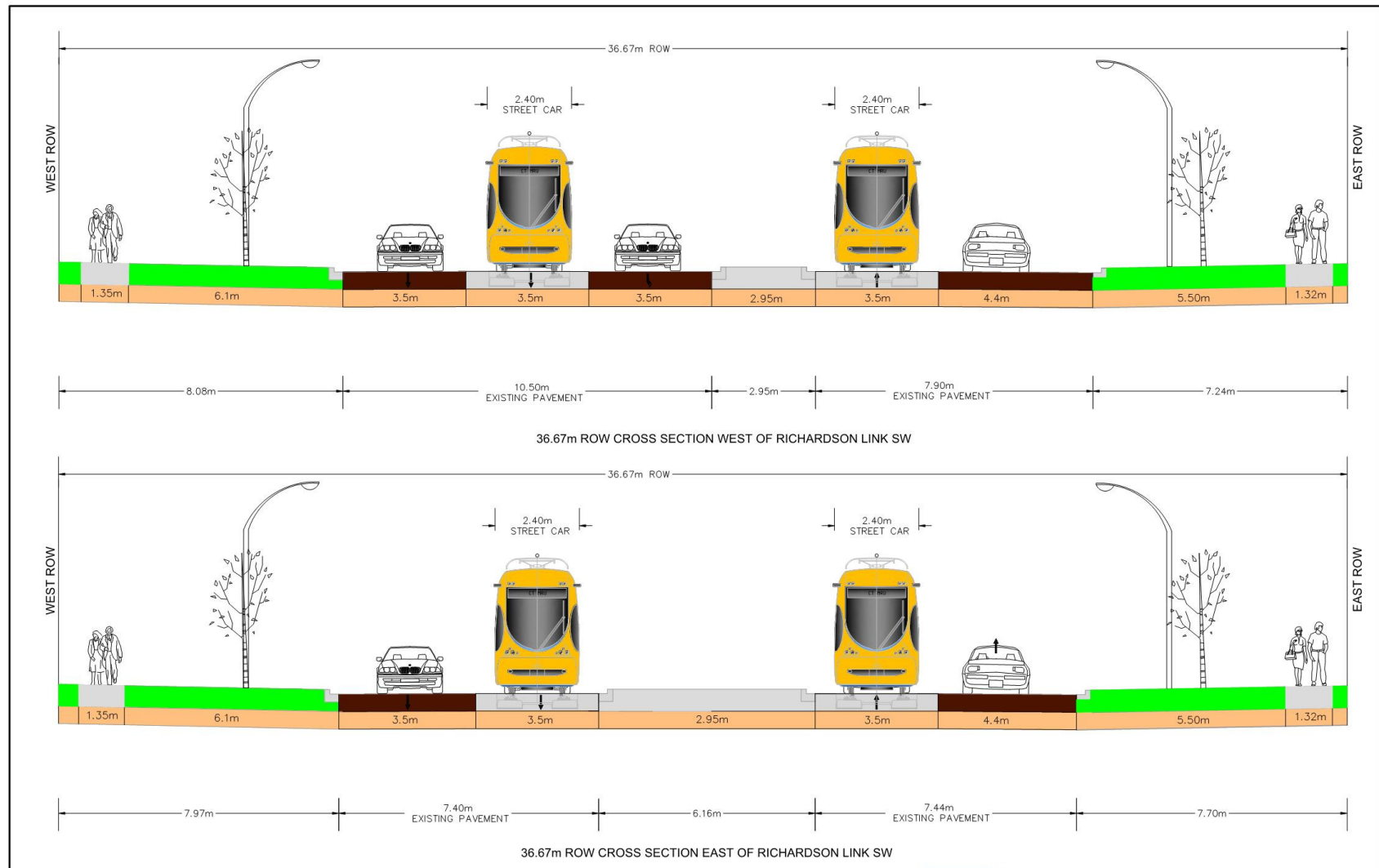
| PROJECT MANAGER |      |             | PROJECT NUMBER |  |
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**Calgary**  
THE CITY OF CALGARY  
LRT-MRU CONNECTION  
SARCEE ROAD SW  
TYPICAL SECTIONS



SHEET  
SK-007

# Scoping and Options Feasibility Report. West LRT – Mount Royal University Rail Connection



| PROJECT MANAGER |      |             | PROJECT NUMBER |  |
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| ISSUE           | DATE | DESCRIPTION |                |  |
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**Calgary**  
THE CITY OF CALGARY  
LRT-MRU CONNECTION  
RICHARDSON WAY SW  
TYPICAL SECTIONS



SHEET  
SK-008