

West LRT
Alignment Update and
Costing Report,
2006 May

functional studies
for
west lrt



THE CITY OF
CALGARY
CALGARY TRANSIT
TRANSPORTATION PLANNING

Clifton ND Lea
CONSULTING INC.

West LRT

Alignment Update and Costing Report

**2006 May
Calgary Transit
Transportation Planning
Clifton ND Lea Consultants**

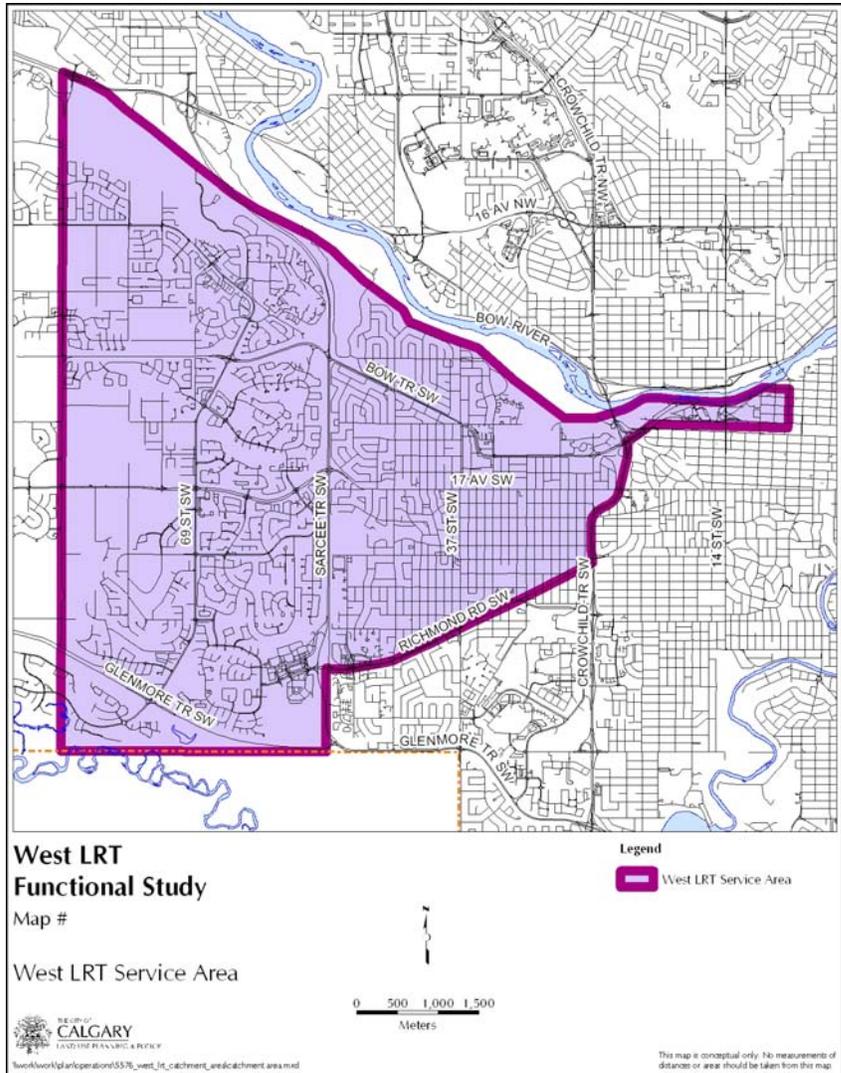
West LRT Update

Background

The service area for West LRT is generally described as being west of 14 Street SW, north of Richmond Road SW and south of the Bow River as shown on this map which is reproduced from the original study report noted below.

In 1983, a functional planning study for West LRT was completed by the Transportation Department (CALTS Series 86). This study is documented in two volumes. “**Volume 1 - Summary Report**” provides an overview of a recommended LRT alignment, facilities, operational characteristics, land use considerations and cost implications. “**Volume 2 – Technical Report**” provides a comprehensive overview of the study area, study process, evaluation of alternatives, land use and cost implications and recommendations.

In 1990, Council approved the recommendations of “**West LRT Functional Study – Volume 3 – 1988 Update**”. This report provides updated population, land use and cost information and confirmed the alignment for West LRT that was identified in the 1983 study.



West LRT Alignment Update

Overview

The purpose of this report is to provide a technical update of the previously approved plans for the West LRT line, to identify land requirements and to provide a cost estimate to facilitate budget planning.

During this update study a number of revisions to the approved plan were identified and investigated. The recommended changes to the approved alignment are not significant from a routing perspective and the line can still be constructed within the general scope of the approved right of way. However, the resulting updated plan requires considerably more elevated structures and some additional property in comparison with the approved plans. In general, this is required to better integrate West LRT into the adjacent communities and land uses that have evolved since 1990. It is acknowledged that the outcome of this report will be subject to a public engagement process.

The updated revisions reflect:

- Land use development that did not occur as anticipated,
- Revised LRT design standards (right of way widths, track, structure and station area requirements),
- Revised roadway standards and opportunities,
- Need to minimize land use and property impacts, and
- Opportunities to facilitate future transit oriented development

This report provides:

1. Updated population, employment and ridership projections.
2. Description of the updated West LRT alignment.
3. A cost estimate for the revised plan based on current pricing.
4. Conclusion and Recommendations

- Appendix 1 LRT Cost Estimates by Area
- Appendix 2 List of Properties Impacted by West LRT
- Appendix 3 1988 Approved West LRT Alignment Drawings.
- Appendix 4 West LRT Technical Update Plan – Clifton ND Lea report

1. Updated Population, Employment and Ridership Projections

Since the 1988 West LRT report, the projected population and employment figures for the West LRT service area have increased significantly. Table 1 shows that the current (2005) population and employment levels for the area have exceeded the values that were previously given for the city's 1.25 million horizon year. The most recent forecasts show that population and employment for the 1.25 million horizon (expected to be reached in year 2025) are 30 percent and 40 percent higher than the old forecasts, respectively. Ultimately, the population of this area could reach approximately 159,000 with up to 44,000 jobs with full build-out of the area east of the future Ring Road.

**Table 1
Comparison of Population and Employment Forecasts
For West LRT Service Area**

	1985 Actual	2005 Actual	Previous Projection for 1.25 Million	Current Projection for 1.25 Million
Population	33,361	81,300	80,050	105,000
Employment	8,261	18,600	15,445	22,000

Note: Previous projections based on 1985 data.
Current projections based on 2005 data

West LRT Ridership Estimate

The following figures show the previous and updated weekday ridership forecasts for West LRT based on these population and employment projections for the 1.25 million population horizon year noted above.

1988 West LRT Weekday Ridership Estimate = 23,400 to 25,800

Updated West LRT Weekday Ridership Estimate = 32,000 to 37,000
 " " " " " " = 37,000 to 44,000 with TOD

Redevelopment with higher density, mixed land use is possible within the future West LRT station areas in accordance with the City's Transit Oriented Development (TOD) Guidelines. The most likely locations for significant TOD are in the vicinity of Westbrook Mall and the future Sirocco Drive and Sunalta station areas. A modest level of TOD is also possible in the vicinity of the other stations subject to land use studies and community consultation. A conservative estimate suggests that an additional 5,000 to 7,000 daily trips on West LRT could be achieved beyond the ridership estimates noted above as a result of TOD.

2. Description of The Updated West LRT Alignment

In 2005 December, the consulting firm of Clifton ND Lea was retained by The City of Calgary Transportation Department to conduct a technical review of the approved alignment for West LRT as defined in the 1983 and 1988 West LRT studies noted at the beginning of this report. Based on this review a number of functional design concept changes to the approved plan for West LRT are recommended. A description of each area of the recommended alignment and updated functional drawings are provided below. As well, a summary of changes from the approved plans are also noted here. A revised cost estimate for the updated alignment is provided in section #3 of this report. Drawings of the approved alignment from the 1983 and 1988 studies are provided in Appendix 3 for comparison purposes. A technical description of key elements of the updated alignment is provided in the Clifton ND Lea report which is attached as Appendix 4.

Area 1 – 10 Street to 18 Street SW

The West LRT line will begin at the west end of 7 Avenue, just east of 11 Street SW. A new 11 Street station is scheduled for construction in 2007 to replace the existing 10 Street station that is the current terminus of Northeast LRT. West LRT will operate as an extension of Northeast LRT so that trains on this line will no longer turn around in the downtown.

West LRT tracks will cross 11 Street at-grade and pass through the Telus World of Science (Science Centre) site. This will require the demolition of a raised deck that provides an additional exit from the Science Centre. Discussions with the Science Centre suggest that the Science Centre will no longer occupy this building by the time West LRT is constructed, however, vehicular and pedestrian access to accommodate the future use of this building and the adjacent Millennium Park will be required as part of the final LRT design for this area.

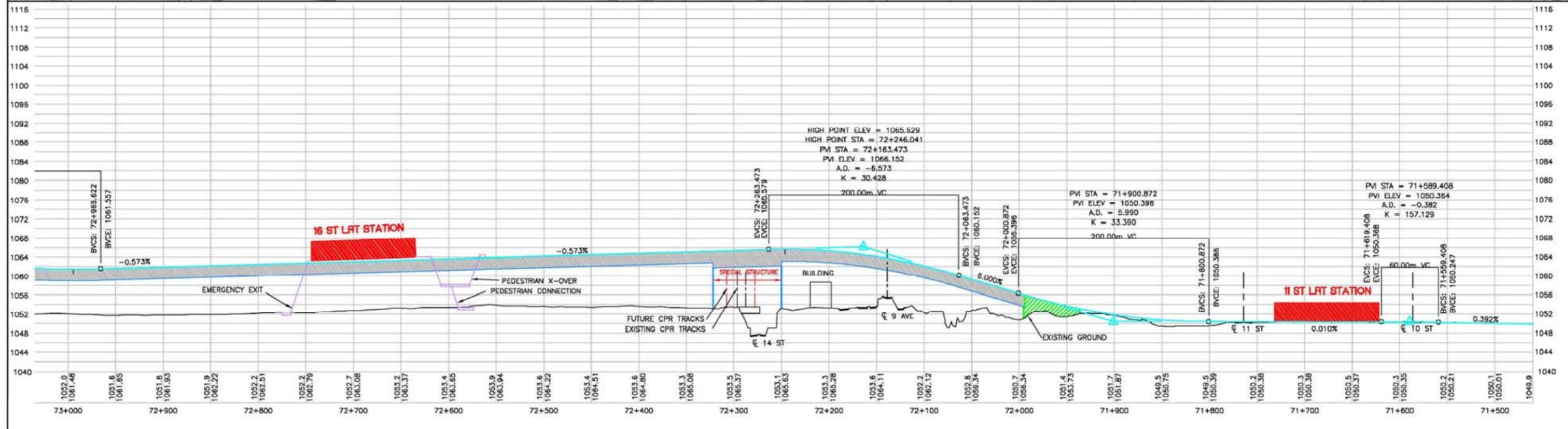
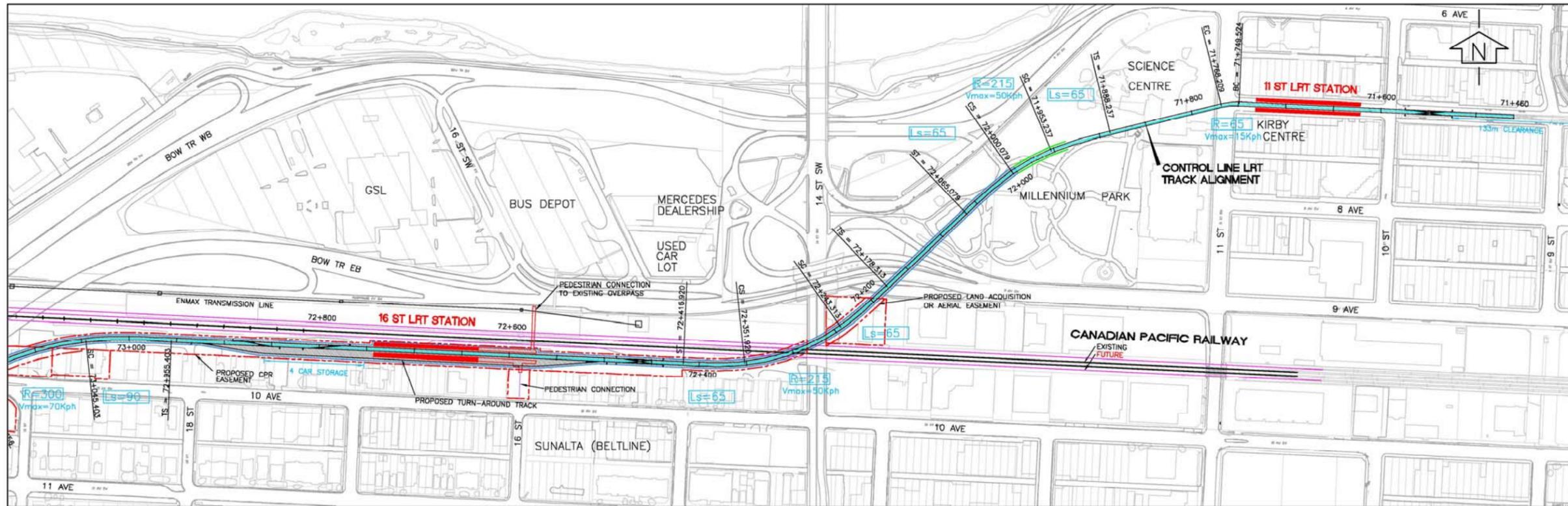
Just west of the Science Centre the LRT tracks will ramp up to an elevated structure that will take the tracks over Millennium Park, 14 Street, 9 Avenue and the CPR mainline tracks. West LRT will remain on an elevated structure within the south portion of the CPR right of way. An elevated station with side loading platforms will be constructed just west of 16 Street SW with pedestrian connections to the Greyhound terminal to the north and to the Sunalta community to the south. This station will include a third track on the south side of the inbound station platform to facilitate train turn arounds and a storage track for 4 car trains. All West LRT stations will be designed for 4 car train operation.

West of the Sunalta Station, LRT tracks will proceed on an elevated structure located within the CPR right of way and then follow the south edge of the eastbound lanes of Bow Trail and the Crowchild Trail off-ramp. CPR has indicated that this land, currently leased to business on the north side of 10 Avenue can be leased or purchased. Several industrial buildings in this area and a small piece of land on the south side of 10 Avenue at the westerly end must be purchased to accommodate LRT. There will be residual lands under the elevated structure that can continue to be available when LRT is completed.

Changes Proposed in Area 1 vs Approved Alignment

1. A station is located on 7th Avenue between 10th and 11 Streets SW (to be completed in 2007).
2. Millennium Park has replaced Mewata Stadium and some modifications to Millennium Park will be required to accommodate LRT.
3. The Sunalta Station is located south of the CPR tracks, which requires a structure to carry LRT over 9 Avenue SW and the CPR.
4. The Sunalta Station is elevated to provide a better track profile and improved pedestrian access.
5. A turn around and storage track is incorporated into the Sunalta Station to facilitate the operation of 4 car trains and to allow the short turning or storage of trains.
6. LRT can be built independent of Bow Trail roadway improvement.

Updated Alignment – Area 1



KEY: LRT CONTROL LINE ELECTRICAL SUBSTATION RETAINING WALL TRACK CL ROAD REALIGNMENT PEDESTRIAN LINK STRUCTURE	DATE: JUNE 06 SCALE: 1 : 4000 H 1 : 800 V DWG NO.: 11166 REC-PLAN- AREA 1		PROJECT: CITY OF CALGARY WEST LRT TECHNICAL UPDATE	TITLE: AREA 1 10 STREET TO 18 STREET STA. 71+400 – 72+900
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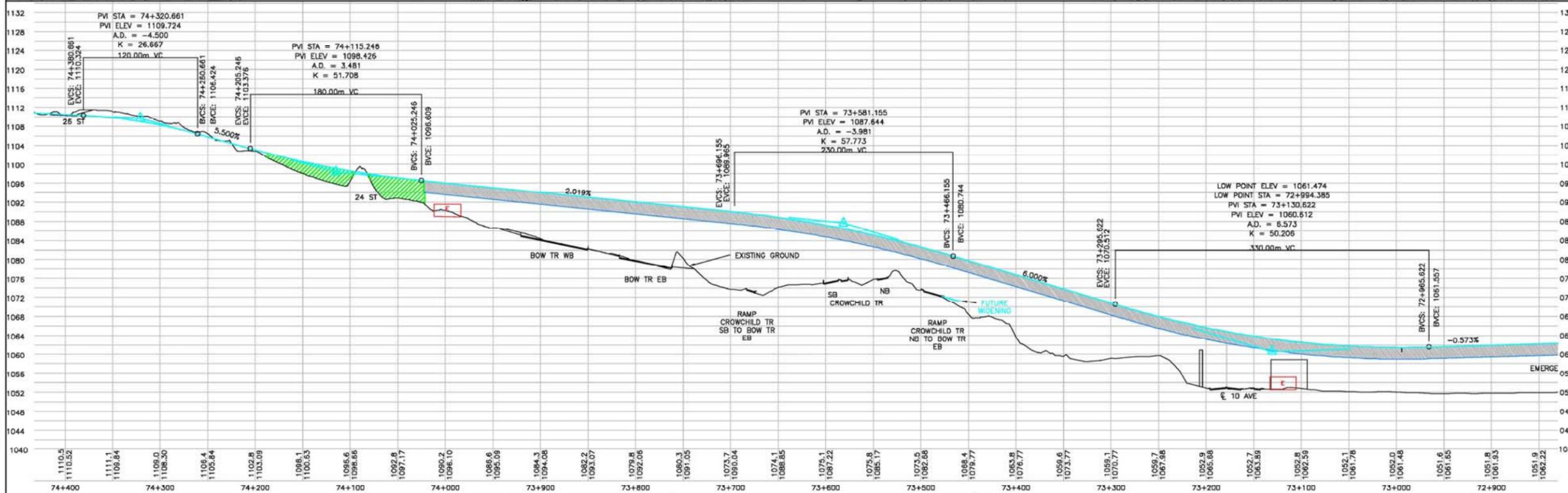
Area 2 – 18 Street to 26 Street SW

From 10 Avenue SW, the LRT line will parallel the south edge of eastbound Bow Trail on an elevated structure that will pass over the southern most portion of the Crowchild Trail / Bow Trail interchange and then swing to the north coming back to grade to run along the north side of Bow Trail. The line will cross 26 Street SW at-grade. A centre loading platform will be located immediately west of 26 Street with at-grade access for pedestrians via the existing roadway crossing and area sidewalks. Some additional property along the south edge of the Jacques Lodges (Metropolitan Calgary Foundation) site must be obtained. As well, land will also be required from south edge of the Shaganappi Golf Course. Some degree of golf course revision is anticipated depending on the final design width of Bow Trail.

Changes Proposed in Area 2 vs Approved Alignment

1. LRT is elevated over Crowchild Trail to avoid conflict with the interchange and Enmax power lines.
2. LRT is located along the north side of Bow Trail to minimize impact to the park on the south side of Bow Trail and to the Shaganappi Golf Course.
3. The 26 Street Station is located on the north side of Bow Trail, just west of 26 Street SW which provides for improve pedestrian access and a better station environment for passengers since the platform is not in the roadway median.

Updated Alignment – Area 2



KEY: LRT CONTROL LINE ELECTRICAL SUBSTATION RETAINING WALL TRACK CL ROAD REALIGNMENT PEDESTRIAN LINK STRUCTURE	DATE: JUNE 06 SCALE: 1 : 4000 H 1 : 800 V DWG NO.: 11166 REC-PLAN-AREA 2		PROJECT: CITY OF CALGARY WEST LRT TECHNICAL UPDATE	TITLE: AREA 2 18 STREET TO 26 STREET STA. 72+900 - 74+400
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Area 3 – 26 Street to 37 Street SW

West of the 26 Street Station, LRT tracks will parallel the north side of the westbound lanes of Bow Trail. As noted in Area 2, land for LRT and future Bow Trail widening will be required from the south edge of the Shaganappi Golf Course and some golf course revisions will be necessary. It is intended that the final design of Bow Trail and LRT will strive to minimize the land needed from the golf course and the residential properties to the south. An urban corridor design is being prepared for this area.

At approximately 29 Street SW, LRT will ramp up to an elevated structure that will take the tracks southward over Bow Trail. At this point two options were investigated. A minimum impact alignment has the elevated LRT structure located parallel to the west edge of 33 Street SW with a tight turn to parallel the north side of 17 Avenue SW. Existing land uses along 33 Street and 17 Avenue SW, except for the abandoned Plains Indians Cultural Survival School (Melville Scott School), can remain with little impact to their access since LRT will be overhead.

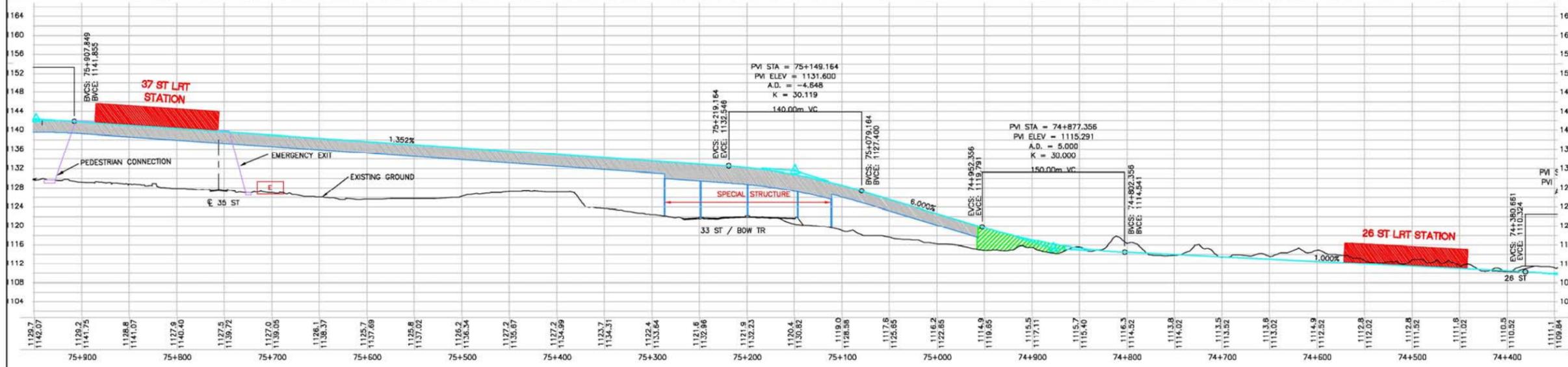
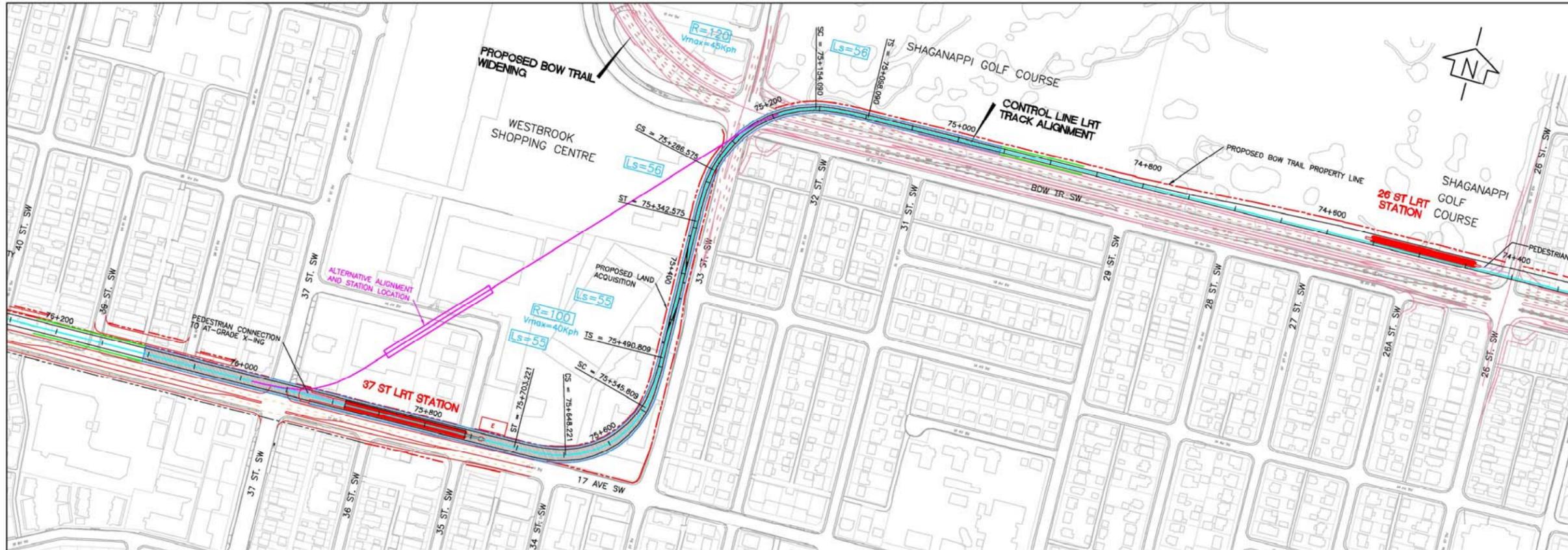
The second option for this section will require redevelopment of the block of land bounded by 33 Street, 37 Street, Bow Trail and 17 Avenue. LRT can cross diagonally through this site with an elevated station incorporated into the redevelopment. Conceptually, this redevelopment would include transit supportive, higher density retail, office and residential uses. This concept is generally supported by the major land owners (Westbrook Mall and the Calgary Board of Education). Some additional land assembly and relocation of the Ernest Manning High School to a new site reserved at 17 Avenue & 69 Street SW is required. Ideally, redevelopment of this site should occur concurrently with the construction of West LRT. A land use plan for this area is underway to explore redevelopment concepts and integration with the adjacent communities.

Regardless of which LRT alignment option is pursued in this section, an elevated station should be located in close proximity to 17 Avenue and 37 Street SW which will be the primary location of bus zones for feeder buses serving the surrounding communities. The station will be accessed via a combination of ramps, stairs and elevators from the street level. As well, +15 connections can be developed as part of future redevelopment on the adjacent lands. As well, opportunities for the creation of approximately 300 to 500 park and ride stalls (potentially as part of a joint use arrangement) will be sought with the redevelopment of these lands.

Changes Proposed in Area 3 vs Approved Alignment

1. LRT is located along the north side of Bow Trail.
2. An elevated structure carries LRT over Bow Trail and either along the west edge of 33 Street SW or diagonally through the centre of a redeveloped Westbrook Mall / Ernest Manning High School site. An elevated structure is considerably less expensive than a tunnel and reduces impacts to existing businesses or access to the future development site.

Updated Alignment – Area 3



KEY:

	LRT CONTROL LINE		TRACK CL
	ELECTRICAL SUBSTATION		ROAD REALIGNMENT
	RETAINING WALL		PEDESTRIAN LINK
			STRUCTURE

DATE	JUNE 06
SCALE	1 : 4000 H 1 : 800 V
DWG. NO.	11166 REC-PLAN - AREA 3



PROJECT:	CITY OF CALGARY WEST LRT TECHNICAL UPDATE
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TITLE:	AREA 3 26 STREET TO 37 STREET STA 74+400 - 75+900
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Area 4 – 37 Street to Glenside Drive SW

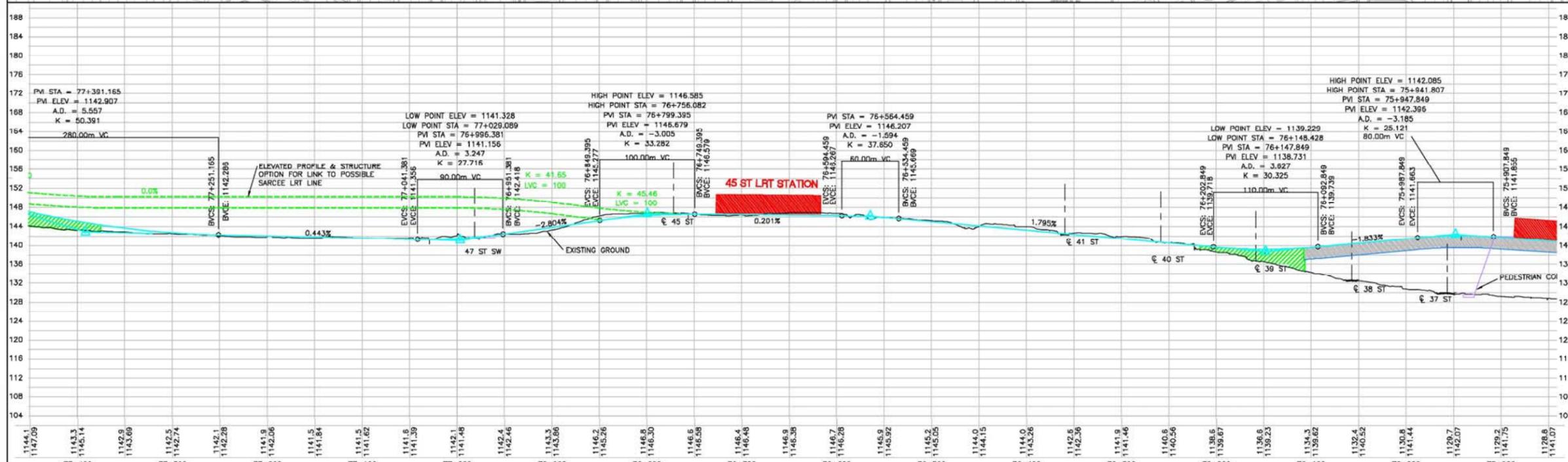
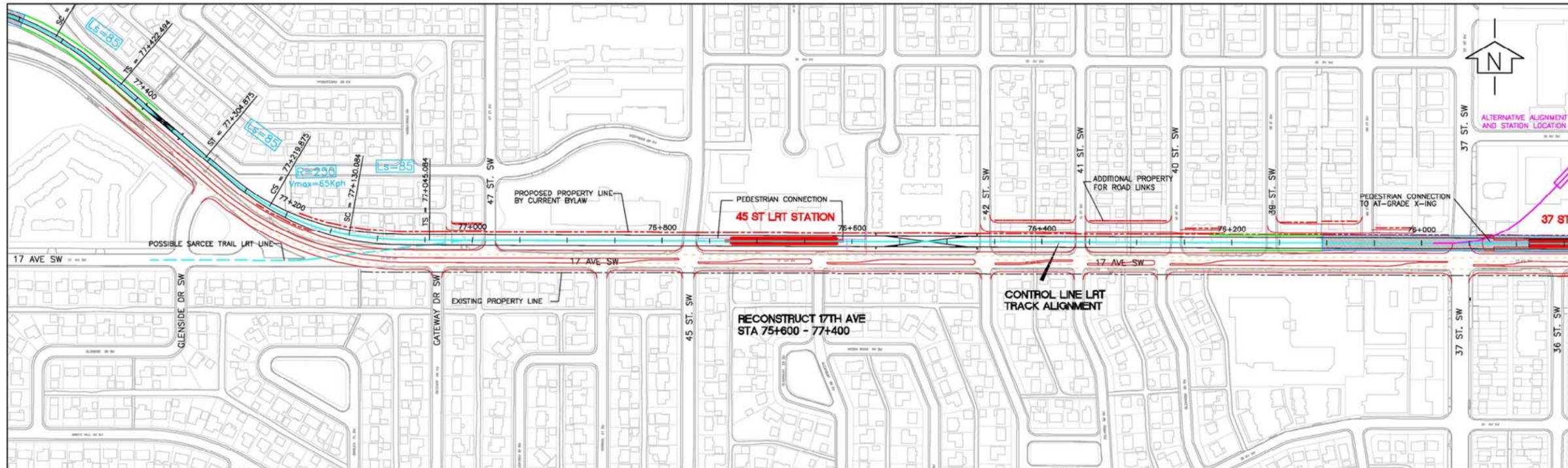
The elevated LRT structure crosses over 37 Street along the north edge of the 17 Avenue SW right of way and returns to grade just west of 39 Street SW. An LRT right of way has been protected with setbacks along the north side of 17 Avenue SW and some land has already been acquired in this area. As well, construction of the AMA and Calgary Police Services buildings has left sufficient land for LRT. It is recommended that West LRT be routed along the north side of 17 Avenue. An at-grade, centre loading platform would be located just east of 45 Street SW. Access to the station will be via sidewalk connections and the existing at-grade intersection. Most existing street connections from the north (except 45 Street) should be closed north of 17 Avenue SW to minimize conflicts with LRT. Rather than constructing cul-de-sacs it is proposed that connecting lanes be constructed parallel to the north side of the LRT alignment. In some locations this will require property that would be in addition to the currently protected setback. Community consultation and a traffic study are required to determine the final configuration of these streets.

The potential for a future LRT spur line to serve development along the future Sarcee Trail ring road, south of Glenmore Trail, has been identified. A spur line connection to West LRT is feasible west of 46 Street SW. This connection should be made via an elevated structure beginning just west of 45 Street SW. Conceptually, the spur line could run down the old section of 17 Avenue SW before turning south to enter the Sarcee Trail right of way. A decision on this spur line is required prior to construction of West LRT.

Changes Proposed in Area 4 vs Approved Alignment

1. LRT is located along the north side of the 17 Avenue SW. This requires some additional property from the protected setback. This configuration will mean less impact to 17 Avenue and intersecting streets.
2. The 45 Street Station is located on the north side of 17 Avenue which will improve pedestrian access and provide a better passenger environment since it will not be in the roadway median.
3. A connection to a potential Sarcee Trail spur line may be feasible to serve future development on Tsu Tina land and further south in the future Providence community.

Updated Alignment Area 4



KEY: LRT CONTROL LINE ELECTRICAL SUBSTATION RETAINING WALL TRACK CL ROAD REALIGNMENT PEDESTRIAN LINK STRUCTURE	DATE: JUNE 06 SCALE: 1 : 4000 H, 1 : 800 V DWG NO.: 11166 REC-PLAN- AREA 4		PROJECT: CITY OF CALGARY WEST LRT TECHNICAL UPDATE	TITLE: AREA 4 37 STREET TO GLENSIDE DRIVE STA. 75+900 - 77+400
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Area 5 – Glenside Drive to Christie Park Gate SW

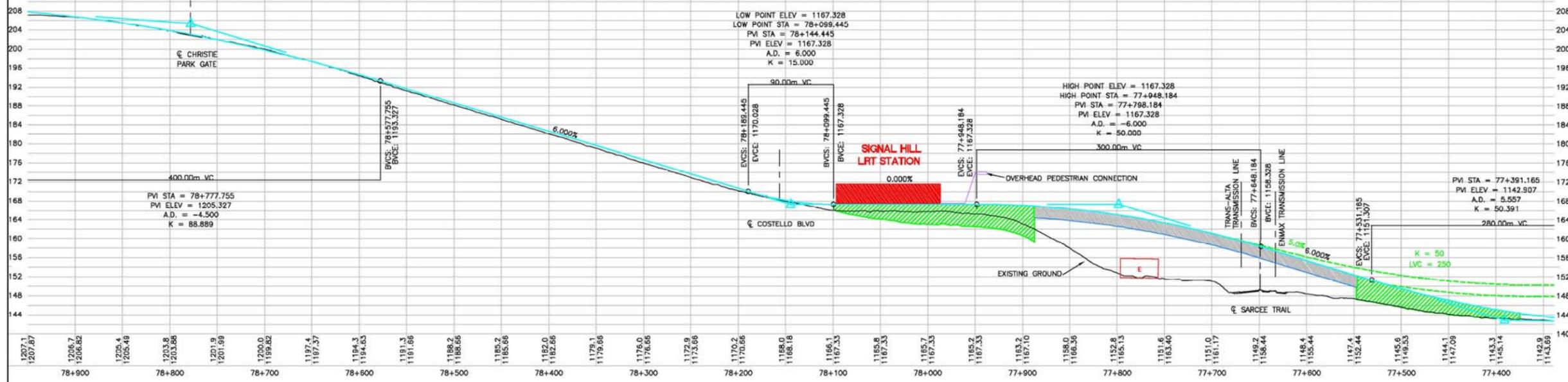
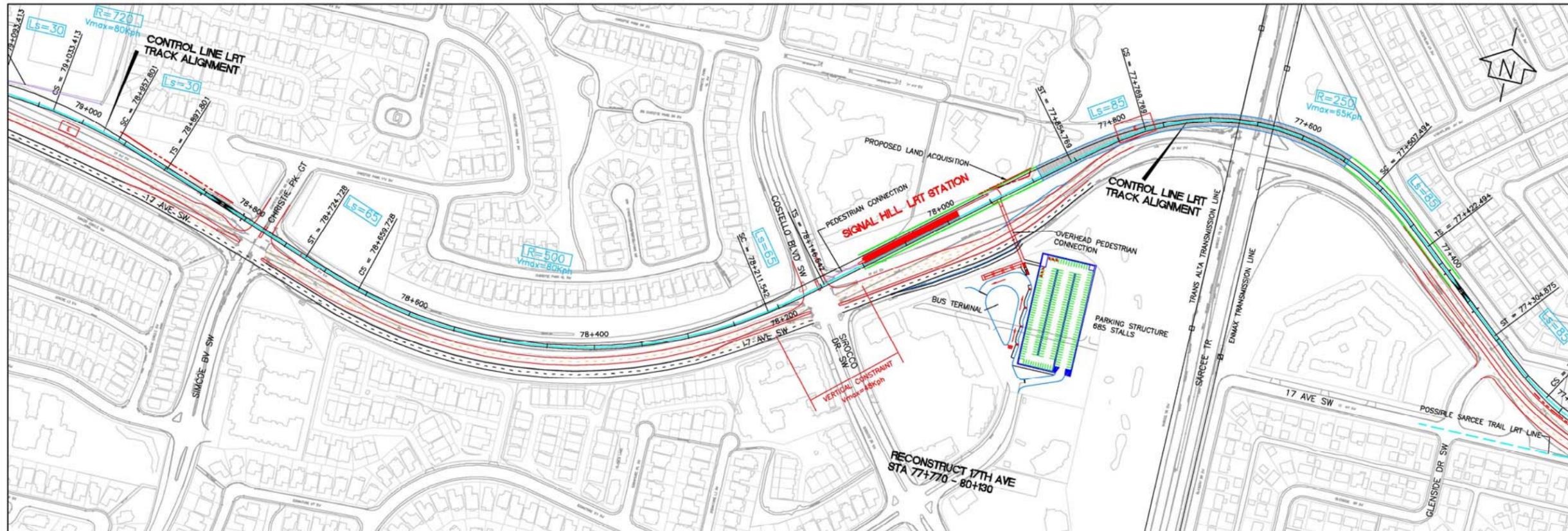
At either 46 Street or Glenside Drive SW, an elevated structure would begin to carry LRT over Sarcee Trail. This structure is located to facilitate the future construction of an interchange at 17 Avenue and Sarcee Trail SW. A final design for this roadway structure and future upgrading of Sarcee Trail is required. West LRT will remain within the north portion of the 17 Avenue SW right of way. West of Sarcee Trail, the Signal Hill station will be located on a portion of the LRT structure immediately east of the intersection of Sirocco Drive / Costello Boulevard. A bus terminal and a parking structure for approximately 685 park and ride spaces will be constructed at the east end of Signature Park on the current Calgary Transit park and ride site east of the West Market Square shopping centre. Pedestrian access to the station will be via an overpass from the bus terminal / park and ride and via at-grade connections from the intersection and the residential community to the north.

West of Sirocco Drive SW, LRT will be at-grade and located in the northern portion of the 17 Avenue SW right of way. This will require reconstruction of 17 Avenue between Sarcee Trail and 69 Street SW. LRT will cross Costello Boulevard and Christie Park Gate intersections at-grade.

Changes Proposed in Area 5 vs Approved Alignment

1. An LRT structure is on the north side of the future Sarcee Trail interchange to allow LRT to proceed independent of the interchange.
2. LRT is located along the north side of 17 Avenue. This requires the rebuilding of 17 Avenue between Sarcee Trail and 69 Street SW (some rebuilding at intersections was required for a median LRT operation). LRT on the north side has less impact on the functionality of 17 Avenue.
3. The Signal Hill Station can be accessed via a pedestrian overpass from the south and at grade sidewalk connections from the north.
4. A parking structure for 685 cars and bus terminal for 4 buses will be located east of West Market Square. A parking structure while more expensive than surface parking allows optimum use of the site and with an option to expand the parking.

Updated Alignment Area 5



KEY:

	LRT CONTROL LINE		RIGHT OF WAY
	ELECTRICAL SUBSTATION		PEDESTRIAN LINK
	RETAINING WALL		STRUCTURE
	TRACK CL		
	ROAD REALIGNMENT		

DATE	JUNE 06
SCALE	1 : 4000 H 1 : 800 V
DWG NO.	11166 REC-PLAN-AREA5



PROJECT: CITY OF CALGARY
WEST LRT
TECHNICAL UPDATE

TITLE: AREA 5
GLENDSIDE DRIVE TO CHRISTIE PARK GATE
STA. 77+400 - 78+900

Area 6 – Christie Park Gate to 69 Street SW

LRT will continue at-grade along the north side of 17 Avenue SW. An at-grade station will be located approximately 200 metres east of 69 Street. This station is expected to function as a terminal station for this line for an extended period of time or until such time as LRT supportive development occurs to the west.

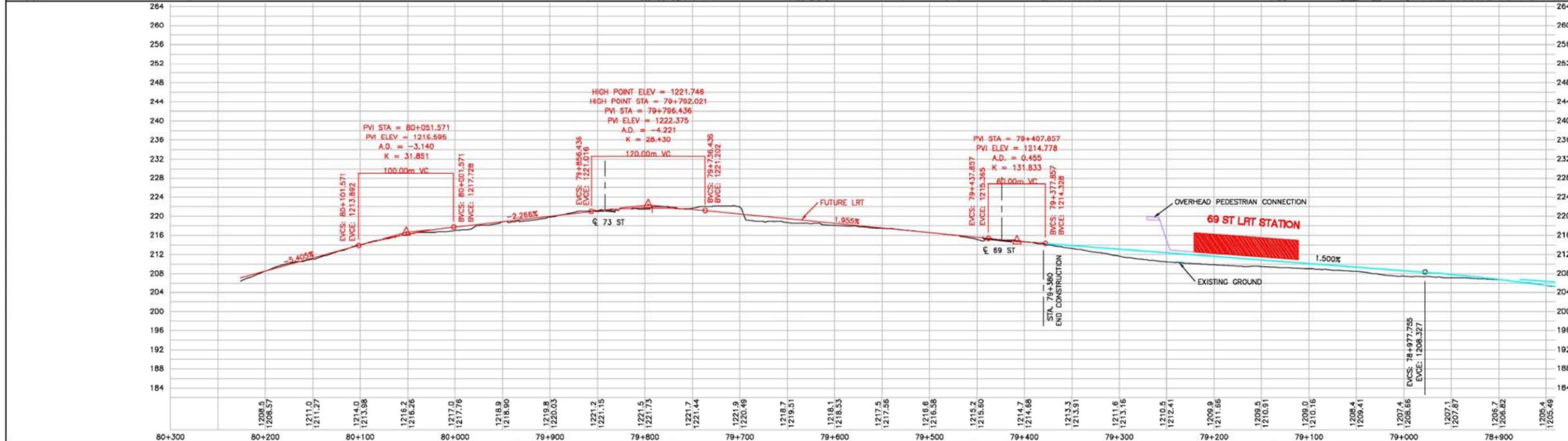
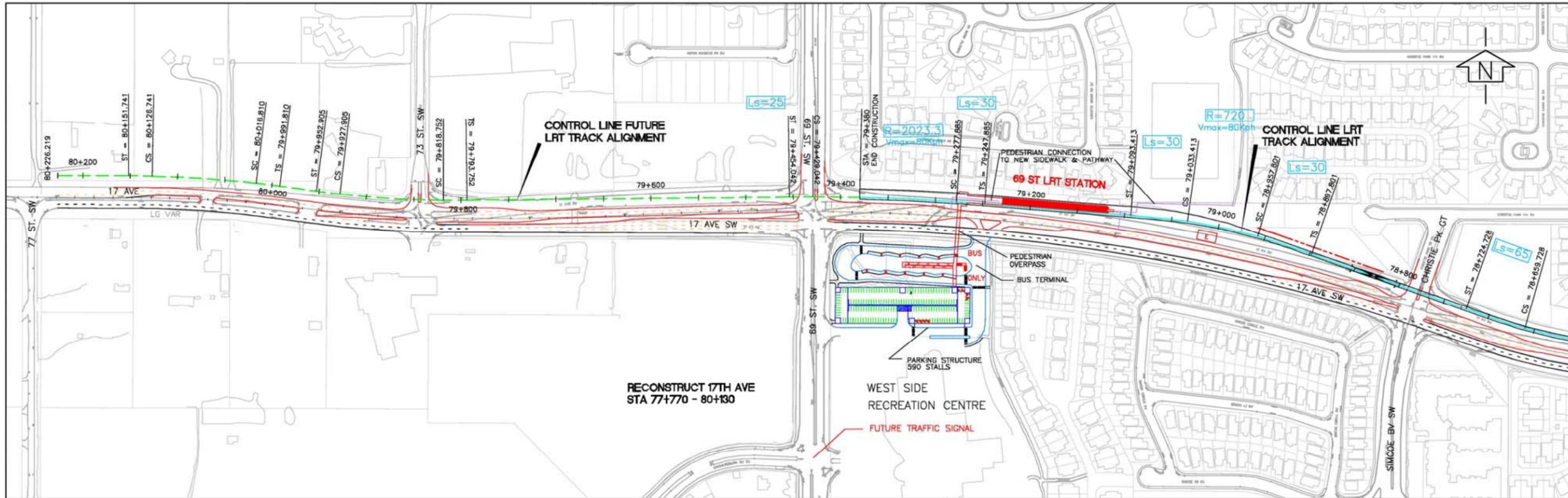
To reflect the importance and the extensive area served by this station, a conceptual plan for a bus terminal with ten bus bays and an elevated structure for 590 parking stalls is proposed on the City owned lands immediately south of 17 Avenue SW. This plan includes a pedestrian overpass to provide a grade separated connection from the bus terminal and park and ride lot to the LRT station. At-grade sidewalk connections will provide pedestrian access from the 69 Street SW intersection and local community pathways to the north and east. An LRT storage track can be provided between the west end of the platform and 69 Street.

A portion of the area proposed for the bus terminal and park and ride facility currently contains a small bus loop and a 170 stall park and ride lot. The remainder of the land required for an expanded bus terminal and park and ride lot is currently leased to the Westside Recreation Centre. Negotiations with the Westside Recreation Centre are required to determine how this site can be modified to incorporate an expanded transit facility, bus and vehicular access and future Westside operating requirements for the benefit of both parties.

Changes Proposed in Area 6 vs Approved Alignment

1. LRT is located along the north side of 17 Avenue SW. (see Area 5). This facilitates the potential for a further westward extension of West LRT.
2. LRT is closer to homes to the north but the roadway is further away.
3. The 69 Street Station is located east of 69 Street and is accessed via a pedestrian overpass from the south and at-grade sidewalk connections from the north.
4. A park and ride structure for 590 cars and a bus terminal with 10 bays is proposed on the south side of 17 Avenue SW. The approved (1988) plan calls for a bus terminal and 500 to 1,000 parking spaces to be built as part of a Strathcona Towne Centre that was not built as envisioned. Revision to the current Calgary Transit park and ride lot and bus terminal plus the Westside Recreation Centre parking and outdoor recreation space is required.

Updated Alignment Area 6



KEY: LRT CONTROL LINE ELECTRICAL SUBSTATION RETAINING WALL TRACK CL ROAD REALIGNMENT PEDESTRIAN LINK STRUCTURE	DATE: JUNE 06 SCALE: 1 : 4000 H 1 : 800 V DWG NO.: 11166 REC-PLAN - AREA 6		PROJECT: CITY OF CALGARY WEST LRT TECHNICAL UPDATE	TITLE: AREA 6 CHRISTIE PARK GATE TO 73 STREET STA. 78+900 - 80+400

West LRT Station Design

All West LRT stations have been planned to accommodate 4 car train lengths. It is not feasible to operate 5 car trains on the West or Northeast lines due to the limited space available in the downtown to construct platforms for trains more than 4 cars in length.

Future Extension West of 69 Street SW

As noted above, it is expected that the 69 Street Station will function as a terminal station for West LRT for the foreseeable future. A right of way for a potential long range, westward extension of LRT, with an at-grade crossing of 69 Street SW, has been protected along the north side of 17 Avenue SW. As well, a future LRT right of way and station site with a small park and ride lot has been reserved west of 85th Street SW as part of the community plan. This extension is dependent on the long term development of LRT supportive land use west of 69th Street SW.

West LRT Staging

Nearly 70 percent of the population that will be served by West LRT is located in the new and developing communities west of Sarcee Trail. Construction of LRT west of Sarcee Trail will result in more efficient local bus routings and shorter feeder bus connections to LRT. Expanded park and ride facilities will intercept auto trips before they cross Sarcee Trail. These improvements planned as part of the West LRT line will greatly improve the attractiveness of transit service in this area, reduce current transit travel times and reduce auto travel towards the downtown and other destinations.

These benefits would not be provided if West LRT is only constructed as far as Westbrook Mall. A terminal station (albeit short term) at Westbrook Mall, located only 4 km from the downtown, would result in very little travel time savings for the majority of transit customers within the service area. As well, there is very limited opportunity to provide the required park and ride and bus terminal facilities at Westbrook and the resulting traffic would have a detrimental impact on the area communities and roadways.

3. Cost Estimate of Updated West LRT Plan

The following cost estimate is based on the updated alignment as shown in the previous drawings. This cost estimate includes the land, structures, track work, LRVs, stations, landscaping, signals and communications, engineering and project management costs. Estimated costs are based on 2005/2006 unit costs and project requirements based on the known elements at a functional plan level of detail. Contingency costs, of 25 to 30 percent are recommended to be budgeted based on the total estimate for fixed facilities. This allows for unknown elements such as complications related to property acquisition, utilities and geotechnical elements. As well, additional costs may be experienced at the time of construction due to inflation. Detailed cost estimates for each area of the alignment are provided in Appendix 1.

WEST LRT - SUMMARY

CONCEPTUAL ESTIMATE FOR BUDGET PURPOSES

Preferred Alignment

ITEM	Area	DESCRIPTION	Length km	TOTAL [\$]	Cost Per KM (\$M)
1		WEST LRT			
		Fixed Facilities			
	1	11th Street to 18th Street	1.175	\$67,734,375	\$57.6
	2	18th Street to 26th Street	1.475	\$59,265,225	\$40.2
	3	26th Street to 37th Street	1.55	\$71,116,600	\$45.9
	4	37th Avenue to Glenside Drive	1.35	\$33,257,500	\$24.6
	5	Glenside Drive to Christie Park Gate	1.465	\$51,681,975	\$35.3
	6	Christie Park Gate to 69th Street	0.635	\$29,531,025	\$46.5
		Sub Total - Fixed Facilities	7.7	\$312,586,700	\$40.9
2		LRVs, (21 LRV's @ \$3.9M)		\$81,900,000	
3		Property (including residual)		\$43,000,000	
		SUB-TOTAL		\$437,486,700	
		Contingency, (on fixed facilities only)	27%	\$84,366,625	
		Engineering, 15%, on Item 1		\$46,888,005	
		Project Management, 10%, on Item 1		\$31,258,670	
		TOTAL ESTIMATE		\$600,000,000	

Note:

- 1 Estimate is based on concept design level only
- 2 Bow Trail Connector costs in the downtown are excluded

4. Conclusion and Recommendations

Conclusion

This report provides an updated alignment with drawings and a cost estimate prepared at a functional level of detail for West LRT. The report also provides a revised LRT ridership forecast based on current population and employment forecasts for the West LRT service area. As well, an explanation is provided to describe how the updated plan differs from the plan approved for West LRT. The 1988 plan drawings are provided for reference in Appendix 3.

Since plans for West LRT were approved in 1990, significant growth has occurred in the area identified as the future service area for this line. Current population and employment levels exceed the previous 1.25 million horizon year forecasts published in the 1988 West LRT Functional Study. Recent forecasts for the 1.25 million city population horizon year (expected at 2025) predict an additional 30 percent growth in population and an 18 percent rise in employment from the current (2005) levels. Additional population and employment predicted within the West LRT service area, plus 25 years of LRT operating experience suggest that future West LRT ridership will exceed the original forecasts by about 40 percent. Intensification of land use (transit oriented development) in the vicinity of several of the proposed stations could see this number increase by an additional 15 to 20 percent. As a result, it is expected that this line will carry at least 40,000 daily passengers. Therefore, West LRT represents an appropriate and timely investment from a transportation and land use perspective.

The updated plan for West LRT includes a number of recommended changes to the approved plan. In general these changes are required to reflect current LRT and roadway design standards, reduce construction and property costs, minimize land use impacts and improve station area plans. The main differences from the approved plan are: a) an increase in the length of elevated structures in the area east of 37th Street SW, b) a revised alignment for West LRT to exit the downtown, and c) location of LRT within the 17 Avenue SW right of way.

Prior to detailed design and construction of this line, several outstanding issues require resolution.

- Pedestrian and vehicular access to the Telus World of Science building and Millennium Park (this will depend on the future use of the former Science Centre building).
- Final design of Bow Trail east of 33 Street SW.
- A land use plan for the potential redevelopment of Westbrook Mall and Calgary Board of Education lands between 33 and 37 Street SW.
- Land use plans (urban corridor design) for other areas adjacent to the LRT line.
- A community roadway plan along the north of 17 Avenue, west of 37th Street SW
- The need for a proposed West LRT spur line southwards along Sarcee Trail
- Access / egress to the park and ride lot proposed for the north portion of the Westside Recreation Centre complex.

Recommendations:

1. That the updated plan for West LRT be reviewed in a public engagement process and that a recommended plan be submitted for LPT and Council approval.
2. That a comprehensive plan for the lands in the vicinity of Westbrook Mall be prepared in conjunction with the current land owners and local communities.
3. That Transit Oriented Development land use plans be developed for the other West LRT station areas including an urban corridor plan for the area adjacent to the LRT line along Bow Trail and 17 Avenue SW.
4. That discussions be held with the Westside Recreation Centre to explore how the current parking and recreation area on the north portion of this site can be modified to accommodate facilities required for a terminal LRT station that is mutually beneficial for both parties.
5. That plans for the upgrading of Bow Trail, east of 33 Street SW be finalized in conjunction with the LRT requirements and the intention of minimizing the impact on the Shaganappi Golf Course.

Appendix 1

LRT Cost Estimates by Area

WEST LRT - AREA 1

CONCEPTUAL ESTIMATE FOR BUDGET PURPOSES

ITEM	Sub Item	DESCRIPTION	UNIT	ESTIMATED QUANTITIES	ESTIMATED PRICE [\$]	TOTAL [\$]
		WEST LRT				
		Preferred Alignment				
		11th Street to 18th Street				
		1.175				
1		Track Elements				
	1	Track work	km	1.175	1,650,000	1,938,750
	2	Grading/Drainage	km	0.125	965,000	120,625
	3	Traction power and signals	km	1.175	3,100,000	3,642,500
	4	Power supply	each	1	2,000,000	2,000,000
	5	At Grade Crossings	each	1	300,000	300,000
	6	Turnouts (incl X overs and switch heaters)	each	6	180,000	1,080,000
	7	Storage Tracks	km	0.3	1,100,000	330,000
2		Earth works				
	1	Imported Fill	m3	3000	20	60,000
	2	Traffic signal 11th Street	ea	1	250,000	250,000
3		LRT Structures				
	1	CIP Retaining Walls	m2	200	700	140,000
	2	MSE Retaining Walls	m2		550	0
	3	14th Street/CPR	m	330	30,000	9,900,000
		Special Structure over 14th Street/CPR	m	150	40,000	6,000,000
	5	Elevated Section CPR to Bow Trail	m	570	30,000	17,100,000
	6	Turnaround Track	m	300	30,000	9,000,000
4		Misc.				
	1	Landscaping	km	1.175	500,000	587,500
	2	Major Utilities	km	1.175	1,000,000	1,175,000
	3	Demolition Science Centre Deck	LS			500,000
	4	Enmax Transmission u/g	m	660	1,000	660,000
	5	Millennium Park revisions	LS			750,000
5		Station Costs				
		Sunalta Station (elevated)				
	1	Pedestrian Bridge across CPR to Sunalta	m2	1040	2,500	2,600,000
	2	Landscaping 10th Ave and ped bridge	LS			250,000
	3	Station House	each	1	3,600,000	3,600,000
	4	Escalator/elevators	each	3	250,000	750,000
	5	Platform + utilities	each	1	2,500,000	2,500,000
		Emergency Egress, west station house	each	1	1,000,000	1,000,000
	6	Side Platform	each	1	1,500,000	1,500,000
SUB-TOTAL						67,734,375

WEST LRT - AREA 2

CONCEPTUAL ESTIMATE FOR BUDGET PURPOSES

ITEM	Sub Item	DESCRIPTION	UNIT	ESTIMATED QUANTITIES	ESTIMATED PRICE [\$]	TOTAL [\$]
		WEST LRT				
		Preferred Alignment				
		18th Street to 26th Street				
		1.475				
1		Track Elements				
	1	Track work	km	1.475	1,650,000	2,433,750
	2	Grading/Drainage	km	0.415	965,000	400,475
	3	Traction power and signals	km	1.475	3,100,000	4,572,500
	4	Power supply	each	1	2,000,000	2,000,000
	5	At Grade Crossings (26th Street)	each	1	300,000	300,000
	6	Turnouts (incl X overs and switch heaters)	each	4	180,000	720,000
	7	Storage Tracks	km	0	1,100,000	0
2		Earth works				
	1	Cut to Fill	m3	0	10	0
	2	Imported Fill	m3	3000	20	60,000
	3	Stripping. (cut, store, screen, place)	m3	0	15	0
	4	Bow Trail Improvements	m2	28000	220	6,160,000
	5	Interchange Revisions Crowchild	m2		220	0
	6	Local Road Revisions	m2	4500	220	990,000
	7	Traffic signal 26th Street	ea	1	250,000	250,000
3		LRT Structures				
	1	CIP Retaining Walls	m2	280	700	196,000
	2	MSE Retaining Walls	m2		550	0
	3	10th ave/Crowchild/Bow Trail	m	1060	34,500	36,570,000
4		Misc.				
	1	Landscaping	km	1.475	500,000	737,500
	2	Major Utilities	km	1.475	1,000,000	1,475,000
	3	Roadway Utility allowance	m	800	3,000	2,400,000
5		Station Costs				
		N/A				
SUB-TOTAL						59,265,225

WEST LRT - AREA 3

CONCEPTUAL ESTIMATE FOR BUDGET PURPOSES

ITEM	Sub Item	DESCRIPTION	UNIT	ESTIMATED QUANTITIES	ESTIMATED PRICE [\$]	TOTAL [\$]
		WEST LRT				
		Preferred Alignment				
		26th Street to 37th Street				
		1.55				
		Elevated through Westbrook Area				
		Track Elements				
1	1	Trackwork	km	1.55	1,650,000	2,557,500
	2	Grading/Drainage	km	0.54	965,000	521,100
	3	Traction power and signals	km	1.55	3,100,000	4,805,000
	4	Power supply	each	1	2,000,000	2,000,000
	5	At Grade Crossings	each	0	300,000	0
	6	Turnouts (incl X overs and switch heaters)	each	4	180,000	720,000
	7	Storage Tracks	km	0	1,100,000	0
2		Earth works				
	1	Cut to Fill	m3	0	10	0
	2	Imported Fill	m3	2000	20	40,000
	3	Stripping, (cut, store, screen, place)	m3	0	15	0
	4	Bow Trail Improvements	m2	24000	220	5,280,000
	5	17th Avenue Improvements	m2	8400	220	1,848,000
	6	Local Road Improvements	m2	8000	220	1,760,000
3		LRT Structures				
	1	CIP Retaining Walls	m2	300	700	210,000
	2	MSE Retaining Walls	m2		550	0
	3	Westbrook Structure	m	800	30,000	24,000,000
	4	Special Structure over 33rd Street	m	210	40,000	8,400,000
	5	Additional width for Storage Track	m	200	15,000	3,000,000
4		Misc.				
	1	Landscaping	km	1.55	500,000	775,000
	2	LRT Major Utilities	km	1.55	1,000,000	1,550,000
	3	Roadway Utility allowance	m	1000	3,000	3,000,000
5		Station Costs				
		26th Street (at grade No Station House)				
	1	Station House	each	0	3,600,000	0
	2	Pedestrian Bridge to station	m2	0	2,500	0
	3	Escalator/elevators	each	0	250,000	0
	4	Platform + utilities	each	1	1,500,000	1,500,000
	5	Ped crossing signals	each	1	300,000	300,000
	6	Landscaping	LS	1	500,000	500,000
		37th Street Station, Elevated				
	7	Pedestrian Bridge	m2	0	2,500	0
	8	Landscaping	LS	1	500,000	500,000
	9	Station House, west/main station house	each	1	3,600,000	3,600,000
	10	Escalator/elevators	each	3	250,000	750,000
	11	Platform + utilities	each	1	2,500,000	2,500,000
	12	Emergency Egress, east station house	each	1	1,000,000	1,000,000
SUB-TOTAL						71,116,600

WEST LRT - AREA 4

CONCEPTUAL ESTIMATE FOR BUDGET PURPOSES

ITEM	Sub Item	DESCRIPTION	UNIT	ESTIMATED QUANTITIES	ESTIMATED PRICE [\$]	TOTAL [\$]
1		WEST LRT Preferred Alignment 37th Avenue to Glenside Drive 1.35 North side of 17th Track Elements				
	1	Trackwork	km	1.35	1,650,000	2,227,500
	2	Grading/Drainage	km	1.2	965,000	1,158,000
	3	Traction power and signals	km	1.35	3,100,000	4,185,000
	4	Power supply	each	1	2,000,000	2,000,000
	5	At Grade Crossings	each	2	300,000	600,000
	6	Turnouts (incl X overs and switch heaters)	each	4	180,000	720,000
	7	Storage Tracks	km	0	1,100,000	0
2		Earth works				
	1	Cut to Fill	m3	0	10	0
	2	Imported Fill	m3	2000	20	40,000
	3	Stripping, (cut, store, screen, place)	m3	0	15	0
	4	Cut and cover Tunnel	km	0	48,000,000	0
	6	17th Avenue Improvements	m2	33600	220	7,392,000
	7	Local Road Improvements	m2	5000	220	1,100,000
3		LRT Structures				
	1	CIP Retaining Walls	m2	300	700	210,000
	2	MSE Retaining Walls	m2		550	0
	3	Westbrook Structure	m	150	30,000	4,500,000
	4	Special Structure over 33rd Street	m	0	40,000	0
	5	Additional width for Storage Track	m	0	15,000	0
4		Misc.				
	6	Landscaping	LS	1	500,000	500,000
	1	Landscaping	km	1.35	500,000	675,000
5	2	Major Utilities	km	1.35	1,000,000	1,350,000
	3	Roadway Utility allowance	m	1600	3,000	4,800,000
		Station Costs				
5		45th Street (at grade No station House)				
	1	Station House	each	0	3,600,000	0
	2	Pedestrian Bridge to station	m2	0	2,500	0
	3	Escalator/elevators	each	0	250,000	0
	4	Platform + utilities	each	1	1,500,000	1,500,000
5	Ped crossing signals	each	1	300,000	300,000	
SUB-TOTAL						33,257,500

WEST LRT - AREA 5

CONCEPTUAL ESTIMATE FOR BUDGET PURPOSES

ITEM	Sub Item	DESCRIPTION	UNIT	ESTIMATED QUANTITIES	ESTIMATED PRICE [\$]	TOTAL [\$]
1		WEST LRT Preferred Alignment Glenside Drive to Christie Park Gate 1.465				
		Track Elements				
	1	Track work	km	1.465	1,650,000	2,417,250
	2	Grading/Drainage	km	1.165	965,000	1,124,225
	3	Traction power and signals	km	1.465	3,100,000	4,541,500
	4	Power supply	each	1	2,000,000	2,000,000
	5	At Grade Crossings	each	2	300,000	600,000
	6	Turnouts (incl X overs and switch heaters)	each	4	180,000	720,000
7	Storage Tracks	km	0	1,100,000	0	
2		Earth works				
	1	Cut to Fill	m3	15000	10	150,000
	2	Imported Fill	m3	6000	20	120,000
	3	Stripping, (cut, store, screen, place)	m3	0	15	0
	4	17th Ave Revisions	m2	9650	220	2,123,000
	5	Local Road Revisions	m2	200	220	44,000
6	Traffic signal Revisions at Sirocco & Christie	ea	2	500,000	1,000,000	
3		LRT Structures				
	1	MSE Retaining Walls	m2	600	550	330,000
	2	MSE Retaining Walls	m2	2500	550	1,375,000
	3	Structure from Glenside to station	m	340	30,000	10,200,000
4	Parkade at Signal Hill station	stalls	884	13,000	11,492,000	
4		Misc.				
	1	Landscaping	km	1.465	500,000	732,500
	2	Major Utilities	km	1.465	1,000,000	1,465,000
	3	Transmission towers				
		Altalink 240V	m	330	2,000	660,000
	Enmax	m	320	1,000	320,000	
4	Roadway Utility allowance	m	965	1,500	1,447,500	
5		Station Costs				
		Signal Hill Station				
	1	Station House	each	1	3,600,000	3,600,000
	2	Pedestrian Bridge to station	m2	560	2,500	1,400,000
	3	Escalator/elevators	each	4	250,000	1,000,000
	4	Platform + utilities	each	1	1,500,000	1,500,000
6	Feeder Bus Terminal	m2	6000	220	1,320,000	
SUB-TOTAL						51,681,975

WEST LRT - AREA 6

CONCEPTUAL ESTIMATE FOR BUDGET PURPOSES

ITEM	Sub Item	DESCRIPTION	UNIT	ESTIMATED QUANTITIES	ESTIMATED PRICE [\\$]	TOTAL [\\$]
		WEST LRT				
		Preferred Alignment				
		Christie Park Gate to 69th Street				
		0.635				
1		Track Elements				
	1	Track work	km	0.635	1,650,000	1,047,750
	2	Grading/Drainage	km	0.635	965,000	612,775
	3	Traction power and signals	km	0.635	3,100,000	1,968,500
	4	Power supply	each	1	2,000,000	2,000,000
	5	At Grade Crossings	each	0	300,000	0
	6	Turnouts (incl X overs and switch heaters)	each	4	180,000	720,000
	7	Storage Tracks	km	0	1,100,000	0
2		Earth works				
	1	Cut to Fill	m3	0	10	0
	2	Imported Fill	m3	0	20	0
	3	Stripping, (cut, store, screen, place)	m3	0	15	0
	4	17th Ave Revisions	m2	10350	220	2,277,000
	5	Local Road Revisions	m2	3000	220	660,000
	6	Traffic signal Revisions at 69th Street	ea	1	500,000	500,000
3		LRT Structures				
	1	CIP Retaining Walls	m2	300	700	210,000
	2	MSE Retaining Walls	m2		550	0
	3	LRT Structures	m	0	30,000	0
	4	Parkade at West side	stalls	590	13,000	7,670,000
4		Misc.				
	1	Landscaping	km	0.635	500,000	317,500
	2	Major Utilities	km	0.635	1,000,000	635,000
	3	Roadway Utility allowance	m	1035	1,500	1,552,500
5		Station Costs				
		69th Street Station				
	1	Station House	each	1	3,600,000	3,600,000
	2	Pedestrian Bridge to station	m2	600	2,500	1,500,000
	3	Escalator/elevators	each	4	250,000	1,000,000
	4	Platform + utilities	each	1	1,500,000	1,500,000
	5	CIP Retaining Walls	m2	0	700	0
	6	Feeder Bus Terminal	m2	8000	220	1,760,000
SUB-TOTAL						29,531,025

APPENDIX 2

List of Properties Impacted by West LRT

Updated Alignment

List of Properties Impacted by West LRT						May16-06		Clifton-ND Lea Consulting Inc. Job #11166
Station	Title No.	Address	Estimated Percentage of land required	Property Use	Area		Road Widening	
					Parcel m2	Net Rentable m2		
72+200	67244012	1407 9 St SW.	100	Com	3033	697		
72+590	66189705	1644 10 Av SW	100	Com	612			
72+800	200200624	1895.5 9 St. SW.		Trans	96835			
73+025	66144254	1924 10 Av SW	100	Ind	463	181		
73+050	66144205	1928 10 Av SW.	100	Com	1290	1113		
73+075	66144106	1944 10 Av SW	100	Com	1075	844		
73+100	66144007	2004 10 Av SW.	100	Com	464	495		
73+170	66165234	2005 10 Av SW	100	Ind	0	344		
73+180	66165200	2017 10 Av SW	100	Ind	1070	2524		
73+400	66184706	528 Scarboro Av SW	100	Res	730	133		
73+750	66187709	1116 Surrey St SW	25	Res	1433	122	R	
73+800	66020009	1107 Surrey St SW	20	Res	715	125	R	
74+200	65006314	2500 Bow Tr SW	20	Res	55030	5071	Jacques Lodges	
74+376	65046906	1232 26 St SW	100	Res	670	103		
74+375	65046807	1236 26 St SW	100	Res	670	105		
74+370	65058307	2615 12 Av SW	100	Res	585	103	R	
74+380	65058208	2617 12 Av SW	100	Res	654	76	R	
74+500	65081903	1400 26A St SW	100	Park	341		R	
75+200	65015000	3311 12 Av SW	100	Res	696	150		
75+250	65015109	3315 12 Av SW	100	Res	696	119		
75+300	65078404	1200 37 St SW	5	Com	126947	39561	Westbrook Mall	
75+500	65012809	1723 33 St SW	100	Inst	54370		Plains Indian School	
75+740	82118001	3515 17 Av SW	10	Com	20	1680	R	
75+800	65068108	3616 17 Av SW	100	Com	1944	196		
75+820	82240607	1904 36 St SW	100	MR Com	614	410	R	
75+850	65014003	3708 17 Av SW	5	Com	11535	2871		
75+930	65013906	3720 17 Av SW	30	Com	1609	195		
75+940	82213307	3717 17 Av SW	100	Com	1109	497	R	
75+990	64028400	3804 17 Av SW	30	Com	1073	396		
76+040	64028509	3820 17 Av SW	100	Com	1223	291		
76+100	64200306	3904 17 Av SW	50	Com	1125	120		
76+190	64198807	4004 17 Av SW	50	Com	2031	1070		
76+230	64198906	4020 17 Av SW	100	Com	1174	757		
76+280	64197353	4104 17 Av SW	100	Res	281	77		
76+285	64230709	1643 40 St SW	100	Res	281	207		
76+290	64230600	1641 40 St SW	100	Res	285	207		
76+300	64197403	4106 17 Av SW	100	Res	331	77		
76+330	64197502	4116 17 Av SW	100	Res	611	158		
76+340	64197601	1634 41 St SW	100	Res	566	78		
76+390	64053119	4208 17 Av SW	100	Inst	1178	298		
76+420	64053200	4220 17 Av SW	100	Inst	1178	182		
76+500	64224900	4308 17 Av SW	100	Com	460			
76+760	64224702	4336 17 Av SW	20	Inst	2230	1201		
76+740	64224801	4540 17 Av SW	30	Com	790			
77+000	64002207	1715 47St SW	100	Res	528	97		
77+010	64002108	1711 47 St SW	100	Res	508	97		
77+040	64002306	4908 17 Av SW	100	Res	493	97		
77+050	64002405	4912 17 Av SW	100	Res	497	97		
77+060	64002504	4916 17 Av SW	100	Res	497	97		
76+070	64002603	4920 17 Av SW	100	Res	497	97		
77+100	64002702	4924 17 Av SW	100	Res	497	97		
77+120	64002801	4928 17 Av SW	100	Res	497	97		
77+140	64002900	4932 17 Av SW	100	Res	496	103		
77+160	64509102	1 4940 17 Av SW	100	Res		92		
77+165	64509003	2 4940 17 Av SW	100	Res		92		
77+170	64508906	3 4940 17 Av SW	100	Res		92		
77+175	64508807	4 4940 17 Av SW	100	Res		91		
77+180	64508708	5 4940 17 Av SW	100	Res		91		
77+920	63198303	5615 14 Av SW	10	Inst	9960	676		
78+890	84214808	6500 17 Av SW	20	Inst	3290			

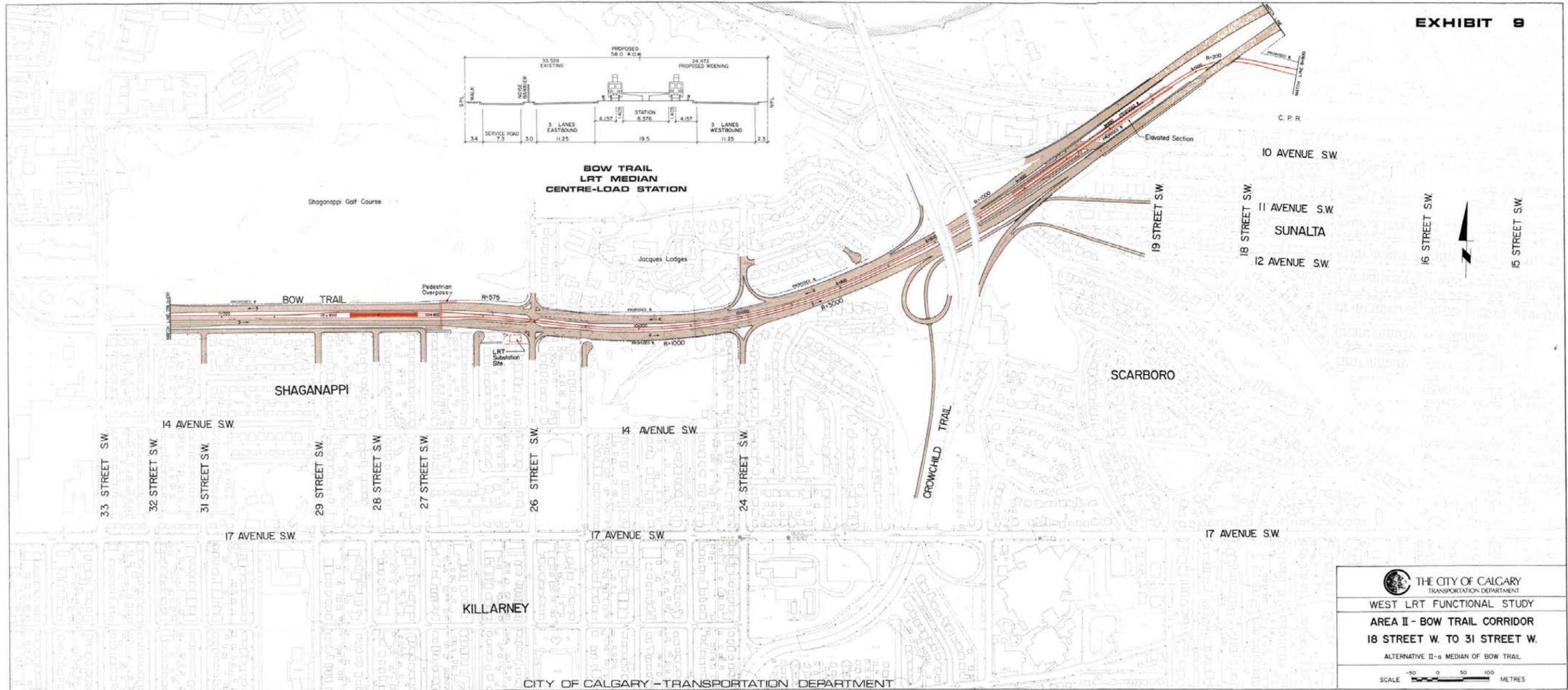
APPENDIX 3

1988 Approved West LRT Alignment Drawings

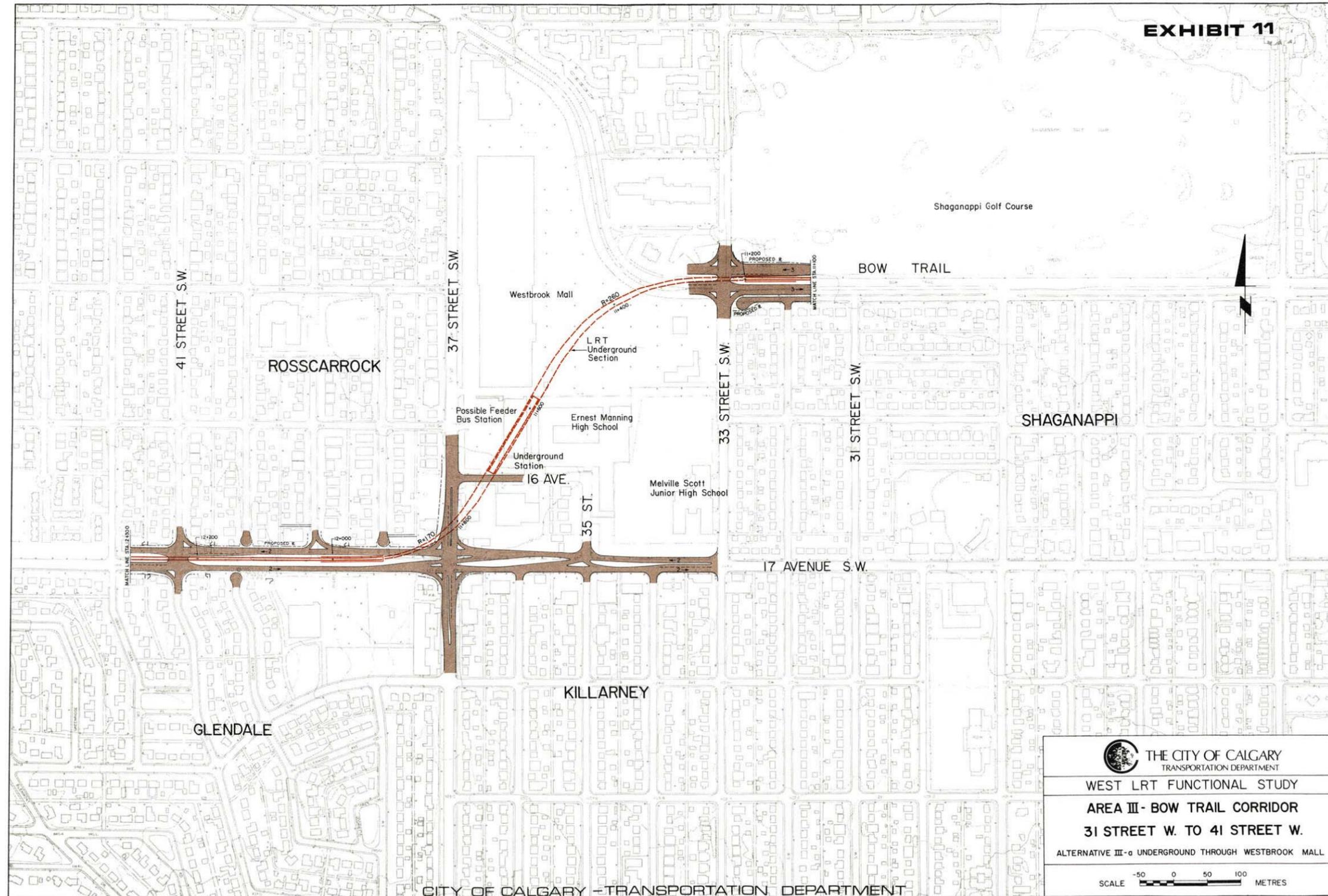
1988 Approved Alignment – Area 1



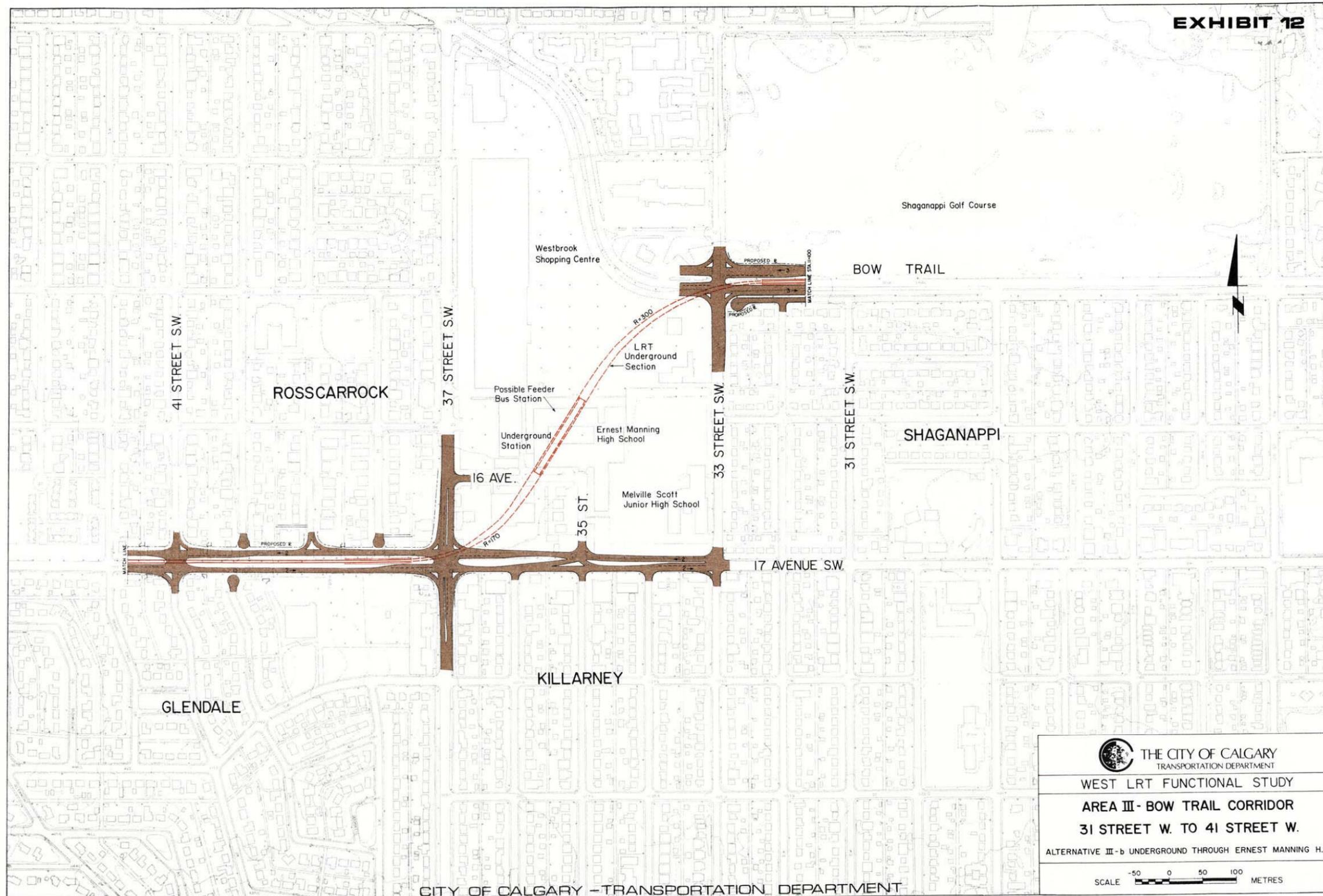
1988 Approved Alignment – Area 2



1988 Approved Alignment – Area 3 (Alternative 1)



1988 Approved Alignment – Area 3 (Alternative 2)



1988 Approved Alignment – Area 3 (Alternative 3)

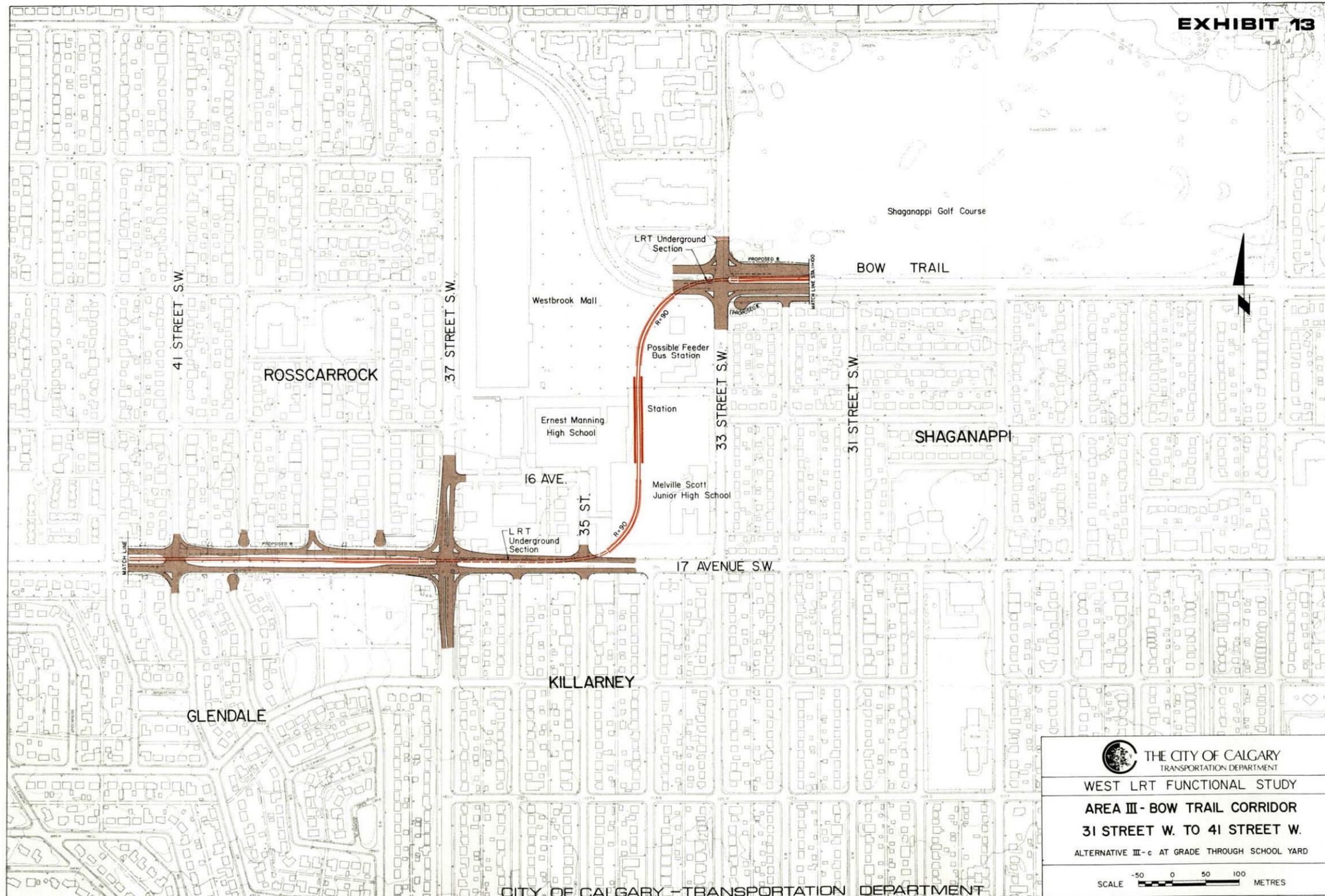
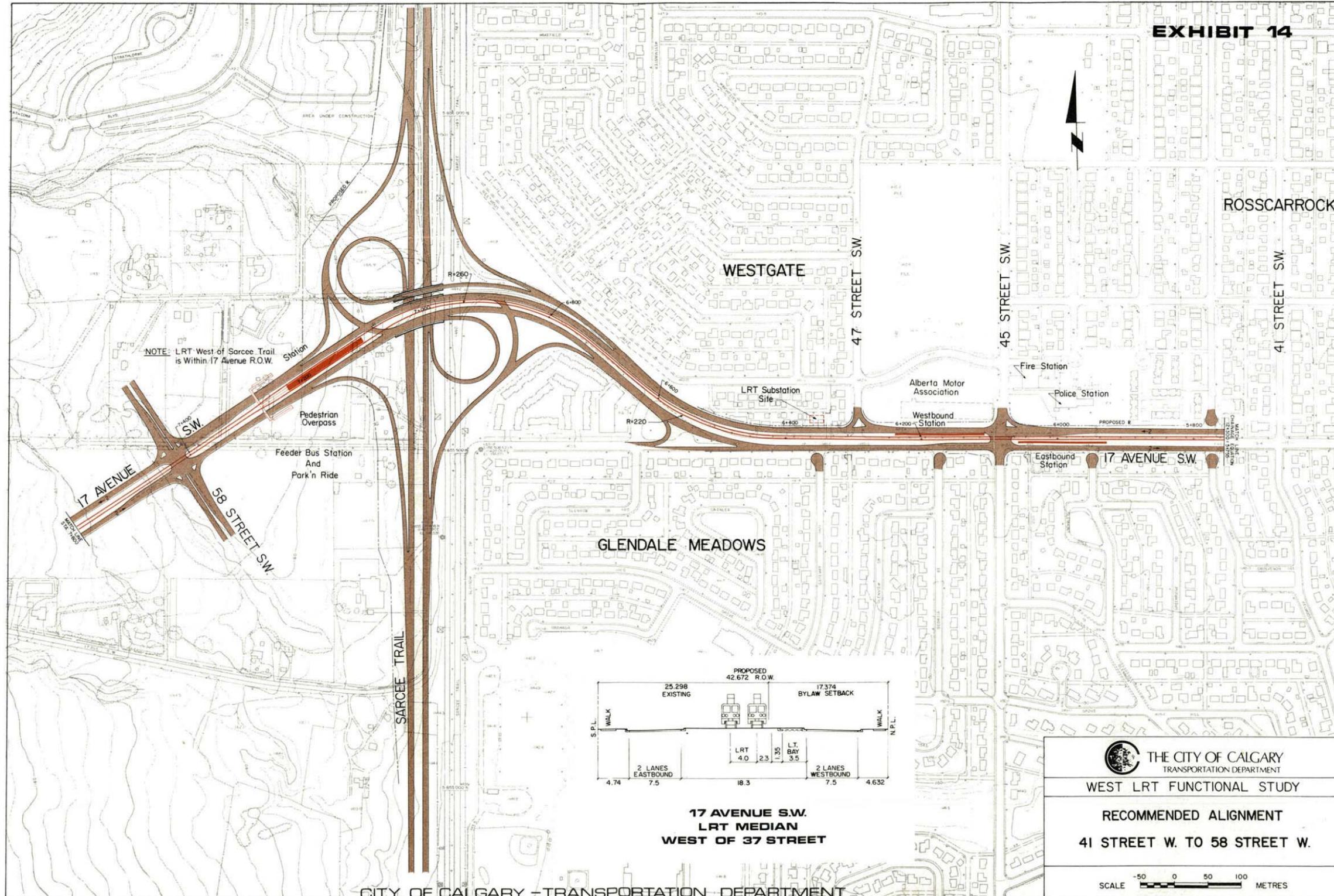


EXHIBIT 13

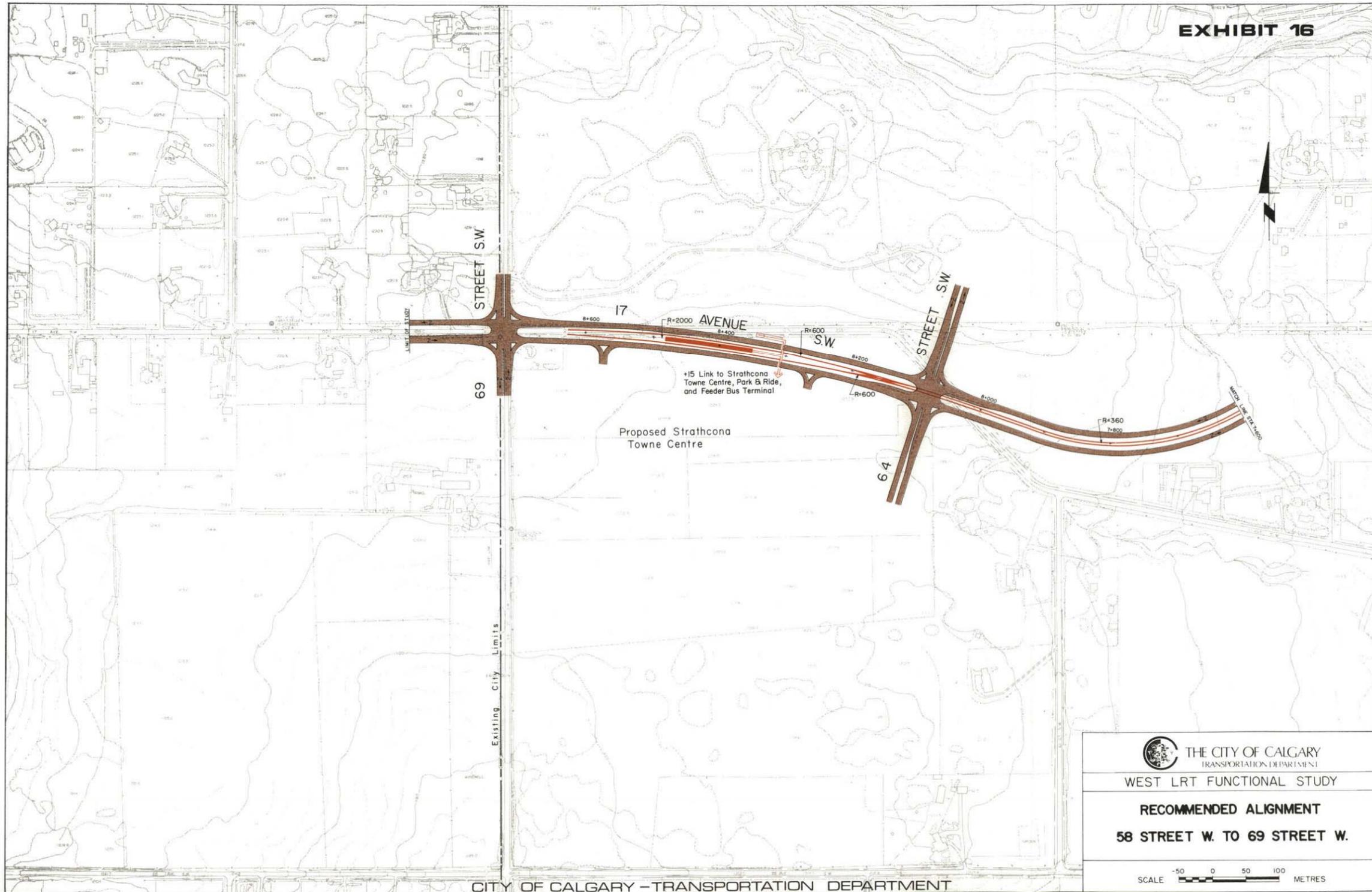
CITY OF CALGARY - TRANSPORTATION DEPARTMENT

1988 Approved Alignment – Area 4 & 5

EXHIBIT 14



1988 Approved Alignment – Area 6



Appendix 4

West LRT Technical Update:

Updated Plan

Clifton ND Lea