

Southeast LRT

Functional Planning Study

Phase III

Glenmore Trail to Elbow River

SUBMITTED TO:
CITY OF CALGARY
TRANSPORTATION PLANNING DIVISION

SUBMITTED BY:
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IN ASSOCIATION WITH:
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G WHIZ CONSULTING

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SE LRT Planning Policy Context

SUMMARY

The Southeast (SE) LRT corridor has been identified in the Calgary Transportation Plan as a future LRT corridor extending from the downtown through the SE Industrial Area through Mackenzie Towne and extends south of the Marquis of Lorne Trail. The overriding purpose of the SE LRT route is to support the growth management objectives of the Calgary Transportation Plan. Many of the policies contained in these strategic documents are focused on guiding this growth. These include provisions for employment centers, mixed-uses in new neighbourhoods that are transit supportive, and the general intensification of residential and commercial development along transit corridors.

The main objective of this study is to recommend a functional route including station locations for the SE LRT from Glenmore Trail to the edge of downtown. This route ties in with the previous studies to the south of Glenmore Trail and collectively defines a route from the edge of downtown to Marquis of Lorne Trail. Further studies are required to define the SE LRT route in the downtown core and south of the Marquis of Lorne Trail.

From previous studies, the estimated ridership for the SE LRT line is projected to be 55,000 trips per day. This is based on a 1.5 million-population threshold generating a catchment area of 230,000 people. This would result in an estimated construction timeframe of 20 to 25 years.

It is anticipated that the first stage of the SE LRT line would extend from the downtown to an interim terminal station at Douglasdale near 114th Avenue and 29th Street, for an approximate length of 12.5 km. This would have the greatest impact in shortening bus routes and attracting ridership from the southeast.

The recommended alignment follows the CPR right of way from Glenmore Trail through the community of Millican/Ogden. It then goes west over Ogden Road and along the edge of the Lynnview Ridge adjacent to CN track. It next parallels the CN tracks over the Bow River, through the Bonnybrook/Highfield Industrial district until the junction of the CN and CPR tracks in the community of Ramsay. The alignment then parallels the CPR tracks through Ramsay and ends at the Elbow River on the south side of the CPR mainline tracks.

The public consultation process included 3 meetings with a stakeholders group and 2 public open houses to solicit feed back on the alignment options and the recommended alignment. In general, the public feedback on the recommended alignment and station locations was positive, with concerns primarily related to the proposed timeline for the project.

1. INTRODUCTION

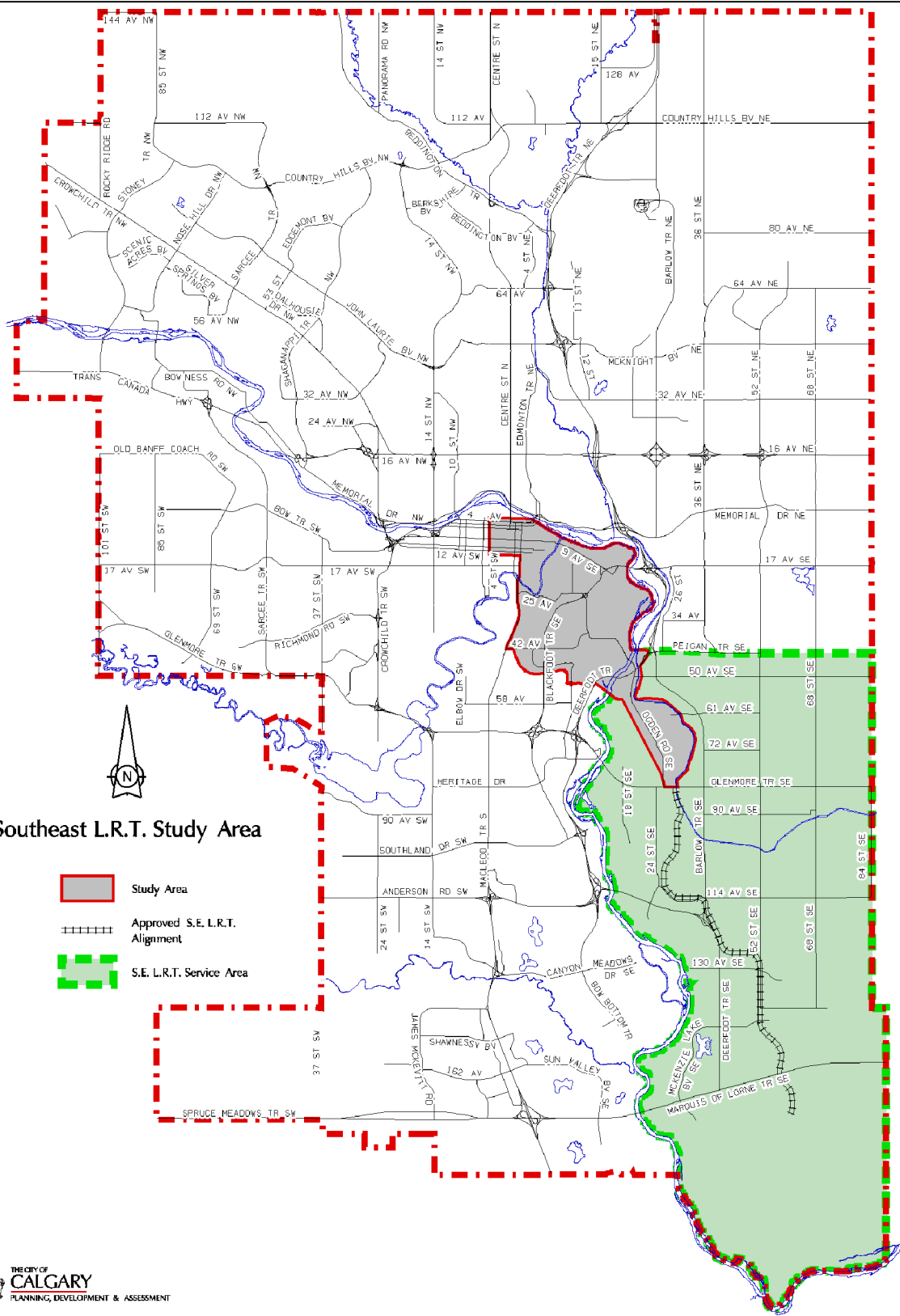
1.1 General

The City of Calgary, Transportation Planning Division issued an RFP in July of 2002 to select an engineering firm to examine, plot and report on the possible southeast route options for a Light Rail Transit line between Glenmore Trail/Ogden Road and downtown. The study area is illustrated in Figure 1. Clifton ND Lea Consultants Ltd was selected as the preferred consultant and the study commenced in October of 2002.



The History of LRT in the Southeast

The Southeast LRT Corridor has been identified through the Calgary Transportation Plan process (GO Plan) as a future LRT Corridor extending from the downtown through the Southeast Industrial area to McKenzie Town and extending south of Highway 22X, through new development lands. The current transportation bylaw map shows two options to service the southeast, a new radial line extending from downtown, or a spur line running east along Highway 22X from 52nd Street east and connecting to the south LRT Line.

In 1987, Reid Crowther & Partners (Currently Earth Tech (Canada) Inc.) prepared a study of the South East corridor and evaluated the various options for creating a mass transit corridor to serve this large residential and industrial growth area. The updated population estimate for the SE Line based on the 1.5 million population threshold, showed a population catchment's area for the line totalling 230,000, generating a ridership of approximately 55,000 trips per day. The recommendations from the report concluded that the link from the south east would overload the South LRT Line without major upgrading, and that in order to provide shorter travel times a separate route was required. To this end two functional planning studies have been previously commissioned by The City of Calgary, namely the "South Hill Study" dated October, 1999 by Reid Crowther & Partners Ltd (Earth Tech Canada Inc.) and the "52nd Street SE" study dated March, 2002 by Earth Tech Canada Inc. These studies provided functional alignments and station locations for SE LRT from Glenmore Trail, south to the Marquis of Lorne Trail. The alignment and station locations south of the Marquis of Lorne Trail are currently under review by the City of Calgary in conjunction with land use planning studies.



Southeast L.R.T. Study Area

-  Study Area
-  Approved S.E. L.R.T. Alignment
-  S.E. L.R.T. Service Area



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DATE PLOTTED: 28-OCT-2003

PROJECT:
SOUTHEAST LRT FUNCTIONAL PLANNING STUDY

TITLE SHEET:
**FIGURE 1
STUDY AREA**

Clifton ND Lea
CONSULTING INC

DESIGN BY	OFFICE FILE NO: 11025
DRAWN BY RAL	SCALE NTS
CHECKED BY	DRAWING NO. FIGURE 1
DATE Jan. '04	

1.2 Study Process

Scope

The scope of the study as originally defined was to examine all feasible LRT routes from Glenmore Trail to the downtown. It quickly became apparent that the downtown segment of the project was more complex than originally thought and involved issues that were beyond the original scope of the study. These issues included:

- ◇ What part of the downtown is the SE Line serving?
- ◇ How does the SE Line connect or interchange, with the existing system?
- ◇ How does the SE Line connect or interchange, with the future West and North Centre LRT Lines?
- ◇ What LRT technology should be used?
- ◇ How do the future LRT lines fit with the downtown transportation plan?
- ◇ How do these new LRT lines affect downtown bus service?

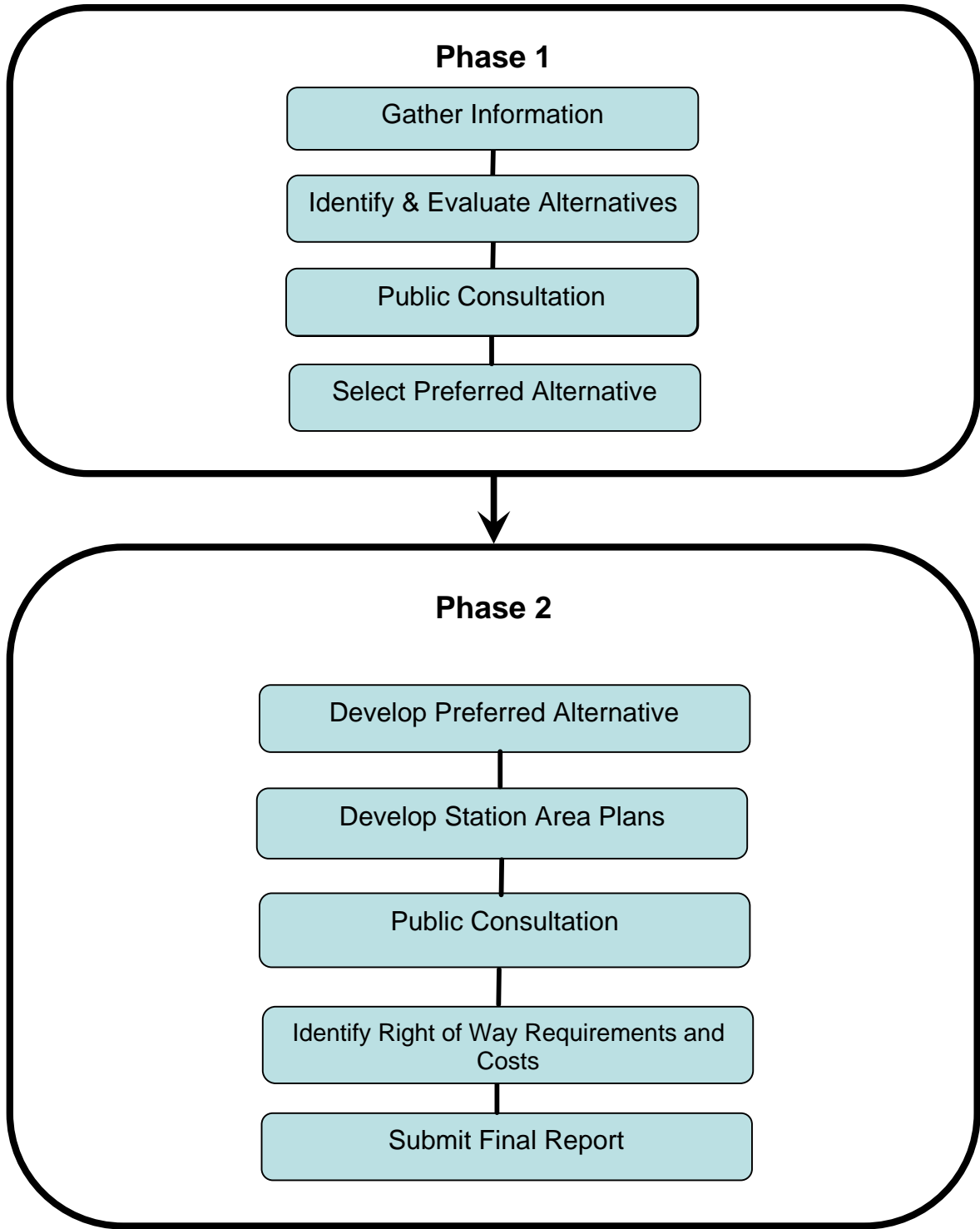
As a result of the above, the scope of the downtown portion of the study was revised and feasible routing options for Southeast LRT are included in Section 5.5. It should be noted that these downtown route options were developed subsequent to the SE LRT public consultation process. A separate Downtown LRT Functional Planning Study will identify LRT alignments for the future Southeast, West and North Centre LRT connections to the downtown. This study will include public consultation on these options and provide a final recommendation on future downtown LRT routing.

As a part of this study a great deal of time was spent discussing options and future planning with both Canadian Pacific Railway (CPR) and Canadian National (CN). As a result of the discussions with CPR it became apparent that they were unaware of the past two LRT studies noted in Section 1.1. In particular the recommend route selected in the South Hill study conflicted with the CPR's future plans for their mainline corridor south of Glenmore Trail. A portion of the South Hill alignment also was designed as a 60kph alignment and it preferably should be 80kph to minimize travel times. As a result of these two factors the South Hill alignment has been modified and included as a part of this study.

Methodology

This study was broken into two distinct phases. Phase 1 deals with the gathering of information, the identification & evaluation of alternate alignments, and the selection of a Preferred Alternative. Phase 2 deals with the issues associated with

the Preferred Alternative. It also deals with the station and station- area issues, identifies right-of-way requirements, developed a Staging Plan, and wraps the whole study up in a Final Report. This process is depicted in the following Flow Chart.



1.3 Planning Policy Context

1.3.1 Strategic Documents

LRT route and station selection is influenced and guided by a number of strategic documents (plans, policies and strategies) that The City of Calgary has developed in the last decade. The documents outline policy about consultation and communication with the community, growth management and land use, and the environment (river valleys and open space). Some of the documents are issue specific but most touch upon all of the preceding policy areas.

There is a hierarchical organization to the documents with “The Calgary Plan”(CP) sitting at the apex. The Calgary Plan seeks to integrate three major objectives – a healthy environment, growth management and healthy communities – in order to maintain and enhance the quality of life in the city. Policy developed around the first two objectives has the greatest implications for route and station location. The CP was created by drawing upon a number of planning documents, most notably the Calgary Transportation Plan (CTP). The documents are listed in Table 1 along with a brief synopsis of their goals and intent.

Table 1 Strategic documents relevant to LRT route and station location

Strategic Documents	Synopsis
Transportation System Bylaw 41M95	Defines the Calgary transportation network
Calgary Pathway & Bikeway Plan - 2000 (PB)	Comprehensive set of guiding principles relating to planning, design and management of the pathways and bikeway system
Calgary Transportation Plan – 1995 (CTP)	Strategy to balance <ul style="list-style-type: none"> • community and environmental quality; • mobility; • and cost, while accommodating Calgary’s transportation needs to a 1.25M population
Employment Centres Strategy – 1999 (EC)	Details employment centre concepts and types
Industrial Short-Term Growth Management Strategy – 2000-2004 (ISGM)	Inventories and monitors industrial land use in order to accommodate growth needs
Sustainable Suburbs Study –1995 (SSS)	Focuses on the design of new suburbs in order to: <ul style="list-style-type: none"> • reduce infrastructure costs; • and responds to the social and environmental needs of a community

The Calgary Land Use Bylaw – 1980	<p>General By-law that controls development in the City</p> <p>Defines land use designations</p>
The Calgary Plan -1998 (CP)	<p>Pre-eminent plan to guide growth and development</p> <p>A cornerstone of the growth management objective is to integrate the overall pattern of land use and the design of transportation system to:</p> <ul style="list-style-type: none"> • increase mobility options for Calgarians; • protect environmentally significant areas; • reduce the need for additional river crossings; and • increase transit use.
Transit Friendly Design Guide – 1995 (TFD)	Describes the principles and techniques for the improved integration of transit into residential and non-residential areas
Urban Parks Master Plan – 1994 (UPM)	Details a vision for a continuous integrated River Valley Park System that reflects the cities unique prairie and foothills setting

1.3.2 Implications

The overriding purpose of the SE LRT route is to support the growth management objectives of the Calgary Plan. Many of the policies contained in the strategic documents are focused on guiding this growth. These include provisions for employment centers, mixed-uses in new neighbourhoods that are transit supportive and the general intensification of residential and commercial development along transit corridors. These policies also have implication for route and station locations in mature communities, and valued parks and river systems. Key factors include:

- ◇ Public participation – There is a clear and consistent call for public involvement and consultation in those activities that affect the community and the environment.
- ◇ Increased residential density – Residential land use along transportation corridors and LRT stations should support the maximum possible densities appropriate to that area. Conversely,

areas of high residential density can support, and should be well served by transit.

- ◇ Station location – LRT stations should be centred within a community in areas that have the potential to serve as a node of activity. Location considerations should value access, mixed uses, centrality and density.
- ◇ Employment concentrations – A principal purpose of the SE LRT line is to move commuters between the southeast suburbs and the employment centre of Downtown. However transportation policy is also directed towards counter flow use and reducing east/west movement. This suggests careful consideration should be given to route selection, station location and design that would also facilitate movement of commuters from other city quadrants, increasing downtown residential population; and as a method of moving workers into the Southeast and Central industrial areas which are among the highest concentrations of employment in the city, outside Downtown.

The complete Planning Policy document which analyzes strategic and local planning policy affecting the 3 sub-areas in the study area is bound separately.

2. RECOMMENDATIONS

2.1 South of Glenmore Trail

This area extends from Glenmore Trail South, through the South Hill area to approximately 107th Avenue S.E. It is recommended that the “South Hill Study” dated October, 1999 by Reid Crowther & Partners Ltd. (Earth Tech Canada Inc.), be amended as follows:

- 2.1.1 The proposed Shepard Road Station is located just south of Glenmore Trail, in largely undeveloped land, where the road network and land parcels are currently being revised and consolidated by The City. This station is a centre platform walk- on station, with bus interface and 200 park and ride stalls, expandable to 350 stalls. Primary access to the station platform is at the south end of the station at grade across the outbound track.
- 2.1.2 The alignment be modified to meet the future requirements of Canadian Pacific Railway and that the design speed be improved from 60 kph to 80 kph.
- 2.1.3 The Glenmore Trail functional plan be revisited with the view of grade separating or eliminating the at- grade CD roads, multiple track crossing of Canadian Pacific Railway (CPR) and the future LRT.
- 2.1.4 LRT Right of Way property requirements which differ from the “South Hill Study” are as follows:

Muloney Steel: Right of way requirement goes through a portion of the lay down yard, no building impacted

Caravan Trailer Lodges of Alberta Ltd: Vacant Land

JK Molnar (Chemtron Industries): North corner of the property required no building impacts

2.2 Sub Area A, Millican/Ogden

This sub-area extends from Glenmore Trail north, through the communities of Millican, Ogden and Lynnwood to the Bow River.

- 2.2.1 It is recommended that 69th Avenue be closed at Ogden Road and that a new underpass be constructed at 74th Avenue S.E. to access the Ogden industrial lands to the northeast of the CPR.

As a result of this access change, the City will need to reinstate the truck route designation on Ogden Road Between 69th Avenue S.E. and Glenmore

Trail. Local community representatives have reviewed the proposed changes to 69th Avenue S.E. and 74th Avenue S.E., however the proposed truck route designation on Ogden Road will require additional community consultation.

Retaining walls are proposed between 78th Avenue S.E. and 69th Avenue S.E. to preserve all of the existing housing in this area, including the City of Calgary recent co-operative housing development on 76th Avenue S.E.

- 2.2.2** The proposed 69th Avenue Station is located just north of 69th Avenue S.E. in the CPR right of way. This is a centre platform walk-on station, with bus lay-bys located on Ogden Road SE. No park and ride facilities are recommended. Access to the platform is from both ends; however primary access to the station platform is at the south end across the outbound track. Property acquisition for bus lay-bys will be required in conjunction with the future widening of Ogden Road.
- 2.2.3** It is recommended that a memorandum of understanding be negotiated with CPR upon acceptance of this report, for the long term lease of portions of the CPR mainline right of way between Glenmore Trail and the Canadian National (CN) overpass of Ogden Road.
- 2.2.4** It is recommended that the LRT Crossing of Ogden Road be grade separated, and that retaining walls be constructed west of the Lynnview Ridge Station to eliminate any impacts on the existing multi-family dwellings at the top of the Lynnview Ridge.
- 2.2.5** The proposed Lynnview Ridge Station is located in the cut/fill transition near Lynnview Road. This station is a centre platform, with a bus terminal and 240 park and ride stalls, located on City owned property at the base of the ridge. This park and ride site could also serve recreational uses and is easily expandable.

Access to the east side of the station platform from the bus mall and park and ride site is via a tunnel beneath the existing CN track and a station head on the east end of the platform (similar to the Calgary Zoo station). Access for walk-on traffic from the Lynnview community would also be from the east side of the platform at grade across the outbound track.

Property (currently vacant) is required from Imperial Oil for the Station and LRT right of way from Ogden Road to Lynnview Road SE.

2.3 Sub Area B, Ramsay, Inglewood, Bonnybrook/Highfield Industrial

This sub area extends from the Bow River north through the Bonnybrook/Highfield Industrial area and the communities of Ramsay and Inglewood, terminating at the Elbow River. The recommended LRT alignment primarily uses CN and CPR right of way.

2.3.1 Bonnybrook/Highfield Industrial

2.3.1.1 Grade separations are required across the Bow River and Deerfoot Trail. The proposed grade separation of Deerfoot trail has been extended to accommodate the ramps for the future 50th Avenue connection to Deerfoot Trail. Crossing of Deerfoot Trail will require approval from Alberta Transportation.

2.3.1.2 It is recommended that a memorandum of understanding be negotiated with CN upon acceptance of this report, for the long-term lease of portions of the Industrial Spur right of way between Ogden Road and 26th Avenue.

2.3.1.3 The proposed Highfield Boulevard Station is located just south of Highfield Boulevard and west of the CN track on vacant land. This is a centre platform walk on station, with bus stops located on Ogden Road and Highfield Boulevard. No park and ride facilities are recommended. Primary access to the station platform is on the north end of the station at grade across the outbound track. Pedestrian access from the south side of Highfield Boulevard would be via a pedestrian walkway on the proposed LRT Structure over Highfield Boulevard.

2.3.1.4 Grade separations are required over Highfield Boulevard, under CN's Highfield Spur, over Blackfoot Trail and 26th Avenue. Upslope retaining walls are required on the south side to minimize impact to the existing escarpment and transmission towers. Retaining walls are also required to separate the revised CN track (which is dropping to "at grade" at Blackfoot Trail) and at the proposed CN underpass.

2.3.1.5 The proposed 26th Avenue/Blackfoot Trail Station is located between Blackfoot Trail and 26th Avenue. It is recommended that this be an optional station, and its implementation would be dependant on the development of City-owned vacant land to the west and the possible redevelopment of the Crossroads Market. This is a centre platform walk on station, with bus stops on 26th Avenue. No park and ride facilities are recommended. Primary access to the station platform is from both ends of the platform at grade across the outbound track. Pedestrian access from the north side of 26th Avenue and the south side of Blackfoot Trail would be via pedestrian walkways on the proposed LRT structures.

Two commercial properties are required for the construction of the station and LRT right of way. Both properties have building impacts.

2.3.2 Ramsay/ Inglewood

2.3.2.1 It is recommended that alignment alternative A or A4 be carried forward to Preliminary Design. Alignment alternative A is the base case

option which follows the current CN/CPR alignments through Ramsay with a station located just west of the current CPR/11th Street Underpass. Alternative A4 differs only in vertical alignment to accommodate the potential future Portland Street Connector and underpass on 11th Street.

2.3.2.2 A retained fill through the property at (1010 – 26th Avenue) together with a 22 m right of way allowance is recommended. The extra right of way width (4 metres) is required to provide maintenance access to the LRT right of way, which is cut off by the CN trackage on the north side.

2.3.2.3 A grade separation with the current CPR south line is required along with a retained fill up to the 11th Street grade separation. A grade separation of 11th Street at Portland and at the current 11th Street underpass is recommended.

2.3.2.4 Between 11th Street/Portland Street and the proposed Inglewood/Ramsay station, two buildings of historical note are impacted: the CC Snowdon Building (1912) and the Arman's Building (1926) currently the Ramsay Design Studio. Further investigation of these buildings is required to determine if the historical portion of the Snowdon building can be retained and to determine the impact of the proposed LRT on parking and emergency access to the Arman's building.

Property requirements from 11th Street/Portland to the Elbow River include 6 residential properties and portions of 11 commercial/industrial properties.

2.3.2.5 It is recommended that a memorandum of understanding be negotiated with CPR upon acceptance of this report, for the long-term lease of the right of way currently occupied by a 'y' storage track adjacent to CPR's MacLeod Subdivision. Relocation of this storage track elsewhere on the CPR system is probably required.

2.3.2.6 The Inglewood/Ramsay station is located just west of the existing 11th Street/CPR underpass in the cut fill transition. This is a centre platform walk on station, with bus interface on 11th Street SE and community shuttle bus service on the local streets. No park and ride facilities are recommended. Primary access to the station platform is on the west end of the station with a pedestrian overpass of the CPR trackage and pedestrian ramps for the Ramsay and Inglewood communities. Pedestrian access from the east is via the existing 11th Street SE under pass or via a pedestrian walkway on the proposed LRT Structure from the east side of 11th Street SE. Access to the east side of the platform would be "at grade" across the outbound track.

One commercial property with a building impact is required for the construction of the station and LRT right of way.

2.3.2.7 From Inglewood/Ramsay station west to the Elbow River, the location of a possible North Centre LRT line and its possible connection or interchange with the SE Line needs to be considered in the next phase of the study. With the future requirements of 3 additional CPR tracks and 2 LRT tracks the at grade crossing of 8th Street S.E. may need to be closed at 9th Avenue S.E.

2.4 Sub Area C, Downtown

It is recommended that a further study be commissioned to determine LRT alignments and station locations for the 3 future LRT lines to enter and operate within the downtown. These lines are:

- Southeast LRT
- West LRT
- North/Centre LRT

It is also recommended that alternative vehicle technologies for these future LRT lines be considered. Alternative vehicle technologies could include: Tram-on-tires, low floor LRT, or partial low floor LRT vehicles.

3. THE RAILWAY CONSULTATIVE PROCESS

3.1 General

A number of the route alternatives proposed for the Southeast LRT favour utilizing available rights of way within existing railway corridors. Both Canadian National (CN) and Canadian Pacific Railway (CPR) were contacted early in the planning stages to discuss the possibility of using their railway rights of way for the future Southeast LRT, to ensure that they understood the planning process, and to provide them the opportunity to be involved and provide comments on proposed functional designs within their property boundaries.

In general, the response from the railways was positive provided the proposed LRT line would not impact current or future railway operations. Both railways required conceptual plans that showed the proposed alignment of the LRT with all of their projected future requirements. Meeting these requirements varied significantly between CPR and CN. CPR is much more sensitive to the potential loss of any land within this particular right of way since it accommodates their main line and is a key link for their entire network. The CN right of way accommodates an industrial lead into the Highfield Industrial Area and also serves Calgary Metals near Ogden Road and is for local rail traffic only.

Both railways currently have agreements allowing LRT systems within their rights of way in Alberta. CN has agreements with the City of Edmonton and CPR has agreements with the City of Calgary.

3.2 Canadian National

Early discussions with CN were held to determine the planned future use of their right or way. CN advised that they are committed to retaining service into the Highfield Industrial Area and they do not anticipate any reduction in traffic within this corridor in the foreseeable future. Conceptual plans for an LRT alignment must consider unconstrained service to CN's customers in this area.

The consultation process with CN involved a site walk through with CN representatives, two meetings held in CN's regional office in Edmonton, and other communication as required. It was clear that modifications to the existing CN track layout would be required to accommodate an LRT line through this corridor. In part, this includes a requirement for retaining walls to allow for elevation differences in the tracks in the area south of Blackfoot Trail and relocating some of the yard tracks. Functional designs, included in Appendix E, were prepared and reviewed with CN. Their comments have been incorporated into the Recommended Plan.

The CN right of way between Blackfoot Trail and CN's connection to CPR's MacLeod Subdivision could not be considered for use at this time. During a visual inspection of this section of track it was concluded that this track has not been

used for rail traffic for some time. However, CN is reluctant to give up the connection to CPR, which could be used as an emergency access to the Highfield Industrial Area if required. It is possible however that CN's position regarding future requirements of this right of way could change in the future. It should be noted that our analysis has concluded that attempting to run the proposed LRT entirely within this corridor would result in a reduced design speed.

The CN right of way is largely undeveloped land and is suitable for an LRT line. It should be recognized that this land could be valuable for other industries as well, particularly those that are linear in nature.

CN was cooperative throughout the process providing information on their future requirements and comments on proposed alignments. In general, they see the proposed LRT as potential revenue in an under utilized corridor.

The Recommended Plan requires significant revision to the CN tracks. Drawings illustrating these changes are in Appendix E and are detailed as follows:

Between Blackfoot Trail SE and Highfield Boulevard SE, the existing eastern CN track is retained in its present alignment and profile. For 250 m south of Blackfoot Trail it is utilized as the main spur line (Sta. 7+250 – 7+500) and for the rest of the way it is utilized as a storage track for the adjoining business (Calgary Metals). Immediately west of the storage track a 400 m run-about track is constructed (Sta. 7+500-7+900), which follows the storage track profile. At the northern limit of the run-about track (Sta. 7+500), the main spur line shifts to the west and parallels the run-about track, climbing to tie to the Highfield spur line at Sta. 7+780. From this point the main spur line bends in an 'S' curve to match back to the original track alignment and profile at Sta. 8+080.

The Highfield spur line is newly constructed for 300 m from its tie to the main spur line at Sta. 0+780 (Sta. 7+780 on the main spur line). The alignment is adjusted to cross over the LRT before tying back into the exiting track. The existing gradient of the Highfield spur line is extended from the main spur line, across the LRT, and to the horizontal tie point.

CN has a small yard between Highfield Boulevard and Deerfoot Trail. The two eastern tracks and the east service track are retained in their current alignment and profile. The main spur line is realigned (from Sta. 8+400-8+800) to run down the centre yard track. The two western storage tracks of the yard are lost to the LRT alignment. At the southern limit of the yard the main spur line is realigned (Sta. 9+050-9+300) to parallel the existing CN track for 200 m (Sta. 9+300- 9+500) before bending back to align with the Deerfoot Trail overpass. The existing track becomes a storage track to replace the existing storage track that follows the Highfield escarpment. The latter must be abandoned due to the LRT alignment.

3.3 Canadian Pacific Railway

Canadian Pacific Railway was approached early in the planning process to discuss the potential use of their right of way in two distinct areas. The first area is adjacent to their main line from Glenmore Trail past their Ogden Yards and continuing to the proposed grade separation over Ogden Road. The majority of this area is included in Sub Area A. The second area is along (and over) CPR's Macleod Subdivision in the community of Ramsey, continuing adjacent to the CPR 'y' trackage and main line right of way to the Elbow River.

The consultation process with CPR included a hi-rail trip on CPR's main line from 11th Street SW in downtown Calgary to 68th Street SE, east of CPR's Intermodal Yard. It also included three meetings with CPR and City of Calgary representatives to evaluate options and solicit feedback from CPR. CPR was provided with copies of draft drawings to allow them to circulate internally for comments. This was an iterative process, which evolved to the development of alignment configurations discussed in Section 6.

CPR explained that the proposed route runs adjacent to their main line for most of the route and a secondary main line for the balance. Any and all future railway growth required through this corridor is limited to the existing lands that they own. It is extremely difficult for railways to expand their rights of way in an urban environment. It was established that CPR would describe their anticipated future requirements within this corridor and the functional plan would have to demonstrate that the existing right of way could accommodate both the CPR and the LRT requirements without impacting CPR operations.

CPR's requirements, in part, are summarized below:

- An additional five tracks could be required within the right of way adjacent to Ogden Road.
- Maximize the number of tracks between Ogden Yard and the Calgary Intermodal Yard, located between 52nd Street and 68th Street S.E. and 114th Avenue S.E.
- The current access into Ogden Yard at 69th Ave could not function with potentially six or seven CPR tracks and two LRT tracks (this is discussed further in Section 6).
- The current level of service on the Macleod Subdivision and the adjoining 'y' track in Ramsay could not be compromised. The storage track adjacent to the west leg of the 'y' can be relocated.
- CPR required continual access to the area near the 'y' track.
- An additional three tracks may be required over the Elbow River south of the existing river crossing.

CPR does not have a fixed timeline for their expansion requirements. Therefore, it is unknown whether the SE LRT or CPR may be constructed first. Work should be

coordinated to accommodate the ultimate alignment goals for both parties. This would apply to embankment widening north of Glenmore Trail, construction of the 74th Avenue underpass, and construction along Ogden Road.

3.4 Negotiations With Canadian National and Canadian Pacific Railway

Railway rights of way are governed under federal jurisdiction. In the absence of a trigger within a governing federal regulation, the railways are not required to seek approval or provide notification for the construction of trackage on their lands. CN and CPR both have the right to build track (and potentially other fixed assets) to meet railway needs without municipal or provincial approval or requiring public notification. This could significantly impact the viability of these portions of the functional plan. Furthermore, the current Canadian railway business environment, coupled with the restriction of land availability within the urban environment, could result in the railways future vision changing. Railway traffic volumes, direction of flow, etc. are driven by their customers needs and can change. A cooperative approach is highly recommended.

It is recommended that a memorandum of understanding be negotiated with both CN and CPR upon acceptance of this report.

4. THE PUBLIC CONSULTATION PROCESS

4.1.1 Summary

The Communication Plan developed for the public consultation process was designed to provide ongoing opportunities for the public to review discuss and provide input on the data being generated by the engineering consultants. Specifically, the process was geared to uncovering issues and concerns related to the six preliminary LRT alignment options, and the preferred alignment, being considered by the engineering consultants and City administration.

Personal contact was made with approximately 30 community association representatives in Inglewood, Ramsay, Millican-Ogden, Victoria Park, and Connaught, businesses located within the Study boundaries and the Ward Alderman to develop the Stakeholders list for this project. Interest in the project did not reach a high level of attention. Contributing factors are thought to be the 20+ year timing horizon of the project and the fact that very few people – either residents or businesses – were to be impacted by any of the proposed options.

A higher level of interest surrounded the second Open House held on April 8, 2003. The contributing factor was the presentation of the “11th Street Option” alternative developed prior to the Open House and shared with the community representatives prior to the Open House. The presentation of the new alternative utilizing land along the west side of 11th Street caused concern among Ramsay community residents and business owners. This resulted in a comparatively higher turn out at the Open House and a very high rate of response and comments from the attendees.

The communication initiatives for the Southeast LRT Planning Feasibility Study have been itemized and summarized as follows:

4.1.2 Stakeholders Meeting – 2002 November 26, Fort Calgary

Sixteen stakeholders attended. These included community representatives from Inglewood, Ramsay, Ogden/Millican, East Village, Connaught, and Victoria Park as well as local business representatives including the Calgary Stampede.

The study objectives and proposed timelines were discussed. Most participants expressed concern with the long lead-time before the line was slated for construction.

Stakeholders reviewed five alignment options and the consensus was to retain Options 1, 2 and 3 for more detailed study.

4.1.3 Public Open House – 2003 January 22, Ramsay Community Hall

Eighty-two people, mostly residents of the communities of Ramsay, Inglewood, Ogden/Millican and Victoria Park attended the open house and provided comments on the alignment options.

Most written comments indicated general support for Option 1, and some support for Option 2.

Some comments indicated opposition to a station in Ramsay due to concern with neighbourhood impacts and requests to minimize property and building impacts.

Build it sooner was a common theme.

4.1.4 Stakeholder Meeting – 2003 February 11, Glenmore Inn

Six members of the Stakeholder team attended to consider input from the public open house and review the proposed alignment (Option #1) and station locations.

Comments on the draft plan included:

- ◇ A request to improve the quality of the pedestrian walkways that are within 11th St S.E. CPR underpass
- ◇ Provide good bus access to stations
- ◇ Consider an 11th St S.E. alignment with 11th St going under the LRT and CPR tracks to eliminate delays and short cutting caused by train blockages.
- ◇ No specific concerns were raised with the alignment presented.

4.1.5 Ramsay Stakeholder Meeting – 2003 April 7, CNDL Offices

Ramsay community representatives attended a special meeting to review a new alignment option involving 11th St S.E. with a station located on 11th Street. Concerns were raised regarding community impacts.

4.1.6 Public Open House – 2003 April 8, Ramsay Community Hall

One hundred and five people attended, most were residents of Ramsay with some from Inglewood and Ogden/Millican.

Most comments received indicated opposition to the 11th St SE alignment option and support for the 'base' alignment that generally follows the CPR and CN railway trackage.

4.1.7 Expanded Stakeholder Meeting – 2003 November 20, Fort Calgary

This meeting was called to bring together stakeholders and interested members of the public who have been involved in the study to review the preferred alignment and related items that will be recommended in the final report. It was also an opportunity to briefly review the downtown options being considered, and to invite public participation in a Downtown LRT stakeholders group.

4.1.8 Web Site

Project information was displayed and updated regularly on the Calgary Transit web site at www.calgarytransit.com.

4.1.9 Other Public Interface

A presentation was requested by the Ramsay community association and made by a City of Calgary representative. Newsletter information was provided upon request by community associations and the Ward Alderman.

5. THE ROUTE SELECTION PROCESS

This section summarizes the alternative routes examined for the Southeast LRT Functional Planning Study and identifies those proposed for further analyses. The routes have been developed by the sub-areas designated in the Terms of Reference and shown on Figure 1 - Study Area. Sub-area A is comprised of the general area of the community of Ogden and the CPR Ogden yards with the south study boundary being Glenmore Trail; Sub-area C is comprised of the downtown with the east limit defined as the Elbow River and the south limit defined as 17th Avenue; and Sub-area B incorporates the general commercial\industrial areas between Sub-area A and Sub-area C, loosely bounded by McLeod Trail on the west and the Bow River on the east. It includes the residential neighbourhoods of Inglewood and Ramsay.

The route options developed are shown on Figure 2 – Preliminary Options. Alternatives developed for Sub-areas A and B were compared on a **macroscopic** level and the least desirable options were dropped from further study. Figure 2 shows the routes proposed for further study in magenta and those examined and dropped from further study in blue. Three route options in sub area B were selected for further study. These routes options were presented to the Stakeholders Workshop in November /2002.

The following text describes the routes and notes their key assets and constraints.

5.1 Sub-Area A – CPR Ogden Yards

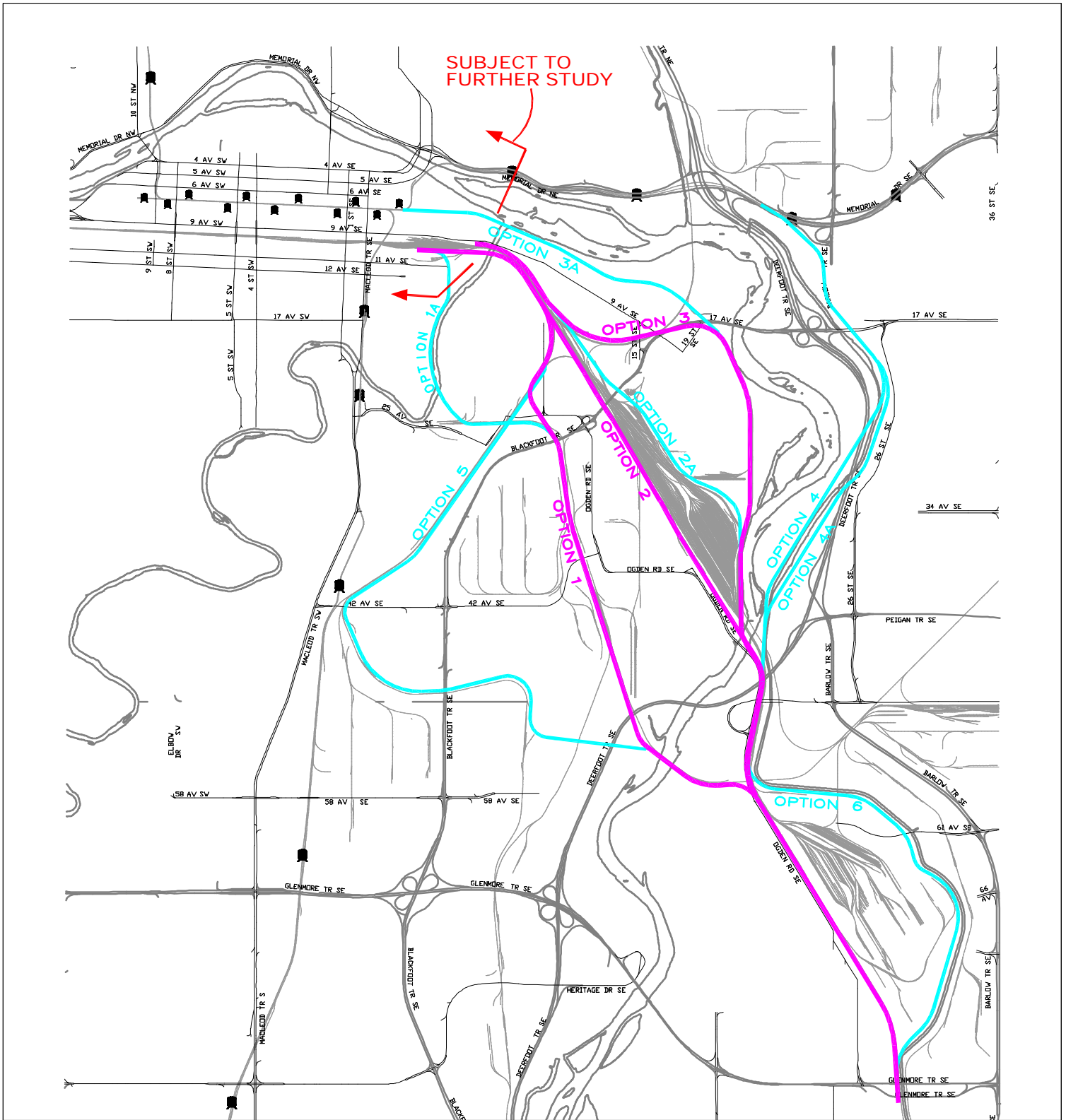
Study Sub-Area A has a southern limit of Glenmore Trail and its northern limit coincides with the northern limit of the CPR Ogden Yards. Two options were examined for this area. A brief description of each is given below.

5.1.1 OPTION 1

Option 1 parallels the CPR mainline tracks from Glenmore Trail to the northern limit of the CPR Ogden Yards. The LRT alignment is located immediately west of the existing CPR tracks and on the eastern edge of the residential neighbourhood of Ogden (see Figure 2).

5.1.2 OPTION 6

Option 6 starts on the west side of the CPR mainline tracks at Glenmore Trail and crosses the tracks via a grade separation before following the irrigation canal around the east side of the Ogden Yards. The alignment crosses at grade the 61st Avenue access to the Ogden Yards as well as the north CPR track access to the Ogden Yards before returning to the CPR mainline tracks (see Figure 2).



Southeast LRT Study Area

The study area extends east of Macleod Trail to west of Barlow Trail, north of Glenmore Trail to just South of the Bow River.

		KEY: PREFERRED OPTIONS OPTIONS DISCONTINUED	PROJECT: SOUTHEAST LRT FUNCTIONAL PLANNING STUDY
DESIGN BY DRAWN BY RAL CHECKED BY DATE JAN. '04	OFFICE FILE NO: 11025 SCALE NTS DRAWING NO.		TITLE SHEET: PRELIMINARY OPTIONS
FIGURE 2			

5.2 Comparison of Options Sub-Area A

Option 6 has the following advantages/disadvantages in comparison to Option 1

- ◇ Increased length (940 m) and increased travel time
- ◇ Greater property acquisition
- ◇ Reduced potential to provide LRT service to the Ogden/Lynnwood communities
- ◇ Increased grade separations for existing railway infrastructure (3)
- ◇ The Stakeholders Workshop group could not see any advantages to Option 6

Option 1 has the following advantages/disadvantages in comparison to Option 6

- ◇ It is the most direct route
- ◇ Option 1 provides the greatest LRT service potential to the Ogden/Lynnwood communities
- ◇ The 69th Avenue access to the Ogden Yards would need to be grade separated and relocated east.
- ◇ There will be residential property impacts and retaining walls between Glenmore Trail and 69th Avenue.
- ◇ There may be increased noise and traffic in the community, which would require mitigation. Noise mitigation must be in accordance with the City of Calgary Surface Transportation Noise Policy.

5.2.1 SUB AREA A RECOMMENDATION

Option #1 be carried forward to the functional design stage.

5.3 Sub-Area B – Route To Downtown

Five 'base' options were developed to connect to the downtown (see Figure 2):

- ◇ Option 1 mainly follows the CN Industrial spur line rights-of-way. It does this from the northern limit of the CPR Ogden Yard to 20th Avenue, it then follows the CPR Macleod Subdivision right of way for a short distance before following a City owned right of way to the Elbow River and into the downtown core. This is a relatively direct route to the downtown with little conflict.
- ◇ Option 2 provides the most direct route to the downtown core. It follows the CPR mainline tracks continuously from the northern limit of the CPR Ogden Yard through the CPR Alyth Yard to the Elbow River and into the downtown core. Although the alignment is the most direct, it has significant conflicts in the CPR Alyth Yard, and the CPR mainline corridor.
- ◇ Option 3 generally follows the CN spur line to the old Petro-Canada site and the abandoned CN right-of-way north of this. At Blackfoot Trail it bends to the west following the roadway until it meets the CPR north line and parallels this to the Elbow River. This alignment is relatively direct but does impact on the CPR/CN interchange yard north of the Bow River and the ongoing residential development by the Bow River near 22nd Street.
- ◇ Option 4 minimizes the length of construction by tying into the northeast LRT line at the Barlow Trail LRT station. The alignment follows the CPR mainline tracks to Deerfoot Trail then follows the irrigation canal through the Bow River Valley to 17th Avenue, where it parallels Barlow Trail to Memorial Drive and the Northeast LRT line. Option 4 has significant impact (environmental and geotechnical) to the Bow River Valley as well as impacts to Memorial Drive and the Northeast LRT line.
- ◇ Option 5 consists of an indirect route that follows a series of rail lines through the industrial area to the downtown core. From the northern limit of the CPR Ogden Yard the alignment follows the CN Industrial spur line across the Bow River then heads west over Deerfoot Trail to the CPR south industrial spur and parallels it westward to the CPR MacLeod Subdivision which is then followed to the Elbow River. As well as being indirect, Option 5 impacts many business developments and overlaps the service area currently covered by the south LRT line in the vicinity of 42nd Avenue.

Variations were also developed for the first four of these routes, as follows (see Figure 2).

- ◆ Option 1A is identical to Option 1 from the CPR Ogden Yards to Blackfoot Trail. North of Blackfoot Trail, the alignment bends to the west and goes down the old CN right-of-way on 25th Avenue. This was recently acquired

by the City. The alignment then bends back to the north around 6th Street, crosses the Elbow River and follows it through the east edge of the Stampede Grounds.

This alignment is not favoured due to the potential impact to the lineal park system along the Elbow River. The Stampede Board representatives at the Stakeholders workshop were also not in favour of this option.

- ◆ Option 2A is similar to Option 2, but circles around the east side of the CPR Alyth Yard. From the northern limit of the CPR Ogden Yard, the alignment passes under Deerfoot Trail and then crosses over the Bow River, the CPR mainline tracks, and the interchange track linking the Alyth Yard to the CN spur line for the old Petro-Canada site.

This alignment is not favoured since grade separations would be more extensive than Option 2.

- ◆ Option 3A is identical to Option 3 from the northern limit of the CPR Ogden Yard to 9th Avenue. North of this point the alignment continues along the old CN right-of-way, through the residential neighbourhood of Inglewood and along the Bow River until it meets the Elbow River.

This alignment is not favoured due to impacts to the Inglewood, Fort Calgary, and the East Village redevelopment.

- ◆ Option 4A is a variation of Option 4, but crosses over the irrigation canal when the alignment crosses the CPR mainline and the CN Petro-Canada spur line immediately south of the Bow River. Option 4A then parallels the irrigation canal on its east side until 17th Avenue. From this point it connects to the Barlow – Max Bell LRT station in the same manner as Option 4. Option 4A does not impact the Inglewood Golf Course by being on the east side of the irrigation canal but results in much of the alignment being on the Bow River embankment slope – a less desirable geotechnical condition.

5.4 Comparison of Options Sub-Area B

Preliminary screenings of options were undertaken for Sub-Area B and the less desirable options were dropped from further study. For Sub-Area A this was a straight-forward comparison of the two alternatives. For Sub-Area B, a comparison of the key issues was undertaken to weigh the overall benefits and disadvantages of the options.

In Sub-Area B, the comparison criteria were divided into three general categories; Design Issues, Impacts, and Costs. The comparisons were evaluated on the relative impact between the options. The overall results are shown in Figure 3. Preliminary Comparison of Route Options for Study Sub-area B. A brief discussion of the criteria is given below.

5.4.1 DESIGN ISSUES

Grade Separations – Options 1 and 3 minimize grade separations. Options 4 and 4A require lengthy grade separations to cross Deerfoot Trail and the adjacent irrigation canal. Option 2 requires an extensive grade separation through the CPR Alyth yards. Option 2A requires grade separations for the CPR/CN interchange yard and the crossing of the Alyth Yard fuelling station. Option 3A would require a grade separation north of Fort Calgary to retain the continuity of the park. Option 1A requires grade separation through the Stampede Grounds to maintain pedestrian pathways and the linear parkway

Road Network Impacts – The tie-in of Options 4 and 4A to the existing northeast LRT line will require widening of the existing station and revision of both carriageways on Memorial Drive to accommodate the widening. Option 2A impacts the road network on the east side of the CPR yards. Option 5 requires several at-grade crossings through the industrial area. Option 3A impacts the road network in Inglewood and the East Village. Options 1, 1A, 2, and 3 minimize impacts by following the existing rail lines and major arterial roads.

Railway Impacts – Options 4 and 4A do not impact existing rail lines as they minimize the contact with them. Options 1 and 1A parallel abandoned lines and low utilization spur lines before paralleling the CPR mainline. Options 3 and 3A impact on the CN\CPR interchange tracks and parallel a low utilization spur line. Option 5 parallels both CN and CPR spur lines and the CPR main south line before meeting with the CPR mainline. Options 2 and 2A adversely impact on operations of the CPR Alyth Yard.

River Crossings – Options 4 and 4A cross only the irrigation canal adjacent to the Bow River. The remaining options, except Option 1A cross the Bow and Elbow Rivers at existing river crossing locations. Option 1A crosses the Bow River at an existing river crossing location but has a new crossing location across the Elbow River.

Service Area Potential – Options 1, 1A and 5 have the greatest potential service areas, although parts of the potential service area for Option 5 overlap with the service areas of the existing south LRT line. The potential service area of Options 1 and 1A are limited by the Highfield escarpment but Option 1A may also serve as a second LRT access to the Stampede Grounds. Options 3 and 3A can service the neighbourhoods of Inglewood and Ramsay. Options 4 and 4A have limited potential to serve the neighbourhoods of Dover and Forest Lawn, as most of the alignments run through the river valley. Options 2 and 2A are the most limited, as the CPR Alyth Yard cuts the potential service area in half.

5.4.2 IMPACTS

Residential – Options 1, 1A, 2, 2A, and 5 do not directly impact existing residential development, with the exception of the north edge of Ramsey for Option 1. Options 3, 4, and 4A impact the edge of residential areas abutting the river valley. Option 3A has the greatest impact, as it cuts through Inglewood and the East Village.

Business – Options 3A, 4, and 4A minimize impact to existing businesses. Option 1, 1A, and 3 have some impact to existing businesses but also have potential to trigger redevelopment. Options 2 and 2A impact the businesses adjacent to the CPR Alyth yards. Option 5 will require the acquisition of several businesses to allow its construction.

Stampede Grounds – Only Option 1A impacts on the Stampede Grounds. There is potential for an additional station to service the grounds but the alignment will impact potential land uses.

Parkland\Green Space – Options 1, 2, 2A, and 5 minimize the impact to green space. Option 3 impacts a small portion of the Bow River valley. Options 3A, 4, and 4A impact significant lengths of the Bow River Valley while Option 1A impacts a portion of the Elbow River green space.

Environmental - Options 4 and 4A have the greatest impact to the environment with their extensive lengths within the Bow River Valley. Options 1, 2, 2A and 5 minimize contact with environmentally sensitive areas.

5.4.3 COSTS

Land – It has been assumed that the construction of LRT may be within the existing CPR\CN lands where the alignments parallel existing tracks (i.e.: lease arrangement) or alignments will maximize use of land currently owned by the City; land costs compare the purchase of other private properties. Options 1 and 2 follow existing rail lines continuously and minimize purchase of other lands. Option 3A follows the old CN right-of-way purchased by the City; some of this land has been sold as residential lots. Options 1A and 2A require minor acquisitions of private properties. Options 3 and 5 will require moderate acquisitions of private properties whilst Options 4 and 4A have the shortest construction lengths and require the least acquisition of property.

Construction costs – Option 1 is relatively direct with a minimum of grade separations and is projected to be the least costly. Options 1A has more grade separations and is projected to be marginally more costly whilst Options 3 and 3A require a complex crossing of the Bow River and rail tracks and alterations to the CN\CPR interchange yard. Options 2 and 2A, whilst the most direct will also require significant grade separations and

represents a significant increase in costs. Option 5 is 1/3 longer than the other options and requires signalization of numerous at-grade crossings. Options 4 and 4A, whilst possessing the shortest construction lengths require the widening of the median at the connection to the northeast LRT line and a corresponding realignment of the Memorial Drive carriageways. These are projected to be the most costly alternatives.

Travel Time – Based on the total travel lengths from Glenmore Trail to downtown, the shortest length is on Option 2, followed closely by Options 1, 1A and 2A, then Option 3, followed by Option 3A and, lastly. Options 4, 4A and 5.

5.4.4 PRELIMINARY FINDINGS

Options 2A, 3A, 4, 4A, and 5 were eliminated from further study based on the above analysis. Option 1A was also eliminated based on the initial response of representatives from the Stampede Board, and the impact the alignment had on the Elbow River pathway was deemed to be unfavourable.

Options 1, 2, and 3 were taken forward to the stakeholders' workshop for public input.

The preliminary assessment of these options shows that Option 2 would only be chosen if CPR moves its Alyth Yard before construction of the southeast LRT line takes place. Option 1 is preferred as it is more direct than Option 3 and has less impact. While Option 3 is a viable alternative it impacts on the CPR/CN interchange tracks, the residential development near 8th Avenue and 23rd Street SE, and requires the purchase of land along Blackfoot Trail and the north side of the CPR tracks.

5.4.5 SUB AREA B, RECOMMENDATION

The unadjusted rankings or score of options 1, 2, and 3, is 47, 36 and 38 respectively out of a possible score of 56. A further examination of the key issues of these 3 options namely, constructability, construction cost and community impacts, essentially eliminates Options 2 and 3, as discussed below.

The portion of Option 2 that is located adjacent to Alyth Yard and CPR's mainline trackage requires continuous grade separation to fit the alignment into the available space and to avoid conflicts with the numerous industrial spurs in the yard. The cost premium over an at-grade system is approximately \$25,000 per linear metre, for a total premium of \$40M. In addition to this there would be constructability issues working close to the railway to allow for column construction and beam erection. There is also the issue of derailment risk on the CPR mainline impacting the LRT columns. In all likelihood the columns would need protection, which would

add to the construction costs. CPR would also not welcome the construction related impacts to the mainline corridor, and it is unlikely that any agreement could be reached with the railway for this route option, without significant penalty clauses for construction related delays and slow orders.

It is therefore recommended that this Option #2 be dropped from further evaluation.

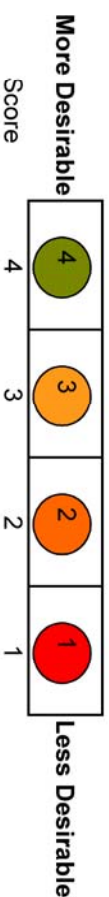
Option 3 involves a complex crossing of the Bow River combined with a grade separated crossing of the CPR mainline and CN branch line at the southern throat of Alyth Yard. The northern abutment of this crossing requires the relocation of the CN/CPR interchange Yard and CN's branch line, to minimize the impacts on the Bow River and the regional path system for approximately 800 m. The cost premium for this structure (excluding the Bow River Crossing) and associated trackage revisions is in the order of \$17M. This option was viewed as the least favourable by the stakeholders group, who had concerns with the alignment limiting the expansion of the Inglewood bird sanctuary into the green space to the west (old Petro-Canada site), and further isolation of the south Inglewood residential area with the alignment cutting off access to the Bow River and along 17th Avenue/Blackfoot Trail. This option also impacts 18 residential lots near 8th Avenue and 23rd Street S.E., and the Bow Valley linear park system between 22nd Street and 20th Street S.E.

For these reasons it is recommended that Option #3 be dropped from further evaluation.

Therefore it is recommended that Option #1 be carried forward to the functional design stage (see Figure 4).

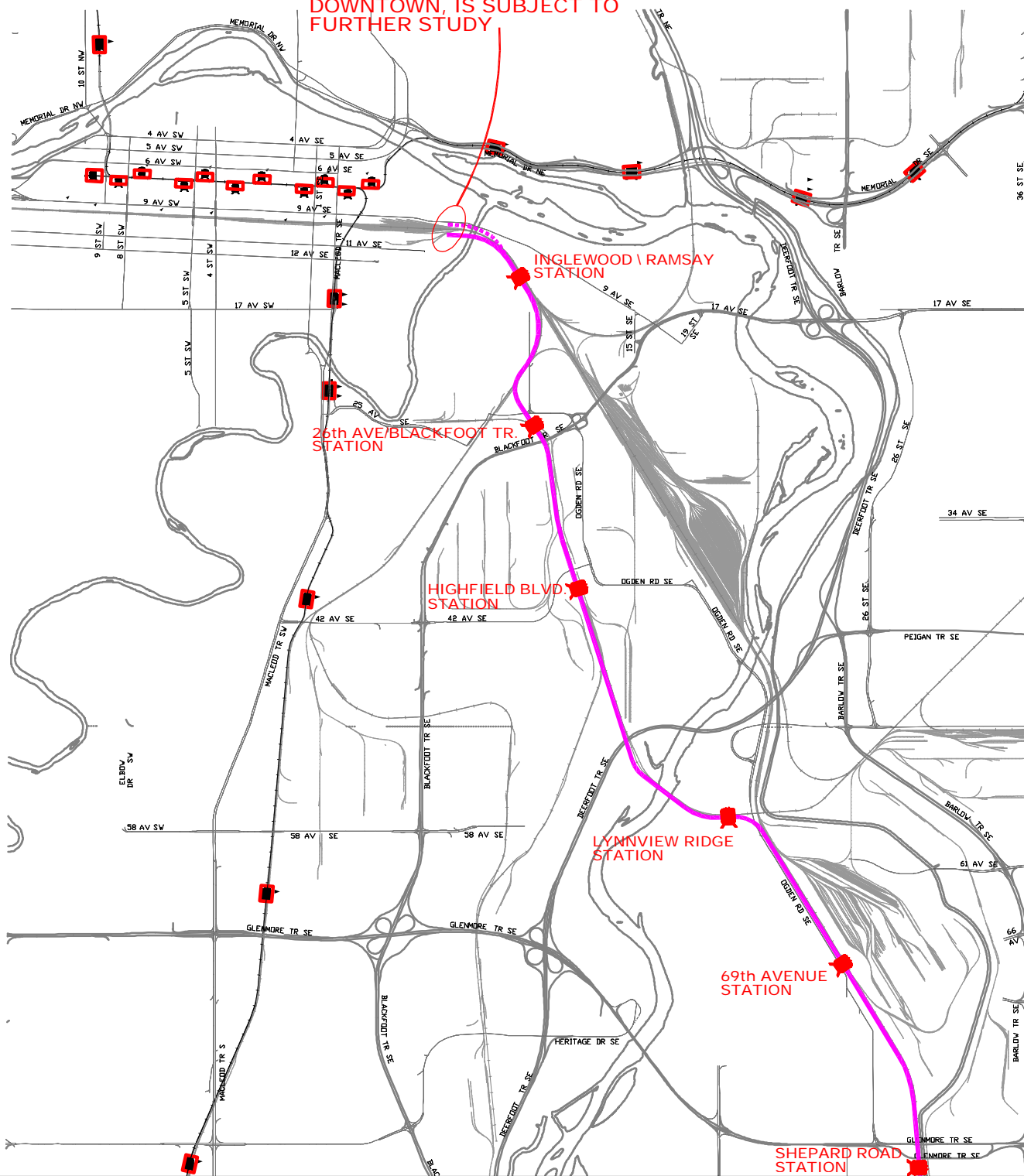
Comparison of Route Options

CRITERIA	STUDY SUB-AREA B						STUDY SUB-AREA A					
	OPTION						OPTION					
	1	1A	2	2A	3	3A	4	4A	5	1	6	
DESIGN ISSUES												
Grade Separations	4	2	1	2	4	2	1	1	2	4	2	
Road Network Impacts	4	4	4	2	4	3	1	1	2	3	3	
Railway Impacts	3	3	1	1	3	3	4	4	2	3	2	
River Crossing Issues	2	1	2	2	2	2	4	4	2	4	4	
Service Area Potential	4	4	1	1	3	3	2	2	4	4	2	
IMPACTS												
Residential	4	4	4	4	3	1	3	3	4	2	4	
Business	3	3	2	2	2	2	4	4	1	3	2	
Stampede Grounds	4	2	4	4	4	4	4	4	4	N/A	N/A	
Parkland/Greenspace	4	2	4	4	3	2	1	1	4	4	2	
Environmental	4	3	4	4	4	2	1	1	4	3	4	
COSTS												
Land Costs (Excluding CPR, CNR & City)	4	3	4	3	2	4	1	1	2	4	1	
Construction Costs	4	3	1	1	2	2	1	1	2	4	3	
Construction Length	9400	9300	9000	9500	9950	10200	8400	8500	12100	2900	3840	
Travel Time	3	3	4	3	3	2	1	1	1	4	2	
Travel Length	9400	9300	9000	9500	9950	10200	12000	12100	12100	2900	3840	
TOTAL												
Unadjusted Average	4	3	3	2	3	2	1	1	2	4	2	
Unadjusted Score	47	36	37	33	39	34	28	29	34	42	31	



		PROJECT: SOUTHEAST LRT FUNCTIONAL PLANNING STUDY	
DESIGN BY	OFFICE FILE NO:	SCALE	TITLE SHEET:
DRAWN BY: RAL	11025	NTS	FIGURE 3
CHECKED BY:	DATE: 12 NOV 03	DRAWING NO:	FIGURE 3
		COMPARISON MATRIX OF PREFERRED ROUTE OPTIONS	

S.E. LRT ALIGNMENT ENTERING AND WITHIN THE DOWNTOWN, IS SUBJECT TO FURTHER STUDY



Southeast LRT Study Area

The study area extends east of Macleod Trail to west of Barlow Trail, north of Glenmore Trail to just South of the Bow River.

		KEY: PREFERRED ROUTE ALTERNATE ENTRY POINT TO DOWNTOWN CORE POSSIBLE LRT STATION	PROJECT: SOUTHEAST LRT FUNCTIONAL PLANNING STUDY
DESIGN BY DRAWN BY RAL CHECKED BY DATE Jan. '04	OFFICE FILE NO: 11025 SCALE NTS DRAWING NO.		TITLE SHEET: <p style="text-align: center;">THE RECOMMENDED PLAN</p>
FIGURE 4			

5.5 Sub-Area C – Downtown

To complete the Southeast LRT Planning Feasibility Study, route options were developed for SE LRT to enter and operate within the Downtown. These options are shown in Figure 5 and described below. An initial review of these options and discussions with local stakeholder groups has identified the need to examine these options in greater detail and provide opportunities for additional stakeholder, community and the public input. A Downtown LRT Functional Planning Study is underway to address the Downtown routing of SE LRT and the functionality and connectivity of the existing and other future LRT lines (i.e. West and North Centre lines). The Downtown LRT Functional Planning Study will be completed in 2004.

5.5.1 SE LRT Connection to the Downtown

As part of the SE LRT Planning Feasibility Study, two options have been identified to connect SE LRT from the Elbow River, just south of the CPR mainline tracks, to the Downtown. Each option has several possible variations.

- i) The first option would see SE LRT tracks cross the Elbow River and become either a one-way LRT couplet or a two way LRT operation on some combination of 10, 11 and 12 Avenues SE (e.g. a single track westbound on 11 Avenue and an eastbound track on 12 Avenue). In these scenarios, LRT could operate like a streetcar in mixed traffic or with the possibility of a transit only lane(s) on these Avenues. SE LRT would turn northward, cross under the CPR and enter the Downtown via 2nd Street SW, 6th Street SW or a one-way single track loop involving 5th Street and 6th Street SW. Stations could be spaced every two or three blocks. Figure 5a and b show a possible street cross section with LRT operating in the curb lane.
- ii) The second option would see SE LRT crossing over the Elbow River south of the CPR, running parallel to and then crossing under the CPR tracks with a connection to the 7 Avenue LRT tracks via either 6 Street or 4 Street SE.

A preliminary review of the second option indicates that having SE LRT connect with and operate on 7 Avenue would result in LRT capacity constraints on 7 Avenue, even with four-car trains. This would likely require the immediate relocation of the existing South/Northwest LRT line to a subway under 8 Avenue S. The cost of constructing a subway the length of the Downtown is considerable - roughly \$400 million. It is recognized that such a subway will likely be required in the very long term to provide capacity relief for LRT on 7 Avenue. This option would also require a revision to the East Village Land Use Plan.

The option of LRT operating on 10, 11 or 12 Avenues without connection to 7 Avenue would enable the use of low floor LRT cars on the SE LRT line. Low floor trains are now common in North American and European cities. They have similar operating characteristics to our current LRT cars but they allow for better

integration with streetscape and simpler stations since station platforms are merely raised sidewalks. Low floor trains would result in less expensive station construction throughout the SE LRT line.

Initial discussions with community and Downtown stakeholder groups indicate general support for further study and refinement of the option involving 10, 11 and 12 Avenues S.

5.5.2 Downtown LRT Network

The ultimate LRT network for Calgary in the foreseeable future will consist of the following lines:

- The existing South, Northwest and Northeast LRT lines
- Future West, Southeast and North Centre LRT lines

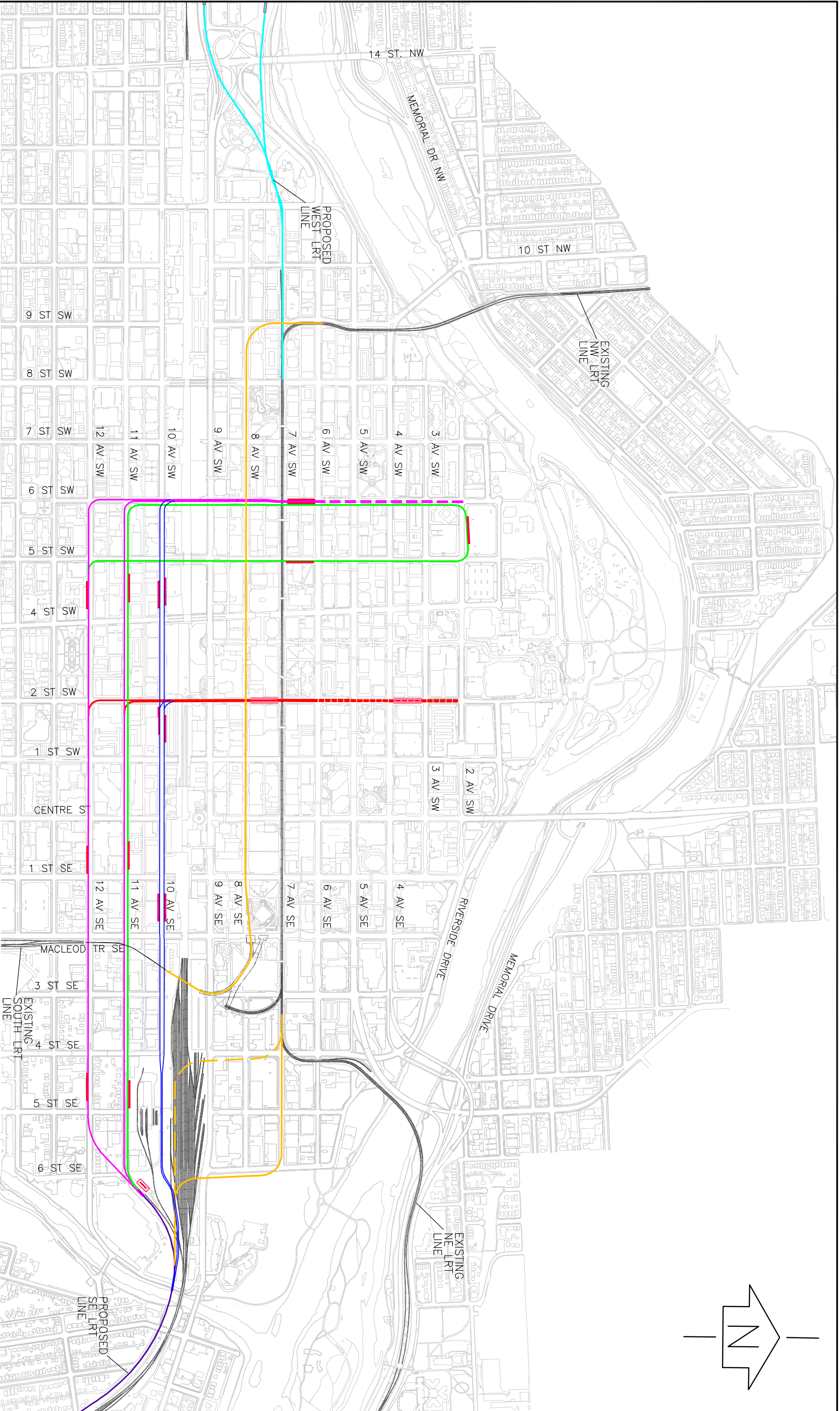
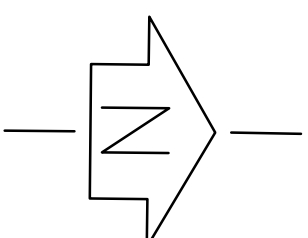
The Downtown LRT Functional Planning Study will explore options and recommend alignments for the Southeast and North Centre LRT lines to enter the downtown and confirm a right of way for the previously approved West LRT line to enter the Downtown. This new study will determine how connections between these lines can be made in the Downtown.



Sample LRT Right of Way adjacent to travelled lanes



Sample LRT Station

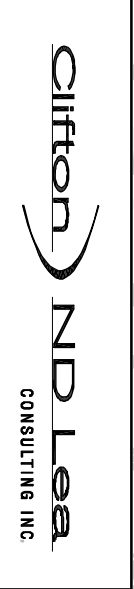


- KEY:
- CONCEPT 6A - 6 ST SW VIA ONE WAY COUPLET ON 11 & 12 AVES
 - CONCEPT 6C - 2 ST SW VIA ONE WAY COUPLET ON 11 & 12 AVES
 - CONCEPT 5 - 5/6 ST SW LOOP & ONE WAY COUPLET ON 11 & 12 AVES
 - CONCEPT 4 - SOUTH LRT ON 8 AVE
 - CONCEPT 3 - ON 7 AVE
 - SE LRT - AS PER SE LRT FUNCTIONAL PLANNING STUDY

DATE: Jan. '04

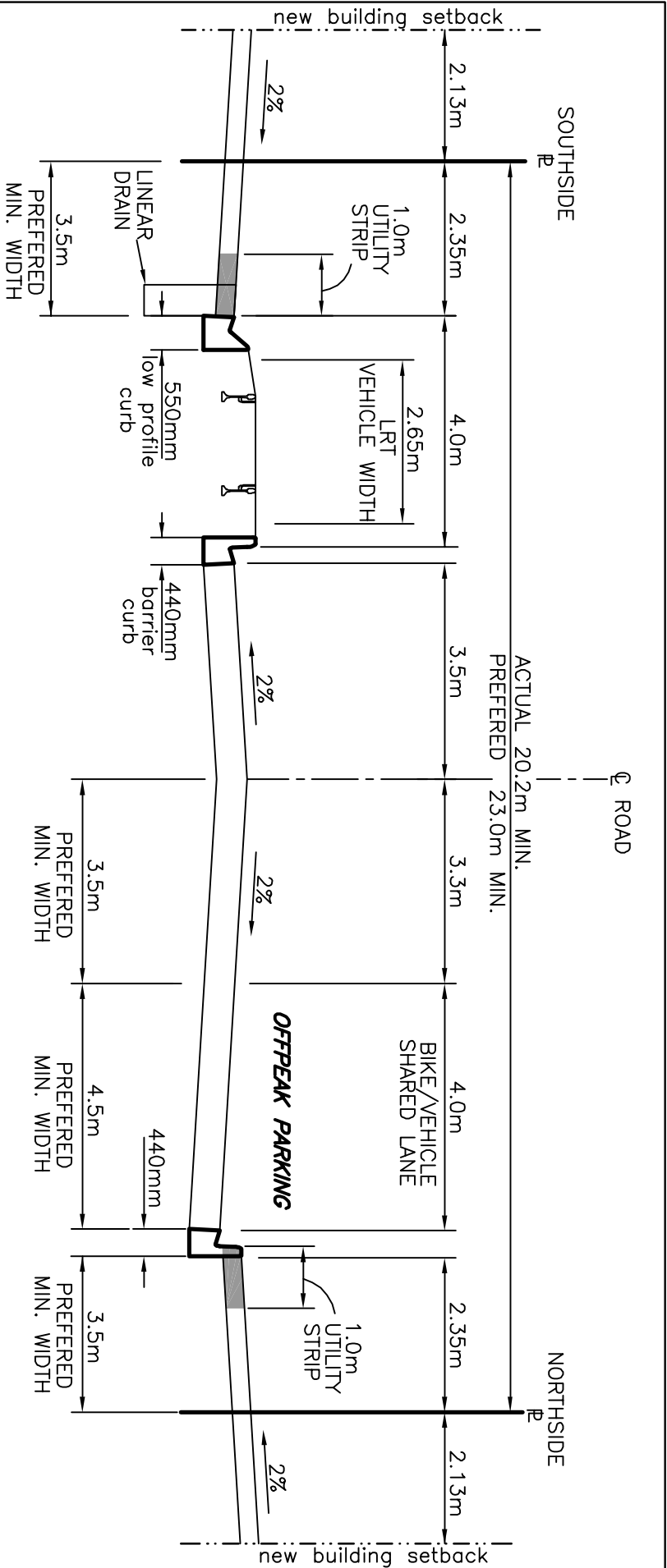
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DWG NO.: **FIGURE 5**



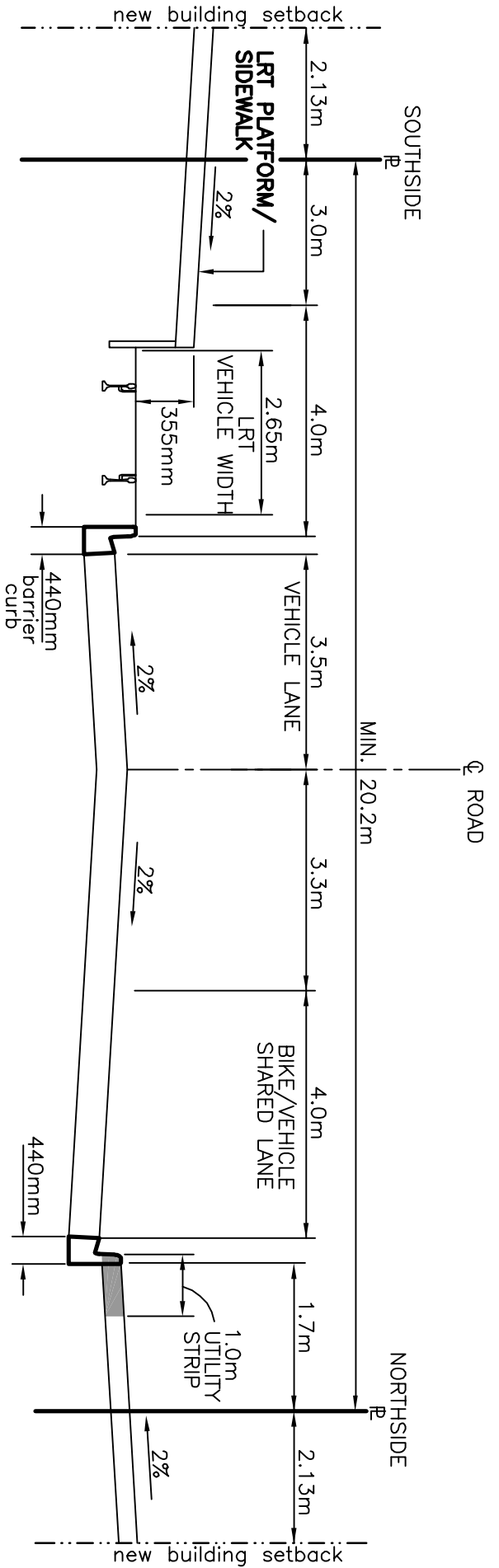
PROJECT: CITY OF CALGARY
SOUTHEAST LRT
FUNCTIONAL PLANNING STUDY

TITLE: SOUTHEAST / WEST LRT
DOWNTOWN ALTERNATIVES



11th & 12th AVENUES S.W. – TYPICAL SECTION ON TANGENT TRACK

		PROJECT: SOUTHEAST LRT FUNCTIONAL PLANNING STUDY	
DESIGN BY	MB	OFFICE FILE NO:	11025
DRAWN BY	MB	SCALE	NTS
CHECKED BY		DRAWING NO.	FIGURE 5A
DATE	Jan, '04	TITLE SHEET: FIGURE 5A STREETSCAPE - TYPICAL SECTION	



11th & 12th AVENUES S.W. – TYPICAL SECTION ON TANGENT TRACK

		PROJECT: SOUTHEAST LRT FUNCTIONAL PLANNING STUDY	
DESIGN BY DRAWN BY CHECKED BY DATE	MB Jan. '04	OFFICE FILE NO.: 11025 SCALE NTS	DRAWING NO. FIGURE 5B
TITLE SHEET: FIGURE 5B		FIGURE 5B STREETScape - TYPICAL SECTION SIDE PLATFORM STATION	

6. THE RECOMMENDED PLAN

The objective of the Southeast LRT Functional Planning Study is to select a route between the downtown core and the previously determined LRT right of way that currently ends at Glenmore Trail. The study area is largely comprised of light industrial development and the residential neighbourhoods of Ramsay, Inglewood, and Ogden. The study area as it currently exists would have a low generation of LRT trips. Therefore the primary focus of this alignment is to provide a relatively direct route to the downtown from the residential directly south of Glenmore Trail. However, it is recognized that LRT could influence some redevelopment in this area.

The study area was extended south to 107 Avenue S.E. to address issues with the approved right of way that have arisen since the completion of the South Hill study in 2000.

The horizontal alignment of the Recommended Plan for the Southeast LRT between the downtown core and 107th Avenue S.E. minimizes impacts to private properties while providing relatively direct routing. It does so by utilizing City owned lands where possible and paralleling the existing CN and CPR rail tracks from the Elbow River to Shepard Road S.E. South of Shepard Road S.E., the alignment utilizes City owned lands where possible until connecting with the approved LRT alignment at 107th Avenue S.E. between 24th and 29th Streets S.E.

The design speed of the Recommended Plan is detailed below:

- ◇ Sta. 25+350 – 27+400 (Elbow River to Blackfoot Trail S.E.): Speed is reduced to 60 kph due to the desire to minimize property impacts by following the geometry of the existing CPR tracks
- ◇ Sta. 27+400 – 30+400 (Blackfoot Trail S.E. to Lynnview Ridge Station): Speed is 80 kph (the standard design speed for the LRT)
- ◇ Sta. 30+400 – 31+200 (Lynnview Ridge LRT Station and Ogden Road S.E. grade separation): Speed is reduced to 40 kph (the standard design speed for an LRT station) to provide a long enough tangent to permit the construction of the LRT station and to minimize the length of the Ogden Road S.E. grade separation.
- ◇ Sta. 31+200 – 36+500 (Ogden Road S.E. to 107th Avenue S.E.): Speed is 80 kph

The remainder of this section of the report details the alignment of the Recommended Plan and its related issues. The related Plan-Profile drawings and cross sections are located in Appendix C.

6.1 Horizontal and Vertical Alignments

6.1.1 Sta. 25+350 to Sta. 26+050 - Elbow River to 12th Street S.E.

The recommended LRT alignment parallels the CPR rail tracks on the south side, east of the Elbow River through the residential neighbourhood of Ramsay. An at-grade crossing of 8th Street S.E. may be constructed if closure of this street is not required by CPR expansion. Currently CPR is planning on an additional 3 tracks at this crossing, with the LRT this would make for a total of 7 tracks at the 8th Street SE crossing. Due to the length of the crossing and the limited vehicle storage on 8th Street, closure of this crossing may be required. The alignment continues to follow the CPR tracks east of 8th Street S.E., bending to the south and then running down the Adelaide Street SE right of way until 12th Street S.E. An LRT station with a centre platform is proposed for this location to serve the Ramsay and Inglewood communities.

The vertical profile, elevated to cross 7th Street S.E. and the Elbow River, returns back down to the existing ground at 8th Street S.E. The profile of the LRT mirrors the profile of the CPR tracks between 8th and 12th Streets S.E. This sinks the LRT into the existing hillside, making it less visually intrusive to the residents of the neighbourhood of Ramsay. (Excavation of this hillside also aids in balancing earthworks quantities.)

Within Ramsay, 6 residential properties are required for the alignment of the LRT and revision to the intersection of 10th Street S.E. and 11th Avenue S.E. Revision to the north end of 9th Street S.E. and a circulation link to the adjacent back lane will reduce the existing green space. A retaining wall is proposed between the LRT and neighbourhood between 8th and 12th Streets S.E. to minimize the impacts to private properties and the existing green space.

The LRT station proposed at 12th Street S.E. is a walk-on station with no provisions for park and ride facilities. Bus stops are proposed in Ramsay on 10th Street S.E. and 11th Avenue S.E. for Community Shuttle bus access to the station. Lay-by bus stops are also required on 11th Street S.E. Pedestrian access to the LRT station is provided directly from 10th Street S.E. for Ramsay and via a pedestrian overpass across the CPR tracks to Inglewood. This overpass also serves to link Ramsay to the commercial area of Inglewood. Access to the bus stop on the east side of 11th Street S.E. is via a pedestrian overpass that will adjoin the LRT grade separation at this location, eliminating the need for an at-grade crosswalk on the arterial road.

Additional details of the alignment include:

- Sta. 25+390 - 25+440 (east bank of the Elbow River): Partial land acquisition of an existing business may be required if 8th Street is closed and a cul de sac constructed.
- Sta. 25+455 (8th Street S.E.): Closure of 8th Street at the CPR and LRT crossing may be required for safety reasons. There are 2 existing CPR tracks crossing 8th Street S.E. at this location. Closure may be driven by CPR's plan to increase the number of tracks across 8th Street. Elevating the LRT to provide a grade separation is not cost effective as a future CPR expansion may still result in the closure of 8th Street S.E. It is not possible to construct 8th Street either over or under the railway and LRT without significant impact to Ramsay and 9th Ave S.E. businesses. While 8th Street S.E provides a link to the downtown core and Inglewood via 9th Avenue S.E., access from Ramsay to the downtown can still be gained via MacDonald Avenue S.E. and 11th Street S.E. Access to Inglewood may still be made via 19th Avenue S.E. and 11th Street S.E. Other access relief includes the future 4th Street S.E or 6th Street S.E. underpasses of the CPR. This issue will be reviewed during a community traffic study slated to commence in late 2003.
- Sta. 25+800 – 25+850 (10th Street S.E): Land acquisition of two residences is required for the realignment of the 10th Street S.E. / 11th Avenue S.E intersection. A third lot impacted at this location is already owned by the City. Land acquisition is also required on 11th Street S.E. in Inglewood for the north terminus of the pedestrian overpass.
- Sta. 26+000 (Inglewood\Ramsay LRT Station): Land acquisition of an existing business is required. The building of a second business impacted by the station is already owned by the City. The building can be retained but access to it must be revised to connect to 17th Avenue S.E.
- Sta. 25+700 – 26+000 (Inglewood\Ramsay LRT Station): There is sufficient spacing between the southeast LRT alignment and the CPR tracks allow construction of an adjacent platform for a potential north centre LRT line. (Alignment for the north centre LRT line has yet to be determined.) The second platform would have to be constructed entirely on CPR property.

6.1.2 Sta. 26+050 to Sta. 27+300 - 12th Street SE to Blackfoot Trail S.E.

West of the Inglewood\Ramsay LRT station, the alignment of the Recommended Plan crosses 11th Street S.E. via a grade separation and bends to the south, following the CPR tracks behind the businesses on 11th Street SE and crossing 20th Avenue S.E. at-grade. The alignment follows the CPR south line tracks, rising to cross 11th Street S.E with a grade separation before passing between the businesses on Hurst Road SE and the CPR tracks. At this point there is a CN track linking the industrial spur line to the CPR south line. The LRT alignment continues to the south, crossing over the CPR south line tracks and adjacent service track and then following the CN track and bending to the southeast to cross 26th Avenue S.E. and Blackfoot Trail S.E. Grade separations are proposed at both of

these crossings due to their proximity to each other and the required grade separation at the CPR south line crossing.

An optional LRT station with a centre platform may be constructed between 26th Avenue S.E. and Blackfoot Trail S.E. The station proposed is a walk-on station with no provisions for park and ride facilities. Bus stops will be located on 11th Street S.E. and 26th Avenue S.E. Pedestrian overpasses are located adjoining the LRT grade separations on Blackfoot Trail SE and 26th Avenue S.E., eliminating the need for at-grade crosswalks on the roads.

Retaining walls are proposed through the above area to minimize land requirements and impacts to businesses and the railways. Details of this section include:

- Sta. 26+150: A substation is proposed at this location. The land required is currently owned by the City.
- Sta. 26+200 – 26+260 (11th St. & 18th Avenue): Land acquisition behind an existing building is required. The building is currently abandoned but is not impacted.
- Sta. 26+260 – 26+380 (11th St. & 19th Avenue): Land acquisition behind the existing Ramsay Design Studio is required. The building is not impacted but the alignment will require removal of the old loading dock and parking behind the building. Construction of a small retaining wall will be required to permit the construction of related LRT drainage infrastructure.
- Sta. 26+400 – 26+500 (11th Street and 20th-21st Avenue: Acquisition of an existing business is required.
- Sta. 26+565 – 26+590 (Shamrock Hotel): A vertical retaining wall adjacent to the alignment closes access of the hotel to 11th Street S.E. Extension of the 11th Street S.E. overpass can retain the business access in its current condition.
- Sta. 26+600 – 26+720 (Lilydale Poultry): The alignment impacts on the private property. A 5.0 m wide strip of land or easement is required. There will be 2.3 m between the back of the existing building and the LRT retaining wall.
- Sta. 26+150 – 26+800 (CPR lands): The alignment is partially located within CPR properties along this length and will require the removal of an existing storage track. Communications with CPR indicate that there is no objection to the proposed alignment.
- Sta. 26+440 – 27+200 (20th Avenue-Blackfoot Trail S.E.): A retaining wall is required on the east side of the LRT alignment to minimize impacts to the CN and CPR tracks.
- Sta. 26+800 – 27+000 (CPR R.O.W. – 26th Avenue): Land acquisition of a 22 m wide strip on the west side of the CN right-of-way is required. This assumes that a vertical retaining wall is constructed on the west side of the LRT alignment. The width allows for the construction of the LRT, a 1.0 m allowance for the retaining wall footing and a 3.0 m maintenance

access. The cost of the retaining wall is in the order of \$700,000. If the entire parcel is purchased by the City, the required land may be segregated and the remaining portion of the parcel sold. Alternatively, a sloped embankment could be constructed on the land in lieu of the remaining wall, reducing capital construction costs in the order of \$600,000.

- Sta. 27+050 (26th Avenue): The LRT alignment, station, and pedestrian walkways require land and the acquisition of the business on the south side of 26th Avenue S.E.
- Sta. 27+250 (Blackfoot Trail S.E.): A substation is proposed at Blackfoot Trail S.E. Land acquisition will be required.

6.1.3 Sta. 27+300 to Sta. 28+500 - Blackfoot Trail S.E. to Highfield Boulevard S.E.

The LRT alignment bends back to parallel the CN industrial spur line south of Blackfoot Trail S.E., running along the foot of the Highfield escarpment to Highfield Boulevard S.E. The track configuration is modified for the 200 m immediately north of Highfield Boulevard S.E. to provide a third (storage) track between the northbound and southbound LRT tracks. The LRT profile drops after crossing over Blackfoot Trail S.E. to follow the existing ground and then dips to pass under the CN Highfield spur line before rising to match the CN industrial spur line profile and cross over Highfield Boulevard S.E. with a grade separation.

An LRT station with a centre platform is located immediately south of Highfield Boulevard S.E. The station is a walk-on station with no provisions for park and ride facilities. Bus stops are proposed on Ogden Road S.E. and on Highfield Boulevard S.E. Access to the bus stops on the north side of Highfield Boulevard S.E. is via a pedestrian overpass adjoining the LRT grade separation, eliminating the need for an at-grade crosswalk across the road. An electrical substation is located adjacent to the station. The station, substation, and pedestrian walkways also result in the need for retaining walls to protect the foundation of the electrical transmission tower at this location.

This portion of the alignment is entirely within CN right-of-way and requires significant revision to the alignments and profiles of the CN industrial spur line, Highfield spur line and adjacent run-about and storage tracks. Plan and profiles of the CN tracks are shown in Appendix E. Significant construction of retaining walls is also required through this area:

- Sta. 27+300 - 27+600: A low 2 m high retaining wall between the LTR tracks and the Highfield escarpment for 300 m south of Blackfoot Trail S.E.
- Sta. 27+500 – 27+700: A low retaining wall between the LTR tracks and the CN industrial spur line

- Sta. 27+700 – 28+050: A low retaining wall between the CN industrial spur line and the storage and run around tracks
- Sta. 27+800 – 28+100: Significant retaining walls on both sides of the LRT tracks as the alignment dips under the CN Highfield spur line
- Sta. 28+100 – 28+200: A low retaining wall between the LRT tracks and the CN industrial spur line
- Sta. 28+000 – 28+030: A second retaining wall is required between the CN Highfield spur line and the LRT tracks

6.1.4 Sta. 28+500 to Sta. 30+900 - Highfield Boulevard S.E. to Ogden Road

The LRT alignment south of Highfield Boulevard S.E. continues sandwiched between the Highfield escarpment and the CN industrial spur line, passing through the small CN yard and then across an existing CN storage track at the south terminus of the Highfield escarpment. The alignment necessitates some revisions to the CN industrial spur line and eliminates two storage tracks within the yard and a third storage track that follows the base of the Highfield escarpment immediately south of the yard. The LRT follows the profile of the CN main spur line through the area to minimize impacts to the CN rail tracks. This results in construction of approximately 450 m of low-level retaining wall, 1 to 2 m high, against the toe of the Highfield escarpment.

The horizontal separation between the existing CN industrial spur line and the LRT alignment is increased south of the Highfield escarpment to allow for the construction of a new track for the CN main spur line and to permit better geometry for higher operating speeds on the LRT. The existing CN track becomes a storage track, replacing some of the storage capacity lost due to the construction of the LRT through the CN yard. The LRT alignment continues to follow the CN main spur line alignment, crossing over 46th Avenue S.E., Deerfoot Trail S.E. with grade separations before bending to the southeast and crossing over the Bow River. The alignment then bends to the east, following the CN track on its south side to Lynnview Ridge. An LRT station with a centre platform is located between Lynnview Ridge and Ogden Road S.E.

The profile for the CN main spur line is elevated significantly above the level of the Bow River and below the Lynnview Ridge community. The LRT follows this CN profile to minimize the impacts to the CN track. Significant fill embankments result on the west side of the alignment and impact a portion of the City snow dump north of 46th Avenue S.E. The embankment also impacts lands between Deerfoot Trail S.E. and 15th Street S.E. and the green space on the east side of the Bow River. Following the CN profile also results in a significant cut into Lynnview Ridge. The sunken profile makes the LRT less visually intrusive to adjacent residential Community. Excavation of the hillside is limited to the area within the CN right-of-way and a retaining wall is proposed between the LRT and the development.

Immediately east of Lynnview Ridge the LRT profile rises to obtain vertical clearance for an overpass at Ogden Road S.E.

The LRT station at Lynnview Ridge is connected to Lynnview Road S.E. via a pedestrian walkway at the west end of the station bordering the existing development. Bus stops on Lynnview Road S.E. will provide for local bus access. A 240-stall park and ride facility with a 6-bay bus terminal is proposed to the north, with access from Ogden Road S.E. This park and ride facility can also serve as a joint use parking lot for the current recreational lands. Pedestrian access to the east end of the station from the bus terminal and park and ride lot is via a tunnel under the CN track. Conceptually, this is similar the current design of the Zoo and Barlow Max Bell stations on the N.E. LRT line.

Lands impacted by the LRT alignment and its footprint are owned by the City or CN with the exception of a parcel between Deerfoot Trail S.E. and 15th Street S.E. and the land occupied by the footprint of the Lynnview Ridge LRT station.

6.1.5 Sta. 30+900 to Sta. 32+400 - Ogden Road SE to 69th Avenue S.E.

The LRT alignment bends to the southeast with a sharp curve (45 kph) immediately east of the Lynnview Ridge station. The low speed curve is required to provide a long enough tangent to permit the construction of the LRT station and to minimize the length of the Ogden Road S.E. grade separation. The alignment is then located between Ogden Road S.E. and the CPR tracks until 69th Avenue S.E., where Ogden Road S.E. turns to the south. The alignment is located to allow for future expansion of the CPR tracks as indicated by CPR and detailed on the drawings. An LRT station with a centre platform is proposed at 69th Avenue S.E. to serve the neighbourhood of Ogden.

Retaining walls are required on both sides of the LRT alignment for the 150m immediately east of the Ogden Road S.E. overpass to permit the profile to drop to existing ground level without impacting the road or rail configurations. The LRT profile then follows the profile of the CPR tracks to minimize land requirements.

The LRT station proposed at 69th Avenue S.E. is a walk-on station with no provisions for park and ride facilities. Lay-by bus stops are proposed on both sides of Ogden Road S.E. The existing traffic signal at 69th Avenue S.E. serves as the pedestrian corridor for crossing Ogden Road S.E.

No privately held lands are impacted by this portion of the LRT alignment with the exception of those owned by the CPR.

6.1.6 Sta. 32+400 to Sta. 34+200 - 69th Avenue S.E. to Shepard Road S.E.

The LRT alignment continues to parallel the CPR tracks south from 69th Avenue S.E., passing behind the adjacent residences in the neighbourhood of Ogden and the Glenmore Inn complex. The LRT profile is relatively flat, following the CPR track profile between 69th Avenue S.E. and Glenmore Trail S/E. This results in a substantial embankment between 69th and 80th Avenues S.E. as the surrounding lands drop before rising again near Glenmore Trail S.E. The location of LRT on the west side of the existing embankment will require a retaining wall between 69th and 78th Avenues S.E., which avoids impacting the residences in this area.

The LRT track configuration next to the Glenmore Inn is modified for 200 m to provide a third (setoff) track between the northbound and southbound LRT tracks.

The portion of 69th Avenue S.E. immediately south of the LRT station and east of the Ogden Road S.E. intersection links the CPR Ogden Yards and Ogden Dale Road S.E. to Ogden Road S.E. Closure of this link will be required in the future for safety and operational reasons. There are 2 existing CPR tracks crossing 69th Avenue S.E. at this location that currently result in significant queuing at the signalized intersection with Ogden Road S.E. already. Closure of 69th Avenue S.E. may be driven by CPR's plan to increase the number of tracks in the Ogden Yard or by the LRT itself. Elevating the LRT to provide a grade separation is not cost effective, as future CPR expansion will still result in the closure of the road. As well, a grade separation at this location would potentially remove an historic building. Alternative access between the CPR Ogden Yards \ Ogden Dale Road S.E. and Ogden Road S.E. can be made via a proposed future railway underpass at 74th Avenue S.E. As a result of this access, the City will need to reinstate the truck route designation on Ogden Road between 69th Avenue S.E. and Glenmore Trail. It should be noted that revisions to the truck route designation on Ogden Road S.E. will require additional public consultation.

The LRT alignment crosses the existing Glenmore Trail S.E. at-grade and then starts to gradually bend to the west away from the CPR tracks with a large radius curve. The alignment then passes under the future Glenmore Trail S.E. overpass before crossing 83rd Avenue S.E. at-grade. South of 83rd Avenue S.E. the LRT alignment continues to curve west, crossing 86th Avenue S.E. at-grade in the vicinity of where it will tie to Shepard Road S.E. in the future. The LRT profile follows the existing ground between Glenmore Trail SE and Shepard Road S.E. An LRT station with a centre platform is located at Shepard Road S.E.

A similar condition to 69th Avenue S.E. will also develop at Glenmore Trail S.E. Conceptual plans indicate Glenmore Trail will be relocated via a new

grade separation between the existing Glenmore Trail and 83rd Avenue S.E., eliminating the at-grade crossings of the existing CPR tracks and the future LRT. The existing Glenmore Trail and 83rd Avenues S.E. are to serve as directional collector\distributor (C\D) roads for the new Glenmore Trail. However, the planned expansion of the CPR tracks plus the LRT will result in five track at-grade crossings of the C\D roads. The safety implications of these may require reworking of the planned road network to grade separate the C\D roads.

The LRT station at Shepard Road S.E. includes a 350-stall park and ride facility with bus lay-bys located on both sides of Shepard Road S.E.

In addition to impacting the CPR right of way, the LRT alignment will require a 1.2 m wide strip of land behind the Glenmore Inn complex (Sta. 33+640 – 33+820), and right-of-way for the extension 74th Avenue S.E. and realignment of Ogden Dale Road S.E. The change in function of 74th Avenue S.E. east of Ogden Road S.E. from a local to a collector\arterial road may necessitate the purchase of the two residences on 74 Avenue east of Ogden Road. South of 83rd Avenue S.E., a portion of the Chemtron property will be required for the LRT alignment (Sta. 34+000 – 34+100) but the existing buildings are not impacted. Also, the properties bounded by 27th Street S.E., the CPR and Chemtron will be required for the Shepard Road S.E. LRT station and park and ride lot. The City already owns a portion of this property. Substations are located on the 69th Avenue S.E. right-of-way with its closure, and on a residual piece of City owned property at the 86th Avenue S.E.\Shepard Road S.E.

6.1.7 Sta. 34+200 to Sta. 36+500 - Shepard Road S.E. to 107th Avenue S.E.

South of the Shepard Road SE\86th Avenue S.E., the LRT alignment bends back to the south, passing through the undeveloped portion of Caravan Mobile Home Park property and then through the northwest portion of the Maloney Steel yard before crossing the Rugby Union Fields at their western end. The alignment goes through the west-most field and then bends to follow along the edge of the existing development, utilizing portions of an old CPR right-of way and an old land fill that are both now owned by the City. The profile through this area continues to follow the existing ground, crossing the cut for an old CPR spur line at the end of the rugby fields and then dropping down to loosely follow the gully formed by a natural escarpment to the east and the land fill embankment to the west. South of the landfill, the alignment continues to follow the foot of the escarpment for 200 m before bending to the west and crossing a drainage ditch. The alignment then bends back to the south and climbs up a small escarpment to tie to the approved LRT alignment and profile at 107th Avenue S.E.

The Recommended Plan through this area impacts several lands due to the geometric constraints required for high-speed (80 kph) operation of the LRT. The lands impacted are:

- Sta. 34+230 – 34+360: the southwest corner of the 86th Avenue S.E.\ Shepard Road S.E. tie, currently owned by the Caravan Mobile Home Park,
- Sta. 32+360 – 34+620: the northwest portion of the Maloney Steel property,
- Sta. 34+620 – 34+900: the Rugby Club fields (owned by the City)
- Sta. 35+480 - 35+840: CPR lands from an abandoned spur line
- Sta. 35+480 – Sta. 36+400: eastern and southern portions of NW ¼ 16-23-29-04 as well as an area near Sta. 36+200 for an LRT electrical substation and access.
- Sta. 35+500 – 35+700: undeveloped portions of parcels X and Y are marginally impacted by cut slopes of the LRT alignment. If the acquisition of the recommended portions of these properties becomes problematic, low retaining walls can eliminate the need for the lands.
- Sta. 36+300 – 36+400: a 20 m strip on the eastern edge of Parcel C, 1593HP is impacted by the LRT cut slope. If the acquisition of the recommended portion of the property becomes problematic, a low retaining wall can eliminate the need for the land.
- Sta. 36+400 – 36+500: a 4 m strip on the eastern edge of Lot 5 on 107th Avenue S.E. is impacted by the LRT cut slope. If the acquisition of the recommended portion of the property becomes problematic, a low retaining wall can eliminate the need for the land.

6.2 Portland Street SE – 11th Street S.E. Connector.

This study identified the potential for a direct road connection between Portland Street SE and 11th Street S.E. north of the CPR tracks. This would require construction of an underpass beneath the CPR and proposed LRT tracks. Plan and Profiles are shown in Appendix G. The road connection would start at 19th Avenue S.E. and 11th Street S.E., drop under the CPR tracks and the LRT, and return to existing ground on Portland Street S.E. at 23rd Avenue S.E. Immediately south of the CPR tracks, 11th Street S.E. would terminate in a cul-de-sac while 26th Avenue S.E. would be realigned to form a new tee-intersection with Portland Street S.E.

This proposed roadway realignment would eliminate the current at-grade crossing of the CPR tracks on 11th Street S.E. and provide a more direct connection between 11th Street S.E. and Ogden Road. The grade separation of the CPR tracks would eliminate frequent train blockages of the roadway and reduce traffic shortcutting through Ramsay. This connection would also improve access for businesses on Portland Street. Both 20th and 21st Avenues S.E. would require closure at 11th Street S.E. and an alternate access to the industrial properties on Hurst Road S.E. Reconfiguration of access to the lands on the east side of 11th Street S.E. is also required.

In the event of the 11th Street underpass construction, the LRT profile can be altered, as shown on the plans. This alternative is less expensive to construct, as less extensive retaining walls are required. However, the constraints detailed below prohibit the development of an LRT profile that can cross 11th Street S.E. at-grade for a design speed of 60 kph. Thus a choice must be made by the time of the LRT construction to construct the Connector and close 11th Street S.E. at the CPR/LRT crossing or leave to 11th Street S.E. in its present configuration and cross it with a grade separation. The latter choice would eliminate the possible connection between 11th Street S.E. and Portland Street S.E.

The constraints that necessitate the raising of the LRT profile from the existing grade at 11th Street S.E. are:

- ◇ The distance between the grade separation over the CPR tracks at Sta. 26+720 and 11th Street S.E. (150 m), the vertical clearance requirement of 7.3 m plus structure depth at the CPR grade separation, the maximum LRT gradient of 6%, and vertical curve requirements combine to prohibit the LRT profile from getting up to the structure if it crosses 11th Street S.E. at the existing ground level.
- ◇ Proximity of the LRT to the CPR tracks at 11th Street S.E. (8 m) does not permit adjustment of the profile of 11th Street S.E. to accommodate both crossings at-grade.

6.3 Cross Sections

The standard LRT cross section is based on track centres 2.3 m from the horizontal control line. Standard right-of-way allowance is 16 m but is adjusted to include embankment slopes and curvature considerations. In areas with high retaining walls, the right-of-way includes allowances for a 10:1 wall batter, a 1.0 m footing and a 3.0 m maintenance access where practical. Where the alignment parallels the CPR tracks by Ogden Yard and near the Elbow River, spacing between the LRT and CPR tracks was determined in liaison with CPR representatives. Where the alignment parallels the CN tracks, spacing between tracks was determined in liaison with CN representatives.

Centre platform stations are proposed for all LRT stations. They are proposed because the alignment follows CPR and CN tracks for the majority of its length. Isolating a platform between the LRT and the other tracks was not deemed to be desirable, particularly with the high traffic volumes on the CPR tracks.

Key cross sections for the Recommended Plan are shown by region in Appendix C. The following cross sections were key in developing the design of the LRT through the neighbourhood of Ramsay:

- ◇ Sta. 25+500 and 25+800: Shows the impacts on the residential area of Ramsay and proximity to CPR tracks. The impact to the neighbourhood is minimized by the construction of a retaining wall

- ◇ Sta. 25+840: Shows the Inglewood/Ramsay LRT station and overhead pedestrian link. The station is recessed to minimize the visual impact to the neighbourhood and to allow for the pedestrian crossing of the CPR tracks. A retaining wall is also required to minimize the impact on the park.
- ◇ Sta. 26+360: Shows the impact to the Design Centre and proximity to the CPR tracks. By constructing a retaining wall or subdrain system the building is not impacted but the existing loading dock must be removed. The CPR storage track must also be removed.
- ◇ Sta. 26+460: Shows the impact to the existing building and CPR tracks. The building is impacted and the CPR storage track must be removed.
- ◇ Sta. 26+640: Shows proximity to the CPR McLeod Subdivision track and to the Lilydale poultry plant. Property is required for the LRT and to maintain the retaining wall but the building is not impacted. Alternatively access to the retaining wall may be gained via an easement.
- ◇ Sta. 26+900: Shows the impact to private property. An easement or right-of-way is required to allow maintenance of the retaining wall. Offset to the CN spur line is controlled by the geometry of the LRT. The LRT design speed is higher and the horizontal curve is larger than that of the CN track. This results in a separation between the alignments.
- ◇ Sta. 27+100: Shows the 26th Avenue S.E.\Blackfoot Trail S.E. LRT station. The station is elevated due to the proximity of the grade separations at these locations.

The following cross sections illustrate key factors in the design of the LRT where the alignment parallels the CN tracks:

- ◇ Sta. 27+400, 27+900, and 28+160: Show the relationship between the LRT, the CN spur lines, and the Highfield escarpment. The LRT dips under the Highfield spur line while the main spur line is realigned. The existing service track for the adjoining businesses is not altered.
- ◇ Sta. 28+460: Shows the relationship between the LRT at the Highfield station, the CN main spur line, and the Highfield escarpment.
- ◇ Sta. 28+900: Shows the LRT impact to the CN storage yard. The three eastern tracks are retained at their existing alignment and profile. The next track becomes the CN main spur line while the two western tracks are removed to provide space for the LRT alignment.
- ◇ Sta. 29+400: Shows the height of fill required to parallel the CN tracks. The existing track is now used for storage and a new track is constructed for the CN Main spur line.

- ◇ Sta. 30+000 and 30+400: Show the extent of fill required for the Deerfoot Trail SE and Bow River crossings. The path system on the east bank of the Bow River will require minor revisions.
- ◇ Sta. 30+500: Shows the retaining wall required to minimize impact on the residential area of Lynnview. The LRT is recessed to minimize the visual impact on the neighbourhood and to minimize any impact to the CN track.
- ◇ Sta. 30+800: Shows the Lynnview Ridge LRT station. A tunnel under the CN tracks and hillside is proposed to access the bus terminal and park and ride facilities to the north.

The following cross sections show key elements of the design where it parallels the CPR tracks in the vicinity of the CPR Ogden Yard:

- ◇ Sta. 31+100, 31+600 and 32+000 show the LRT relative to Ogden Road S.E. and the CPR tracks. They show the planned expansion of the CPR and the spacing required. This results in the width between the LRT and Ogden Road S.E. being limited. Future widening of Ogden Road S.E. should therefore be made to the west to avoid constructing retaining walls parallel to the LRT. The sections also show that CPR will require more earthworks to accommodate their future expansion by permitting this LRT alignment. More CPR expansion could take place towards Ogden Road, where fills are not as significant if the LRT was relocated.
- ◇ Sta. 32+300: Shows the location and requirements associated the 69th Avenue S.E. LRT station.
- ◇ Sta. 32+700: Shows the retaining wall required to reduce the impact of the high embankment on the residences adjacent to the LRT alignment north of 74th Avenue. The alternative fill slope is also shown.
- ◇ Sta. 32+960: Shows the proposed connecting roadway between 74th Avenue S.E. and Ogden Dale Road S.E. passing under the LRT and CPR tracks and the extent of structure required.
- ◇ Sta. 33+100: Shows the relationship of the high embankment on the residences adjacent to the LRT alignment south of 74th Avenue. The section shows a retaining wall to avoid impacting these properties.
- ◇ Sta. 33+420: Shows the extent of the embankment in the vicinity of 78th Avenue S.E.
- ◇ Sta. 33+760: Shows the relationship of the LRT alignment and the Glenmore Inn complex. A retaining wall behind the complex minimizes the impact. The wall would also serve as a safety barrier for traffic on the

complex's property. There is provision for the construction of an LRT setoff track in this region.

The following cross sections show key elements of the design of the LRT alignment south of Glenmore Trail S.E.:

- ◇ Sta. 34+060: Shows the Shepard Road LRT station and the impact to the Chemtron property. While a segment of land is required the alignment does not require removal of the building. South of 86th Avenue S.E., the LRT alignment also passes through private properties that will require acquisition, but the alignment does not impact structures.
- ◇ Sta. 35+020 and 35+700: Shows the LRT alignment constructed on the side of the embankment slope.
- ◇ Sta. 35+500: Shows the LRT alignment where it crosses the cut slope of an abandoned CPR spur line. A culvert is required at this location and at Sta. 36+060, where it crosses an existing drainage ditch.

6.4 Setoff Tracks

LRT design guidelines recommend the provision of setoff tracks at 5 km intervals. The horizontal and vertical constraints of the Recommended Plan as well as the costs and availability of right-of-way limit potential locations for storage tracks. Two locations have been recommended:

- ◇ Sta. 28+750 to Sta. 29+000 – South of Highfield Boulevard Station and 4 km from the downtown core
- ◇ Sta. 33+600 to Sta. 33+800 – Immediately north of Glenmore Trail S.E. and 8.5 km from the downtown core.

Two additional locations can be modified to contain a setoff track:

- ◇ Between Sta. 31+300 to Sta. 32+000 – On the east side of Ogden Road S.E. north of 69th Avenue S.E. The drawback of this location is the proximity to Ogden Road and the CPR tracks. A low level retaining wall between the LRT and Ogden Road S.E. would likely be required.
- ◇ Between Sta. 34+700 to Sta. 34+900 – South of 86th Avenue S.E. This location is isolated and access would have to be through the Rugby Club.

7. STATIONS

7.1 General

One of the primary goals of the study was to provide the most efficient and economic means of LRT transportation to the downtown core for the projected 55,000 daily riders mainly generated south of the study area. The station locations were determined in conjunction with community input and site opportunities along the selected route. Determining the number of stations requires a balance between passenger access and travel time. A total of 5 stations and one optional station are recommended for this route.

Station location principles and objectives are as follows:

- ◇ Provide a high level of service
- ◇ Provide convenient pedestrian access
- ◇ Support bus connections
- ◇ Support existing and potential future land use
- ◇ Station spacing approximately 1km

Stations are preferably located on horizontally tangent track, with sufficient space for a 5-car platform, crossovers on the in-bound side of the station, and potentially a centre substation or station house where required. The minimum radius curve that is acceptable for a station is 1200 m. Locating a station on tangent track ensures that the gap between the LRT car and the platform edge is consistent which is the safest situation for passengers.

Stations should also be located on relatively level track, with a maximum grade of 1.5%, and not in vertical curves. This also ensures that the vertical position of the LRT car and doorway is consistent through the platform area.

7.1.1. Station Amenities

There are 3 basic LRT station types; centre platform, side platform, and staggered side platform. For this project since all of the stations border on either the CPR or CN track, centre platforms are recommended for all stations. A centre platform station also allows all passengers to proceed to the same centrally located platform regardless of their intended direction of travel. Centre platforms also have the advantage of providing greater passenger space in peak periods, and are cheaper to construct given that platform canopies, furniture and systems are not duplicated as in the case of a side platform arrangement

All proposed station platforms can accommodate a 5-car train (130m), and are 7.3m in width, with access from both ends of the platform. The proposed stations would have the following common features:

- ◇ A covered 2-car length long platform canopy
- ◇ Provision of ramps or elevators (at the Lynnwood Station only) for wheel chair access
- ◇ Platform lighting
- ◇ Platform shelters
- ◇ Standard platform furniture (seating, waste disposal, Information modules, station signage) and systems (ticketing, video surveillance, help & public phones)
- ◇ Stairs and ramps off of both ends of the platform
- ◇ No public washrooms or retail space is provided.
- ◇ No Transit washrooms or other facilities are provided (operator washroom facilities should be provided in conjunction with the bus terminal facilities at Shepard Rd. and Lynnview stations. These can be incorporated into the detailed bus terminal design.)

The proposed stations for the SE LRT line are based on the existing LRT technology. If the downtown portion of the line dictates a change in technology this may have beneficial impact to the proposed stations, such as reduced platform heights for low floor LRT vehicles.

7.2 Proposed Inglewood/Ramsay Station

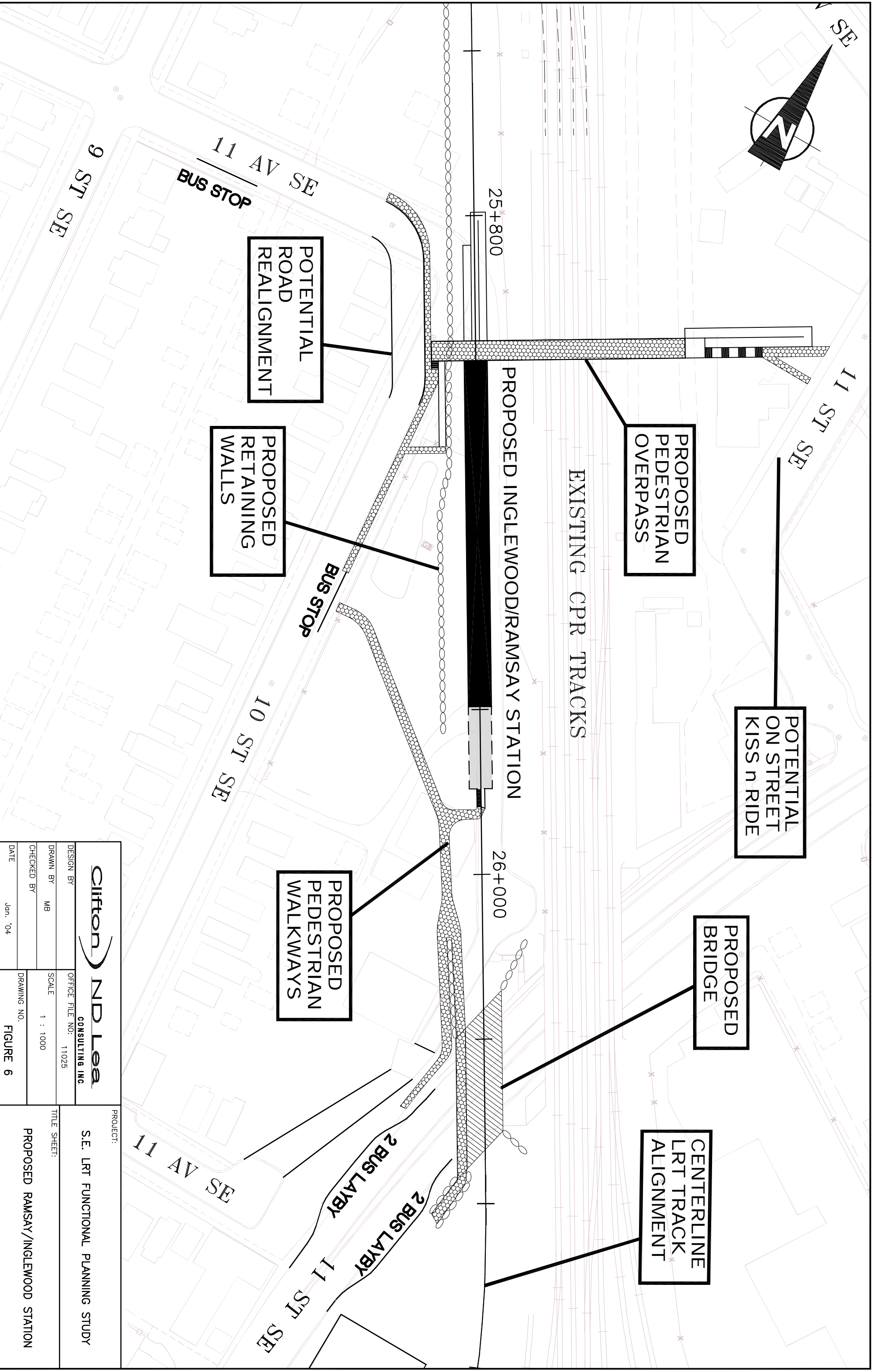
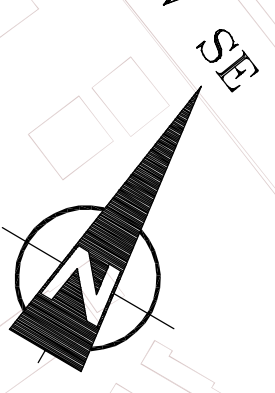
The Inglewood/Ramsay station is located just west of the existing 11th Street S.E. underpass of the CPR (Figure 6). It is located in a cut/fill transition with the east end of the station on a fill and the west end of the station in a cut. The station will provide local service to commercial/Industrial businesses, multi-family residences and single family homes in Inglewood and Ramsay. The station is also within walking distance to commercial businesses on 9th Avenue in Inglewood and 11th Street in Ramsay.

Bus service to the station is provide for on 11th Street with bus lay-bys in each direction, and with bus stops on 10th Street and 11th Avenue for a local community shuttle bus.

No park and ride is recommended for this station due its proximity to downtown and the disruption that is would create in the local community. A small kiss and ride lay-by could be provided on 11th Street in Inglewood in the commercial area near the proposed pedestrian overpass.

Access to the platform from the east side of 11th Street is via a pedestrian walkway on the LRT structure over 11th Street and at grade across the outbound track at the east end of the platform. Access from the west side of 11th Street would be from Inglewood using the existing railway underpass and side walk ramps and at grade across the outbound track to the east end of the platform.

Throughout the public consultation process, residents of Inglewood and Ramsay expressed the need for better connections between the two communities. This is in part accomplished via the new pedestrian overpass from both communities to the west end of the platform. The pedestrian overpass uses ramps and stairs to cross the CPR trackage and access the platform, no elevators or escalators are proposed. A similar concept is in place at the Fish Creek Station. The existing pedestrian access within the existing 11th Street underpass should be upgraded with better lighting and approach grades for the sidewalks.



POTENTIAL ON STREET KISS n RIDE

PROPOSED PEDESTRIAN OVERPASS

EXISTING CPR TRACKS

PROPOSED INGLEWOOD/RAMSAY STATION

PROPOSED BRIDGE

CENTERLINE LRT TRACK ALIGNMENT

PROPOSED PEDESTRIAN WALKWAYS

PROPOSED RETAINING WALLS

POTENTIAL ROAD REALIGNMENT

Clifton **NLD Lea**
CONSULTING INC

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DRAWN BY: MB SCALE: 1 : 1000

CHECKED BY: DRAWING NO.: FIGURE 6

DATE: Jan. '04

PROJECT:

S.E. LRT FUNCTIONAL PLANNING STUDY

TITLE SHEET:

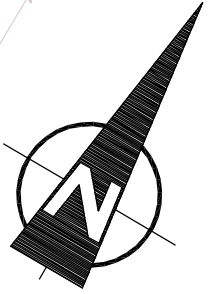
PROPOSED RAMSAY/INGLEWOOD STATION

7.3 Proposed 26th Avenue/ Blackfoot Trail Station (optional)

The 26th Avenue/Blackfoot Trail Station is located in between 26th Avenue and Blackfoot Trail adjacent to the current Crossroads Market (Figure 7). It is located in a cut/fill transition with the north end of the station on a fill and the south end of the station at existing grade. The Station is approximately 8m above the level of 26th Avenue and Blackfoot Trail. The Station will provide local service to Commercial/Industrial businesses, and single family homes in Ramsay. Because of its location and the limited local service area we recommend that this Station be considered as an optional Station. Its implementation would depend on the future development of City owned vacant land to the southwest and perhaps the redevelopment of the Crossroads Market area.

Bus service to the station is provided for on 26th Avenue, with 2 bus lay-bys in each direction and bus stops on 11th Street. No park and ride is recommended for this station due its proximity to downtown.

Pedestrian access to the platform from the 26th Avenue and Blackfoot Trail is via pedestrian walkways on the LRT Structures to avoid mid block crossing of major roadways. Access is gained at grade across the outbound track at both ends of the platform. While crossing the outbound track at grade on the north end of the platform is not the most desirable from a safety perspective, it is also not uncommon in the current system. The alternative would be to direct the pedestrian traffic an additional 130 m to the south end of the platform.



11 ST SE
BUS STOP

PROPOSED
BRIDGE

CENTERLINE
LRT TRACK
ALIGNMENT

26 AV SE

2 BUS LAYBY
2 BUS LAYBY

27+000

BUS STOP

PROPOSED
PEDESTRIAN
OVERPASS

26th AVE. / BLACKFOOT TR. STATION

PROPOSED
RETAINING
WALL

CROSS
ROADS
MARKET

PEDESTRIAN
WALKWAYS

27+200

PROPOSED
SUBSTATION

SUBSTATION

PROPOSED
BRIDGE

BLACKFOOT TR

Clifton		ND Lea	
CONSULTING INC.		CONSULTING INC.	
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CHECKED BY		DRAWING NO.	FIGURE 7
DATE	Jan. '04		

PROJECT:
S.E. LRT FUNCTIONAL PLANNING STUDY

TITLE SHEET:
26th AVE./BLACKFOOT TR. STATION
(OPTIONAL)

7.4 Proposed Highfield Boulevard Station

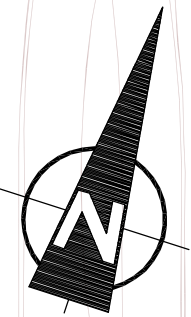
The Highfield Boulevard Station is located just south of Highfield Boulevard and west of the CN track (Figure 8). It is located on a modest fill of 4 to 5 m high. The station will provide local service to industrial businesses in the Alyth/Bonnybrook Industrial Area.

This station is central to Alyth/Bonnybrook Industrial Area, which has a current employment level of 17,000 people. It is also located on the only east/west transportation link (Highfield Boulevard) in the area. Industrial activity has flourished in this area and it is now considered mature with little undeveloped land left. There is undeveloped land to the west of this site; however, topography constrains its use. There is opportunity for redevelopment of the lands along Ogden Road.

Bus service to the station is provided for on Highfield Boulevard with 2 bus lay-bys in each direction, and with bus stops on Ogden Road.

No park and ride is recommended for this station due its proximity to downtown and the fact that this will primarily be a destination station.

Access to the platform is from the north side only, from Highfield Boulevard via pedestrian walkways on the LRT structure, and at grade across the outbound track at the north end of the platform. Emergency egress only is provided off of the south end of the platform. While crossing the outbound track at grade on the north end of the platform is not the most desirable from a safety perspective, it is also not uncommon in the current system. The alternative would be to direct the pedestrian traffic an additional 130m to the south end of the platform.



OGDEN RD SE

BUS STOP

BUS STOP

13A ST SE

38 AV SE

PROPOSED BRIDGE

PROPOSED RETAINING WALL

CENTERLINE LRT TRACK ALIGNMENT

CANADIAN NATIONAL RAILWAY

28+200

28+400

HIGHFIELD BLVD. STATION

PEDESTRIAN WALKWAYS

PROPOSED PEDESTRIAN OVERPASS

SUBSTATION

PROPOSED SUBSTATION

2 BUS LAYBY
HIGHFIELD BV SE

2 BUS LAYBY



PROJECT:
S.E. LRT FUNCTIONAL PLANNING STUDY

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DATE	Jan, '04		

TITLE SHEET:
HIGHFIELD BLVD. STATION

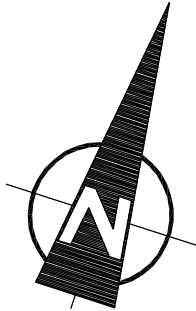
7.5 Proposed Lynnview Ridge Station

The Lynnview Ridge Station is located north of Ogden Road on the west side of the current CN track (Figure 9). It is located in a cut/fill transition with the north end of the station at the start of a cut and the south end of the station on an 8 m high fill. The station will provide local service to mainly industrial business, multi-family residences and single-family homes in the Lynnview Ridge community. A 6-bay bus terminal, a 240-stall park and ride facility with a kiss and ride lay-by is provided on the City owned lands located east of the station and CN track. This park and ride site is located at a lower elevation than the station site by 8 m to 10 m. Therefore, access to the south end of the platform is via a pedestrian tunnel and station house. Access to the north end of the platform from the local community is via a pedestrian walkway from Lynnview Road, with an at grade crossing of the outbound track. While crossing the outbound track at grade on the north end of the platform is not the most desirable from a safety perspective, it is also not uncommon in the current system. The alternative would be to direct the pedestrian traffic an additional 130 m to the south end of the platform along an 8 m high fill.

Bus stops for connections with local bus service are located on Lynnview Road.

Demand for the park and ride at this facility is expected to be low with commuters coming from the communities of Dover and Erin Woods via 50th Avenue and Ogden Road. The park and ride facility could be expanded for joint parking usage to serve recreational land uses along the Bow River.

Currently this part of the Lynnview Ridge Community has environmental issues, and Imperial Oil has purchased most of the affected homes.



CENTERLINE
LRT TRACK
ALIGNMENT

30+600

PROPOSED
RETAINING
WALL

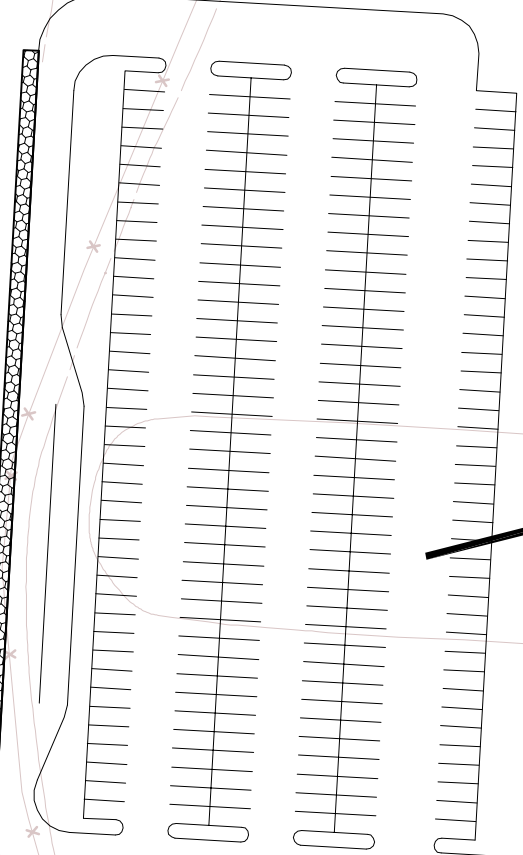
LYNNVIEW RD SE

2 BUS LAYBY

PROPOSED
SUBSTATION

SUBSTATION

PROPOSED
PARK AND
RIDE - 240
STALLS



PEDESTRIAN
WALKWAYS

OGDEN RD SE

CANADIAN NATIONAL RAILWAY

30+800

LYNNVIEW RIDGE STATION

STATION HEAD

PROPOSED
TUNNEL UNDER
CNR TRACKS



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PROJECT:

S.E. LRT FUNCTIONAL PLANNING STUDY

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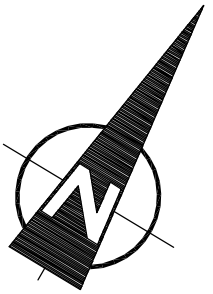
LYNNVIEW RIDGE STATION

7.6 Proposed 69th Avenue Station

The 69th Avenue Station is located immediately west of 69th Avenue, south of CPR's mainline track and north of Ogden Road (Figure 10). The Station is elevated 2 m above Ogden Road at a similar grade to the existing CPR track. The station will provide local service to commercial/Industrial businesses, including Ogden Shops and single family homes in the Millican/Ogden Community. The station is also within walking distance to commercial businesses on Ogden Road. There is planning policy support for a station at this location, since it could stimulate a commercial node and revitalize commercial activities along Ogden Road. Station design could also dovetail into the railway theme proposed for the area.

Bus service to the station is provided for on Ogden Road Street with 2 bus lay-bys in each direction. Final positioning of the southbound bus lay-by is subject to the future widening requirements for Ogden Road. No park and ride is recommended for this station.

Primary access to the platform is from the south end at 69th Avenue, at grade across the outbound track, emergency egress only is recommended from the north end of the platform.



CANADIAN PACIFIC RAILWAY

32+200

69th AVENUE STATION

2 BUS LAYBY

OGDEN RD. SE

PEDESTRIAN WALKWAYS

68 AV SE

69 AV SE

ROAD CLOSURE

2 BUS LAYBY

32+400

SUBSTATION

PROPOSED SUBSTATION

CENTERLINE LRT TRACK ALIGNMENT



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PROJECT:

S.E. LRT FUNCTIONAL PLANNING STUDY

TITLE SHEET:

69th AVENUE STATION

7.7 Proposed Shepard Road Station

The Shepard Road Station is located immediately south of Glenmore Trail and north of the future location of Shepard Road, on the west side of the current CPR track (Figure 11). The Station is at the same elevation as the future Shepard Road. The Station will provide local service to Industrial/Commercial business including the Glenmore Inn site, and South Hill and Riverbend Communities.

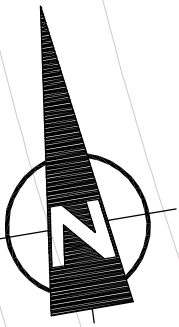
This station location represents a departure from the approved “South Hill” Study that had a station located at the Glenmore Inn Site. The advantages of the revised station are: improved access from Glenmore Trail, a redirection of commuter traffic away from the community of Millican/Ogden, availability of undeveloped land, an improved roadway network for commuters, and a reduced cost for property and fixed facilities.

A 200-stall park and ride facility, expandable to 350 stalls with a kiss and ride lay-by is provided on the City owned lands located west of the station. A total of 6 bus lay-bys are required for this site, two bus lay-bys in each direction on Shepard Road, and a two bus lay-by in the Park and Ride site.

Primary access to the platform is from the south end at Shepard Road, at grade across the outbound track, emergency egress only is recommended from the north end of the platform. A pedestrian activated crossing is recommended from the eastbound Bus Lay-by across future Shepard Road.

Demand for the park and ride at this facility is expected to be low with commuters coming from the communities of Riverbend and Ogden via 24th Street.

The City is currently acquiring and assembling land in this area to upgrade the road network and to reconsolidate the land parcels for future development. The LRT requirements need to be a part of this process, and as such The City of Calgary, Corporate Properties Division is aware of this Project.



CANADIAN PACIFIC RAILWAY

SHEPARD ROAD STATION

SUBSTATION

PROPOSED
SUBSTATION

34+000

34+200

28 ST SE

27 ST SE

SHEPARD RD SE

CENTERLINE
LRT TRACK
ALIGNMENT

PROPOSED
PARK AND
RIDE

PARK & RIDE - 350 STALLS REQ'D.

2 BUS LAYBY

2 BUS LAYBY

2 BUS LAYBY

PEDESTRIAN
WALKWAYS

SHEPARD ROAD

Clifton **NDL** **Lee**
CONSULTING INC.

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DATE Jan. '04

PROJECT:

S.E. LRT FUNCTIONAL PLANNING STUDY

TITLE SHEET:

SHEPARD ROAD STATION

8. CONSTRUCTION COSTING

8.1 LRT Construction Costs

It is estimated that this project will cost, \$288 million dollars, a summary estimate is shown in Section 8.3, with the complete cost estimates contained in Appendix B.

There are typically four types of estimates prepared during the life of a project; Concept, Preliminary, Definitive and Control. We are currently at the Concept level for this project, which is defined as follows.

A Conceptual design estimate is typically defined where the engineering expenditure to date is less than ½% of the capital cost. These types of estimates are produced by factoring in costs from similar projects, using factors for cost escalation, site accessibility, and comparative labour and material rates from other projects. The accuracy of this type of estimate is in the range of 25% to 35%. Typical contingency allowances at this level of estimate range from 20% to 30%. We have selected the contingency at the high range.

The contingency allowance is intended to cover items of the project which fall within the scope of work, but which cannot be foreseen due to a lack of detailed engineering and other information (e.g.: Soil's Reports) at the time of the estimate. Contingencies are not intended to cover, out of scope work, inflation, or inaccuracies within the estimate itself.

LRT construction costs include the following main cost elements: track elements, earthworks, structures, local improvements, miscellaneous costs, station costs, and right of way costs including land. The various components of these elements are explained as follows.

8.1.1 Track Elements

Track Elements are broken down into the following components:

- Trackwork which includes
 - ◇ Supply of 100# rail
 - ◇ Flash butt welding of rail strings
 - ◇ Supply of concrete ties and clips
 - ◇ Supply of track and landscape ballast
 - ◇ Track Installation, stressing and surfacing
- Grading, which includes:
 - ◇ Sub-grade preparation and Improvement

- ◇ Supply and Installation of sub ballast
- ◇ Supply and installation of surface and subsurface drainage system
- ◇ Right of way fencing
- Traction Power and Signals, which includes:
 - ◇ Underground duct banks and conductors
 - ◇ Catenary poles and foundations, contact/support wires
 - ◇ Pull boxes and manholes
 - ◇ ABS Signals and equipment
- Power Supply, which includes:
 - ◇ Traction power substations
 - ◇ Sub station equipment
 - ◇ Substation building
- Turnouts and switch heaters
- Setoff Tracks

8.1.2 Earthworks

Earthworks is the cost to move material from a cut situation to an embankment fill or the cost of importing suitable fill materials. It was assumed that 20% of the cut material will be classed as unsuitable and will be screened and spread as topsoil. For estimating purposes unit rates which represent a conservative approach to earthmoving were used. Cut and fill slopes have been assumed to be 3:1.

There is currently no allowance in the cost estimate for dealing with contaminated soils, which may exist at the Lynnview Ridge Station and Park and Ride site, adjacent to the CPR trackage in Ramsay, and along Ogden Road in Ogden.

Costs include the complete embankment adjacent to the CPR trackage in the Milligan/Ogden area. In order to minimise the costs to both the City and CPR it is preferable to develop the total embankment at one time. This has financial advantages to both the City and CPR, and should be accounted for during lease negotiations with CPR for the right of way.

As a point of correction, the "South Hill Study" page A-8 reported a surplus cut volume of 100,000 m³. The volume was largely generated between stations 35+000 to 35+700 in this study. While this excess cut volume could

have been used in the section north of Glenmore Trail, it was also generating property requirements in excess of the old CPR spur right of way, and impacted 2 buildings. The horizontal alignment in this area has been adjusted to better balance the earthworks, this also creates some property or retaining wall requirements on the down slope side of the LRT right of way.

8.1.3 Structures

Structures includes the cost of LRT bridges over existing roads, railways and river crossings, it also includes the cost of cast in place (CIP), or mechanically stabilised earth (MSE) retaining walls. In general, we have costed for the lower cost MSE walls where the LRT is in a fill situation, where the LRT is in cut adjacent to private property or roadways we have costed for CIP walls since this minimizes impacts to utilities and adjacent property.

8.1.4 Local Improvements

Local improvements generally include cost items related to revisions to local streets to provide bus lay-bys, pedestrian improvements, and restoration or re-establishment of roads and laneways caused by LRT construction.

8.1.5 Miscellaneous

This item includes the costs of system landscaping, lighting around station areas and for local road improvements. It also include the cost of utility works which result from LRT construction, such as watermain encasements, raising power lines to clear structures, and other utility relocations.

This item also includes costs for railway relocations for both the CPR and CN.

8.1.6 Station Costs

The base cost for a simple walk-on centre platform station is estimated to be \$1.5M dollars. The Lynnview Ridge Station House and tunnel is estimated to cost an additional \$1.6M. The base station construction costs include the following Items:

- ◇ 5-car platform 130 m long, 7.3 m wide, pre-cast platform and foundations
- ◇ Walkways, stairs and ramps
- ◇ Railing and other miscellaneous metals

- ◇ Passenger Shelters
- ◇ Pedestrian crossing protection and surface
- ◇ Ticketing systems
- ◇ Lighting
- ◇ CCTV and Paging system
- ◇ System signage and graphics
- ◇ Tactile Strip
- ◇ Landscaping
- ◇ Power supply
- ◇ Rail bracing through the station area
- ◇ 2-car length platform canopy (60 m) and foundations
- ◇ Fire protection
- ◇ Park and ride costs are included separately from station costs

8.1.7 Right of Way

Land costs were estimated based upon the ROW identified on the Drawings.

Property values were based on The City of Calgary 2003 property tax assessment plus 25% as a conservative approach to market value. In some instances the ROW did not affect the entire lot. When this occurred, we estimated the area required and assessed the going real estate rate for the property. We used a rate of \$350,000.00 per acre or approx. \$8.00/ sq. foot or \$86.50 /sq. metre for land acquisition. The cost for leasing right of way from both the CPR and CN has not been included in the capital cost, as this is an operating cost.

8.2 Other Establishment Costs

Other establishment costs such as LRT vehicles, maintenance facilities, and control center improvements have not been estimated. Other costs such as operating costs, right of way leasing costs, have also not been estimated at this time.

8.3 Cost Summary

South East LRT Planning Study ESTIMATE FOR BUDGET PURPOSES

ITEM	Sub Item	DESCRIPTION	TOTAL [\$]
1		Option 1 Base Case Alternative A	
	1	Elbow River to 26 Avenue SE Station 25+200 to 27+000	\$ 42,619,000
	2	26 Avenue SE to the Bow River Bridge Station 27+000 to 30+100	\$ 53,711,000
	3	Bow River to Glenmore Trail Station 30+100 to 33+820 Ties to South Hill Study Costing	\$ 74,312,000
SUB-TOTAL			\$170,642,000
Contingency, 30%			\$ 51,193,000
Engineering, 15%			\$ 33,275,000
Project Management, 15%			\$ 33,275,000
TOTAL BUDGET PRICE (2003 dollars)			\$288,385,000.00

Note:

- 1 Estimate is based on concept design level only.
- 2 Estimate excludes any vehicle, maintenance facility and control centre costs.
- 3 Estimate excludes lease arrangements with CN & CPR, which are operating costs.

APPENDIX A

Property Requirements

Option 1 rev March/04

Station	Roll Number	Address	Assessment	Property Type	Property Use	Area	Sq. ft.	m2	
Elbow River									
25+440	69000107	1001 8th St SE	\$ 31,500	Non Residential	Commercial		30247	2810	Partial
25+680	69014603	1020 9th St SE	\$ 218,500	Residential	Single Res		7095	659	
25+780	69014801	1020 11th Av SE	\$ 284,500	Residential	Single Res		13723	1275	
25+810	69023208	1101 10 St SE	\$ 232,500	Residential	Single Res		7421	689	
25+820	69023307	1105 10 St SE	\$ 221,500	Residential	Single Res		7421	689	
25+830	69009009	1013 11 St SE	\$ 64,000	Non Residential	Commercial		8031	746	
25+840	69009108	1015 11 St SE	\$ 171,500	Non Residential	Commercial		10366	963	
25+850	69026607	1108 10 St SE	\$ 179,500	Residential	Single Res		2197	204	
25+990	69026706	1127 11 St SE	\$ 445,000	Non Residential	Industrial		10887	1011	
26+010	69026813	1141 11St SE	\$ 141,000	Non Residential	Industrial		11583	1076	
26+010	69026904	1141 11St SE	\$ 309,500	Non Residential	Commercial		7958	739	
26+050	69027001	1143 11St SE	\$ 45,000	Non Residential	Commercial		5686	528	
26+080	69027100	1147 11St SE	\$ 43,500	Non Residential	Commercial		5438	505	
26+090	69027209	1149 11St SE	\$ 27,500	Non Residential	Commercial		3496	325	
26+100	69027308	1151 11St SE	\$ 38,500	Non Residential	Commercial		4844	450	
17 th Ave SE									
26+240	78001906	1802 11St SE	\$ 53,550	Non Residential	Industrial		54788	5090	Partial
26+320	78001716	1902 11St SE	\$ 66,150	Non Residential	Industrial		6000	557	Partial
26+420	78001609	2010 11St SE	\$ 369,000	Non Residential	Industrial		34767	3230	
25+550	78006400	2101 11St SE	\$ 75,000	Non Residential	Commercial		24450	2271	Partial
25+560	78006350	2105 11St SE	\$ 3,370	Non Residential	Commercial		2250	209	
25+650	78073202	2126 Hurst Rd SE	\$ 78,750	Non Residential	Industrial		126591	11761	Partial
26+900	78067907	1010 26 Av. SE	\$ 270,000	Non Residential	Industrial		229070	21281	Purchased 2003
26 th Ave SE									
27+000	78070604	1027 26 St SE	\$ 154,500	Non Residential	Commercial		16038	1490	
			\$ 3,523,820						
27+350	200200525	2904 11St SE	\$ 108,000	Non Residential	Industrial		64909	6030	Partial
Bow River									
30+800	99044208	511 Lynnview Rd. SE	\$ 696,500	Non Residential	Industrial		319492	29682	
32+320	114000292	6805 Ogden Rd SE	\$ 36,000	Non Residential	Commercial		54250	5040	Partial
69 th Ave SE									
72 th Ave SE									
74 th Ave SE									
34+000	120000609	8428 Shepard Rd SE	\$ 33,750	Non Residential	Industrial		158122	14690	Partial
34+300	120000906	2815 86th Ave SE	\$ 102,500	Non Residential	Industrial		155108	14410	
34+500	120019303	8825 Shepard Dr SE	\$ 468,000	Non Residential	Industrial		651310	60509	Partial
35+100	120021605	9101 Shepard Dr SE	\$ 432,500	Non Residential	Industrial		494536	45944	
35+200	120020524	9090 24 St SE	\$ 834,300	Non Residential	Industrial		512892	47649	Partial
35+480	120023205	9109 R Shepard Rd SE	\$ 5,180	Non Residential	Institutional		3014	280	
35+500	133001107	10116R 28 St SE	\$ 64,500	Non Residential	Industrial		56618	5260	
35+900	133001008	9908R 24St SE	\$ 160,500	Non Residential	Industrial		139931	13000	
36+000		9908 24 St SE	\$ 1,080,000	Non Residential	Industrial				Partial
36+400		10612 24St SE	\$ 135,000	Non Residential	Industrial				Partial
36+490	133001909	2500 107 Av SE	\$ 68,400	Non Residential	Industrial		198917	18480	Partial
36+500	133002006	2520 107 Av SE	\$ 24,000	Non Residential	Industrial		16253	1510	
107 th Ave SE			\$ 7,772,950						

APPENDIX B

Cost Estimates

ESTIMATE FOR BUDGET PURPOSES

SCHEDULE OF QUANTITIES AND PRICES

ITEM	Sub Item	DESCRIPTION	UNIT	ESTIMATED QUANTITIES	ESTIMATED PRICE [\$]	TOTAL [\$]
		Elbow River to 26 Avenue SE Alternative A, Elevated over 11 Street/ Portland Street SE, Recommended Station 25+200 to 27+000				
1		Track Elements				
	1	Track work	km	1.8	\$ 1,650,000.00	\$ 2,970,000.00
	2	Grading	km	1.8	\$ 965,000.00	\$ 1,737,000.00
	3	Traction power and signals	km	1.8	\$ 3,100,000.00	\$ 5,580,000.00
	4	Power supply	each	2	\$ 2,000,000.00	\$ 4,000,000.00
	5	At Grade Crossings	each	1	\$ 300,000.00	\$ 300,000.00
	6	Turnouts (incl X overs and switch heaters)	each	4	\$ 180,000.00	\$ 720,000.00
	7	Storage Tracks	km	0	\$ 1,100,000.00	\$ -
2		Earth works				
	1	Cut to Fill	m3	19300	\$ 10.00	\$ 193,000.00
	2	Imported Fill	m3	0	\$ 20.00	\$ -
	3	Stripping, (cut, store, screen, place)	m3	5300	\$ 15.00	\$ 79,500.00
	4	Over Haul, cut to fill	m3	11000	\$ 12.00	\$ 132,000.00
		Credit for Import Fill	m3	11000	\$ 20.00	\$ (220,000.00)
3		Structures				
	1	CIP Retaining Walls	m2	2228	\$ 700.00	\$ 1,559,600.00
	2	MSE Retaining Walls	m2	6570	\$ 550.00	\$ 3,613,500.00
	3	Elbow River Crossing	m	90	\$ 45,000.00	\$ 4,050,000.00
	4	11 Street structure/CPR	m	60	\$ 30,000.00	\$ 1,800,000.00
	5	11 Street structure/Portland	m	55	\$ 30,000.00	\$ 1,650,000.00
	6	CPR South Line	m	115	\$ 30,000.00	\$ 3,450,000.00
4		Street Works/Local Improvement & Restorations				
	1	8th Street SE	m2	100	\$ 121.00	\$ 12,100.00
	2	9th Street SE	m2	1800	\$ 121.00	\$ 217,800.00
	3	11 Street SE at CPR	m2	600	\$ 121.00	\$ 72,600.00
	4	10th Street/ 11th Avenue SE	m2	1500	\$ 121.00	\$ 181,500.00
	5	11th Street at Portland	m2	400	\$ 121.00	\$ 48,400.00
	6	26th Avenue SE	m2	240	\$ 121.00	\$ 29,040.00
5		Misc.				
	1	Landscaping (3%)	LS	LS	LS	\$ 965,281.20
	2	Lighting, 25% of (4)	LS	LS	LS	\$ 140,360.00
	3	Major Utilities	PS	1.8	\$ 250,000.00	\$ 450,000.00
	4	CP Rail siding replacement				
	4a	Track, including grading and drainage	km	0.42	\$ 960,000.00	\$ 403,200.00
	4b	Turnouts #9	each	2	\$ 50,000.00	\$ 100,000.00
	4c	Track removals	km	0.42	\$ 25,000.00	\$ 10,500.00
	4d	Railway Corporate Overheads (30%)	LS	LS		\$ 154,110.00
6		Station Costs				
	1	Inglewood/Ramsay Station	each	1	\$ 1,500,000.00	\$ 1,500,000.00
	2	Pedestrian Bridge to Station	m2	300	\$ 2,500.00	\$ 750,000.00
	3	Pedestrian walkways on structures	m2	100	\$ 1,500.00	\$ 150,000.00
7		Right of Way Costs	LS		LS	\$ 5,619,775.00
		Recent Improvement to Remington Property				\$ 200,000.00
		Accessed value *25%, see note 4				
SUB-TOTAL						\$ 42,619,266.20

ESTIMATE FOR BUDGET PURPOSES

SCHEDULE OF QUANTITIES AND PRICES

ITEM	Sub Item	DESCRIPTION	UNIT	ESTIMATED QUANTITIES	ESTIMATED PRICE [\\$]	TOTAL [\\$]
		26 Avenue SE to the Bow River Bridge				
		Station 27+000 to 30+100				
1		Track Elements				
	1	Track work	km	3.1	\$ 1,650,000.00	\$ 5,115,000.00
	2	Grading	km	3.1	\$ 965,000.00	\$ 2,991,500.00
	3	Traction power and signals	km	3.1	\$ 3,100,000.00	\$ 9,610,000.00
	4	Power supply	each	3	\$ 2,000,000.00	\$ 6,000,000.00
	5	At Grade Crossings	each	0	\$ 300,000.00	\$ -
	6	Turnouts (incl X overs and switch heaters)	each	10	\$ 180,000.00	\$ 1,800,000.00
	7	Storage Tracks	km	0.2	\$ 1,100,000.00	\$ 220,000.00
2		Earth works				
	1	Cut to Fill	m3	70000	\$ 10.00	\$ 700,000.00
	2	Imported Fill	m3	87000	\$ 20.00	\$ 1,740,000.00
	3	Strippings, (cut, store, screen, place)	m3	10500	\$ 15.00	\$ 157,500.00
	4	Over Haul, cut to fill	m3	0	\$ 12.00	\$ -
	5	Reversal of Credit for Import Fill from previous section	m3	11000	\$ 20.00	\$ 220,000.00
3		Structures				
	1	MSE Retaining Walls	m2	6800	\$ 550.00	\$ 3,740,000.00
	2	26th Ave SE	m	50	\$ 30,000.00	\$ 1,500,000.00
	3	Highfield Spur Underpass	m2	450	\$ 3,300.00	\$ 1,485,000.00
	4	Pump Station and Drainage	LS	1	\$ 400,000.00	\$ 400,000.00
	5	38th Avenue/Highfield SE	m	50	\$ 30,000.00	\$ 1,500,000.00
	6	Deerfoot Trail	m	120	\$ 30,000.00	\$ 3,600,000.00
4		Street Works/local Improvement & Restorations				
	1	Blackfoot Trail SE	m2	500	\$ 121.00	\$ 60,500.00
	2	38th Avenue/Highfield SE	m2	1000	\$ 121.00	\$ 121,000.00
5		Misc				
	1	Landscaping 3%	LS			\$ 1,228,815.00
	2	Lighting, 25% of (4)				\$ 45,375.00
	3	Major Utilities	PS	3.1	\$ 1,000,000.00	\$ 3,100,000.00
	3a	Transmission Line relocation	PS	1	\$ 250,000.00	\$ 250,000.00
	4	CNR Rail Relocations				
	4a	Track, incl grading and drainage	km	3.7	\$ 960,000.00	\$ 3,552,000.00
	4b	#8 Turnouts	each	13	\$ 50,000.00	\$ 650,000.00
	4c	Taking up existing trk and TOs	km	4	\$ 25,000.00	\$ 100,000.00
	4d	Railway Corporate Overheads	LS	LS		\$ 1,290,600.00
6		Station Costs				
		26th Ave SE/ Blackfoot Trail (Optional)	each	1	\$ 1,500,000.00	
		Highfield Boulevard	each	1	\$ 1,500,000.00	\$ 1,500,000.00
		Pedestrian walkways on structures	m2	200	\$ 1,500.00	\$ 300,000.00
7		Right of Way Costs				\$ 733,750.00
SUB-TOTAL						\$ 53,711,040.00

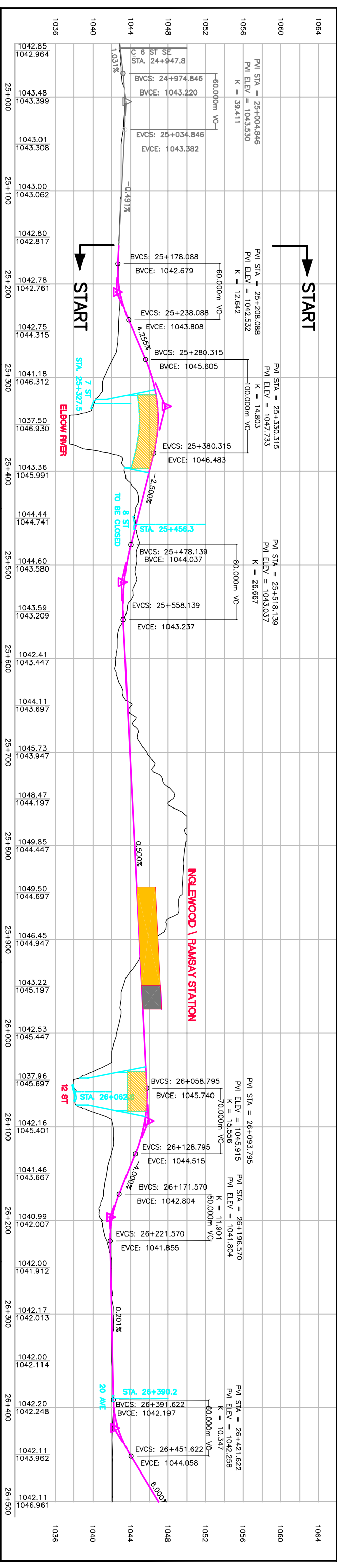
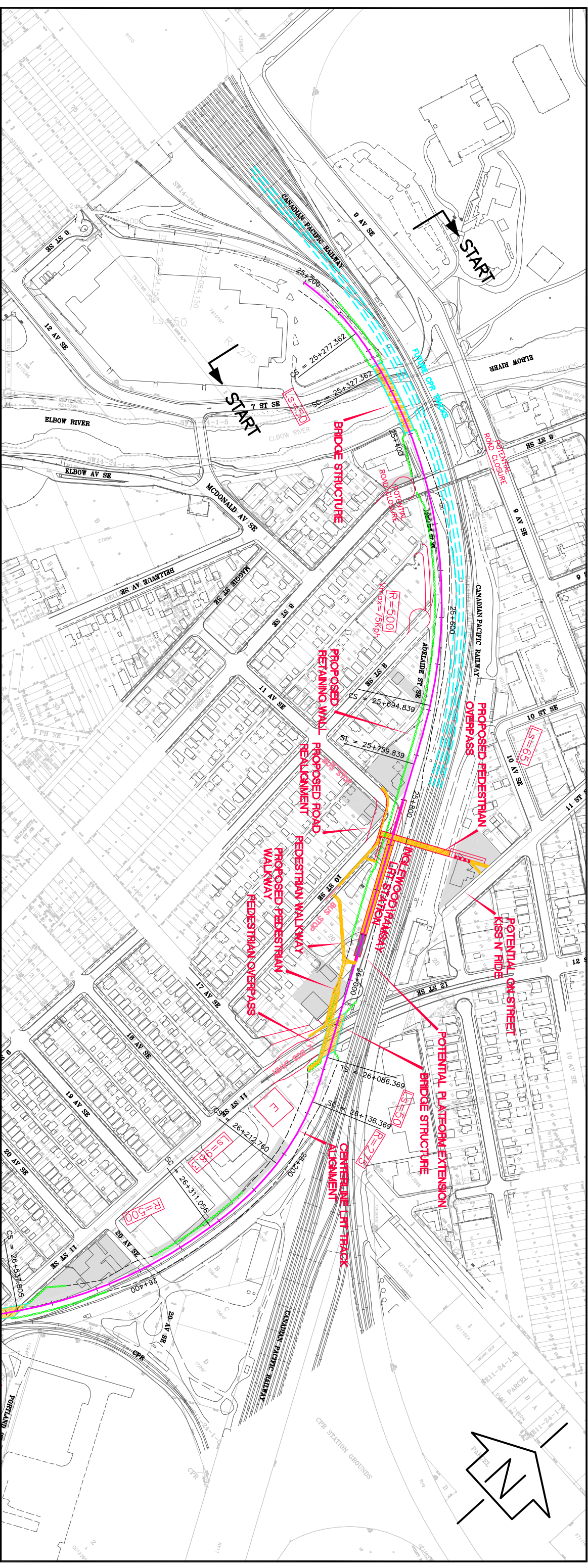
ESTIMATE FOR BUDGET PURPOSES

SCHEDULE OF QUANTITIES AND PRICES

ITEM	Sub Item	DESCRIPTION	UNIT	ESTIMATED QUANTITIES	ESTIMATED PRICE [\$]	TOTAL [\$]
		Bow River to Glenmore Trail				
		Station 30+100 to 33+820				
		Ties to South Hill Study Costing				
1		Track Elements				
	1	Track work	km	3.72	\$ 1,650,000.00	\$ 6,138,000.00
	2	Grading	km	3.72	\$ 965,000.00	\$ 3,589,800.00
	3	Traction power and signals	km	3.72	\$ 3,100,000.00	\$ 11,532,000.00
	4	Power supply	each	4	\$ 2,000,000.00	\$ 8,000,000.00
	5	At Grade Crossings*	each	3	\$ 300,000.00	\$ 900,000.00
	6	Turnouts (incl X overs and switch heaters)	each	14	\$ 180,000.00	\$ 2,520,000.00
	7	Storage Tracks	km	0.2	\$ 1,100,000.00	\$ 220,000.00
2		Earth works				
	1	Cut to Fill	m3	31000	\$ 10.00	\$ 310,000.00
	2	Imported Fill	m3	276000	\$ 20.00	\$ 5,520,000.00
	3	Strippings, (cut, store, screen, place)	m3	6000	\$ 15.00	\$ 90,000.00
	4	Over Haul, cut to fill	m3	0	\$ 12.00	\$ -
3		Structures				
	1	MSE Retaining Walls	m2	6905	\$ 550.00	\$ 3,797,750.00
	2	Bow River Crossing	m	190	\$ 45,000.00	\$ 8,550,000.00
	3	Ogden Road	m	110	\$ 30,000.00	\$ 3,300,000.00
4		Street Works/local Improvement & Restorations				
	1	Lynn View Rd & Ogden Road	m2	500	\$ 121.00	\$ 60,500.00
	2	Ogden Rd at 69th Ave	m2	800	\$ 121.00	\$ 96,800.00
	3	74th Avenue Underpass (Optional)				
	3a	CIP Retaining Walls	m2	480	\$ 700.00	\$ 336,000.00
	3b	Structures	m2	800	\$ 2,500.00	\$ 2,000,000.00
	3c	Road Revisions, 74th Ave	m2	4200	\$ 121.00	\$ 508,200.00
	3d	Misc, Drainage, PS, lighting etc	LS	LS	\$	\$ 250,000.00
	3e	Railway detour costs	LS	LS	\$	\$ 500,000.00
5		Misc				
	1	Landscaping 3%				\$ 1,638,745.50
	2	Lighting 25% of (4)				
	3	Major Utilities	PS	3.72	\$ 1,000,000.00	\$ 3,720,000.00
	3a	Environmental collection System (Bow R)	LS	1	\$ 150,000.00	\$ 150,000.00
6		Station Costs				
		Lynnview Ridge	LS	1	\$ 3,000,000.00	\$ 3,000,000.00
		69th Avenue	LS	1	\$ 1,500,000.00	\$ 1,500,000.00
		Lynnview Ridge Park and Ride + connection rds	m2	10,800	\$ 96.00	\$ 1,036,800.00
		Pedestrian Walkways on structures	m2	0	\$ 1,500.00	\$ -
7		Right of Way Costs (includes right of way cost south of Glenmore Trail)				\$ 5,048,287.50
		Accessed value plus 25%				
SUB-TOTAL						\$ 74,312,883.00

APPENDIX C

Recommended SE LRT Plan, Profiles and Sections



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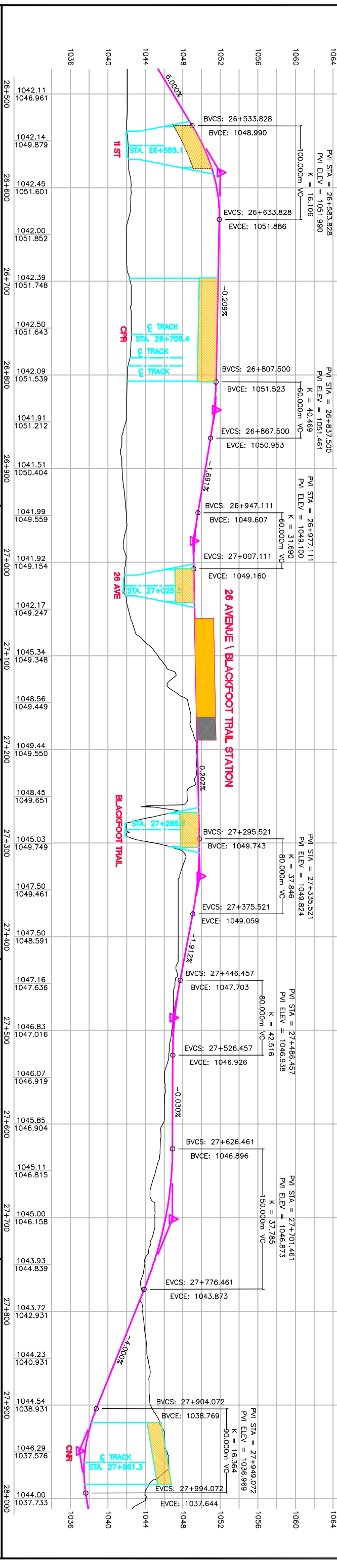
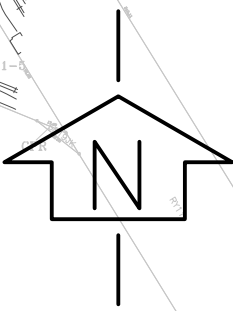
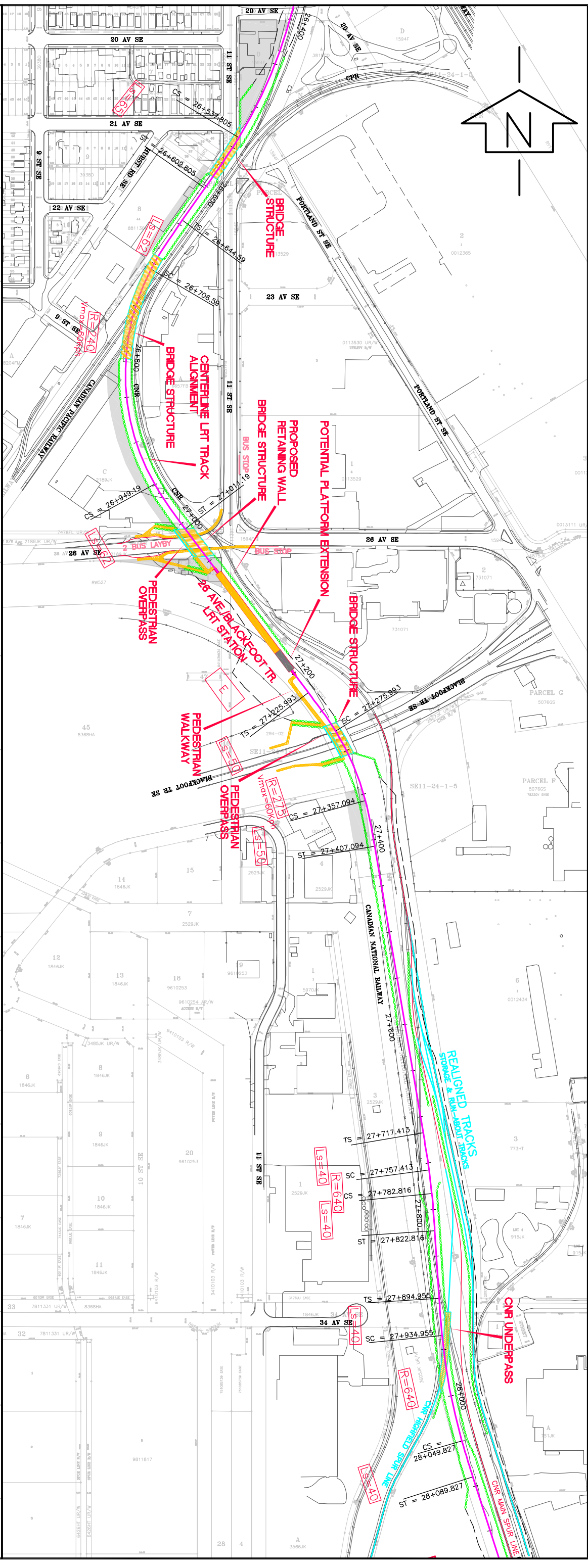
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- RETAINING WALL
- LIMIT OF WORKS
- ROAD REALIGNMENT
- PEDESTRIAN PATH
- LAND TO BE PURCHASED

DATE: Jan. '04
SCALE: 1 : 400 H, 1 : 400 V
DWG NO.: 11025-PP01

PROJECT: CITY OF CALGARY
 SOUTHEAST LRT
 FUNCTIONAL PLANNING STUDY

TITLE: RECOMMENDED PLAN
 PLAN-PROFILE
 STA. 25+220 TO 26+500

Clifton **NPD Lea**
 CONSULTING INC.



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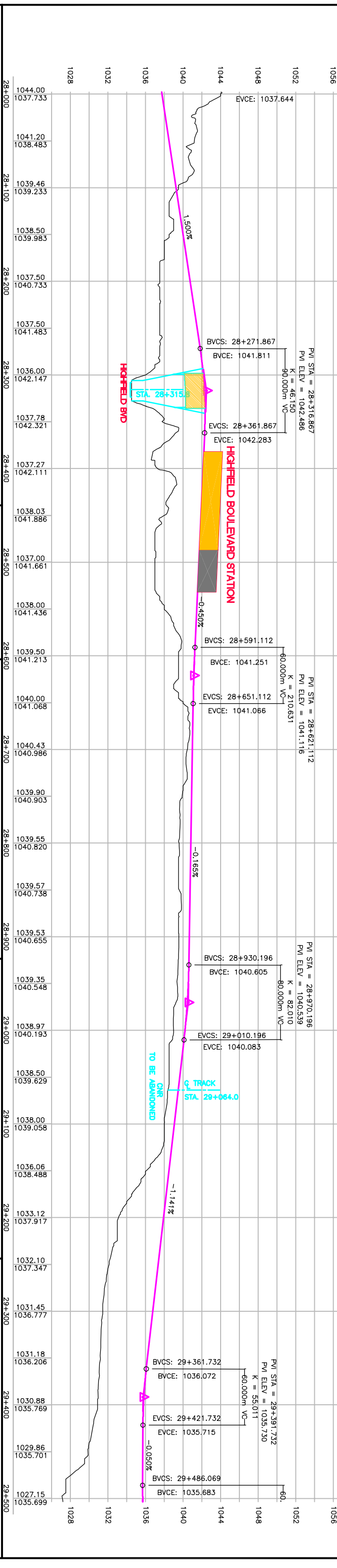
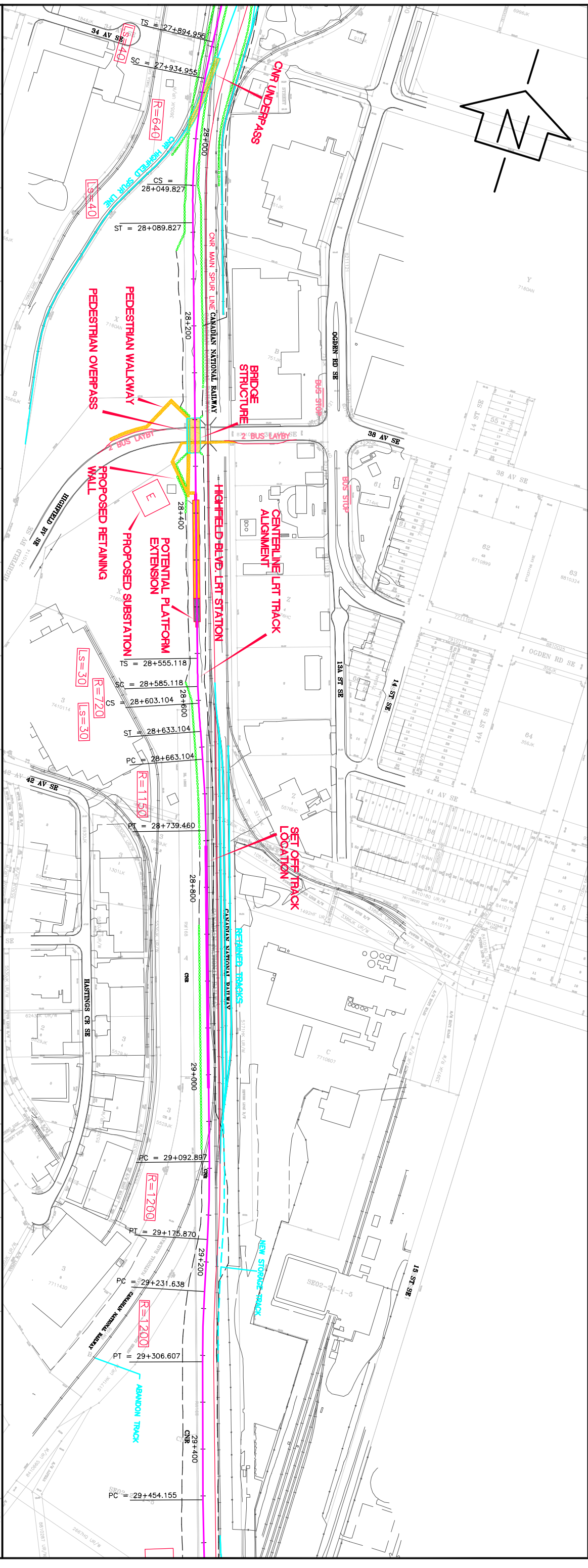
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- RETAINING WALL
- LIMIT OF WORKS
- ROAD REALIGNMENT
- LAND TO BE PURCHASED
- PEDESTRIAN PATH

DATE: Jan. '04
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DWG. NO.: 11025-PP02

PROJECT: CITY OF CALGARY
 SOUTHEAST LRT
 FUNCTIONAL PLANNING STUDY

TITLE: RECOMMENDED PLAN
 PLAN-PROFILE
 STA. 26+500 TO 28+000

CIFFTON **ND Lea**
 CONSULTING INC



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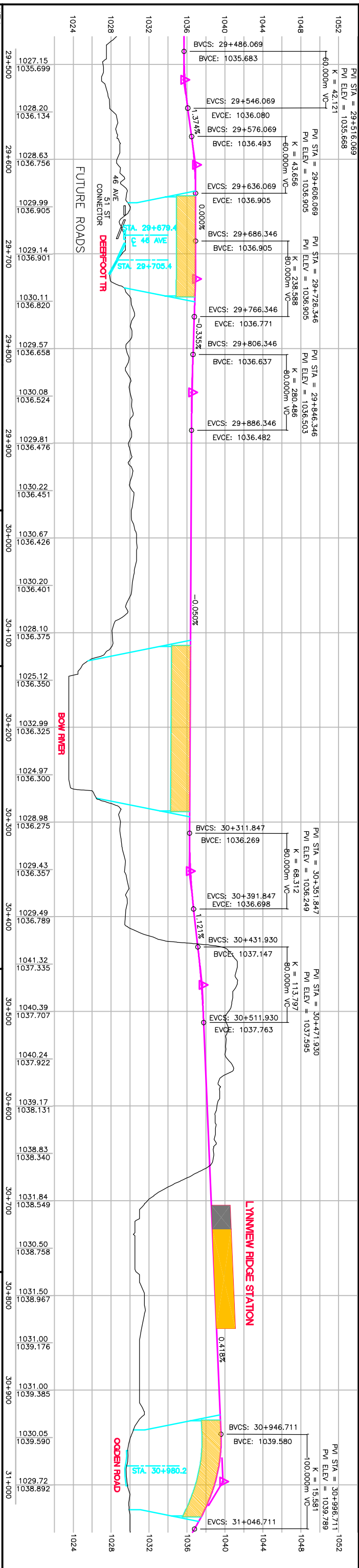
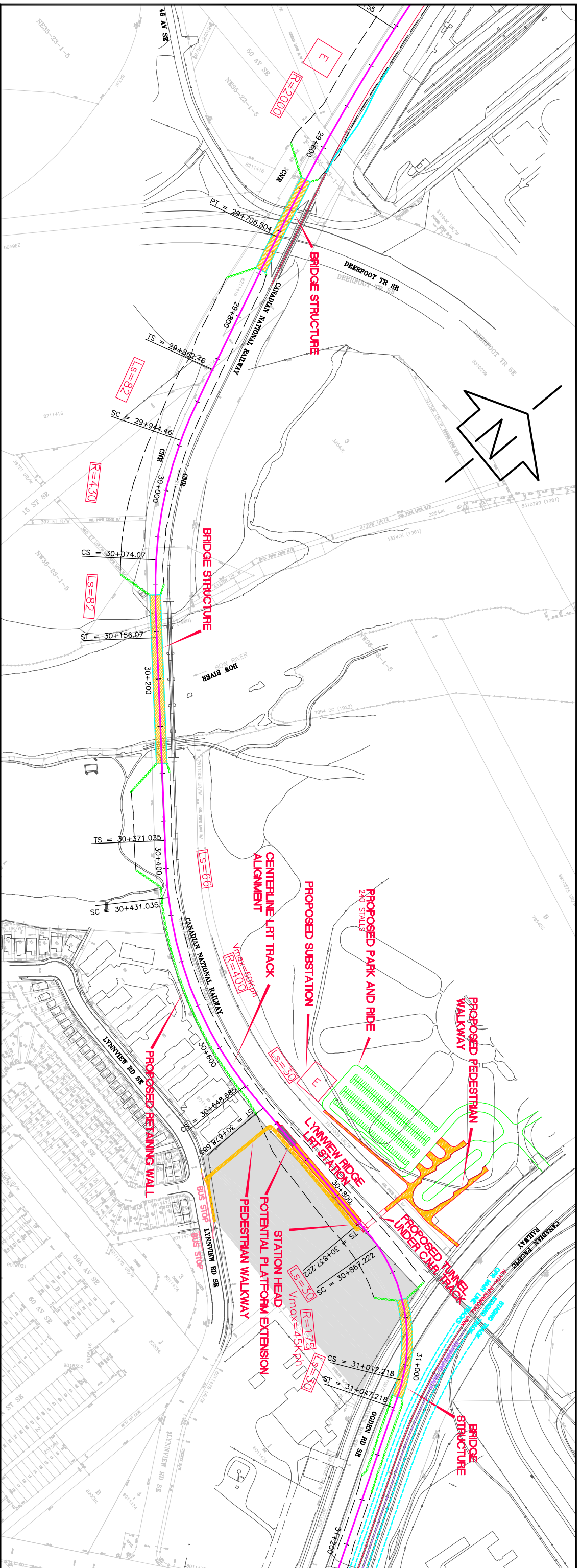
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- RETAINING WALL
- LIMIT OF WORKS
- ROAD REALIGNMENT
- PEDESTRIAN PATH
- LAND TO BE PURCHASED

DATE	Jan. '04
SCALE	1 : 4000 H 1 : 400 V
DWG. NO.	11025-PP03

PROJECT: CITY OF CALGARY SOUTHEAST LRT FUNCTIONAL PLANNING STUDY

TITLE: RECOMMENDED PLAN PLAN-PROFILE STA. 28+000 TO 29+500

Clifton **ND Lea** CONSULTING INC



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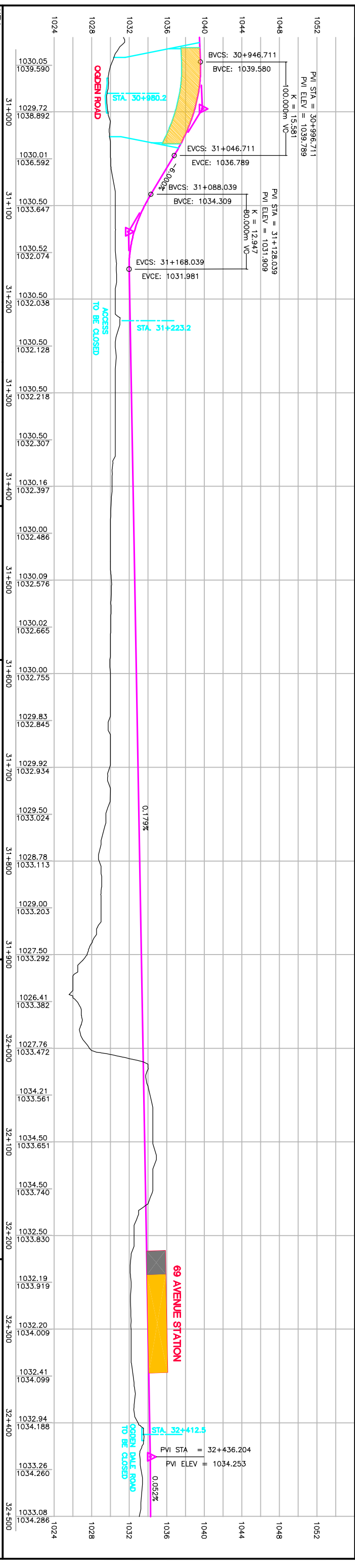
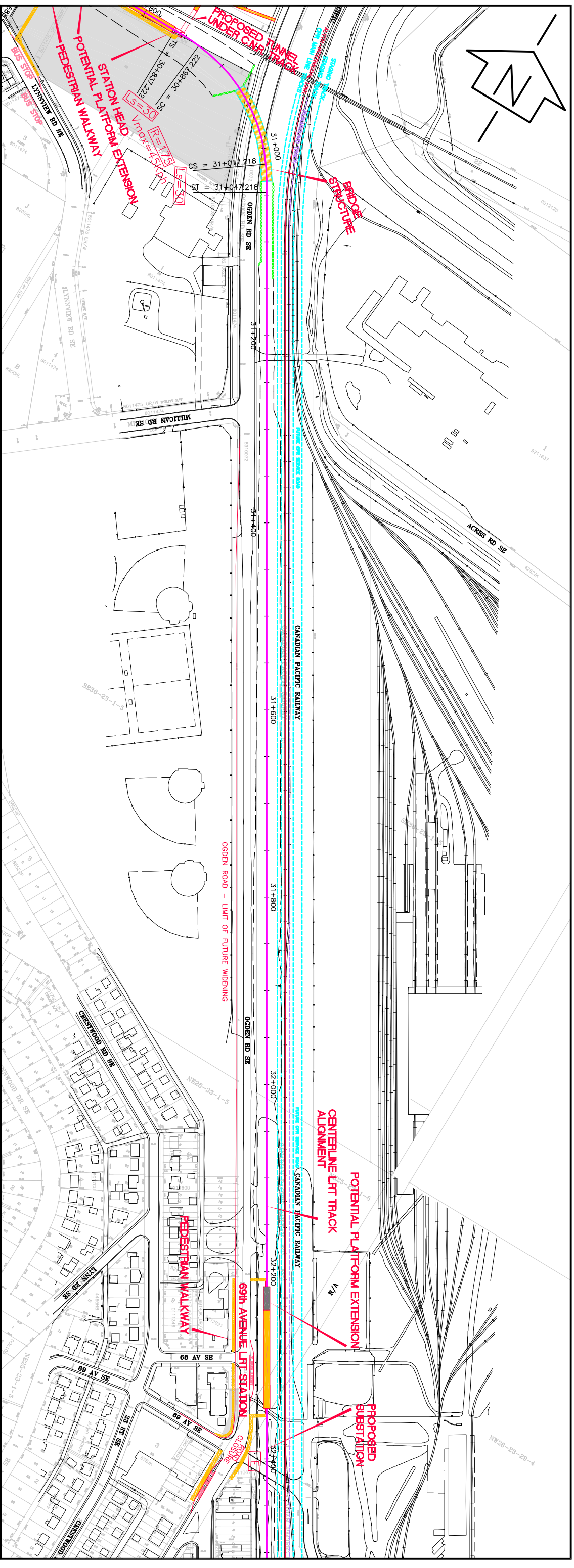
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- RETAINING WALL
- LIMIT OF WORKS
- ROAD REALIGNMENT
- PEDESTRIAN PATH
- LAND TO BE PURCHASED

DATE	Jan. '04
SCALE	1 : 4000 H 1 : 400 V
DWG. NO.	11025-PP04

PROJECT:
CITY OF CALGARY
SOUTHEAST LRT
FUNCTIONAL PLANNING STUDY

TITLE:
RECOMMENDED PLAN
PLAN-PROFILE
STA. 29+500 TO 31+000

Clifton **ND Lea**
CONSULTING INC



KEY:

- LRT CONTROL LINE
- ELECTRICAL SUBSTATION
- RETAINING WALL
- LIMIT OF WORKS
- ROAD REALIGNMENT
- PEDESTRIAN PATH
- LAND TO BE PURCHASED

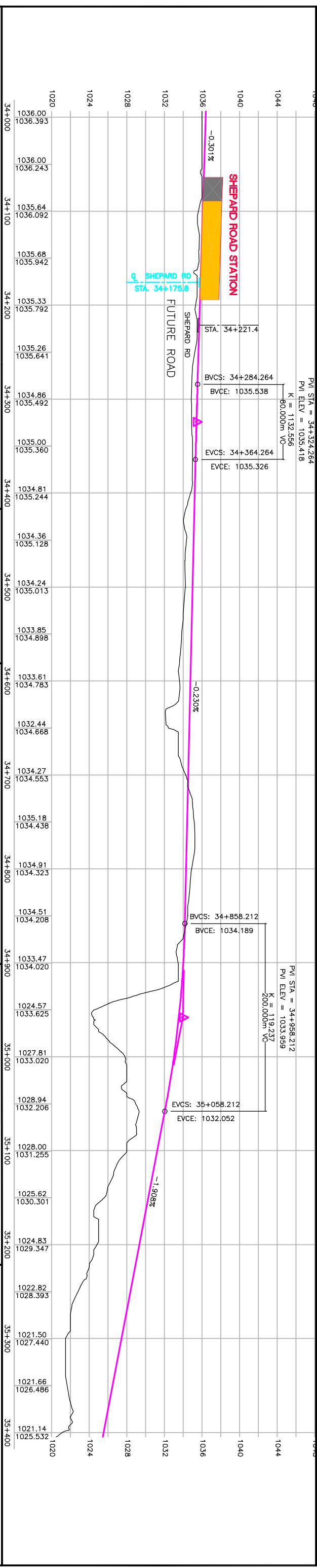
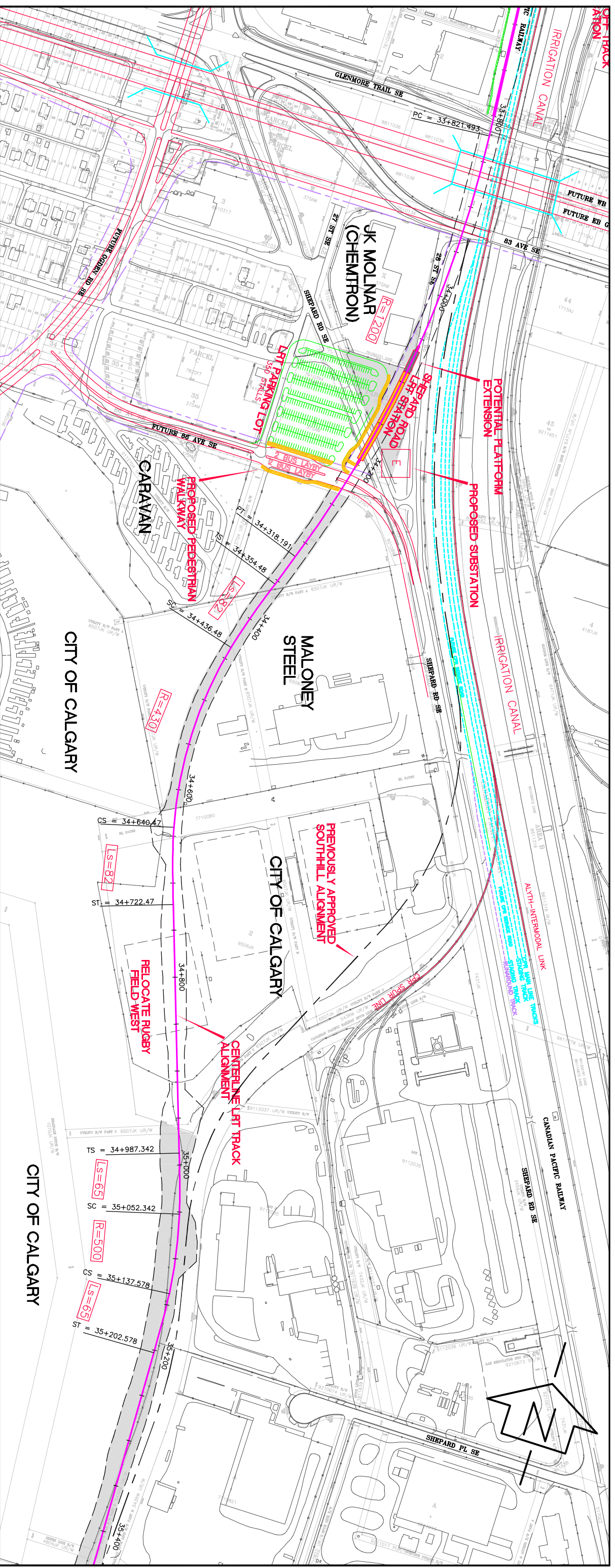
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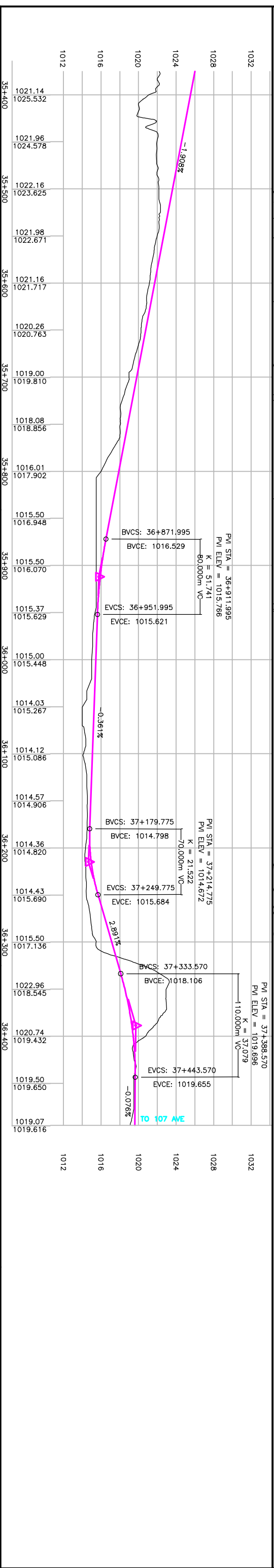
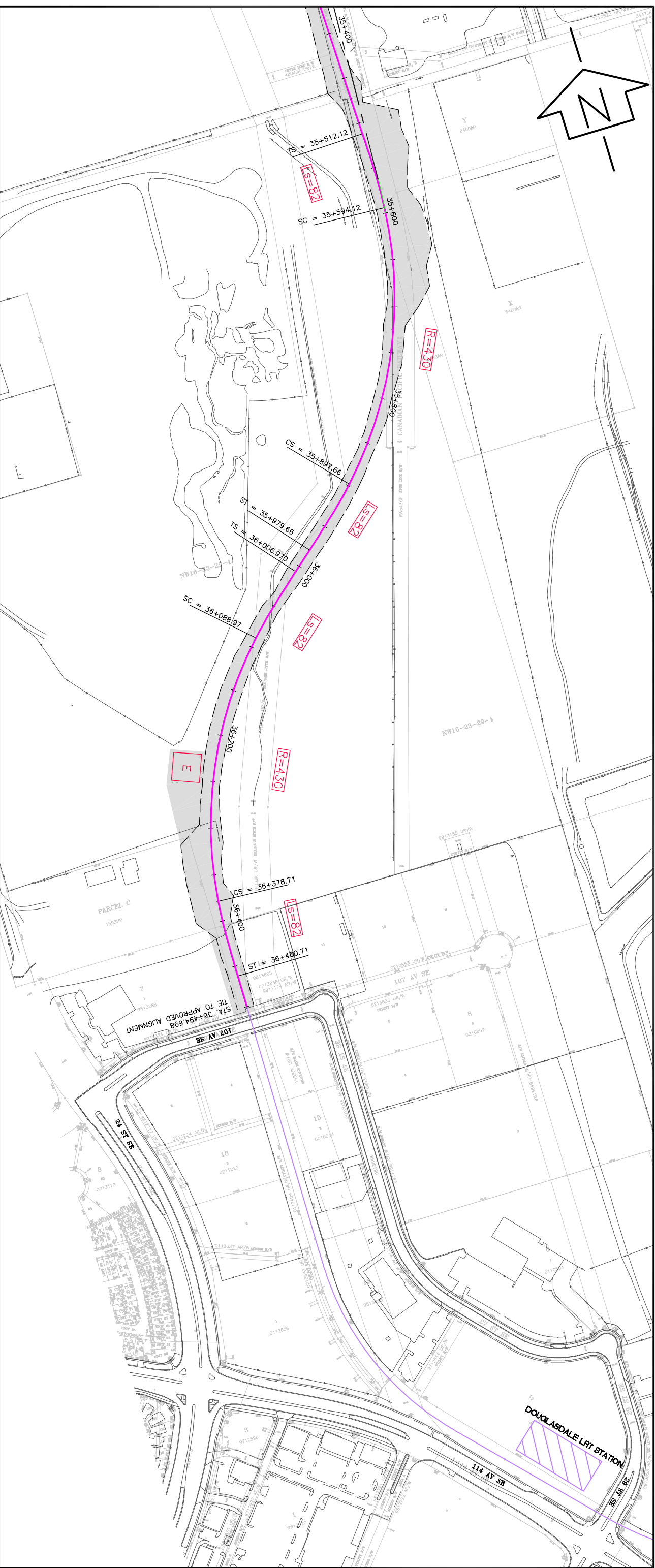
Clifton **ND Lea** CONSULTING INC

PROJECT: CITY OF CALGARY SOUTHEAST LRT FUNCTIONAL PLANNING STUDY

TITLE: RECOMMENDED PLAN PLAN-PROFILE STA. 31+000 TO 32+500

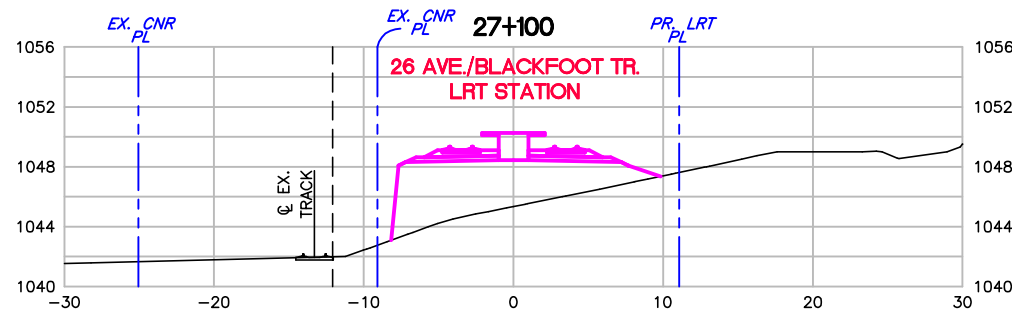
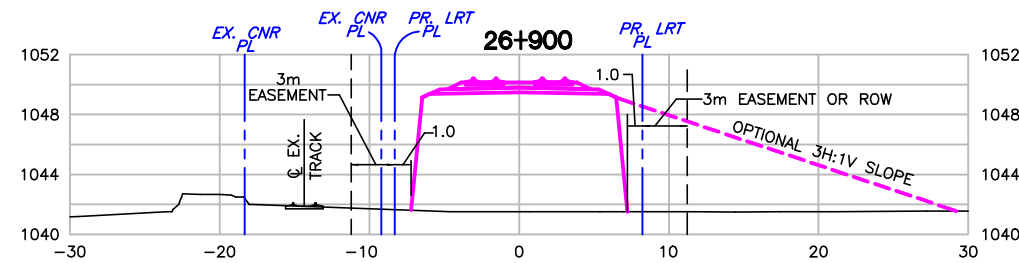
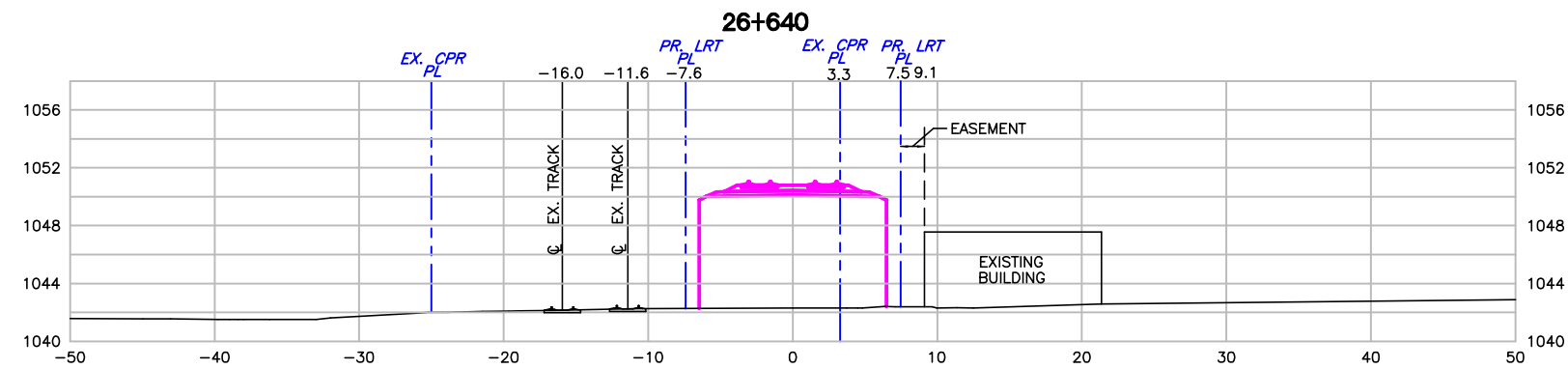
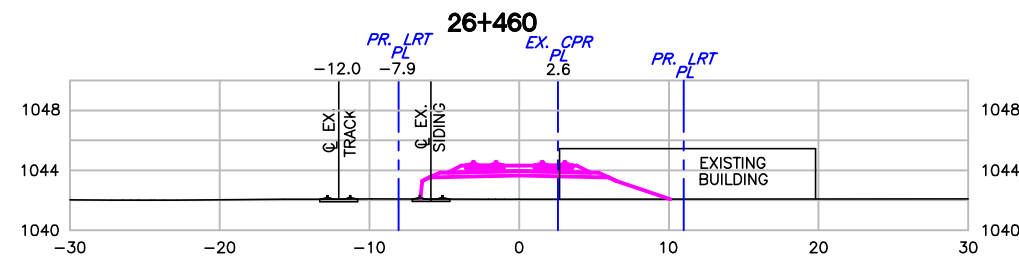
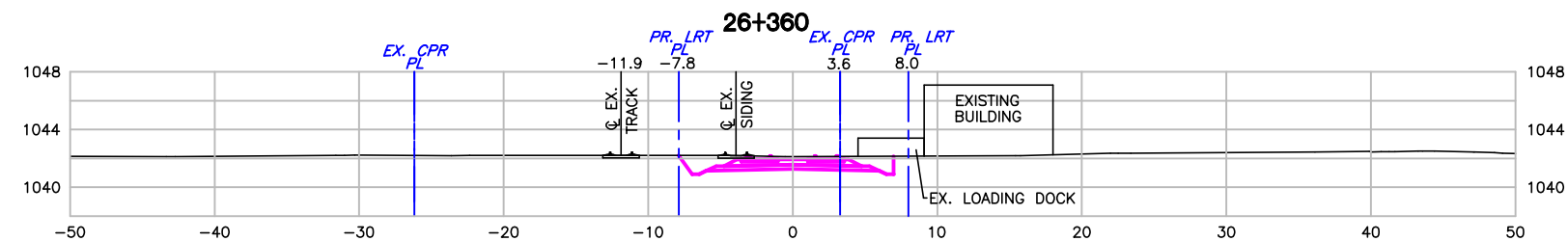
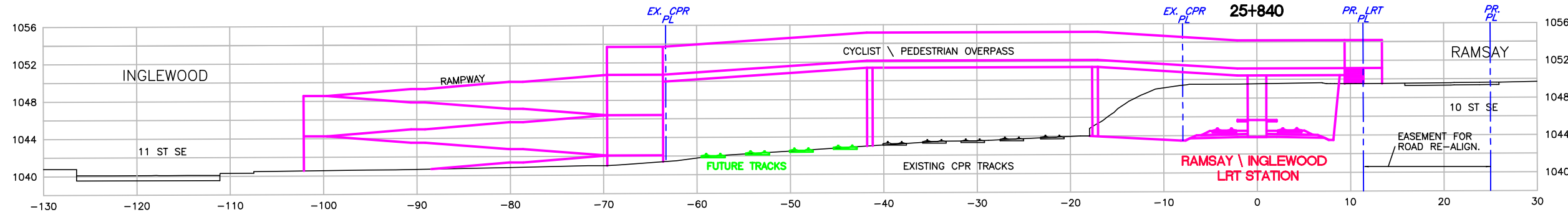
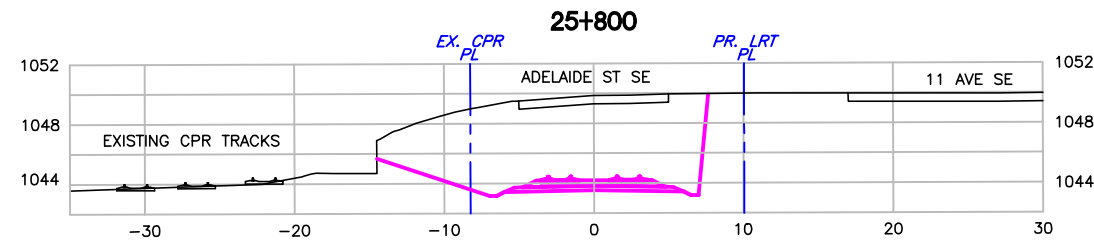
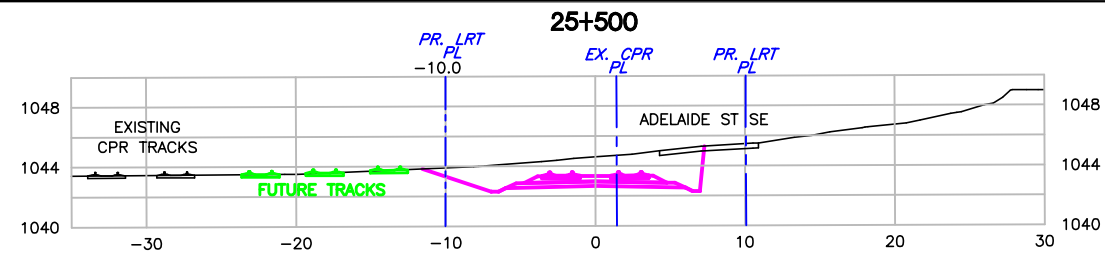


KEY: LRT CONTROL LINE ELECTRICAL SUBSTATION RETAINING WALL LIMIT OF WORKS ROAD REALIGNMENT PEDESTRIAN PATH		DATE: Jan. '04 SCALE: 1 : 4000 H 1 : 400 V DWG NO.: 11025-PP07
PROJECT: CITY OF CALGARY SOUTHEAST LRT FUNCTIONAL PLANNING STUDY		TITLE: RECOMMENDED PLAN PLAN-PROFILE STA. 34+000 TO 35+400



KEY: LRT CONTROL LINE ELECTRICAL SUBSTATION RETAINING WALL LIMIT OF WORKS ROAD REALIGNMENT PEDESTRIAN PATH LRT CONTROL LINE BY OTHERS LAND TO BE PURCHASED	DATE: Jan. '04 SCALE: 1 : 4000 H 1 : 400 V DWG. NO.: 11025-PP08	PROJECT: CITY OF CALGARY SOUTHEAST LRT FUNCTIONAL PLANNING STUDY	TITLE: RECOMMENDED PLAN PLAN-PROFILE STA. 35+400 TO 36+500
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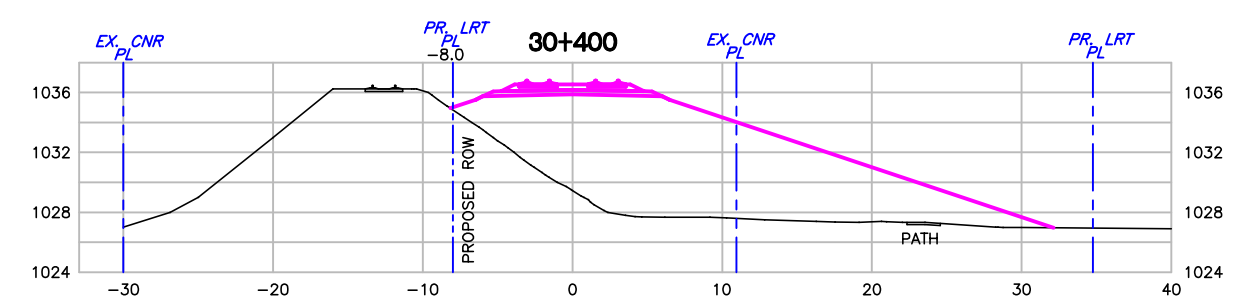
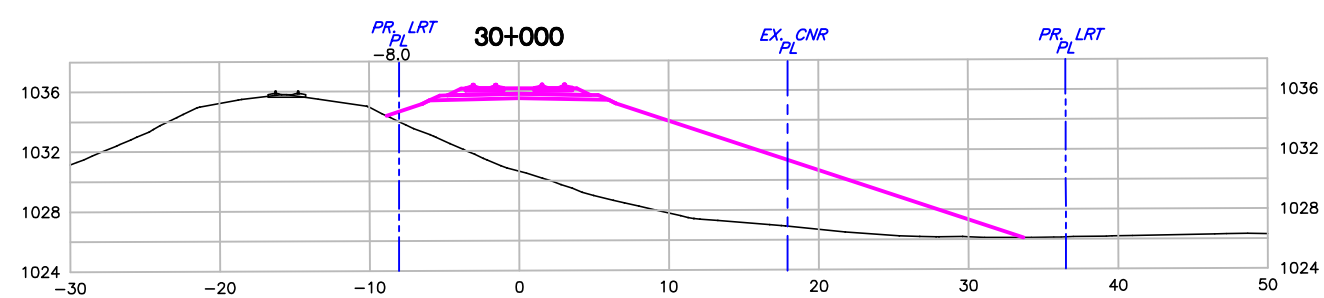
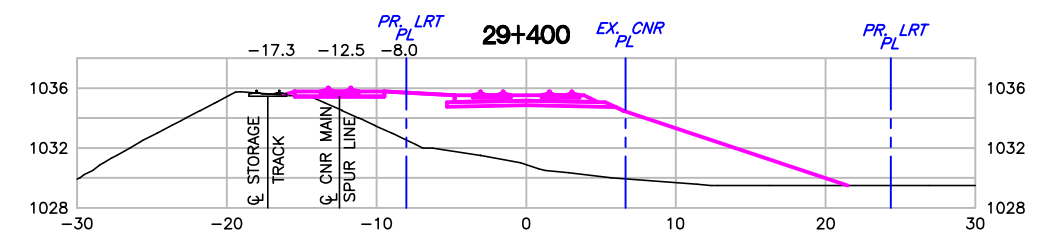
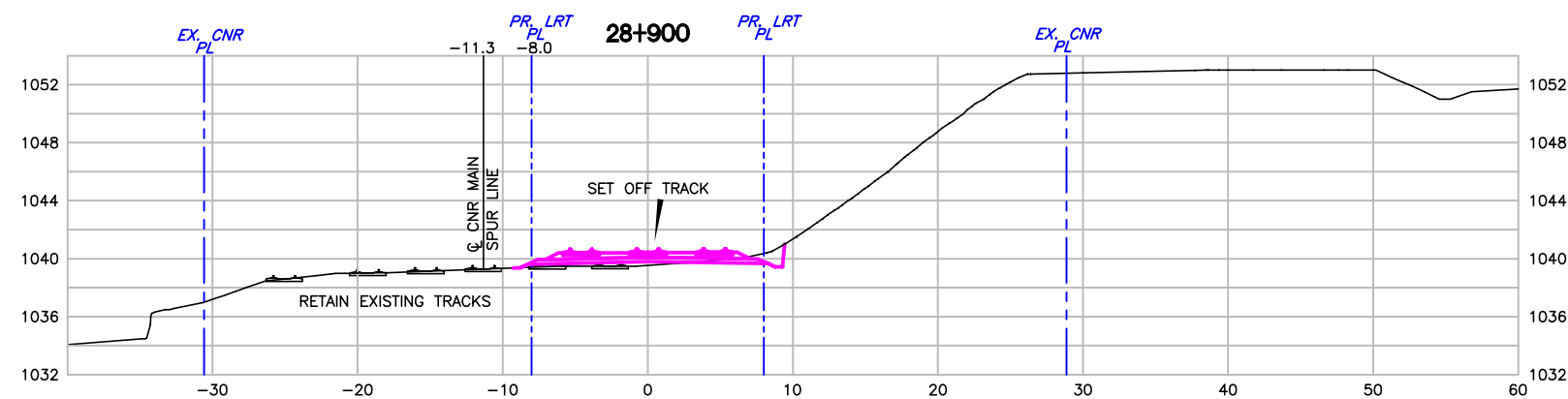
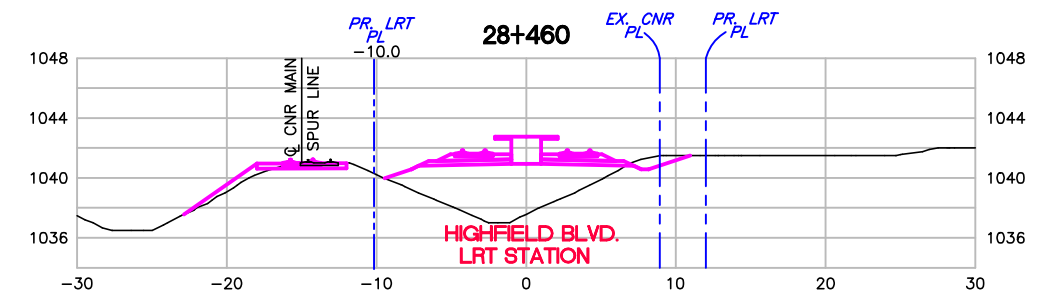
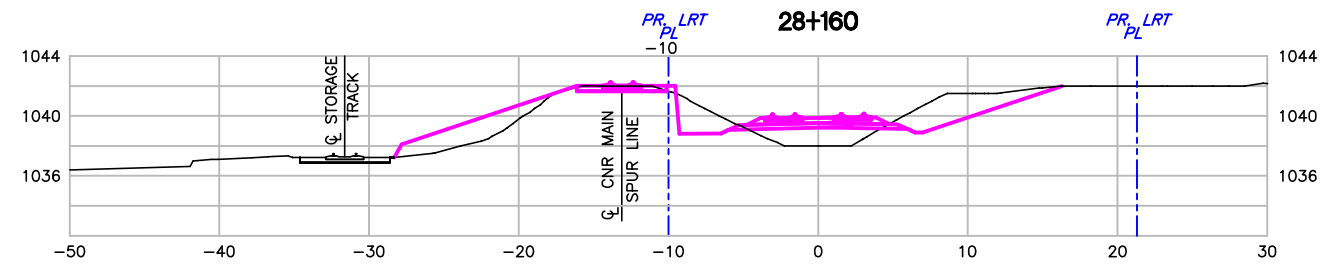
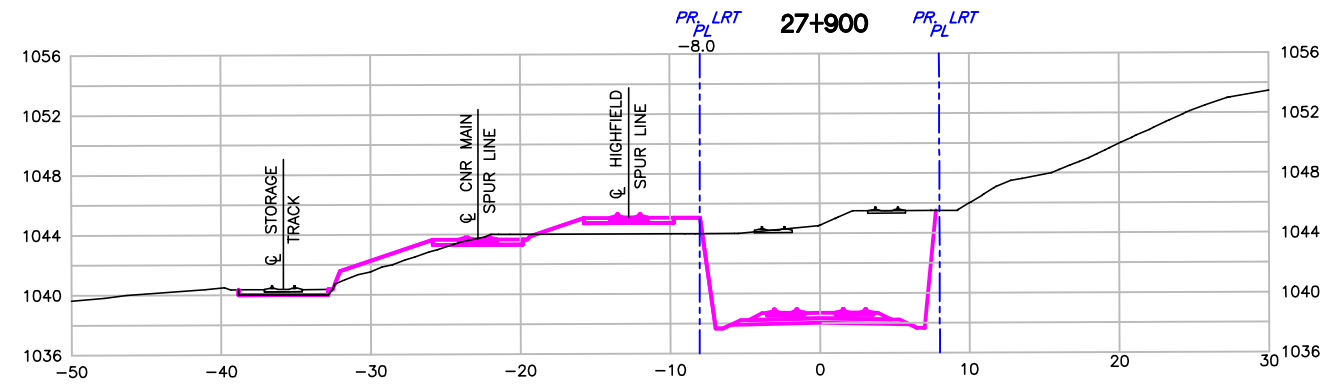
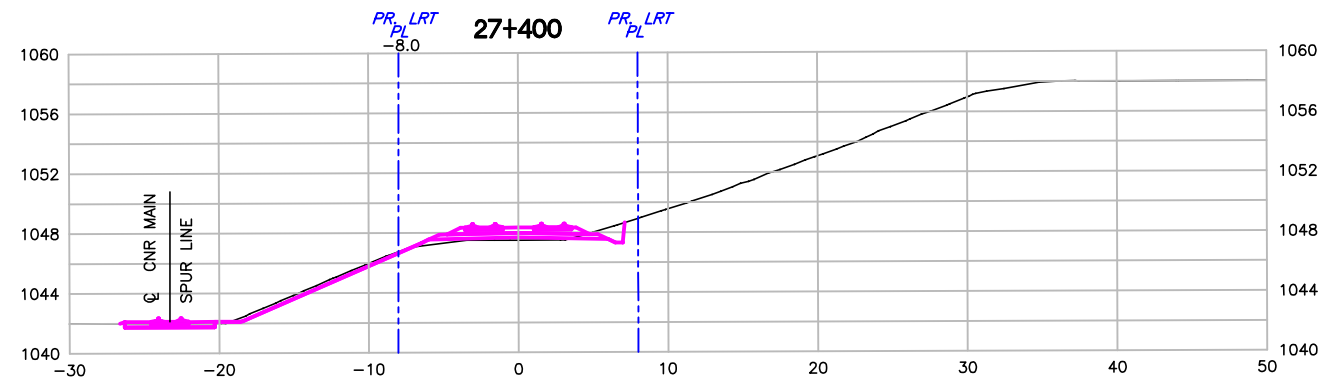


DATE	Jan. '04
SCALE	1 : 500
DWG NO.	11025-CNR-XS01



PROJECT:
CITY OF CALGARY
SOUTHEAST LRT
FUNCTIONAL PLANNING STUDY

TITLE:
RECOMMENDED PLAN
KEY CROSS SECTIONS THROUGH RAMSAY
STA. 25+000 TO 27+100

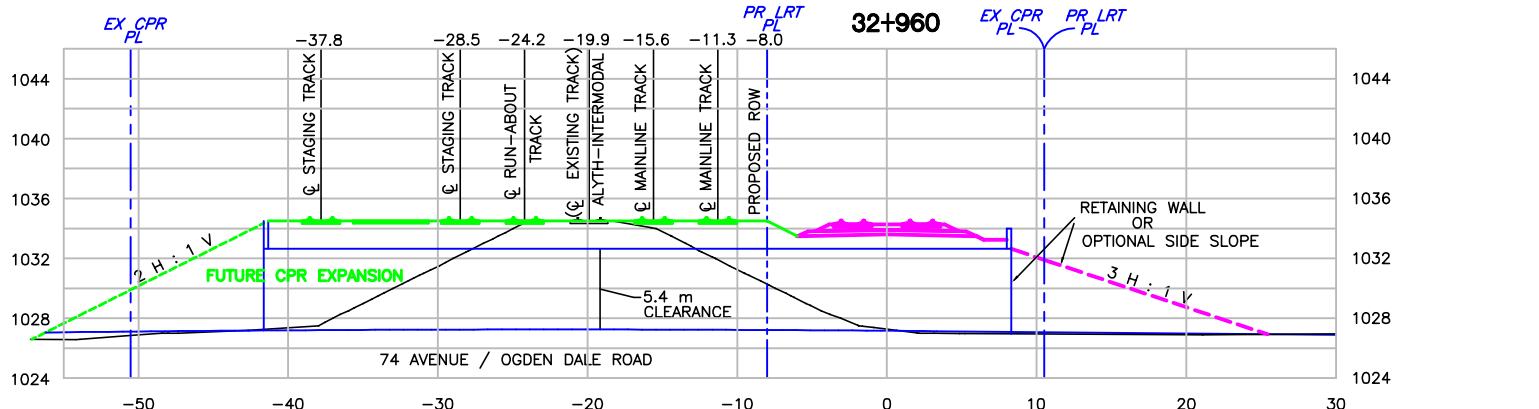
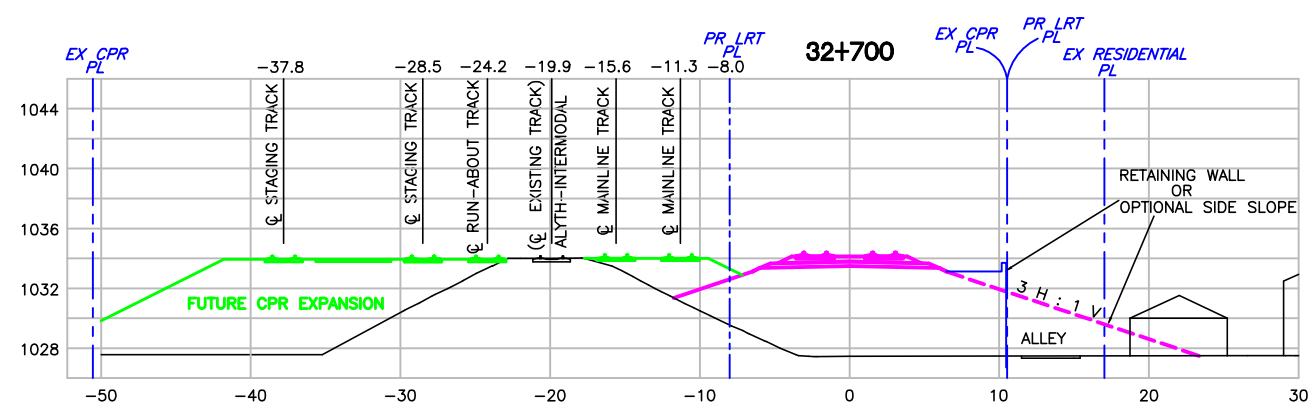
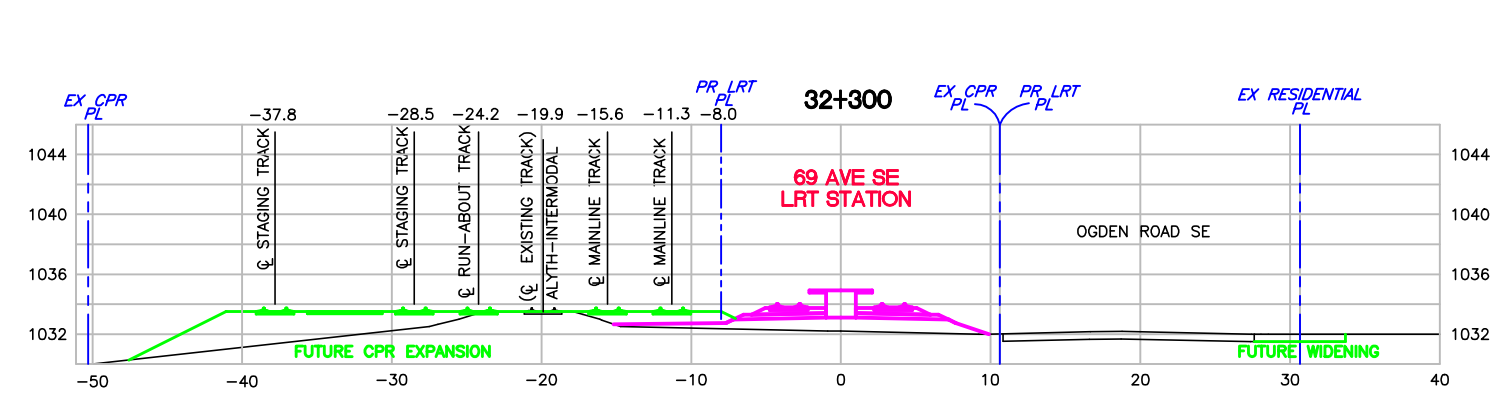
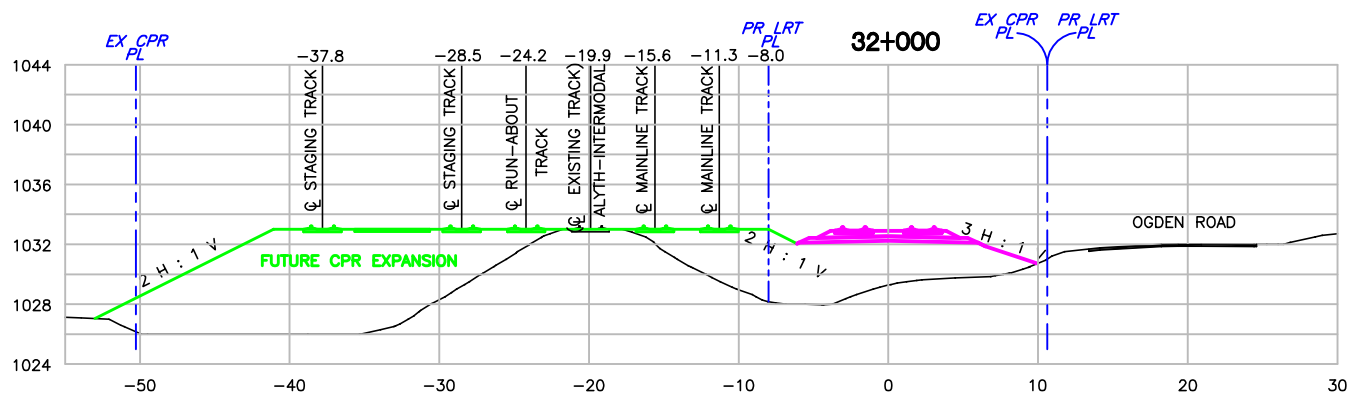
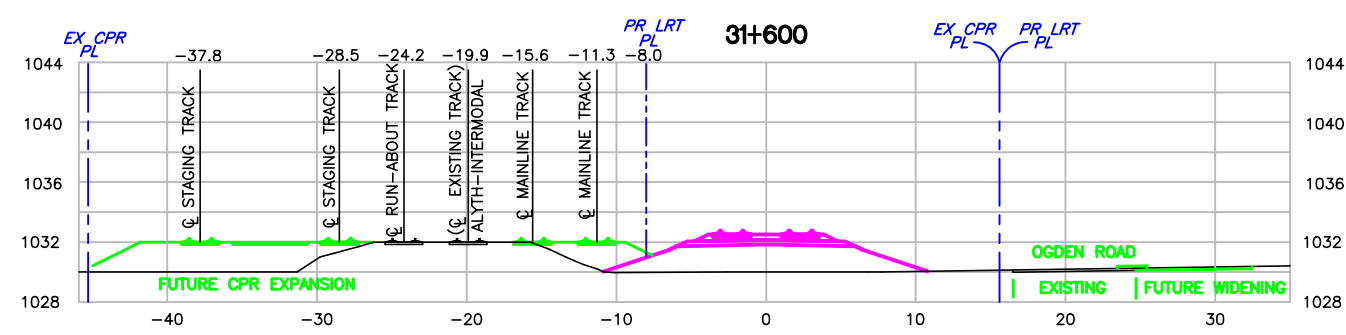
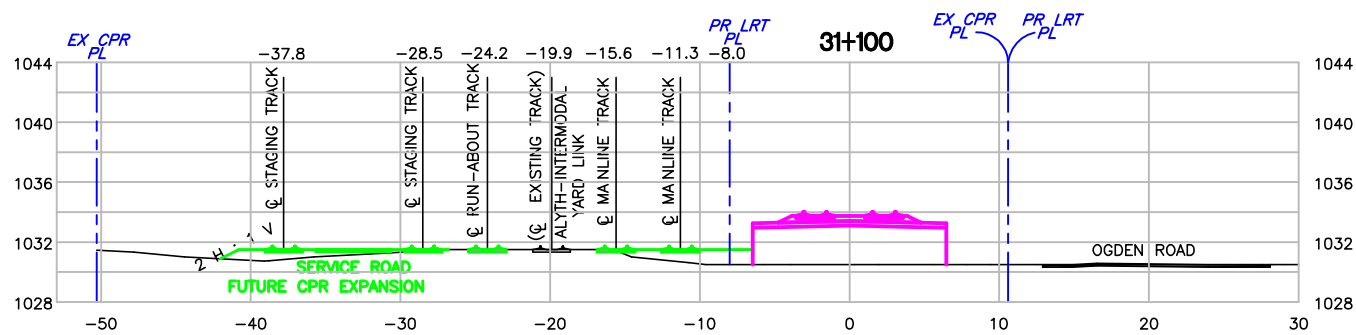
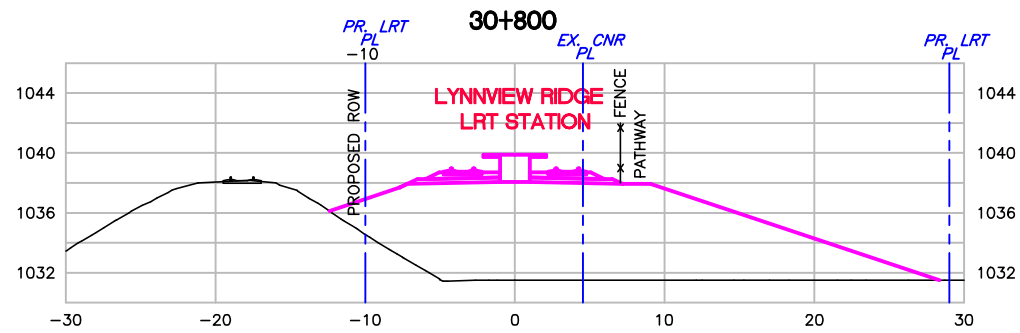
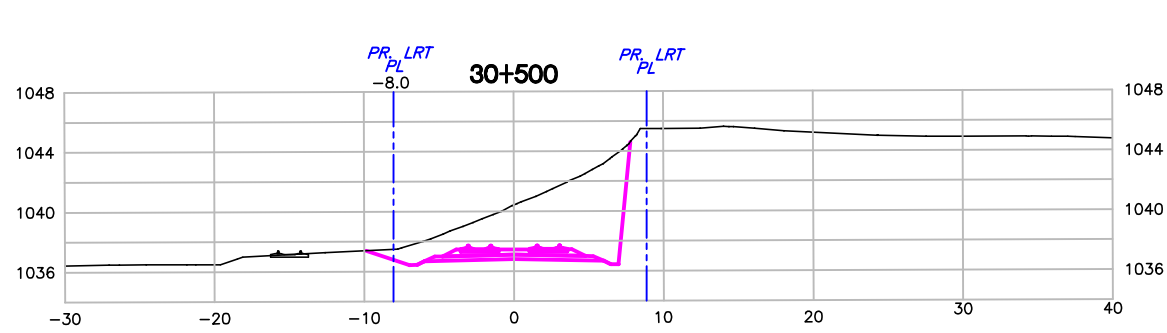


DATE Jan. '04
 SCALE 1 : 500
 DWG NO. 11025-XS02



PROJECT: CITY OF CALGARY
 SOUTHEAST LRT
 FUNCTIONAL PLANNING STUDY

TITLE: RECOMMENDED PLAN
 KEY CROSS SECTIONS BY CNR TRACKS
 STA. 27+100 TO 30+500

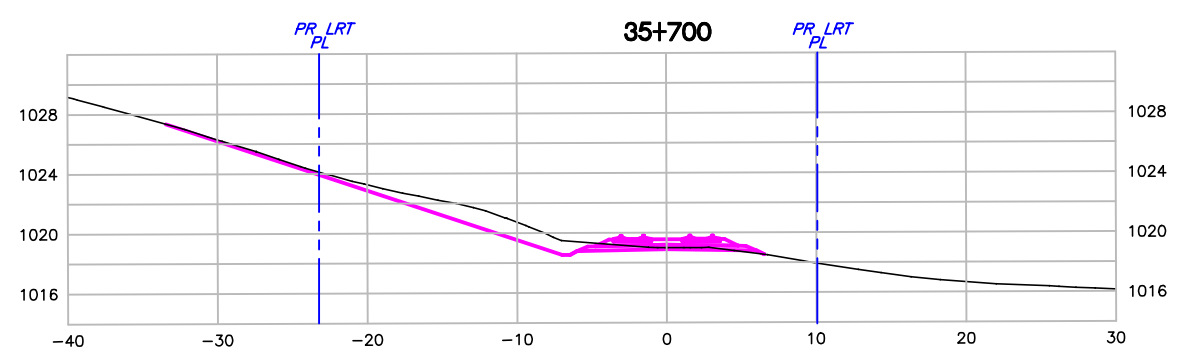
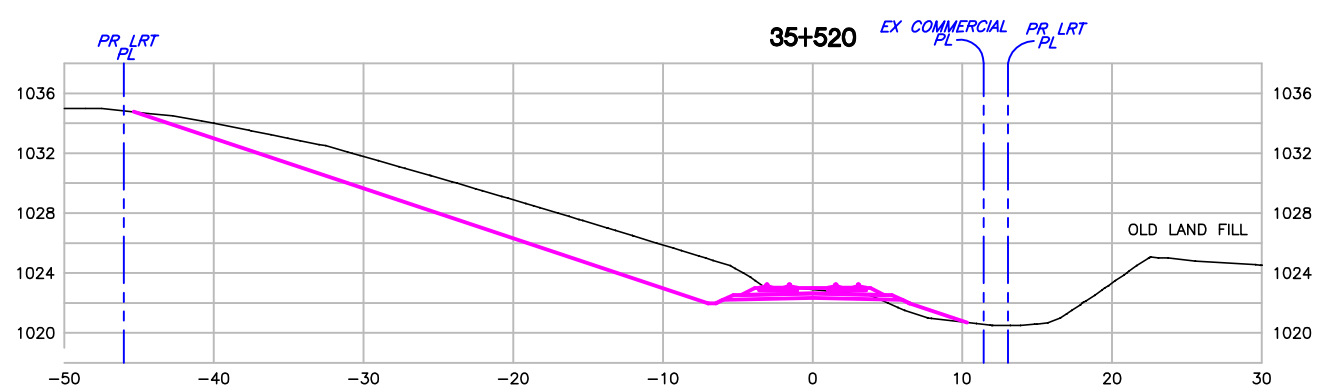
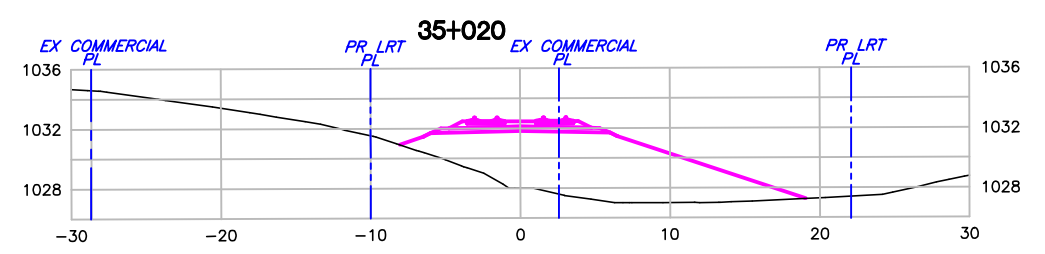
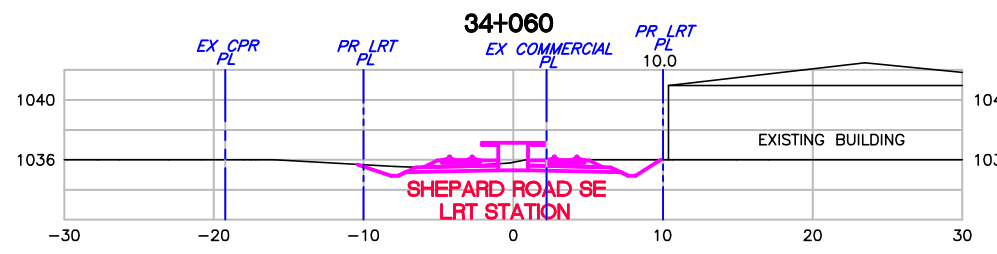
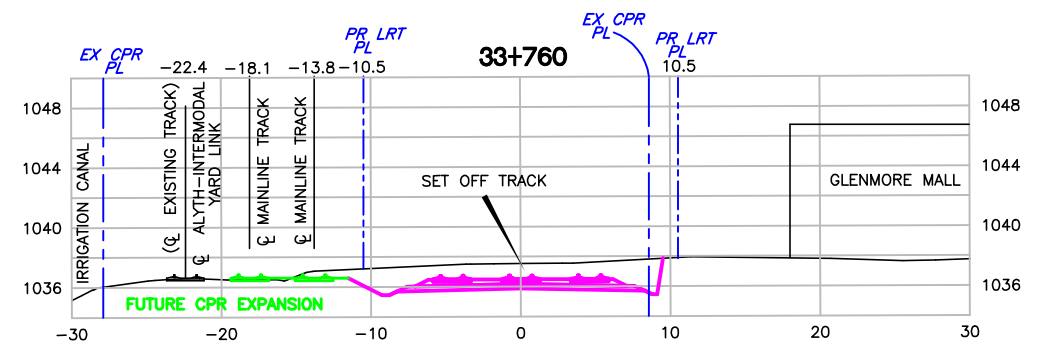
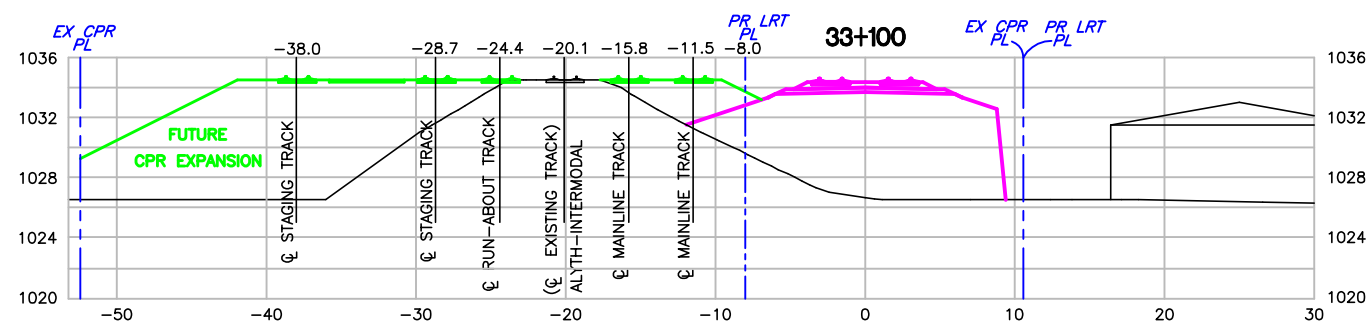
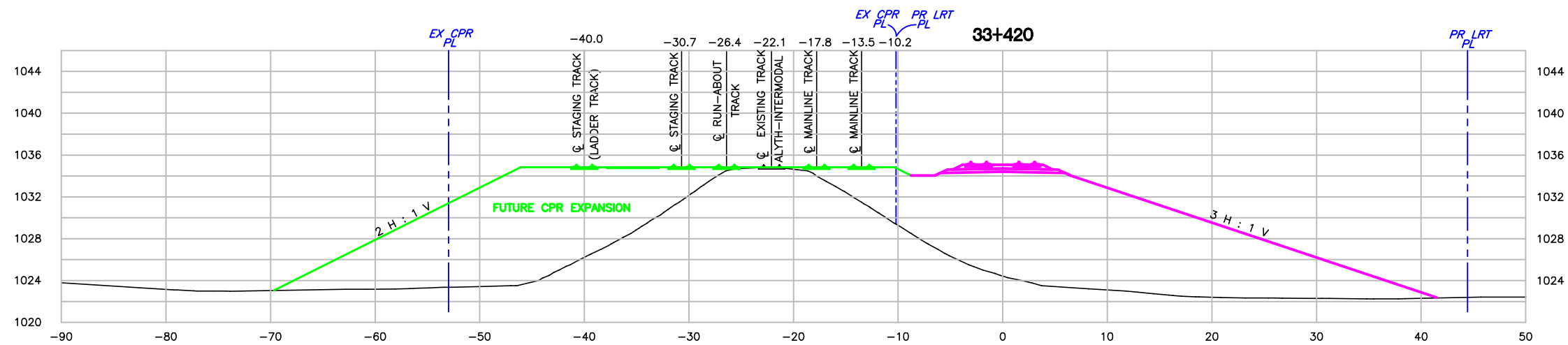


DATE	Jan. '04
SCALE	1 : 500
DWG NO.	11025-XS03



PROJECT:
CITY OF CALGARY
SOUTHEAST LRT
FUNCTIONAL PLANNING STUDY

TITLE:
RECOMMENDED PLAN
KEY CROSS SECTIONS THROUGH OGDEN
STA. 30+500 TO 33+000



DATE	Jan. '04
SCALE	1 : 500
DWG NO.	11025-XS04



PROJECT:
CITY OF CALGARY
SOUTHEAST LRT
FUNCTIONAL PLANNING STUDY

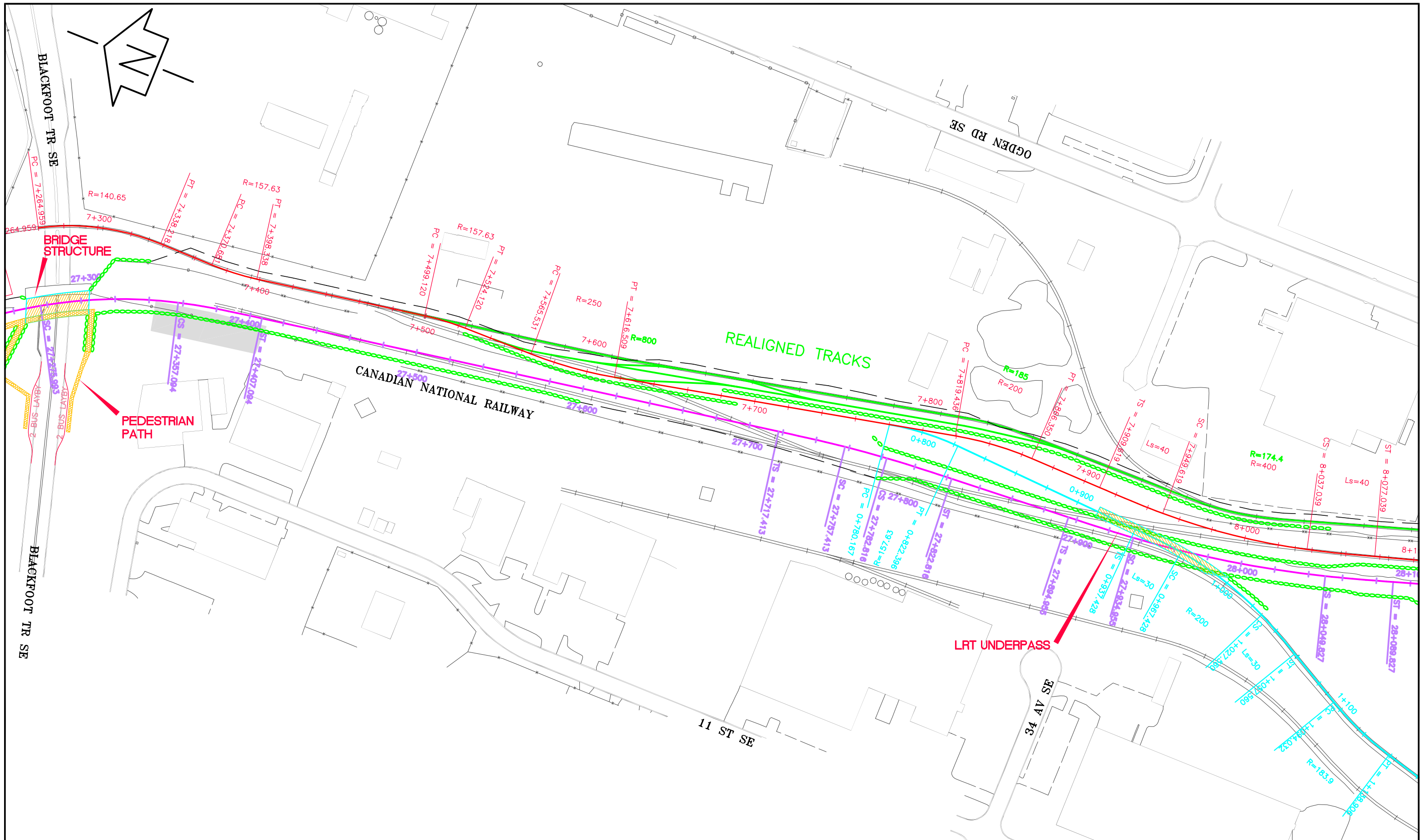
TITLE:
RECOMMENDED PLAN
KEY CROSS SECTIONS SOUTH OF 74 AVE.
STA. 33+000 TO 36+500

APPENDIX D

Project CD-Rom

APPENDIX E

Recommended CN Plan and Profiles



KEY:

CNR MAIN SPUR LINE	—
CNR HIGHFIELD SPUR LINE	—
CNR RUN-ABOUT & STORAGE TRACKS	—
SOUTHEAST LRT CONTROL LINE	—

ALIGNMENT	LIMIT OF WORKS
—	—
—	—
—	—
—	—

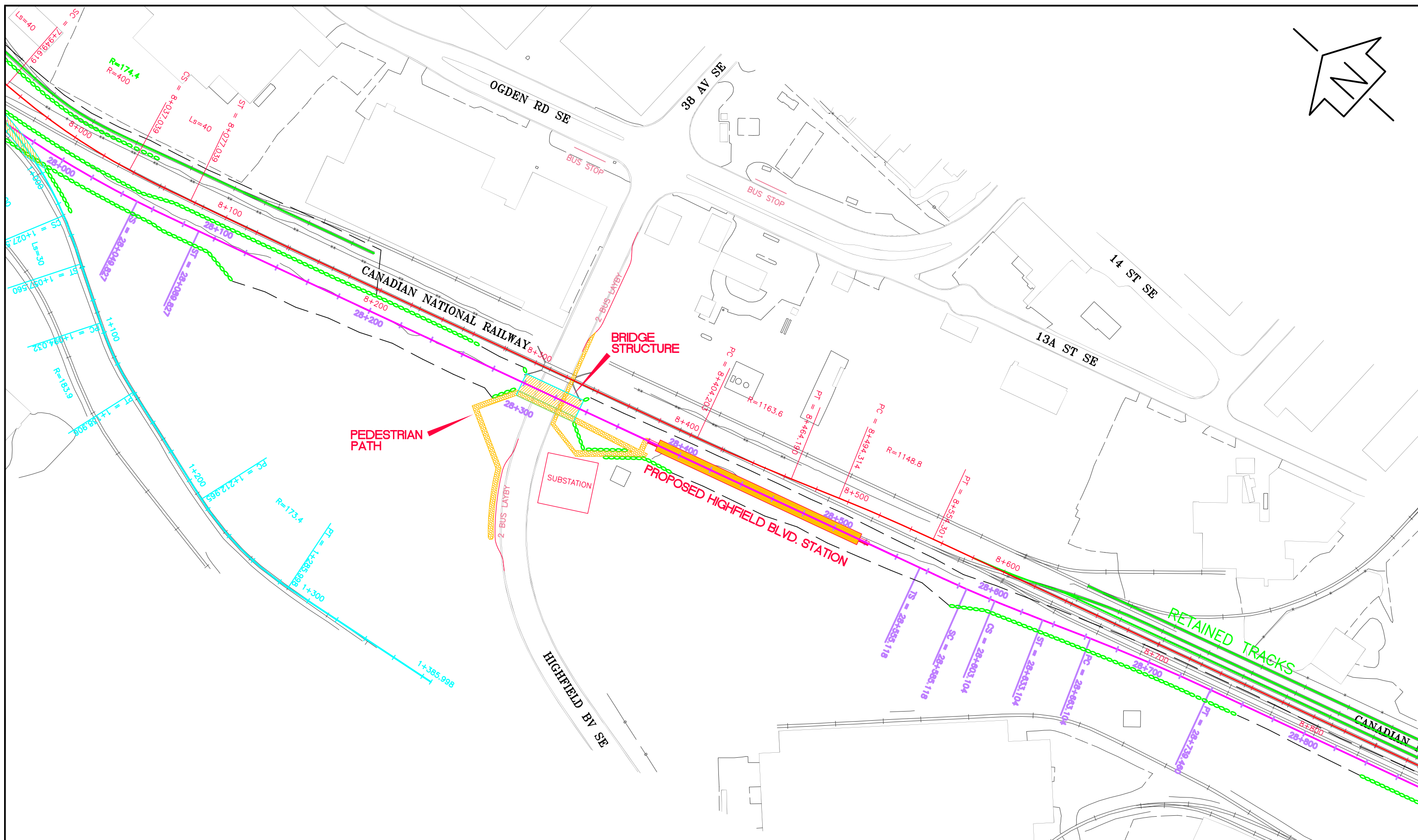
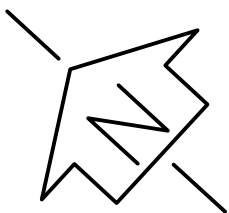
—	RETAINING WALL
—	PEDESTRIAN PATH
—	LAND TO BE PURCHASED

DATE	Jan. '04
SCALE	1 : 2000
DWG NO.	11025-CNR-A01



PROJECT:
CITY OF CALGARY
SOUTHEAST LRT
FUNCTIONAL PLANNING STUDY

TITLE:
RECOMMENDED PLAN
CNR ALIGNMENT
STA. 7+280 TO 8+050

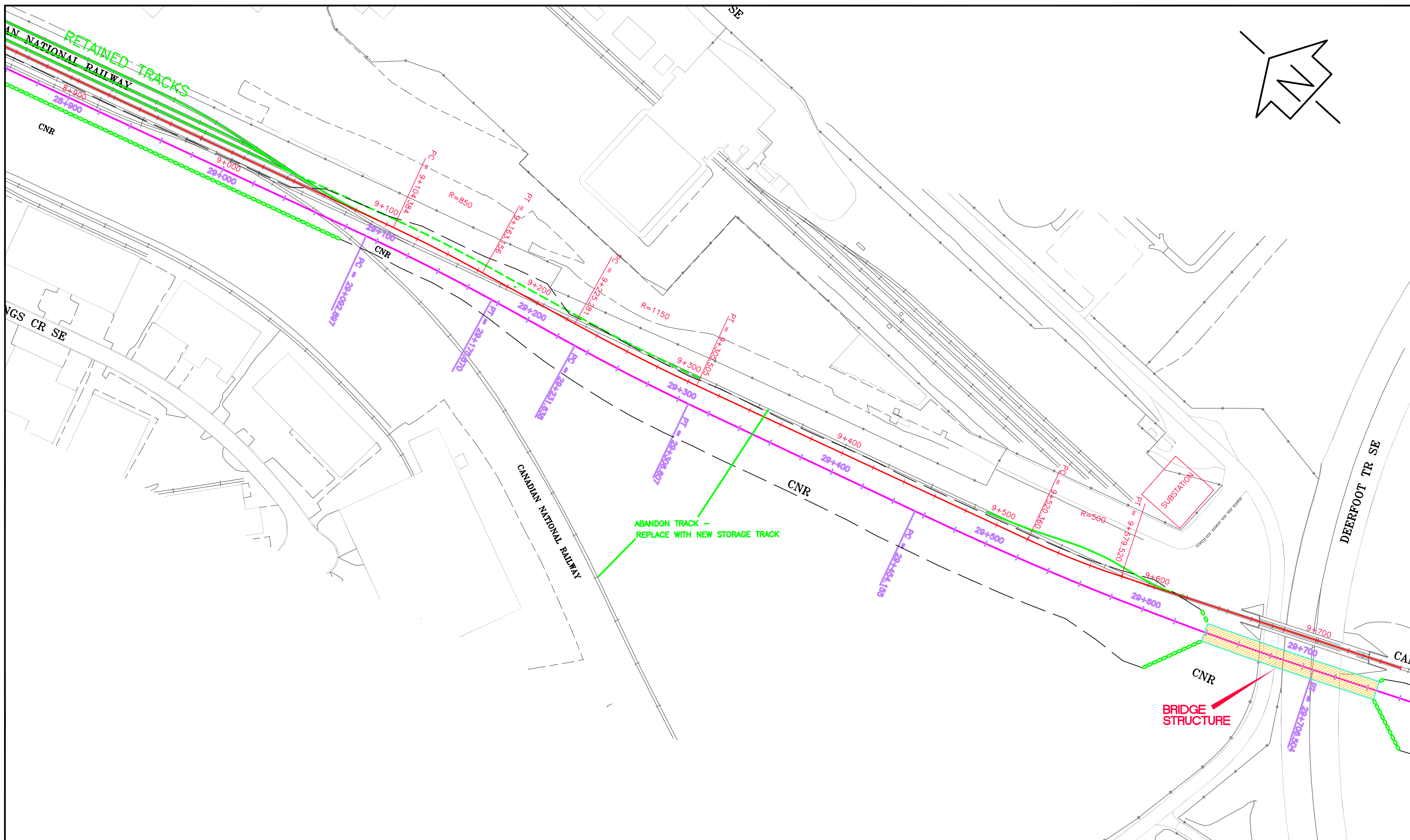
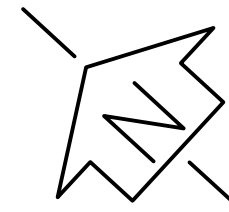


KEY:	ALIGNMENT	--- LIMIT OF WORKS
CNR MAIN SPUR LINE	—	--- RETAINING WALL
CNR HIGHFIELD SPUR LINE	—	--- PEDESTRIAN PATH
CNR RUN-ABOUT & STORAGE TRACKS	—	--- LAND TO BE PURCHASED
SOUTHEAST LRT CONTROL LINE	—	

DATE	Jan. '04
SCALE	1 : 2000
DWG NO.	11025-CNR-A02

PROJECT:
 CITY OF CALGARY
 SOUTHEAST LRT
 FUNCTIONAL PLANNING STUDY

TITLE:
 RECOMMENDED PLAN
 CNR ALIGNMENT
 STA. 8+050 TO 8+850

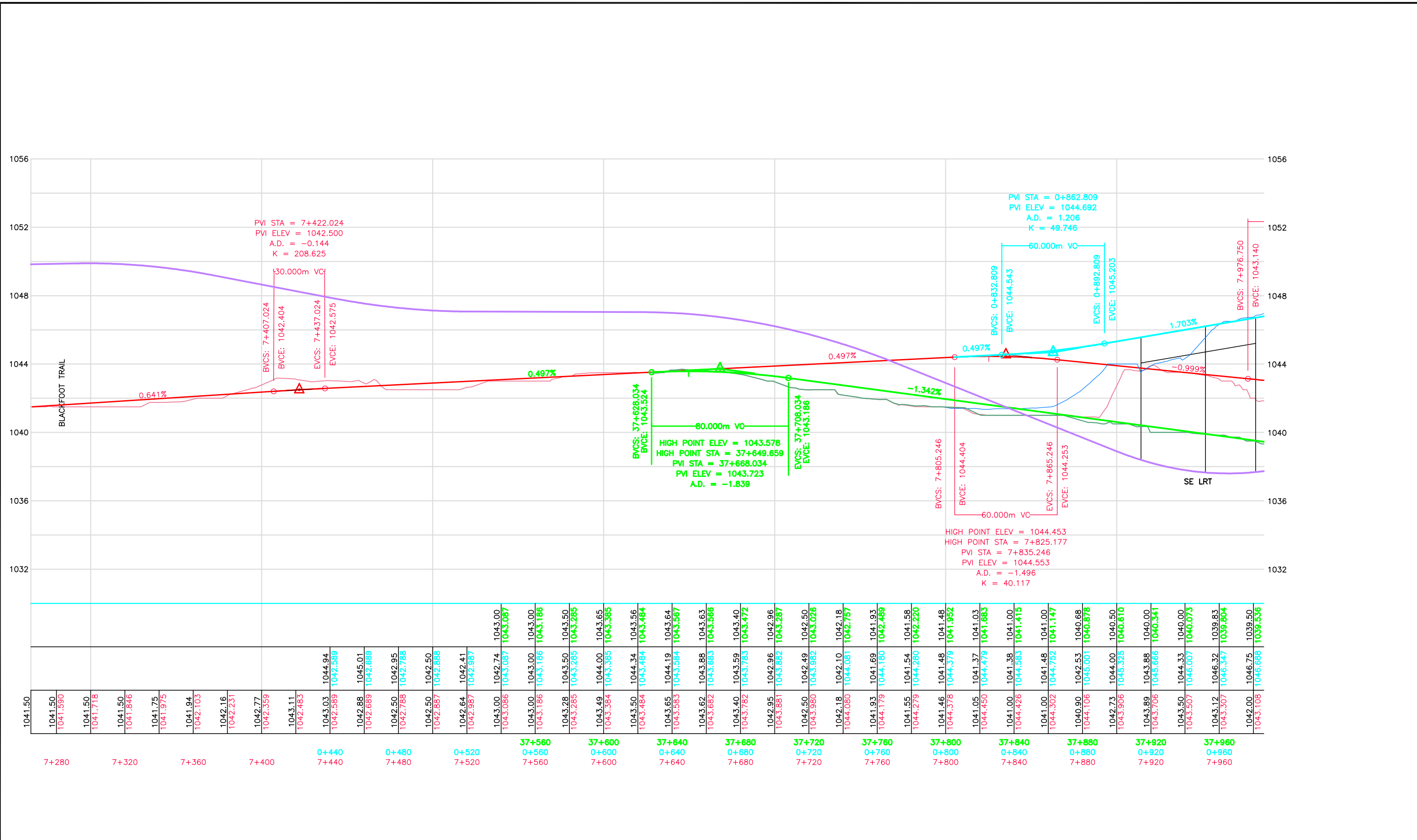


KEY:		ALIGNMENT		LIMIT OF WORKS
		CNR MAIN SPUR LINE		RETAINING WALL
		CNR HIGHFIELD SPUR LINE		PEDESTRIAN PATH
		CNR RUN-ABOUT & STORAGE TRACKS		LAND TO BE PURCHASED
		SOUTHEAST LRT CONTROL LINE		

DATE	Jan. '04
SCALE	1 : 2000
DWG NO.	11025-CNR-A03

PROJECT: CITY OF CALGARY
SOUTHEAST LRT
FUNCTIONAL PLANNING STUDY

TITLE: RECOMMENDED PLAN
CNR ALIGNMENT
STA. 8+850 TO 9+650



KEY:

CNR MAIN SPUR LINE —

CNR HIGHFIELD SPUR LINE —

CNR RUN-ABOUT & STORAGE TRACKS —

SOUTHEAST LRT —

PROPOSED PROFILE —

EXISTING GROUND —

DATE: Jan. '04

SCALE: 1 : 2000 H
1 : 200 V

DWG NO.: 11025-CNR-P01

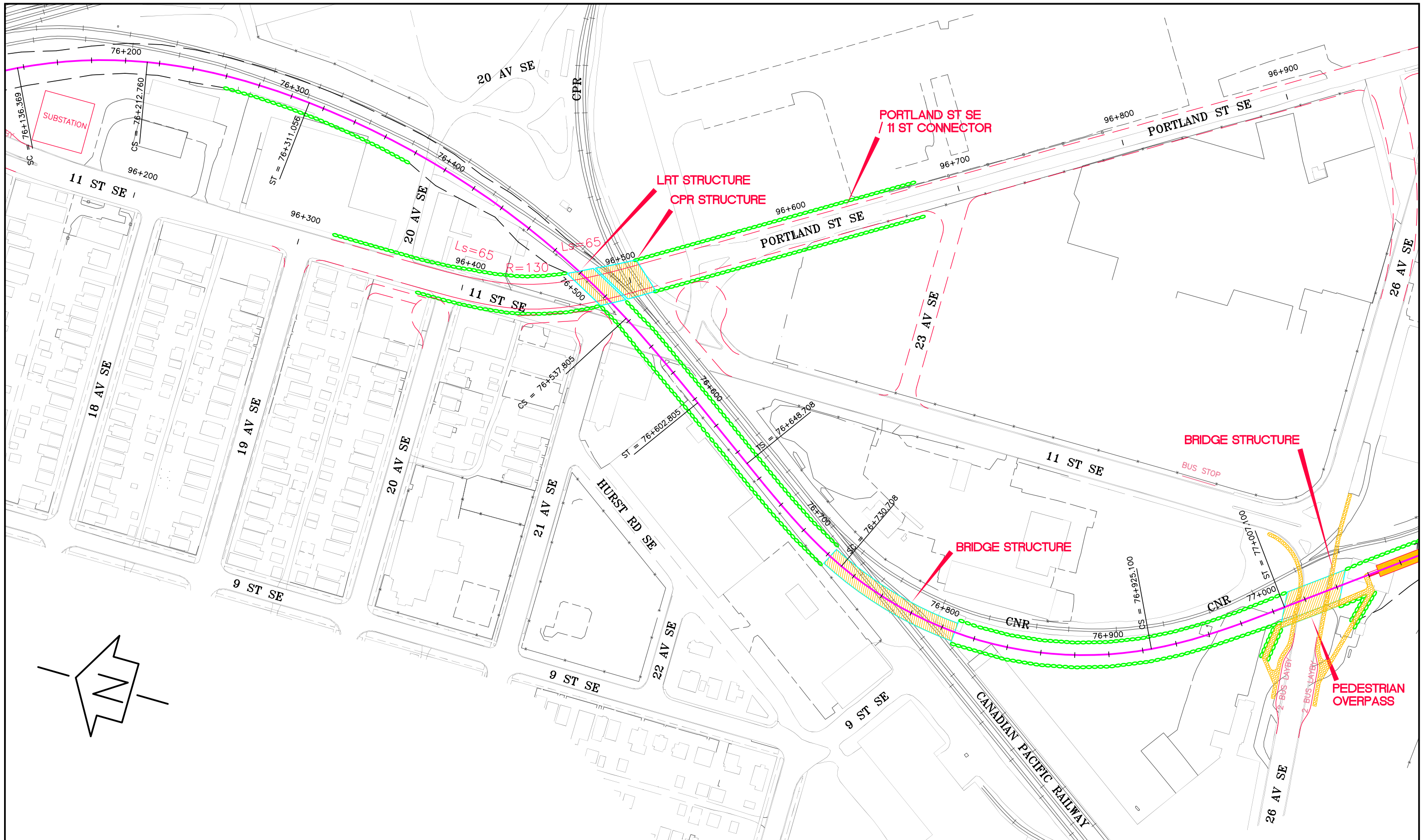


PROJECT: CITY OF CALGARY
SOUTHEAST LRT
FUNCTIONAL PLANNING STUDY

TITLE: RECOMMENDED PLAN
CNR PROFILES
STA. 7+280 TO 7+940

APPENDIX F

Alternative Plans & Profiles 11th Street/Portland Street Connector 11th Street LRT Alignment

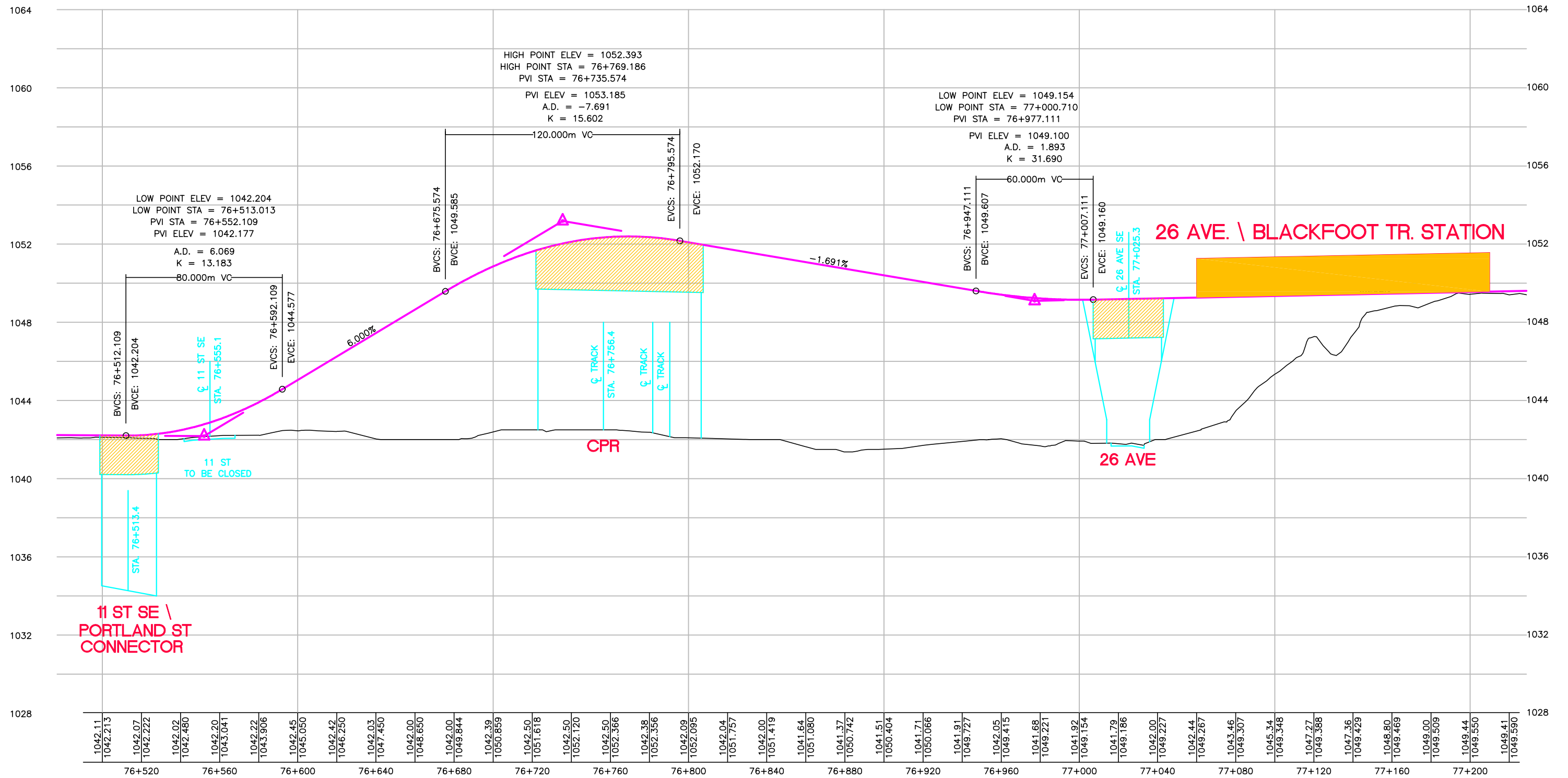


KEY:	LRT CONTROL LINE	LIMIT OF WORKS
SUBSTATION	ELECTRICAL SUBSTATION	ROAD REALIGNMENT
RETAINING WALL		PEDESTRIAN PATH

DATE	Jan. '04
SCALE	1 : 2000
DWG NO.	11025-ALT01

PROJECT: CITY OF CALGARY
SOUTHEAST LRT
FUNCTIONAL PLANNING STUDY

TITLE: 11 ST SE - PORTLAND ST SE CONNECTOR
LRT & CONNECTOR ALIGNMENTS
STA. 96+200 TO 97+000

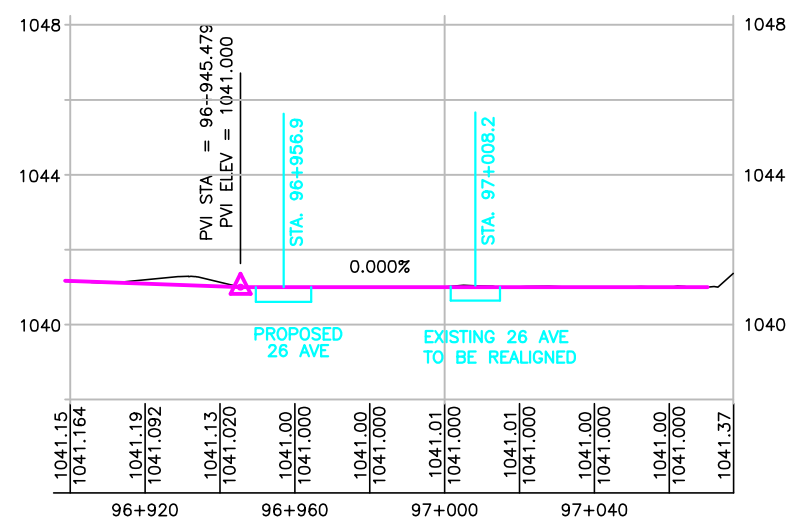
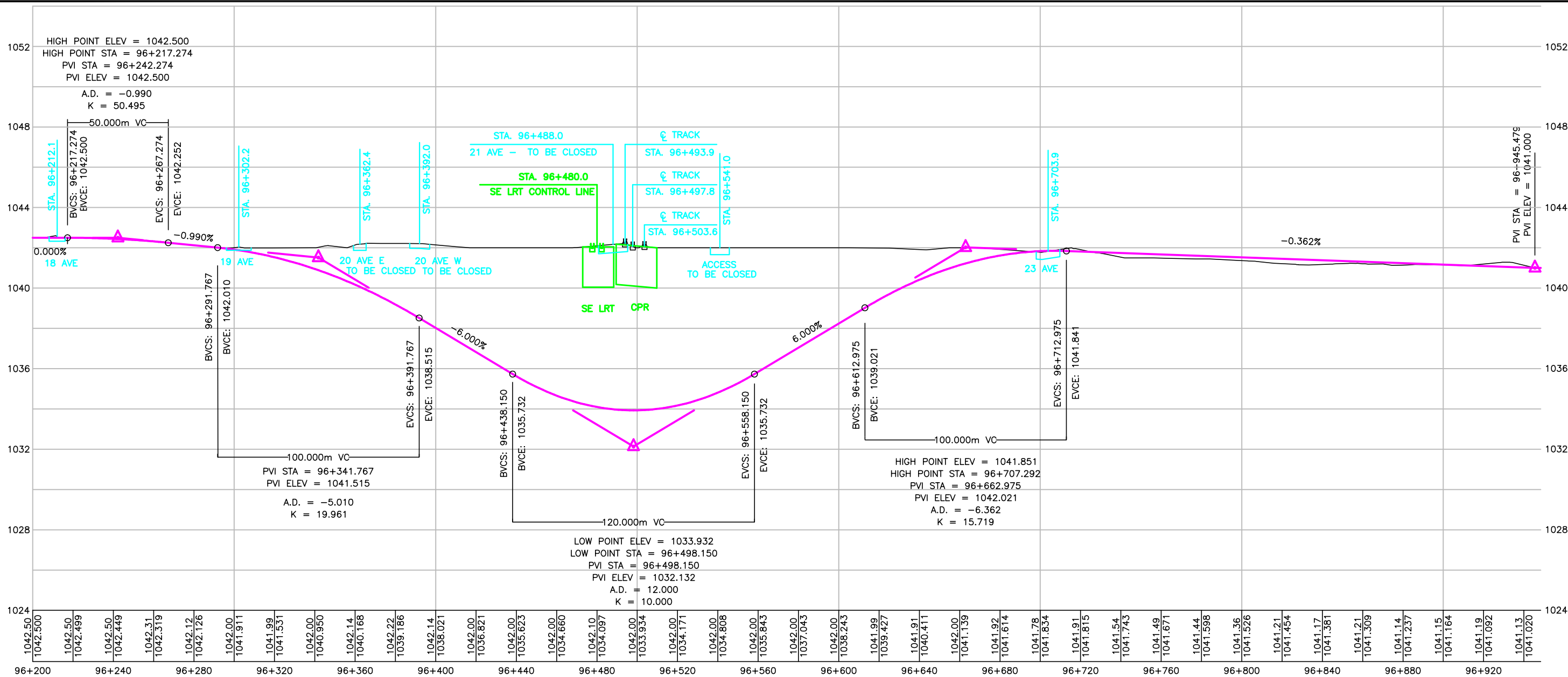


DATE Jan. '04
 SCALE 1 : 2000 H
 1 : 200 V
 DWG NO. 11025-ALT03



PROJECT: CITY OF CALGARY
 SOUTHEAST LRT
 FUNCTIONAL PLANNING STUDY

TITLE: 11 ST SE - PORTLAND ST SE CONNECTOR
 SE LRT PROFILE
 STA. 76+500 TO 77+200

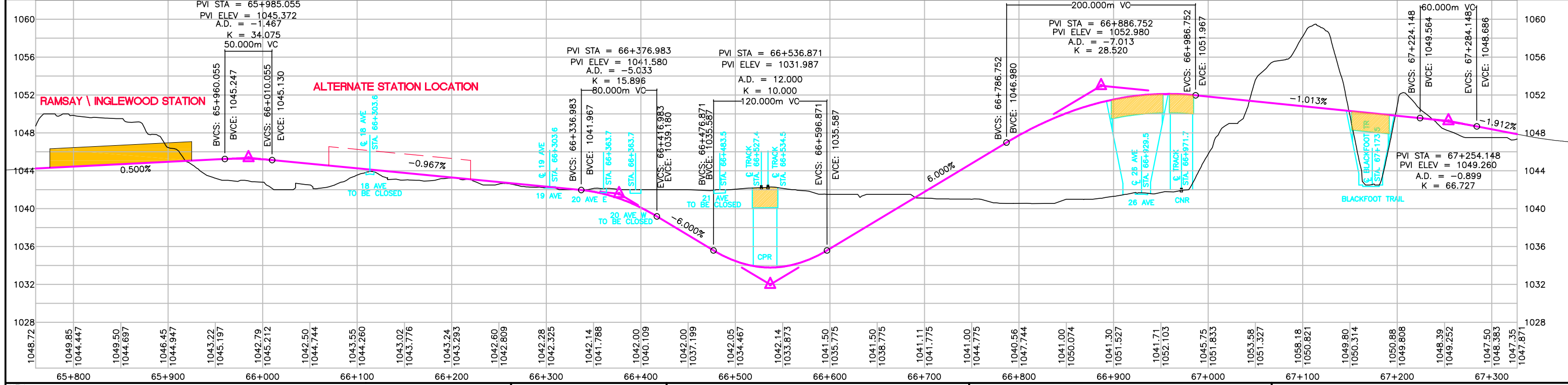
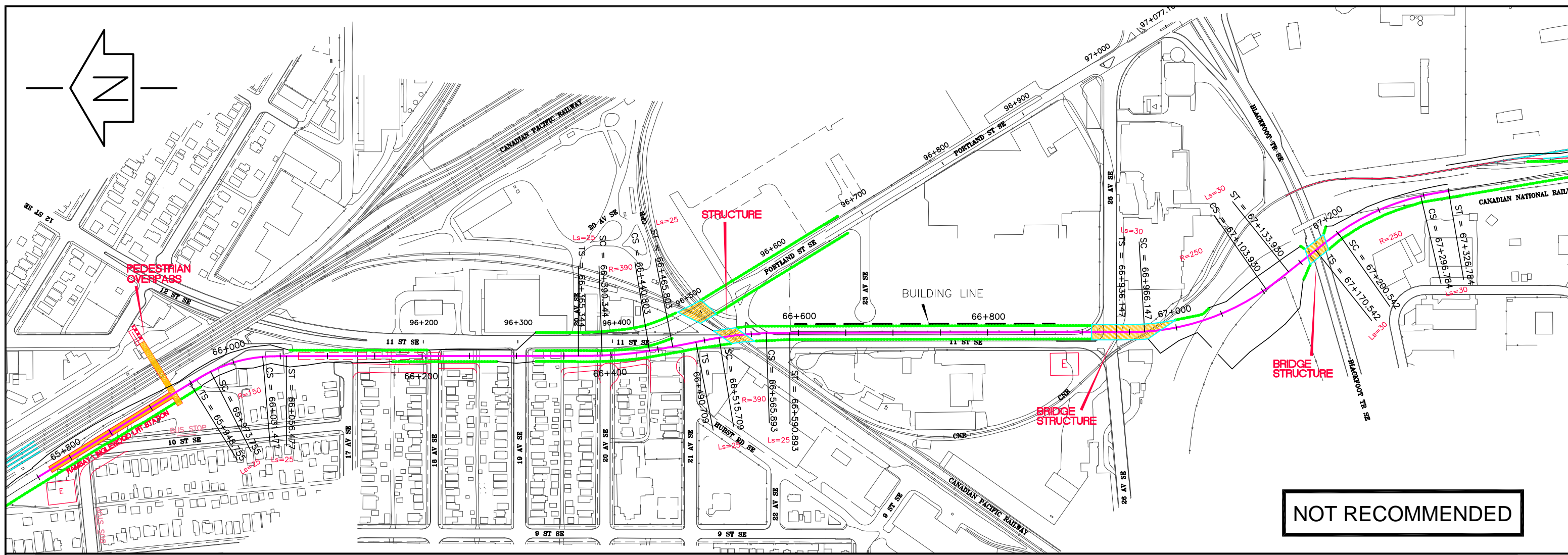


DATE Jan. '04
 SCALE 1 : 2000 H
 1 : 200 V
 DWG NO. 11025-ALT04



PROJECT: CITY OF CALGARY
 SOUTHEAST LRT
 FUNCTIONAL PLANNING STUDY

TITLE: 11 ST SE - PORTLAND ST SE CONNECTOR
 CONNECTOR ROAD PROFILE
 STA. 96+200 TO 97+080



KEY: LRT CONTROL LINE ELECTRICAL SUBSTATION RETAINING WALL LIMIT OF WORKS ROAD REALIGNMENT PEDESTRIAN PATH	DATE Jan. '04		PROJECT: CITY OF CALGARY SOUTHEAST LRT FUNCTIONAL PLANNING STUDY	TITLE: 11 ST SE LRT ALTERNATIVE PLAN-PROFILE	
	SCALE 1 : 4000 H 1 : 400 V		DWG NO. 11025-ALT05		