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## **3.0 ALTERNATIVES**

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### **3.1 ALTERNATIVE DEVELOPMENT PROCESS**

The LRT alignments, stations, yards and shops facility, preliminary system financing options and patronage projections were addressed during the Comprehensive Planning Process for the Hennepin County Comprehensive LRT System Plan. Following the passage of the Comprehensive Plan, June 1988, the LRT Scoping Decision Process further refined the corridor alignments to be studied in the EIS and the subject areas that each alternative would be evaluated against. The following sections outline the alternative development process for the proposed LRT System Plan in Hennepin County.

#### **3.1.1 Comprehensive Light Rail Transit System Planning Process**

This section summarizes the Comprehensive LRT Planning Process and Format. A detailed description of the process, including a list of meetings, committee members, and committee recommendations regarding alignments and stations is found in the Comprehensive LRT System Plan for Hennepin County, June 1988.

The Hennepin County Regional Railroad Authority (HCRRA) established a comprehensive planning process that directed the technical analysis of a potential LRT system in Hennepin County. This system was planned with public input from transportation planning entities, municipalities and neighborhoods potentially affected.

#### **Participation/Communication Program**

##### **Overview**

The community participation and communication process was designed to ensure that affected governmental agencies and the public had ample opportunity to comment on the proposed LRT system. The specific techniques included a bi-weekly newsletter; informational presentations to city councils, community groups and local business associations; and a structured network of advisory committees. HCRRA representatives presented LRT information at over 150 meetings between September 1987 and April 1988.

##### **Advisory Committees**

A Corridor Advisory Committee (CAC) for each of the five corridors under study and downtown Minneapolis was appointed to analyze the LRT issues for its particular area. In the

Southwest Corridor, both suburban and city Advisory Committees were formed. Members represented residents and businesses in the study area, and were appointed by each city along the corridor. In addition, technical staff from each affected city served on the Technical Advisory Committee (TAC), and elected officials served on the Intergovernmental Advisory Committee (IAC). Key metropolitan agencies with transportation planning authority were represented on both the IAC and TAC. Two additional committees examined land use and development issues and system financing options.

Each Corridor Advisory Committee was charged with identifying a preferred alignment and recommended station locations for its corridor study area. The TAC and IAC were charged with resolving the inconsistencies between CAC recommendations and arriving at a consistent, comprehensive network for the entire system.

#### Public Review

In addition to Advisory Committee meetings, all of which were advertised in the Newsletter and open to the public, the HCRRA held five public meetings in the corridors under study. Over 1,000 people attended the hearings during March 1988. A sixth hearing was televised over the metropolitan public access cable television channel in April 1988. Hennepin County residents watching the program were invited to call in questions for immediate response by Commissioners.

Midway through the committee process, the Southwest Suburban Corridor Advisory Committee held a public hearing to solicit local input before finalizing its recommendations to the IAC and the HCRRA.

The HCRRA also sponsored a series of breakfast meetings for state legislators to keep them abreast of the project.

#### 3.1.1.1 Corridor Alignments

Each Corridor Advisory Committee began its analysis with a set of basic criteria designed to identify and evaluate potential alignment alternatives and station locations. Although each committee focused its criteria on issues of particular relevance to the corridor, the technical corridor analyses generally used the following evaluation criteria:

- o Ridership/Patronage: Population and employment, access, service to commuters, area communities and the transit-dependent
- o Availability of Right-of-Way: railroad, street, freeway

- o Land Use Conflicts: Comprehensive plan, zoning, development potential
- o Impact on Street Operations: Traffic capacity, parking, turning movements, delays, compatibility with buses
- o Compatibility with Downtown Alignment: at-grade, tunnel
- o Station Location Opportunities: Pedestrian access, short- and long-term parking, feeder bus service
- o Travel Time
- o Environmental Impacts: Noise, air quality, visual impacts, lighting, park and historic property impacts
- o Capital Cost

Each Corridor Advisory Committee submitted a report summarizing its recommendations. The planning and evaluation process continued with study by the Technical and Intergovernmental Advisory Committees and the HCRRA. Both the TAC and the IAC reviewed individual corridor recommendations, integrating the separate recommendations into a comprehensive plan to meet system-wide service and compatibility goals. Figure 3.1 identifies the Twenty-Year System Plan. Figure 3.2 illustrates the adopted Stage I Plan. The tunnel alignment identified in both figures has been revised following subsequent analysis.

#### 3.1.1.2 Transit Station Planning Process

Each LRT station location was evaluated during the comprehensive light rail transit planning process by the Corridor Advisory Committees (CAC), the Technical Advisory Committee and the Intergovernmental Advisory Committee.

The CAC's considered a broad range of evaluation criteria, including the effect on transit operations and service, and local issues such as traffic impact, environmental impact, and development impact.

#### 3.1.1.3 Yards and Shops Selection Process

During the comprehensive light rail planning process seven potential yard and shop sites were reviewed and considered for inclusion in the Hennepin County light rail transit system. The seven sites initially examined included:

1. Coach Yard--Cedar between I-94 and Franklin
2. University--Burlington Northern yards
3. Hennepin County DOT--Hopkins, west of Highway 18
4. Lyndale Junction--Vicinity US 12, I-94 and North Fremont

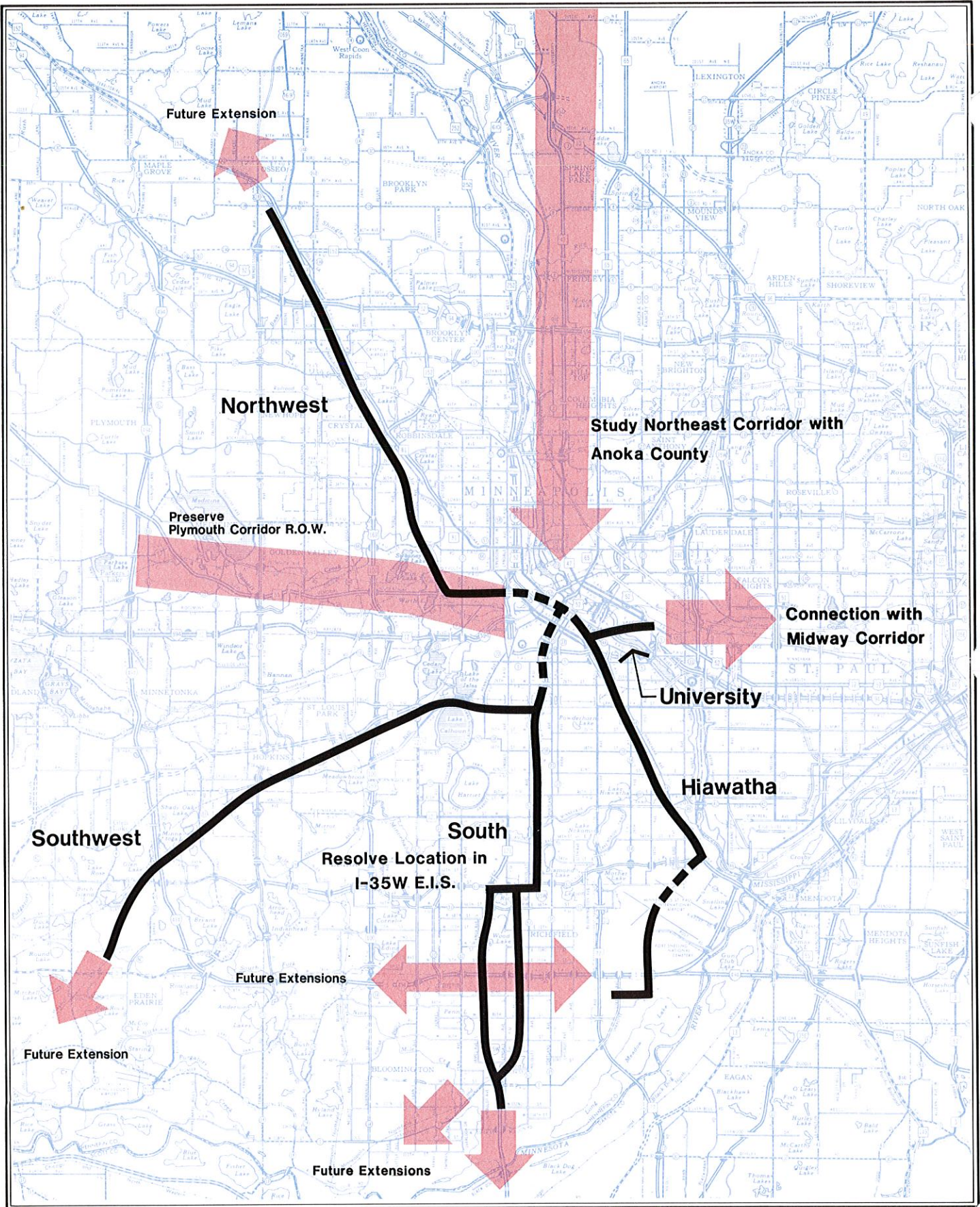


Figure 3.1

# 20 Year Comprehensive LRT System Plan

Source: Comprehensive LRT System Plan for Hennepin County, HCRRA, June, 1988

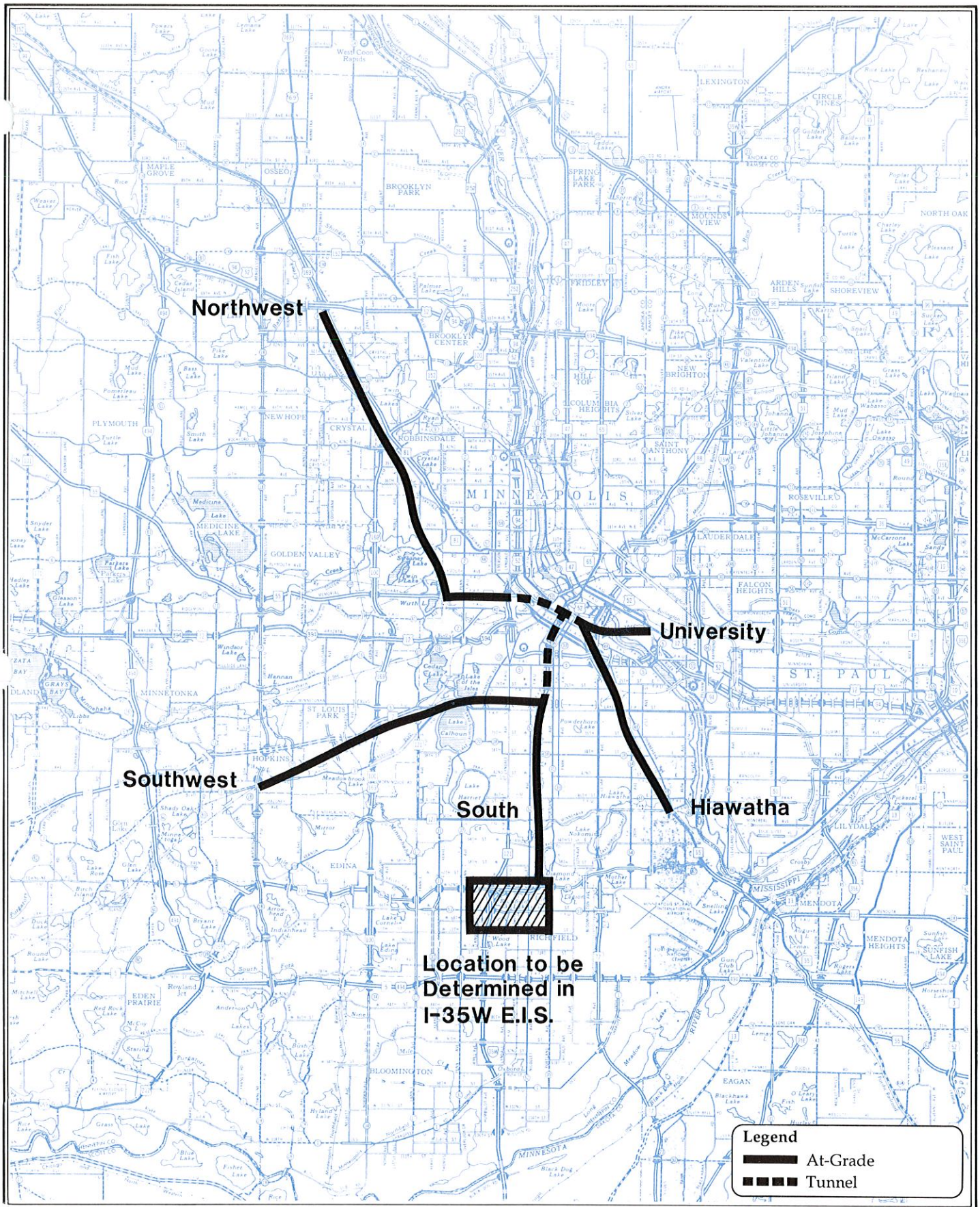


Figure 3.2

5. South Halifax--Burlington Northern, vicinity Halifax near Robbinsdale
6. Brooklyn Boulevard--Soo Line between Brooklyn Boulevard and North Humboldt
7. Kenwood--HCRRA right-of-way, vicinity Route 12 and Cedar Lake

The locations of the sites considered are shown in Figure 3.3.

Each of the sites was evaluated based on the following general criteria: availability, location, impacts, encumbrances, suitability, and services. A summary of the proposed yard and shop facility characteristics can be found in Table 3.1.

Based on site characteristics for each of the proposed locations, the yard and shop site alternatives were initially reduced to two locations: the Coach Yard site and the Hennepin County DOT site. After review by the Technical Advisory Committee and the Intergovernmental Advisory Committee, the Coach Yard Site was selected and identified in the Comprehensive LRT System Plan for Hennepin County, as the preferred site location for the LRT's central operations and maintenance facility, because of its availability, central location and ability to most efficiently service the light rail system. The Coach Yard Site was also the selected alternative in the LRT Implementation Planning Program Report completed in 1985.

#### 3.1.2 Hennepin County Light Rail Transit Scoping Decision Process

In conformance with the Environmental Quality Board's (EQB) regulations pertaining to the preparation of an Environmental Impact Statement, the Hennepin County Regional Railroad Authority prepared an Environmental Assessment Worksheet, August 1988, and a Scoping Decision Document for the Hennepin County Light Rail Transit System.

The purpose of a Scoping Document is to provide an opportunity at the beginning of the planning process to identify priority environmental issues and to narrow the focus of the Environmental Impact Statement accordingly.

On November 8, 1988, the Hennepin County Regional Railroad Authority approved the amended Hennepin County Stage I Light Rail Transit System Scoping Decision Document. The scoping document reflects information prepared for the Environmental Assessment Worksheet (EAW) on the proposed project as well as pertinent comments submitted during the scoping comment period. The information in the EAW was based on collected and evaluated data and public input received during the Comprehensive LRT System Plan planning process.

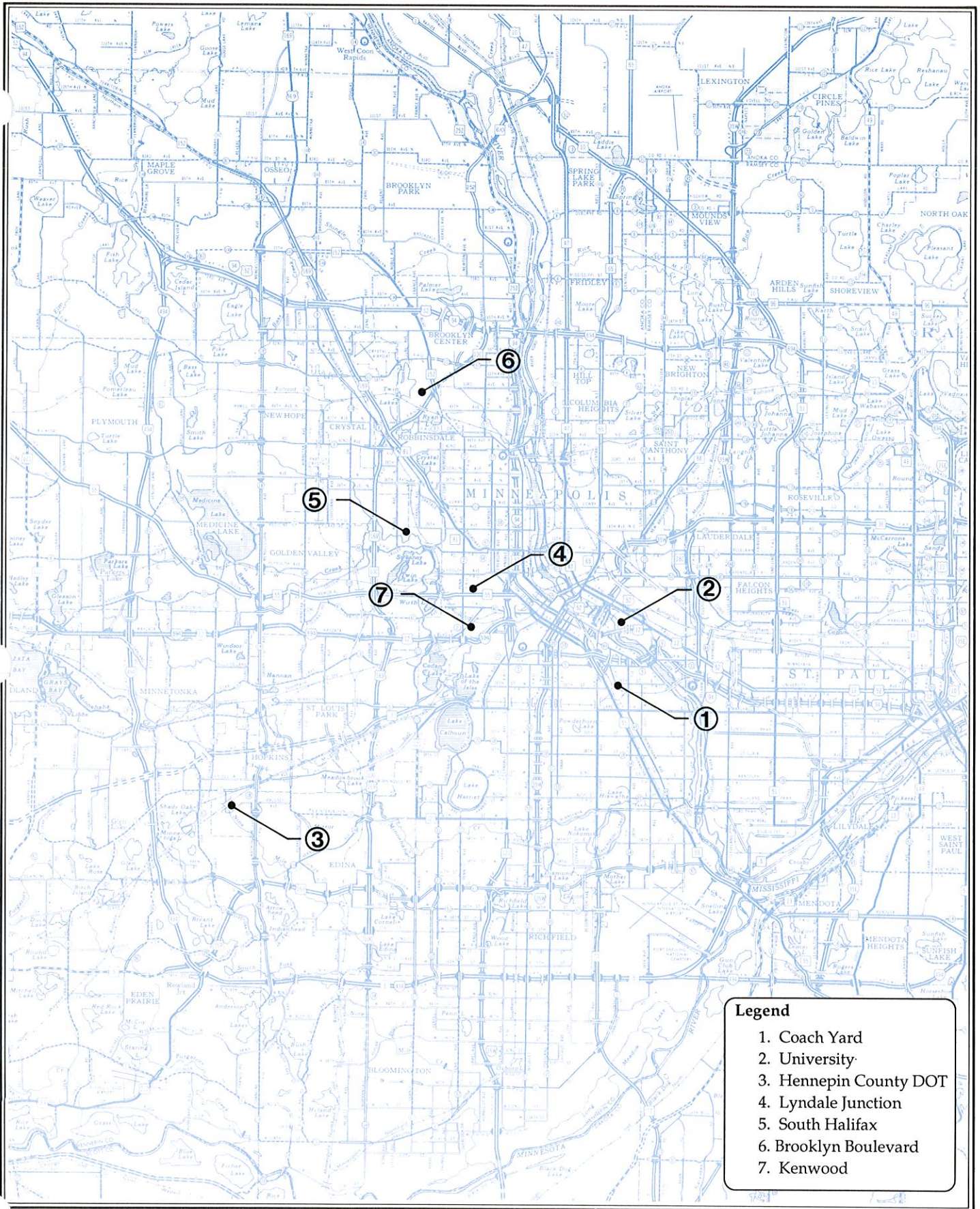


Figure 3.3

# Potential LRT Yard and Shop Sites

**TABLE 3.1  
COMPARISON OF ALTERNATIVE  
LRT YARD AND SHOP LOCATIONS**

SITE	ACRES	AVAILABILITY	RESIDENTIAL IMPACTS	RELOCATIONS	LRT DEADHEADING	CENTRAL TO EXTENSIONS	DRAINAGE	REUSE FACILITIES?	ROAD ACCESS	R. R. FREIGHT INTERFERENCE	SECURITY	EXPANDABILITY?
Coach Yard	13+	Yes-Purchase fr. railroad	No	4+	Some	Yes	Good	No	Good	No	Good	Some
University	100+	Unlikely	Likely	?#	Much	No	Adequate	No	Good	Yes	Fair	Yes
County DOT	40+	Yes (a)	No	No	(b)	No	Adequate	No	Good	Yes	Good	Yes
Lyndale Jct.	-15	No (c)	Yes	No	Some	Yes	Adequate	No	Poor	Yes	Fair	Some
South Halifax	-30	Unlikely	Yes	?	Much	No	Poor	No	Poor	Yes	Fair	Some
Brooklyn Boulevard	50+	Unlikely	Likely	?	Much	No	Adequate	No	Good	Yes	Fair	Yes
Kenwood	-30	County Owns	Yes	No	Some	Yes	Adequate	No	Poor	No	Fair	Yes

(a) Timing: Will site be available when LRT construction begins?

(b) Little for Southwest Corridor, much for other corridors.

(c) Reserved for other public uses (County/City).



The November 8, 1988, Scoping Document identified specific topics to be addressed in the EIS. They include:

- o Wetlands, Vegetation and Wildlife
- o Soils
- o Steep Slopes and Other Geologic Hazards
- o Shoreland Zoning, Floodplains, Mississippi River Critical Area
- o Groundwater Appropriation
- o Runoff, Receiving Waters
- o Air Quality and Noise
- o Cultural Resources
- o Parkland
- o Traffic
- o Transit Service
- o Visual Impacts
- o Economic Development, Employment, and Neighborhood Impacts
- o Financial Impacts
- o Twenty-Year System Issues

On November 28, 1988, an EIS Preparation Notice and summary of the November 8, 1988, Scoping Decision Document was published in the EQB Monitor.

Following the publication of the November 8, 1988, Scoping Decision Document, engineering and design studies for the amended Stage I LRT system continued. These studies influenced the decision to amend the corridor alternatives. Areas of study included: soil borings, soil boring analysis, station location and design analysis which includes initial planning/layout, identification and communication with selected major property owners that could potentially be affected by the light rail field analysis of the LRT corridors to identify potential opportunities and constraints, LRT track layout, and operational analysis. In addition, meetings were held in cities and communities involved in the light rail transit planning process, as well as the Intergovernmental Advisory Committee (IAC), to further discuss issues surrounding the alignment of the Hennepin County Light Rail corridors.

The proposed amendments to the November 8, 1988, Scoping Decision Document were made in direct response to three specific factors generated during discussions with various cities, communities and the IAC, and from information developed during the engineering and design study. The factors included:

- o Requests from the Metropolitan Airports Commission and the City of Bloomington to extend the Hiawatha Corridor line in the EIS beyond 46th Street to the Minneapolis-Saint Paul International Airport and the Mall of America site at 24th Avenue and 81st Street.

- o Request from the City of Minnetonka to eliminate the extension of the Southwest Corridor line from County Road 18 to County Road 62 in the EIS.
- o The development of a new north/south tunnel option that has the following planning and construction characteristics:
  - Locates the tunnel under a suitable limestone shelf which serves as the tunnel roof and is needed for inexpensive tunnel construction in the sandstone.
  - Complements the City of Minneapolis' north/south development plan.
  - Provides transfer - free service between all Minneapolis CBD stations and all corridors.

Amendments to the November 8, 1988, Scoping Decision Document

The factors listed above led to the development of additional alternatives to be considered in the Hennepin County Light Rail Transit Environmental Impact Statement (Figure 3.4). The proposed modifications to the November 8, 1988, Scoping Decision Document were announced in the EQB Monitor on January 23, 1989.

**ADDITIONAL TUNNEL OPTION** (Figure 3.5) - a north/south tunnel alignment with portals located at First Avenue North and West River Parkway and on the 29th Street corridor at a point between Portland and Nicollet Avenue South. The north portal serves the Northwest Corridor, the University Corridor, and the potential Northeast Corridor. The south portal serves the Southwest Corridor, the Hiawatha Corridor, and a potential I-35W South corridor. The stations would be located to complement the existing and planned north/south development of the downtown and to interconnect with the planned Nicollet Mall shuttle terminals. There is a potential location conflict in the area of the proposed expanded Post Office, the West River Parkway, and the University Connector LRT line. In case this conflict cannot be resolved, a surface alternative between the Metrodome and Hennepin Avenue is included between 2nd and 4th Streets. A transfer from this surface line to the tunnel would be required for connecting passengers.

**HIAWATHA CORRIDOR** - Realignment of the Hiawatha Corridor line at Hiawatha Avenue and 29th/Lake to the 29th Street Soo Line Railway Corridor, where it would connect with the tunnel in the vicinity of Portland/Nicollet. This alignment

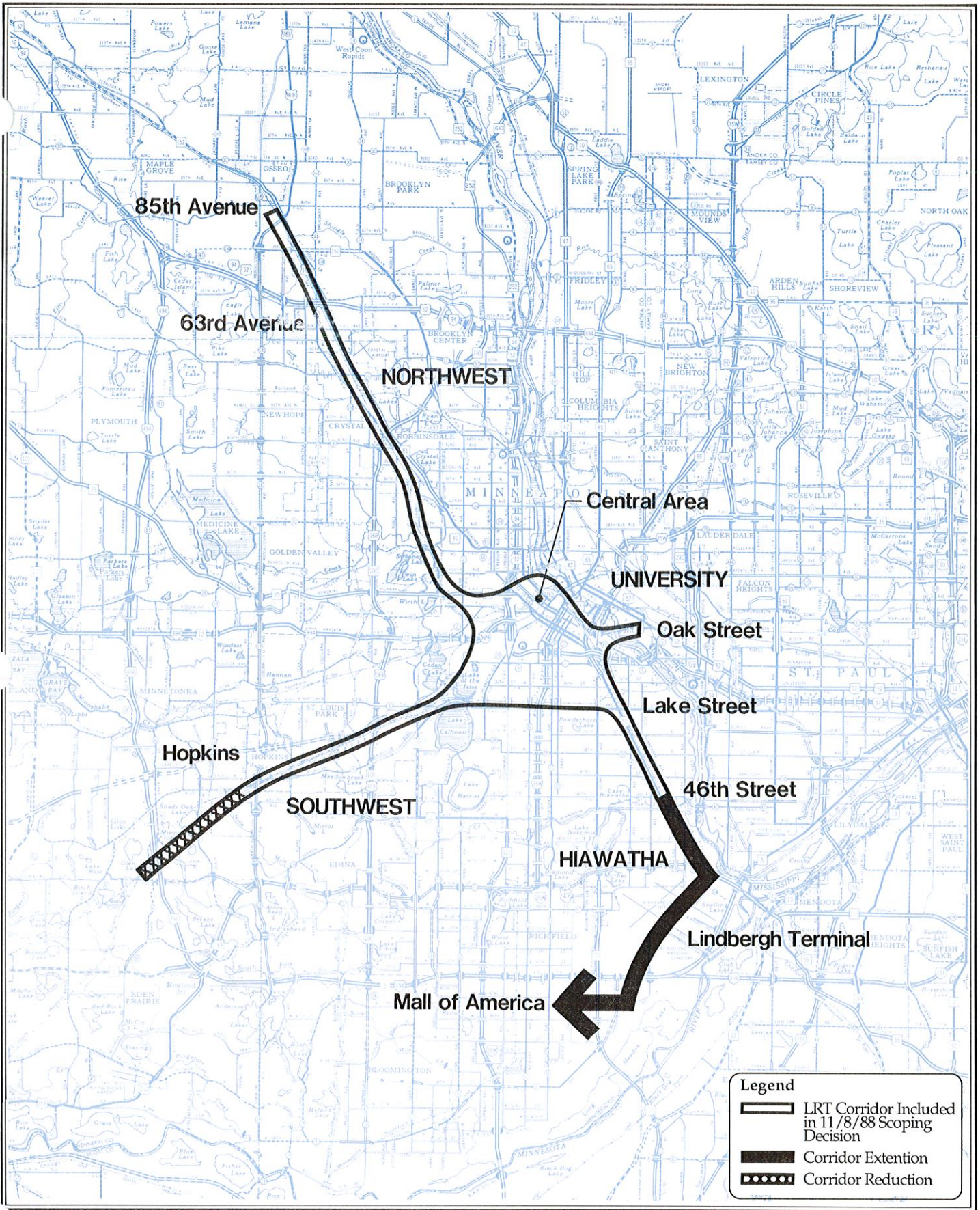


Figure 3.4

## Changes to Corridors for Inclusion in E.I.S.

Source: Changes to the Hennepin County Stage I Light Rail Transit System Scoping Document Dated November 8, 1988, HCRRA, January 31, 1989

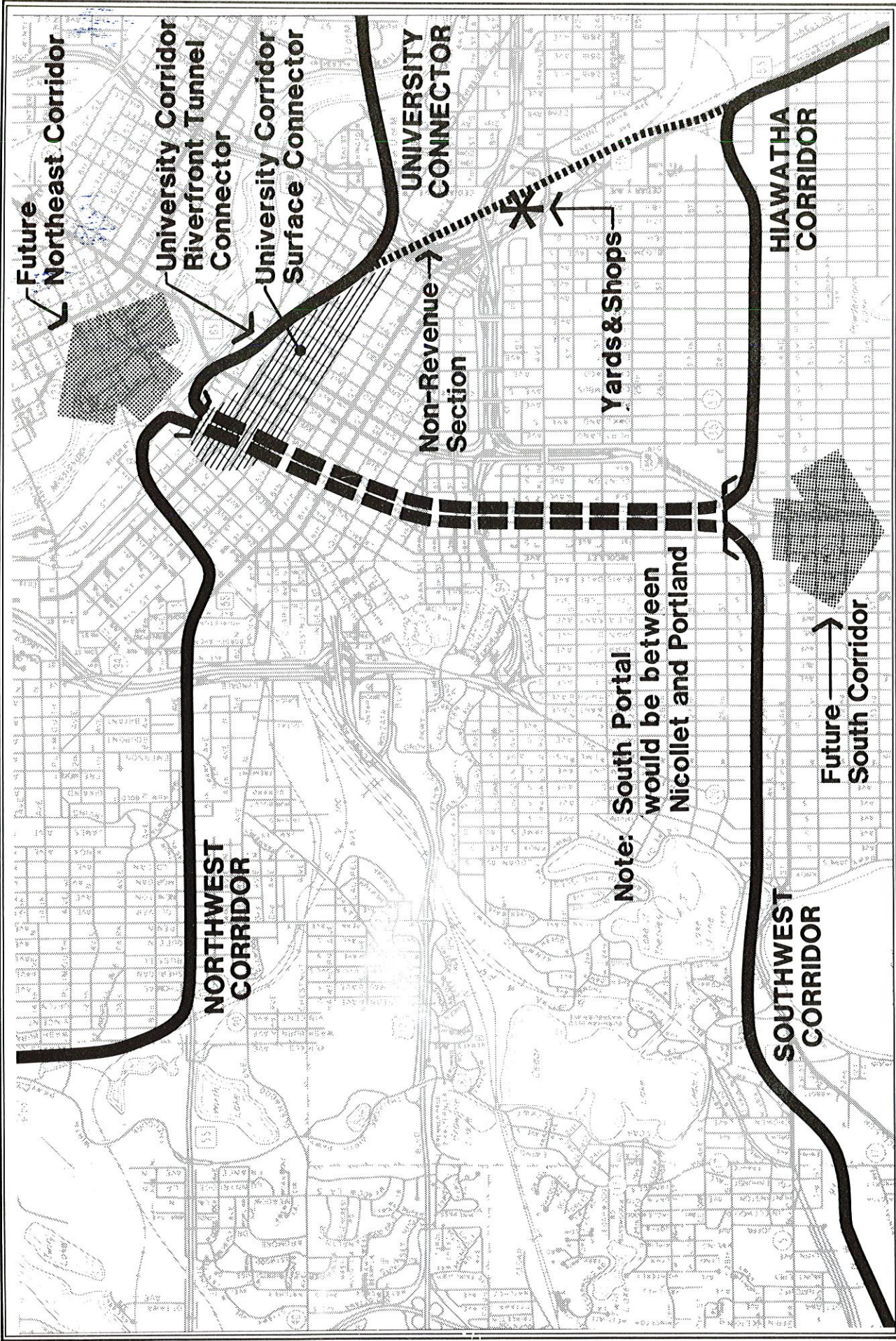


Figure 3.5

# The North/South Tunnel Alternative

Source: Changes to the Hennepin County Stage I Light Rail Transit System - Preliminary Scoping Document Dated November 8, 1988, HCRRA, January 8.

would serve an area of significantly higher ridership potential than along Hiawatha, north of Lake Street. A non-revenue section of the line would be constructed north of 29th Street to the University Corridor, paralleling Hiawatha Avenue, to provide access to the Yards and Shops Site.

**HIAWATHA CORRIDOR** - Extension of the Hiawatha Corridor to the Minneapolis-Saint Paul International Airport and to the Mall of America site at 24th Avenue and 82nd Street in Bloomington is also being studied.

**SOUTHWEST CORRIDOR** - Reduction of the Southwest Corridor from County Road 62 to County Road 18 (Hopkins).

On January 31, 1989, the Hennepin County Regional Railroad Authority approved the amendments to the November 8, 1988, Scoping Decision Document (Appendix). A summary of the amendments was published in the EQB Monitor on February 20, 1989.

### 3.1.3. LRT Scoping Decision Summary

The Hennepin County light rail corridors, corridor boundaries, central area alignment options, and specific subject areas to be included in the Environmental Impact Statement were approved by the HCRRRA on November 8, 1988, and amended on January 31, 1989. Section 3.2 will describe in detail the Build Alternative Alignments, including the tunnel and at-grade alignment options for the Central area.

## **3.2 DESCRIPTION OF ALTERNATIVES**

### Alternative 1: Build LRT

Build and LRT System based on the adopted Comprehensive LRT System Plan for Hennepin County for the Hiawatha, University, Northwest and Southwest Corridors.

After environmental analysis of both Alternative 1 and Alternative 2, the HCRRRA will select a preferred Alternative. If the Build Alternative is chosen, the proposed Hennepin County LRT System may be composed of a combination of system links as identified in the alignment options.

Each LRT corridor in the Hennepin County LRT System could operate independently, including the Central Area and maintenance facility, or as part of an integrated system. The Central Area connection boundaries, where each of the LRT corridors approach and enter downtown, are identified for study purposes only, and therefore should not be considered exact alignment divisions.

## Alternative 2: No-Build

The LRT System in Hennepin County would not be built. Transit service in Hennepin County would continue to be provided by the regular route bus system and paratransit services. Improvements to the existing transit system would be implemented as appropriate.

### 3.2.1 LRT System Description

#### Introduction

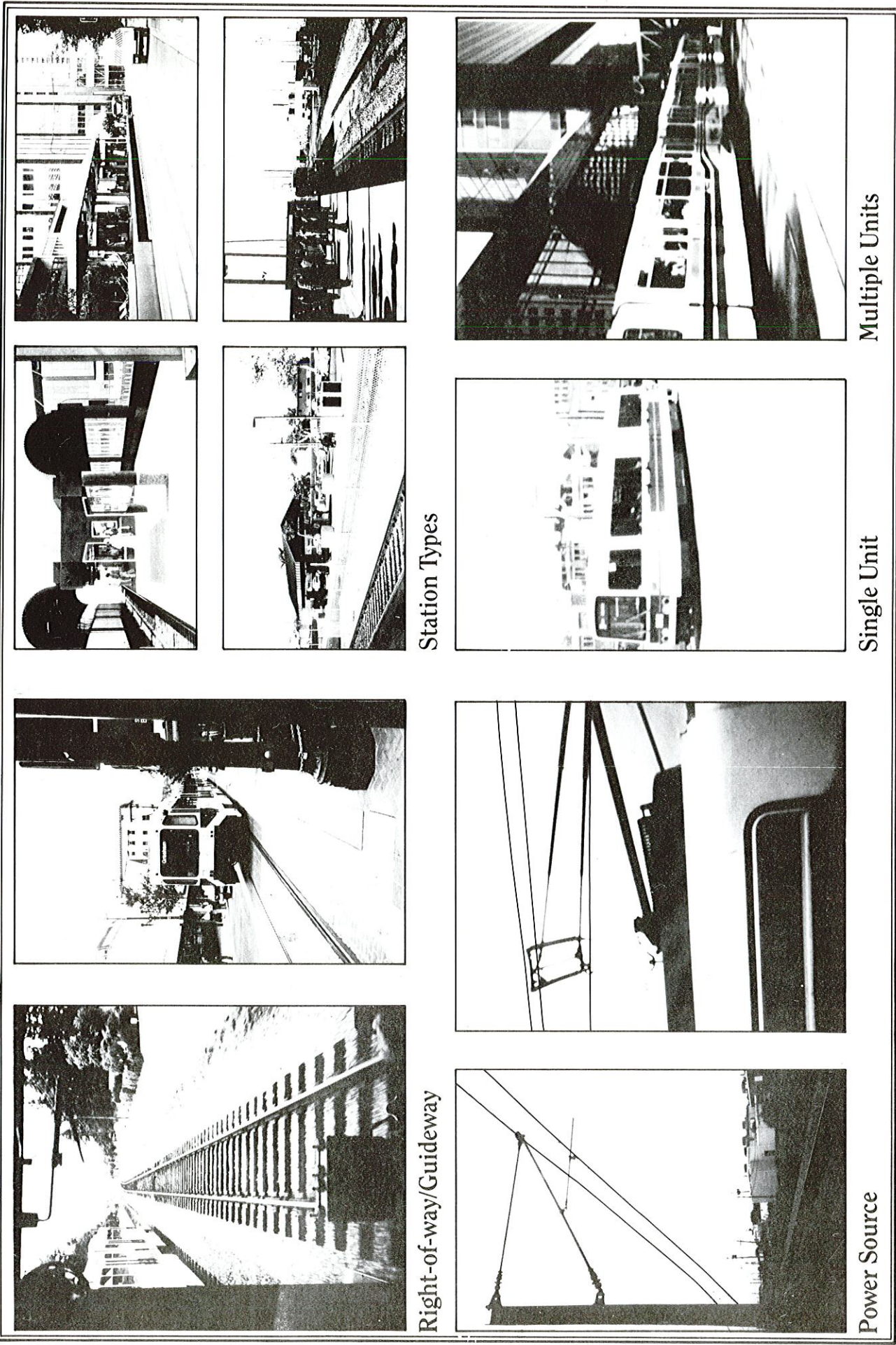
The proposed light rail transit system will utilize conventional LRT technology. A conventional LRT system is one which uses electrically powered steel-wheeled vehicles which run on steel rails and operate singly or in trains on a predominately reserved but not necessarily grade-separated right-of-way. Power is drawn from overhead wires. Reliance on this proven and readily available technology enhances the reliability and cost effectiveness of the system. Figure 3.6 provides an illustration of LRT components from existing LRT systems. Figures 3.7-3.9 illustrate the general cross-sectional dimensions of the LRT system when the track is located in railroad right-of-way, and street right-of-way for both double-track and one-way pair alignments.

#### Stations

The light rail transit system would include stations at approximately one-mile intervals. Bus transfer facilities at appropriate stations will provide across-the-platform bus-train transfers wherever possible. Stations will provide adequate space for automobile drop-offs. Automobile park-and-ride lots will be designed to local standards, maximizing the number of spaces available.

Most stations will be at-grade. Attractive, yet simple and cost-effective shelters will partially enclose the platform. One or more shelters, depending on forecast demand, will be located on each platform to protect waiting passengers from rain, snow and wind. Shelters will be radiantly heated, but not air-conditioned.

Platforms of sufficient length to accommodate the longest trains planned (three 90-foot cars, or 270 feet) will be provided adjacent to the rail line at each station. Each station will have either two side platforms ten to sixteen feet wide or one center (island) platform sixteen to twenty feet wide (Figure 3.10). Exceptions may be considered where local conditions dictate.



Station Types

Multiple Units

Single Unit

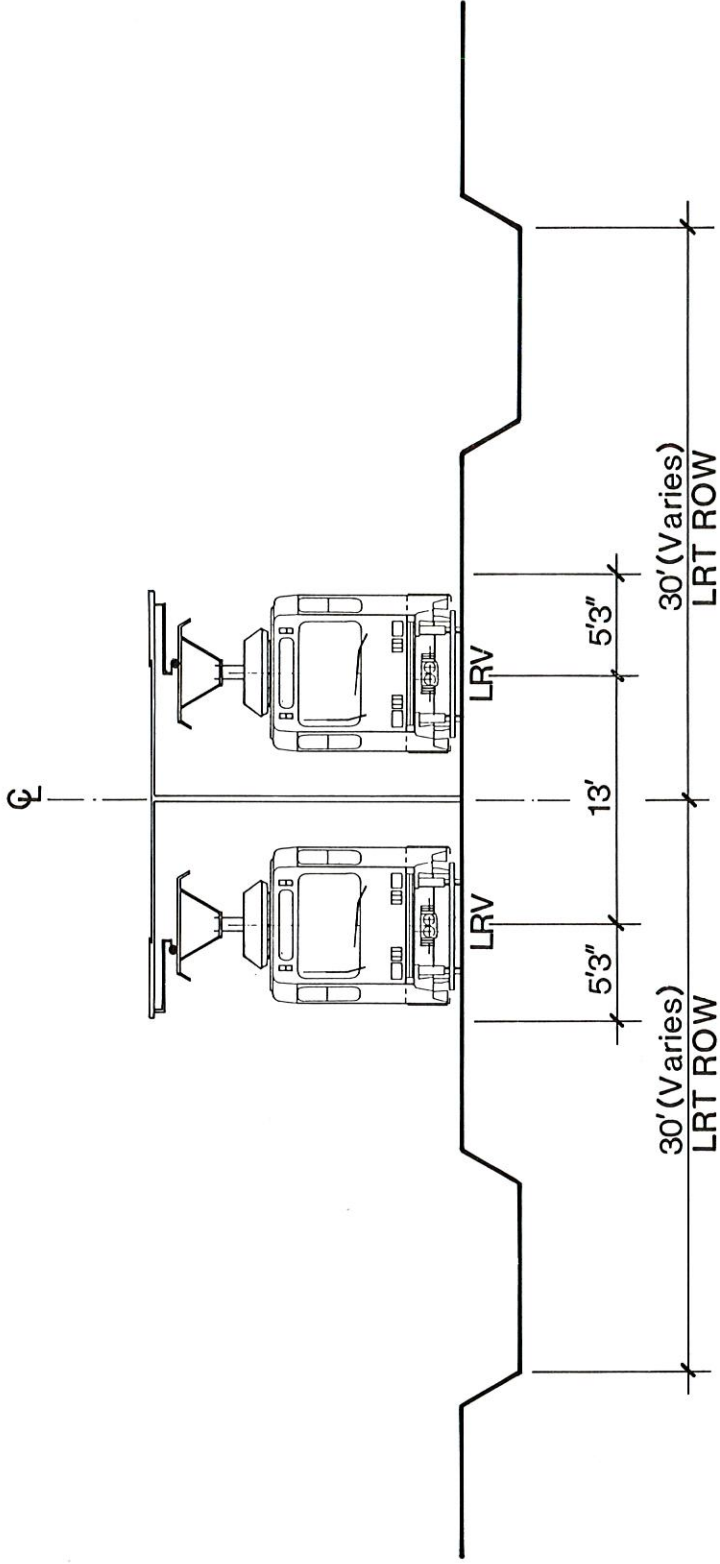
Right-of-way/Guideway

Power Source

# Definition of Light Rail

Figure 3.6



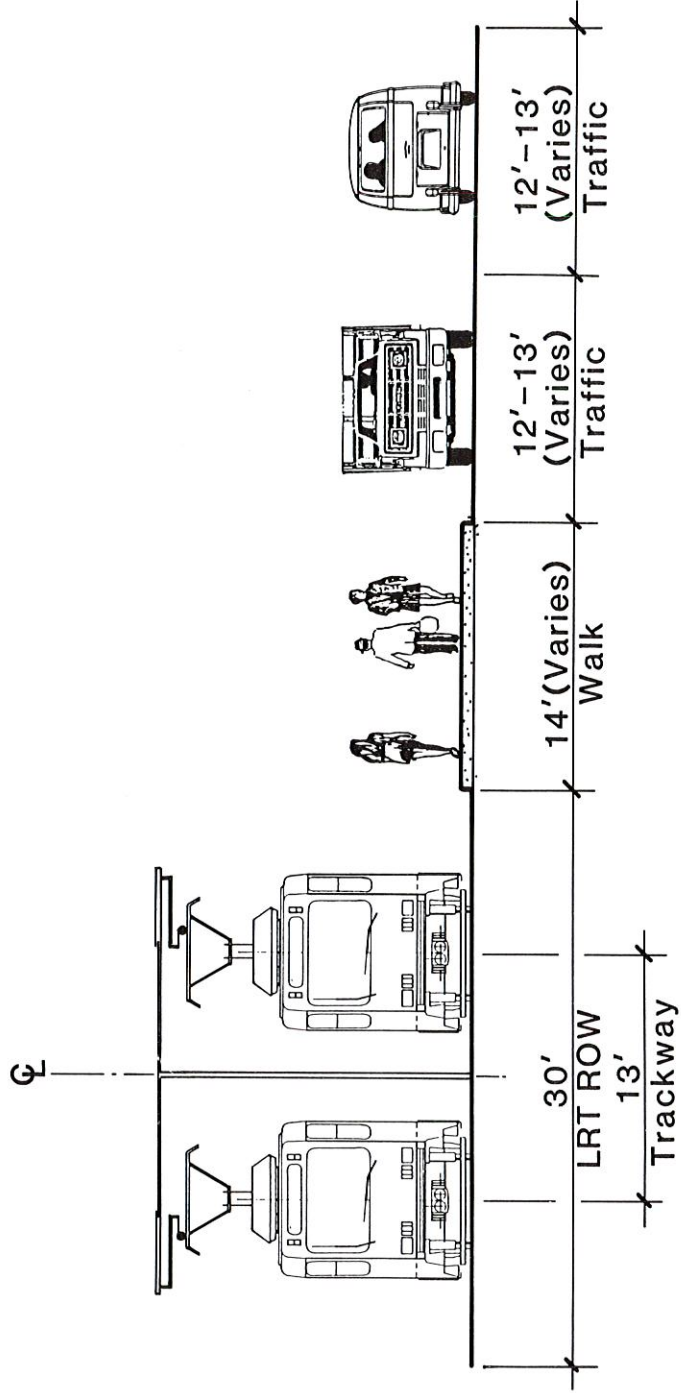


**LRT in Railroad Right-of-Way**

Figure 3.7

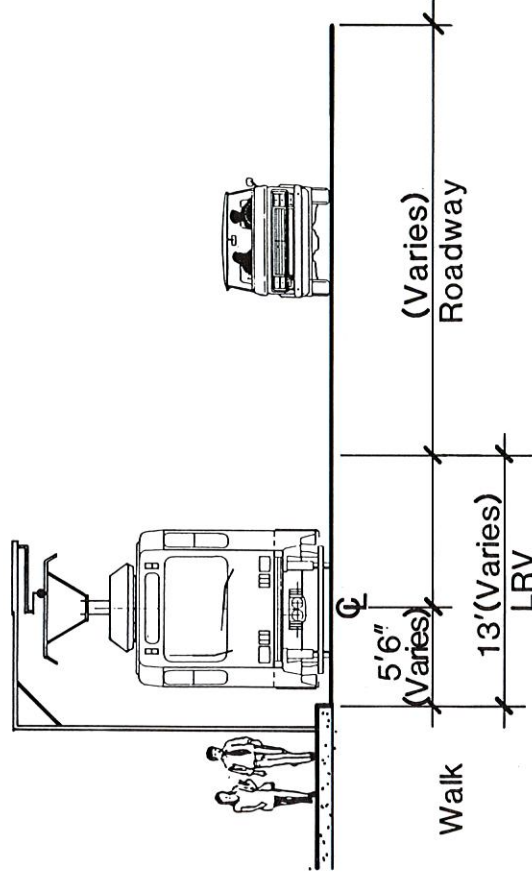






**LRT in Street Right-of-Way**

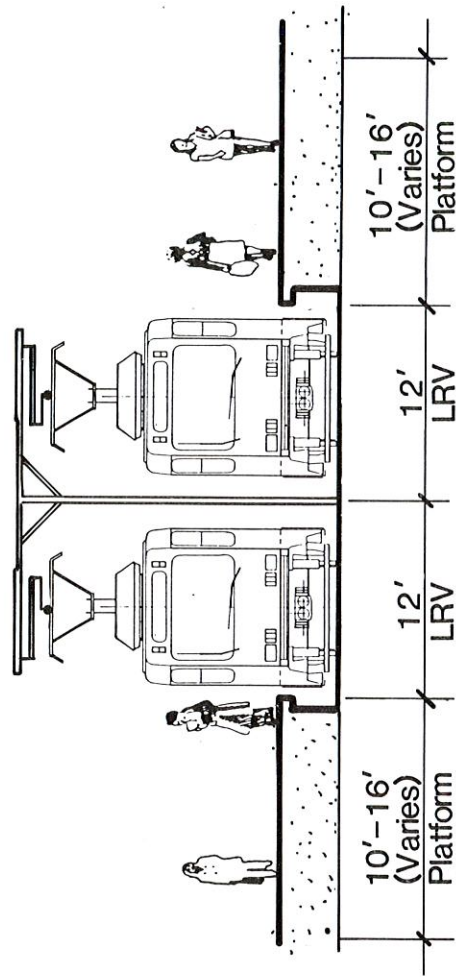
Figure 3.8



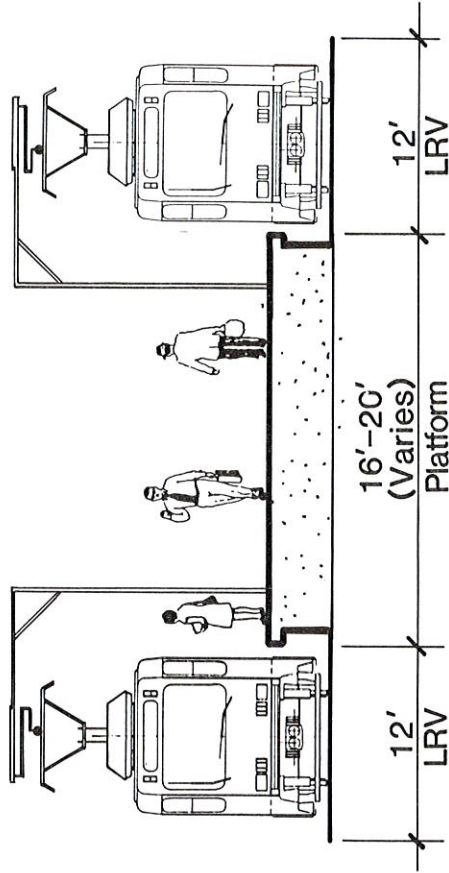
**Downtown One Way Operation**

Figure 3.9





**Side Platforms**



**Center Platform**

Figure 3.10

Side platforms will be accessed from each end and may also be accessed along one side. Center platforms will generally be accessed from the end closest to a cross-street. Emergency access/egress will be provided at both ends.

Platforms will be predominantly constructed of finished concrete, and designed with architectural sensitivity.

All stations will be designed to be barrier free and fully accessible to the handicapped by ramp or elevator and will meet the Minnesota Handicap Code. High station platforms to match normal rail car floor heights (about 40 inches above top of rail) will be built.

Proof-of-payment (POP) fare collection will be used.

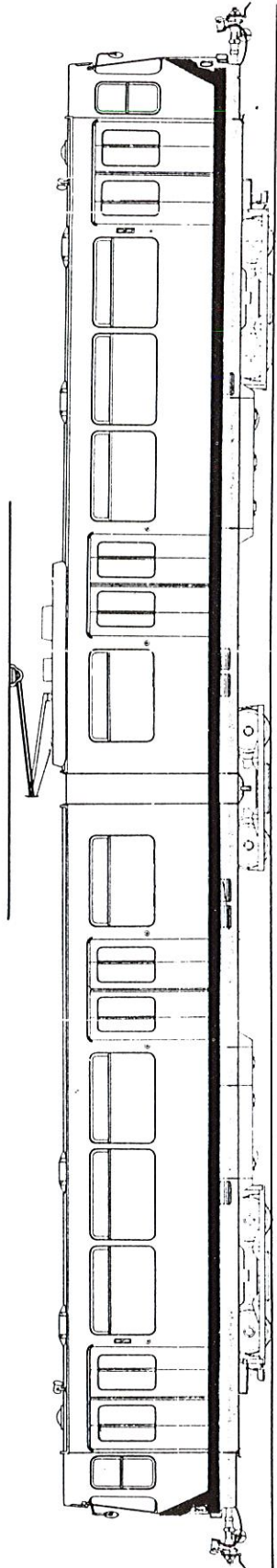
To provide a high level of security when using the LRT system, the station shelter, station and parking lot lighting and landscaping plans and LRV's will be designed to maximize open sight lines and levels of light. Additionally, each station platform will be equipped with an emergency telephone. Observation and surveillance by system employees should increase the security level of the system. Security patrols will be provided if they are determined to be needed after discussions with local law enforcement authorities and existing transit providers.

#### Vehicles

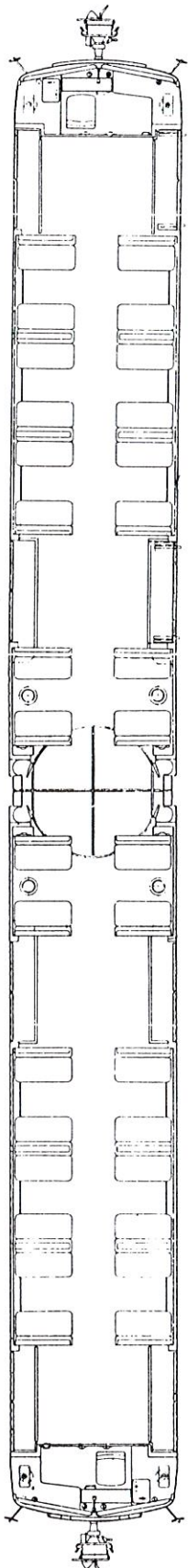
HCRRA LRT system vehicles are proposed to be articulated cars approximately 90 feet in length, 9 feet wide, and 13 feet high. Each car will be equipped for independent two-way operation, with an operator's cab at each end and four double-width doors on each side. A single pantograph will be located on the roof of each car for power collection from the overhead contact (electric wire) system. Vehicles will be both heated and air conditioned.

The LRV will carry 76 seated passengers and, under normal loading conditions (i.e., four standees per square meter of usable floor space), accommodate 166 total passengers per vehicle. Figure 3.11 illustrates a typical LRV car.

The number of cars per train is determined by headways, ridership demand, vehicle limits, and street block lengths. Trains on the Hennepin County LRT system may not exceed a total length of 300 feet because of the constraints of block faces in downtown Minneapolis. It is anticipated that two-car trains will be operated on most peak hour, peak direction trains, supplemented by three-car trains as needed to accommodate demand. Single-car trains will suffice for most off-peak services.



**Exterior-Side Elevation**



**Interior-Floor Plan**

Figure 3.11

The following vehicle performance parameters were adopted in the Hennepin County LRT Comprehensive Plan.

- o Maximum service speed 55 miles per hour
- o Acceleration rate 3.0 miles per hour per second  
(mph/s) (initial)
- o Braking rate 3.0 mph/s (constant)
- o Emergency braking 6.0 mph/s (constant)

LRT train movements will operate by line of sight. Train protection will be accomplished by the means indicated below:

- o Private Right-of-Way - automatic block signals (ABS) including automatic train stop (ATS) using proven, railroad-type vital circuitry and components.
- o Street Right-of-Way - line of sight subject to operating rules and procedures requiring train operators to maintain a separation of at least one block between two trains. Preemption or prioritization of traffic lights.
- o Entire line - train-to-wayside communication for train identification, control of track switches at junctions, etc.

#### System Operations:

Corridor, downtown, yard and turnback operations will be directed from the control center, located in the yard and shop facility on the former Coach Yard site along Hiawatha Avenue near I-94. Communication between the control center and trains will be by two-way radio, with separate channels for operations, maintenance, and supervision. A construction channel may also be provided.

Passenger communication will be through train operators using public address systems (PAs) on the LRVs. LRV PAs will have both interior and exterior speakers.

Trains will stop at each corridor station for approximately twenty seconds, a standard dwell time used by several new North American LRT systems. At downtown stations and other heavily used stops, dwell times may be extended; at lesser-used stations, dwell times may be shortened as ridership patterns become clear.

#### Operating Regulations:

The regulations of the Minnesota Department of Transportation (Chapter 8830, Minnesota Rules) applicable to system operations and maintenance will be followed.

## Operating Characteristics

### Hours of Service:

Normal weekday service will begin at approximately 5:30 AM and end at 1:30 AM. Commuting peaks are assumed to occur from 6:30-9:00 AM and 3:30-6:00 PM. Weekend service will begin at 7:00 AM and extend until midnight.

### Service Frequencies:

Standard LRT headways will be fifteen minutes during the day on weekdays, with thirty-minute headways on week nights and all day on weekends and holidays. Shorter weekday peak period frequencies will be assumed only if estimated demand exceeds the capacity of maximum length trains running at the standard fifteen-minute interval.

### Speed Limits:

Speed limits recommended for Hennepin County LRT lines by segment location are:

<u>Type of Right-of-Way</u>	<u>Speed Limit (Miles/Hour)</u>
Private (e.g., along BN line)	55
Street (reserved median or curb lane)	Street Speed Limit $\leq$ 35

These speeds generally are consistent with LRV performance capabilities, station spacing, adjacent development, and traffic interference. In some locations, local conditions such as sharp curves will reduce speeds for relatively short distances.

### Train Control and Signals:

Trains on the LRT system will be operated manually by an operator. Mainline operations will be directed, controlled, and monitored by a dispatcher at a central control office, primarily via radio.

The dispatcher will control and direct LRT operations in accordance with established operating schedules, rules, and procedures, and will initiate any corrective actions that may be required to maintain service schedules and to minimize the adverse impacts of equipment failures or emergency situations.

### Operating Power:

Operating power for the light rail system will be generated by three major subsystems: substations of 750 to 1000KW at intervals of approximately one mile; the overhead distribution system (750 volts DC), which acts as the positive circuit and the LRT track, which serves as the negative circuit.

### Operating Strategies:

An operating strategy has been established to assure service and schedule reliability between the corridors and the downtown hub. All trains are planned to make all stops. To the extent dwell times are reduced at lightly-used stops, extra dwell time and/or recovery time will be provided at heavily-used stops and timed-transfer feeder bus stops. This would enhance overall schedule reliability.

Trains will be stored overnight at, and will enter the system from, the yard and shop facility.

Each train will be operated by one person. Roving inspectors will check to ensure that riders have obtained proof of payment before boarding.

### 3.2.2 Alignment and Station Description

To facilitate the environmental analysis of the Hennepin County LRT System, the system has been broken down into four specific corridors plus the Central Area. Each corridor has the ability to operate independently, or as part of an integrated LRT system. Individual corridor connection boundaries to the Central Area have been identified for study purposes only.

The following sections will describe the individual corridor alignments, the Central Area alignments (including the Yard and Shop site), and the proposed station locations.

#### 3.2.2.1 Hiawatha Alignment

##### Overview

The Hiawatha Corridor LRT alignment will run north from the proposed Mall of America in Bloomington to Lake Street/Hiawatha Avenue in Minneapolis (Figure 3.12). The total length of the Hiawatha Corridor is approximately 8.5 miles of double track.



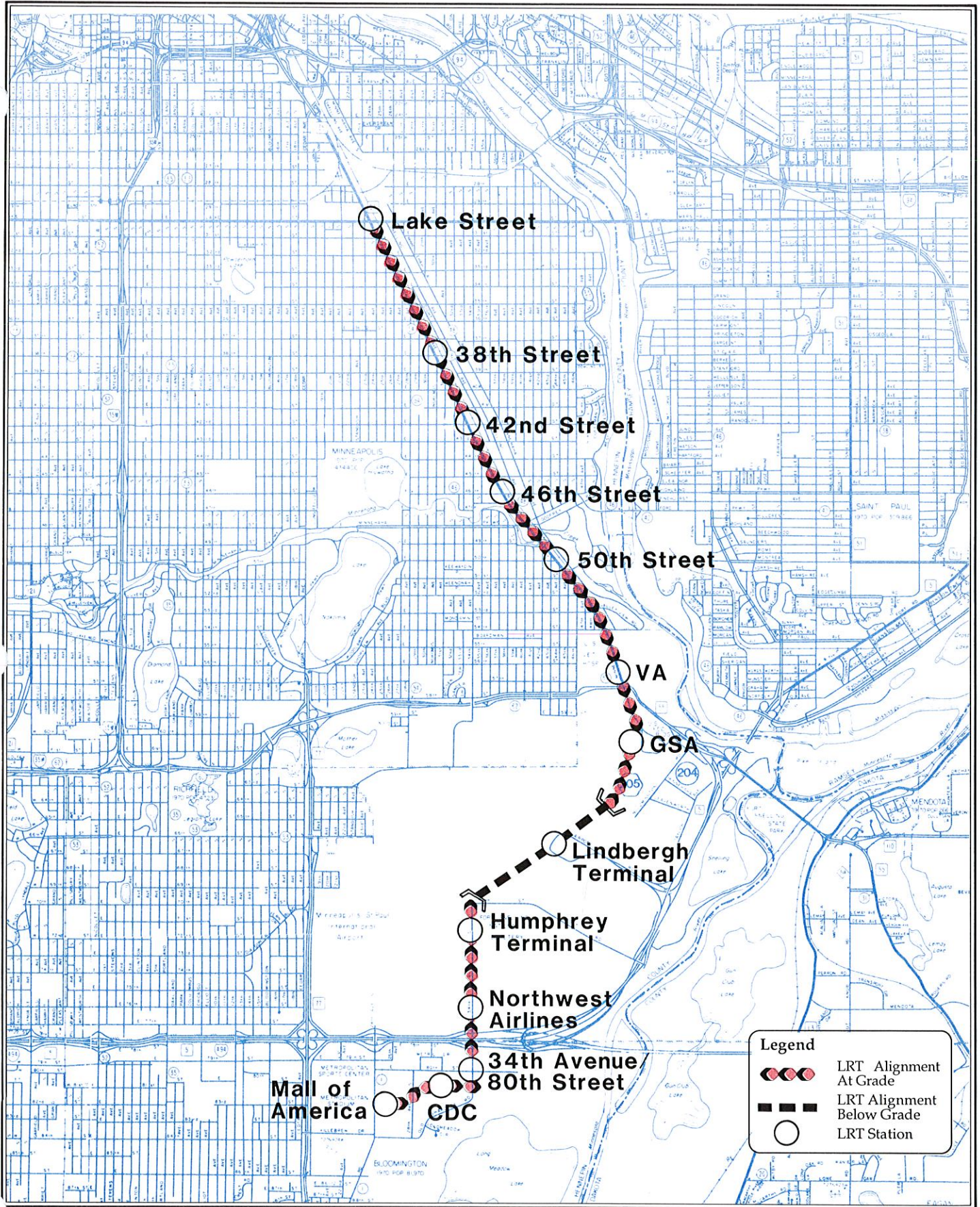


Figure 3.12  
Hiawatha Corridor

Stations would be located at:

- o Mall of America
- o Control Data Corporation
- o 34th Avenue/80th Street
- o Northwest Airlines
- o Humphrey Terminal
- o Lindbergh Terminal
- o GSA Building
- o VA Hospital
- o Hiawatha/50th Street
- o Hiawatha/46th Street
- o Hiawatha/42nd Street
- o Hiawatha/38th Street
- o Hiawatha/Lake Street

#### Alignment Description

The terminating point for the LRT alignment would be at the station at 24th Avenue and 82nd Street. From this station, the LRT track would proceed east, on the south side of 82nd Street, crossing 28th Avenue at-grade. At 28th Avenue, the LRT track would proceed northeast until it reaches the Control Data Corporation (CDC) campus, where it would proceed east on CDC's service road, to 34th Avenue. The LRT track would then proceed north, on the west side of 34th Avenue, cross 80th Street, at-grade, pass under I-494, and continue north to the south airport tunnel portal at approximately 34th Avenue and 70th Street. This portal would begin north of the entrance to the HHH Terminal public parking lot, and would extend approximately 400 feet to the north.

The double-track airport tunnel would then proceed northeast to the Lindbergh (main terminal) station. From the station the LRT track would continue in a northeasterly direction to the north portal, west of Bloomington Road. The total length of the airport tunnel segment is approximately 7,750 feet. From the tunnel portal, the track would proceed north, at-grade, along the east edge of the Army and National Guard Military Reservation, to the GSA station. North of the station, the LRT track would be aligned on the east side of Minnehaha Avenue, where it would cross Crosstown Highway 62, above-grade.

North of Crosstown Highway 62 the LRT track would be adjacent to the west side of Minnehaha Avenue and then Hiawatha Avenue, between the VA Hospital and Hiawatha/Lake Street. The in-street right-of-way would range from 28 to 45 feet. The right-of-way in this area is being provided in conjunction with the planned reconstruction of Hiawatha Avenue.

Grade crossings will occur at 54th Street, 50th Street, 46th Street, 42nd Street, 38th Street, 35th Street and 32nd Street. From Minnehaha Parkway to just north of Minnehaha Creek the LRT track will be located in a covered tunnel. In addition, a structure will be designed to carry the LRT tracks beneath Lake Street. The purpose of this structure is to minimize LRT impact on traffic in this area.

### Stations

#### Mall of America Station:

This station is proposed to be located in the southeast corner of the intersection at 24th Avenue and 80th Street. Future design plans for the station could include a skyway connection, across 24th Avenue, to the Mall of America.

#### Control Data Corporation (CDC) Station:

This station is proposed to be located on the CDC campus, west of the main headquarter's building. This station would primarily serve the CDC employees.

#### 34th Avenue Station:

The station is proposed to be located in the northwest corner of the intersection at 34th Avenue and 80th Street.

#### Northwest Airlines Station:

This station is proposed to be located on the west side of 34th Avenue in front of the Northwest Airlines corporate office. It is projected that this station would primarily service intra-airport commuters.

#### Humphrey Terminal Station:

This station is proposed to be located on the west side of 34th Avenue in front of the Humphrey Terminal. It is projected that this station would primarily service intra-airport commuters.

#### Lindbergh Terminal Station:

This station is proposed to be located on the airport tunnel, approximately ninety feet below-grade. Access to the station would be provided by escalators and stairways. It is projected that this station would service large volumes of primarily walk-on transit users.

**General Services Administration (GSA) Station:**

The GSA station is proposed to be located west of Minnehaha Avenue, across from the GSA building.

**Veterans Administration Station:**

The VA Hospital station at Hiawatha Avenue and 58th Street, is proposed to be located in the southeast corner of the intersection. Because of this station's close proximity and accessibility to the Crosstown Highway (62), a park-and-ride lot is proposed which would accommodate approximately 600 automobiles.

**50th Street Station:**

The station is proposed to be located on the west side of Hiawatha Avenue, at the 50th Street intersection.

**46th Street Station:**

This station is proposed to be located in the northwest corner of the intersection at 46th Street and Hiawatha Avenue.

**42nd Street Station:**

The station at 42nd Street is proposed to be at-grade, positioned in the northwest corner of the Hiawatha Avenue and 42nd Street intersection.

**38th Street Station:**

The 38th Street station is proposed to be located in the northwest corner of the intersection at 38th Street and Hiawatha.

**Lake Street Station:**

The Lake Street station site is proposed to be located south of Lake Street and west of Hiawatha Avenue at a depressed, grade-separated level.

**3.2.2.2 Southwest Alignment**

**Alignment Analysis**

Initially, two alignment options were considered for the Southwest LRT line: alignment on the HCRRA right-of-way (formerly Chicago and Northwestern) or alignment on the Soo Line right-of-way. The HCRRA and Soo Line track run parallel to each other, with the HCRRA right-of-way located to the north of the Soo Line right-of-way.

After evaluating the location of potential station sites, four of the five southwest stations are proposed to be located to the south of the Soo Line track. Therefore, the alignment of the LRT track in Soo Line right-of-way would provide superior pedestrian access to the stations, compared to the HCRRA right-of-way which would require across-the-track access. In addition, the major park-and-ride facility, at the Hopkins station, is more easily accessed by the Soo Line.

Two of the Central Area alignment options include a Southwest and Hiawatha line alignment on the 29th Street Rail Corridor. Therefore, if the Southwest Corridor was located on the Soo Line right-of-way, the connection to the 29th Street Rail Corridor could be accomplished without having to bridge the Soo Line trackage.

Based on the above-mentioned benefits of aligning the LRT track in existing Soo Line right-of-way, the Southwest line alignment on HCRRA owned right-of-way has been screened from further analysis.

#### Description of the Southwest Corridor Alignment

The Southwest alignment runs at-grade from 5th Avenue in Hopkins, northeast to the Minneapolis/Saint Louis Park city limits (Figure 3.13). The approximate length of the Southwest line is 3.7 miles.

Beginning at approximately 5th Avenue in Hopkins, the Southwest Line track would use Soo Line right-of-way. The LRT track would travel in a northeast direction, proceed from the Hopkins Station site, pass under TH 169, and then cross Excelsior Boulevard at-grade. The LRT track would then pass the Tyler Avenue/Blake Road Station, and cross Blake Road at-grade. It would continue northeast, crossing Minnehaha Creek and Louisiana Avenue above-grade. Continuing in a northeast direction, the LRT track would pass the Louisiana Station, travel under the existing Soo Line Railroad Bridge, cross Wooddale Avenue at-grade, and pass the Wooddale Station. The LRT track would continue northeast and cross TH 100 on an existing bridge, cross Beltline Boulevard at-grade, and pass the Beltline Boulevard Station. The track would continue northeast, for approximately .85 miles until it reaches the proposed Abbott Station at 31st and Abbott. This station is included in the Central Area section.

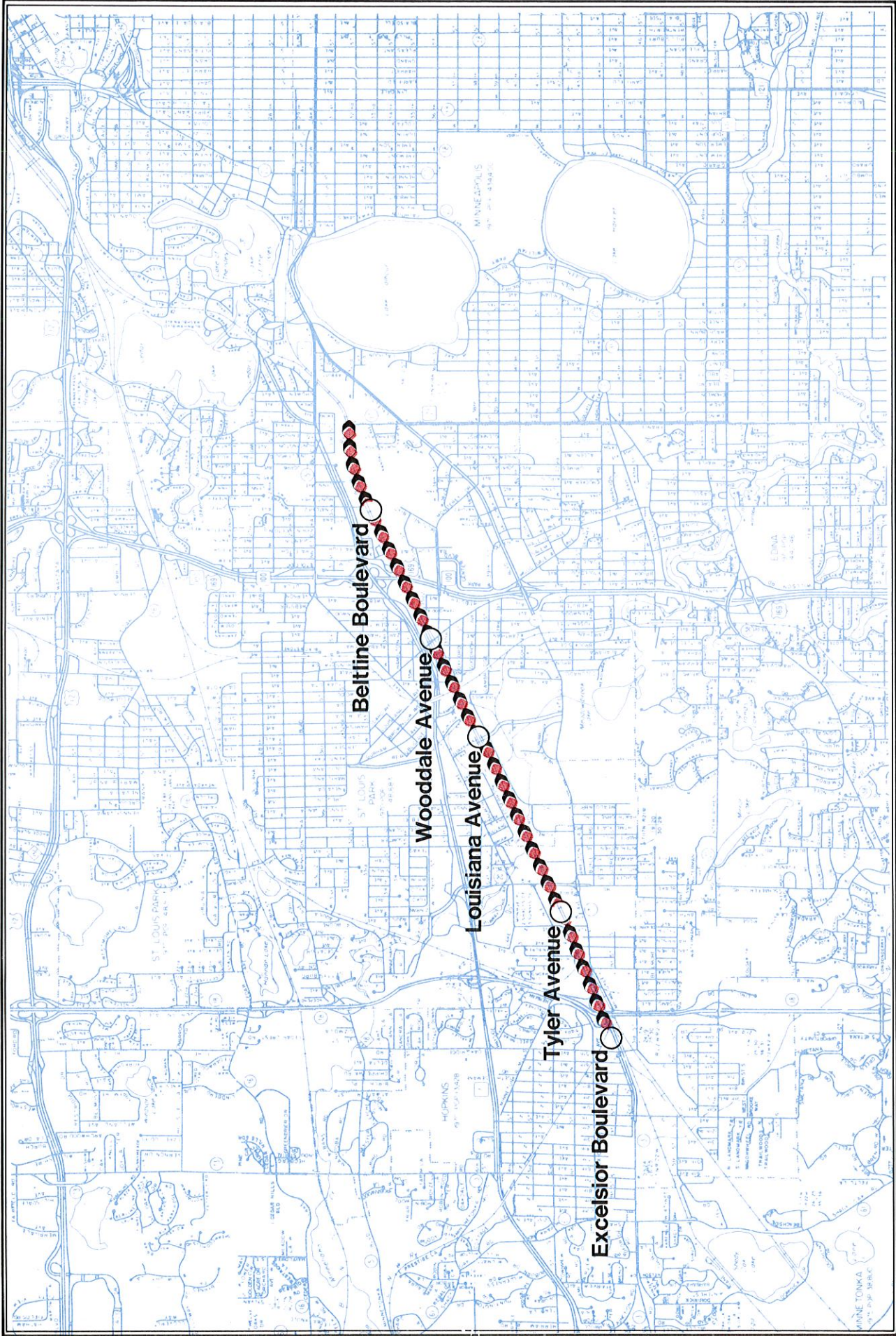


Figure 3.13  
Southwest Corridor



# LRT Alignment and Stations

## Stations

### Hopkins Station:

The proposed site is south of the Soo Line right-of-way, east of Fifth Avenue. The approximate size of the site is 8.5 acres. Because this is the terminating station for the southwest line, a large (approximately 550 parking spaces) park-and-ride facility is proposed.

### Blake Road/Tyler Avenue Station:

The proposed site is just east of the existing Massey-Ferguson property. The approximate size of the Massey-Ferguson site is 6.7 acres with 2.8 acres proposed to be used for a park-and-ride lot.

### Louisiana Avenue Station:

The proposed station site is in the southeast corner of the crossing, and is approximately 3.5 acres. The light rail line will be grade separated and will cross Louisiana on the existing bridge.

### Wooddale Avenue Station:

The proposed site, which is approximately 3.3 acres, is in the southeast corner of the intersection.

### Beltline Boulevard Station:

The proposed site is in the southeast corner of the crossing. The approximate size of the site is 2.2 acres.

## 3.2.2.3 Northwest Alignment

### Analysis of Alignment

After the Comprehensive LRT System Plan for Hennepin County was completed in June 1988, preliminary design activities were initiated. On January 31, 1989, the Preliminary Design of the Northwest LRT Corridor was completed and distributed to each City along the Northwest Corridor for the purpose of public hearings and approval/disapproval. This is in accordance with state law. The plans were viewed as further detail of the project definition for the build alternative.

The HCRRA and each City held public hearings. Resolutions were passed in Brooklyn Park, Crystal, Robbinsdale and Golden Valley. In some cases original resolutions were amended. The City of Minneapolis requested an extension until all preliminary design plans for all LRT service in

the City were available; the HCRRA granted this extension. On July 25, 1989, the Hennepin County Regional Railroad Authority (HCRRA) voted to eliminate the Golden Valley Road and Plymouth Avenue stations in the Northwest LRT Corridor. This action was taken in response to input received at public hearings regarding preliminary design plans and follow-up correspondence. Thus, the official position of the Hennepin County Regional Railroad Authority (HCRRA) is that the stations are not part of the preliminary design plans. The stations were included in the adopted Comprehensive LRT System Plan for Hennepin County dated June 1988, they were presented in the Scoping Decision dated January 31, 1989, and studied in the initial work on the draft DEIS. This DEIS does not include the two stations.

The Cities of Brooklyn Park and Crystal have approved the preliminary design plans essentially as submitted. The Cities of Robbinsdale and Golden Valley have made approvals subject to certain conditions being met. The DEIS only reflects the official position of the HCRRA as of November 1989.

#### Overview

The Northwest line would run at-grade from 85th Avenue in Brooklyn Park southeast to TH 55/Bryant Avenue North in Minneapolis (Figure 3.14). The length of the Northwest Corridor segment is approximately 10.3 miles. The LRT will consist of a double-track (two-direction) configuration along the entire segment.

Stations would be located at:

- o 85th Avenue North/BN
- o 77th Avenue North/BN
- o 63rd Avenue North/BN
- o Bass Lake Road/BN
- o 42nd Avenue North/BN
- o 36th Avenue North/BN
- o Penn Avenue North/TH 55
- o Emerson Avenue North/TH 55

#### Alignment Description

The alignment would run southeast from 85th Avenue using Burlington Northern right-of-way. The LRT tracks would be located to the east of the BN tracks in approximately 100 feet of right-of-way. The BN right-of-way intersects with TH 55 just east of the city limits of Golden Valley.



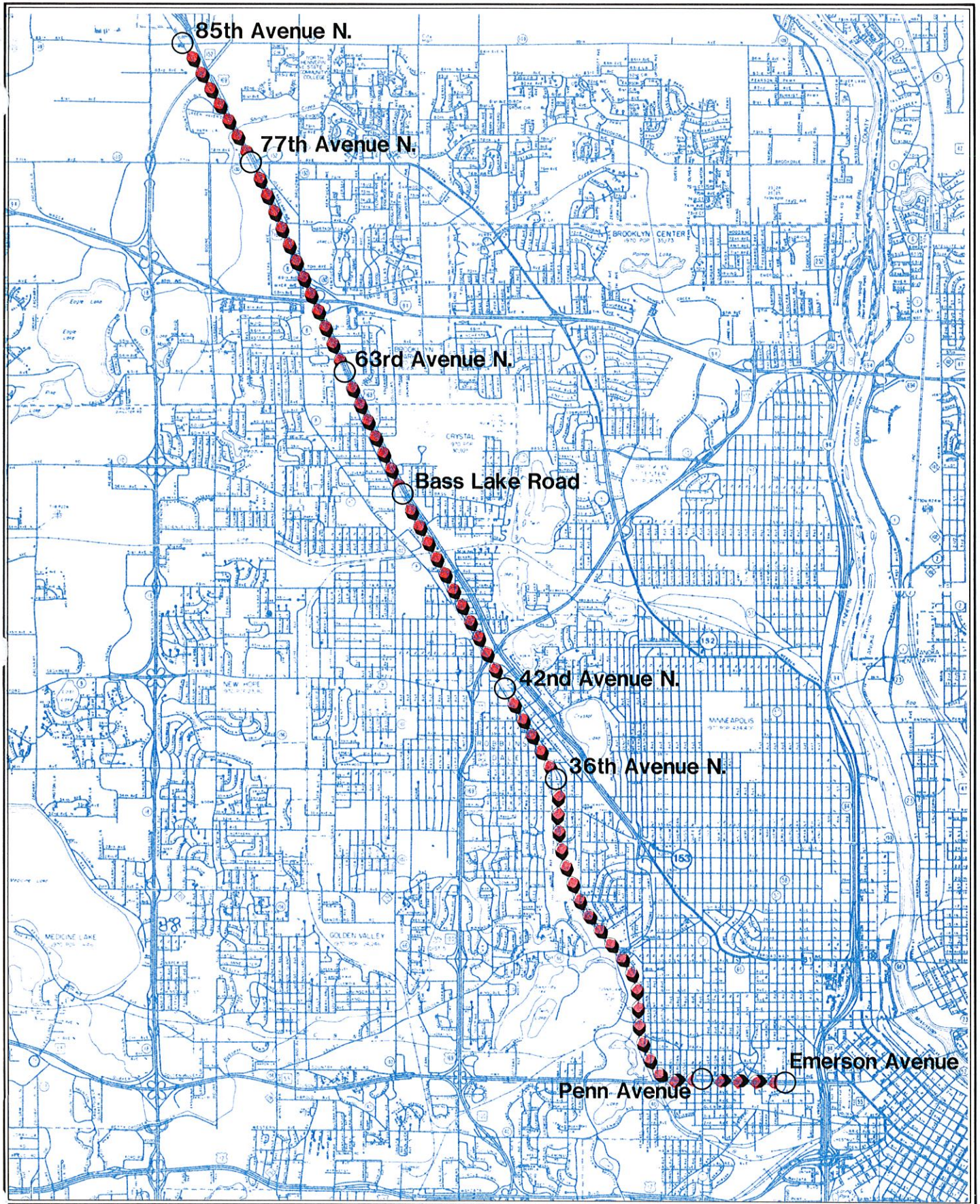


Figure 3.14  
Northwest Corridor

# LRT Alignment and Stations

At-grade intersection crossings on the Burlington Northern Railroad segment of the line would occur at:

- o TH 169
- o 77th Avenue North
- o 73rd Avenue North
- o 63rd Avenue North
- o Bass Lake Road
- o Private drive south of Bass Lake Road
- o Corvallis Avenue North
- o West Broadway Avenue
- o 45 1/2 Avenue North
- o 42nd Avenue North
- o Noble/41st Avenue North
- o 40th Avenue North

Near the TH 55 bridge over the BN tracks, the alignment turns east, utilizing right-of-way immediately south of TH 55, to Bryant Avenue North. The LRT tracks would be located on the south side of TH 55 in right-of-way ranging from approximately 30 to 115 feet. In general, the right-of-way is 30 feet, but it widens out to as much as 115 feet to accommodate stations and station functions within the right-of-way.

At-grade intersection crossings in the TH 55 (Olson Memorial Highway) segment of the line will take place at:

- o Penn Avenue North
- o Morgan Avenue North
- o Humbolt Avenue North
- o Emerson Avenue North
- o Bryant Avenue North

### Stations

#### 85th Avenue Station:

The 85th Avenue Station would be located in the southwest corner of the 85th Avenue and County Road 81 intersection, on approximately eight acres of land.

#### 77th Avenue Station:

The 77th Avenue station site would be located in the northwest corner of the intersection, on approximately six acres of land.

#### 63rd Avenue Station:

The proposed station site would be in the northwest corner of the intersection, covering an area of approximately 5.1 acres. A park-and-ride facility with 400 parking spaces is proposed for this station.

#### Bass Lake Road Station:

The proposed Bass Lake Road station would be located in the northwest corner of the intersection and would cover an area of approximately 2.2 acres.

#### 42nd Avenue Station:

The proposed station site would be between 41st and 42nd Avenue North, covering an area of approximately 1.9 acres.

#### 36th Avenue Station:

The proposed station at 36th Avenue North would be located in the northwest corner of the crossing, on approximately 0.9 acres of land.

#### Penn Avenue Station:

The proposed station site would be located in the southwest corner of the Penn Avenue/TH 55 intersection. The station would cover an area of approximately 1.6 acres.

#### Emerson Avenue Station:

The proposed station would be located in the southwest corner of the TH 55 and Emerson Avenue North intersection.

### 3.2.2.4 University Connector Corridor

#### Alignment Development Process

An at-grade Washington Avenue alignment extending to Oak Street was adopted by the HCRRA for the University Connector Line in the Hennepin County Comprehensive LRT System Plan. The initial alignment was as follows (Figure 3.15):

The eastern terminating point of the University Connector line would be at the Oak Street station site located at Washington and Oak Street. Starting at Oak Street and running westward, the LRT track would run at-grade along the north side of Washington Avenue.

This section of Washington Avenue is currently a four-lane undivided roadway with signalized at-grade intersections at Oak Street, Walnut, Harvard Street, and Union Street.

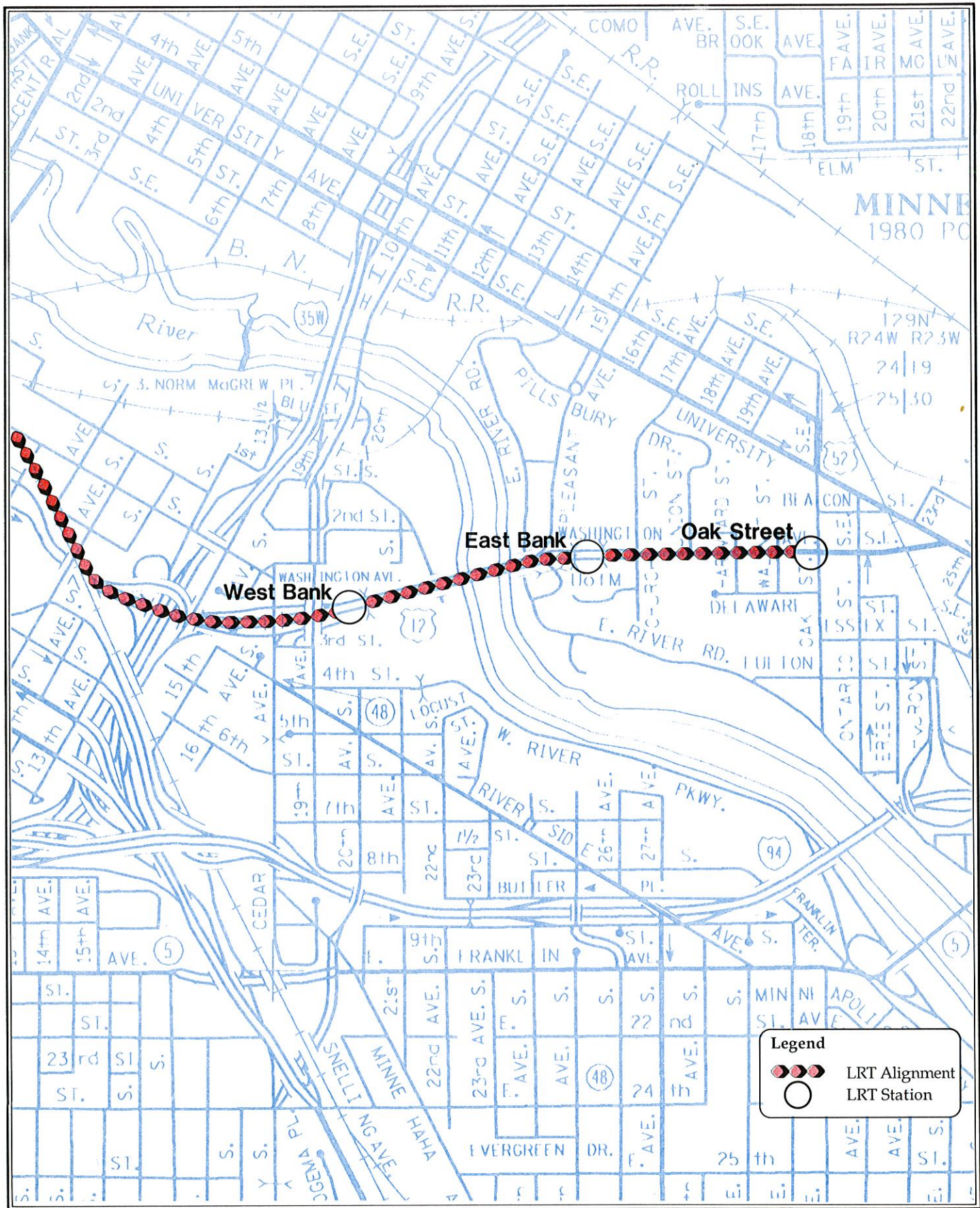


Figure 3.15  
University Corridor

On-street parking is permitted on both sides of the street between Union Street and University Avenue during off peak hours. The proposed plan would maintain a three-lane roadway (the center lane would be a designated left turn lane) in this section. The on-street parking would be prohibited.

As the track approaches and passes through the Church Street intersection, it would cross over and be aligned in the median of Washington Avenue, proceed through the East Bank station and cross the Mississippi River on the Washington Avenue Bridge. The LRT track would then continue west through the West Bank campus area and station site. The LRT track would proceed west, in the median of the 3rd Street-4th Street Freeway (TH 12) passing under 19th Avenue South, Cedar Avenue South, both the Washington Avenue and 3rd Street Ramps, I-35W (north and southbound), Soo Line Railroad and 11th Avenue South. At approximately 10th Avenue, the LRT track would cross 3rd Street on an above-grade structure, and connect with the Hiawatha line on 3rd Street between 9th and 10th Avenue.

The existing roadway has two traffic lanes in each direction, and only controlled access is provided to this section of roadway. Freeway-type ramps provide access to and from East River Road, Cedar Avenue, and I-35W. With LRT located in the inside lanes, one traffic lane in each direction would be maintained for general traffic.

#### Analysis:

Initial engineering studies for the University Connector line focused on how to locate LRT on Washington Avenue and maintain capacity for general traffic. Preliminary studies revealed the following problems and concerns regarding the inclusion of both LRT and auto traffic on Washington Avenue:

- o The roadway section between Church Street and Oak Street does not have sufficient capacity to serve the forecast demand.
- o Portions of the proposed roadway section between Church Street and approximately 11th Avenue near the Metrodome would not provide sufficient capacity to serve the unconstrained 2010 forecast volumes.
- o The proposed plan would exacerbate existing conflicts between buses and general traffic at the West Bank and East Bank stations, resulting in additional capacity and safety problems.

As a result of the above analysis and design work, it was concluded that if LRT is located on Washington Avenue, the street must be closed to automobile traffic between Cedar Avenue and Church Street in order to accommodate the LRT and bus service in the area. Closing this section of Washington Avenue to general traffic would accomplish the following: it would eliminate the unsafe conflicts between general traffic and buses pulling into and out of bus stops, particularly at the east end of the Cedar Avenue ramp; it would eliminate the conflicts between on-ramp traffic from Cedar Avenue and through traffic on TH 12; and it would reduce the traffic demand in the other segments of the proposed alignment to a level that can be accommodated by the proposed design.

Because of the cost and the impacts associated with locating LRT on Washington Avenue, Hennepin County considered alternative LRT alignments for this corridor. The alternative considered to be most feasible, next to Washington Avenue, was an alignment that crossed over Bridge #9 and followed a proposed Dinkytown alignment in the Burlington Northern Corridor (Figure 3.16). Nine criteria were identified for evaluation of this alternative against the Washington Avenue alignment alternative. The criteria included:

- o Capital Cost
- o Right-of-Way
- o LRV Travel Time
- o Patronage
- o Traffic Impacts--Regional
- o Traffic Impacts--Local
- o Transit Interface
- o Compatibility with University Plans
- o Elderly and Handicapped Access

In general, the cost of capital improvements required, including right-of-way, is slightly higher for the Washington Avenue alignment. The regional and local traffic impacts of the Washington Avenue alignment are also significantly greater than the traffic impacts of the Dinkytown alignment. These impacts would affect the travel behavior of people traveling to and through this area. An indirect benefit of the additional congestion expected with the Washington Avenue alignment is that it may encourage greater transit use. The LRV travel time on the Dinkytown alignment would also be slightly less than the time on the Washington Avenue alignment.



Figure 3.16  
University Corridor

# Dinkytown Alternative

The advantages of the Washington Avenue Transit Mall alignment are:

- o It would carry more than twice as many daily riders as the Dinkytown alignment. Specifically, the forecast ridership for the Washington Avenue line is 12,000 riders per day after two years of operation. In comparison, the ridership estimate for the Dinkytown alignment is 5,500 riders per day. Based on classroom and administration space within a one-quarter mile radius of the proposed stations, it was estimated that the Dinkytown alignment would serve only thirty-five percent of the destinations served by the Washington Avenue alignment. The Dinkytown alignment would not provide service to the West Bank.
- o The capital cost per rider (including right-of-way and costs of other required roadway improvements) is significantly less with the Washington Avenue alignment.
- o The long-term transit operating costs would be less with the Washington Avenue alignment since this alignment would replace more of the existing transit services. Most of the existing transit service to the University of Minnesota would have to be maintained with LRT in the Dinkytown alignment because stations on this alignment are too far from the majority of the destinations. If service were discontinued, transit ridership in this area could be expected to decline.
- o A Washington Avenue alignment is consistent with the University's Long-Range Development Plan for the Minneapolis campus which calls for giving priority to transit over automobiles on Washington Avenue and the creation of a pedestrian/transit mall on Washington Avenue. The City of Minneapolis has also supported the Washington Avenue alignment in the past.
- o The Washington Avenue alignment makes LRT more accessible for the elderly and handicapped since the stations on this alignment are located much closer to many of their major destinations, such as the University Hospital, Coffman Union, and most classrooms.
- o The Washington Avenue alignment would be located in existing street right-of-way. Therefore, there would be no right-of-way acquisition costs. Conversely, the Dinkytown alignment would require the purchase of right-of-way from the railroad.



The Dinkytown alignment alternative is screened from further environmental analysis based on the advantages identified for the Washington Avenue Transit Mall alignment, along with the fact that an LRT alignment on Washington Avenue was recommended by the Citizen Advisory Committee and included in the adopted Comprehensive LRT System Plan for Hennepin County.

### Description of the University Alignment

The University Connector alignment, which includes closing off Washington Avenue to automobile traffic (emergency vehicle access would continue) between Church Street and Cedar Avenue, will be the alignment alternative studied in the Draft EIS (Figure 3.17).

The line would extend from Washington Avenue at Oak Street, westward to 3rd Street between 9th and 10th Avenue. The total length of the University Connector segment is approximately 2.0 miles.

### Stations

#### Oak Street Station:

Because the Oak Street station is considered a temporary terminal station a single side platform is proposed, with plans for future expansion into a center platform. Access to the station would be at-grade primarily by pedestrians and bus transfers. Residents to the southeast, plus staff, faculty, students and patrons/employees of the local commercial district would be the primary users.

#### East Bank Station:

The East Bank station will be designed to accommodate high pedestrian volumes. The station would primarily serve the faculty, students, University and hospital staff. Access to the LRT vehicle would be by grade-separated center platforms.

#### West Bank Station:

The West Bank station would also be designed to accommodate high pedestrian volumes. The station would primarily serve the West Bank faculty and students, Cedar/Riverside and the Seven Corners business communities, and the residents of the area. Overhead grade-separated access from the 19th Avenue and Washington Avenue bridge head is proposed for this station.

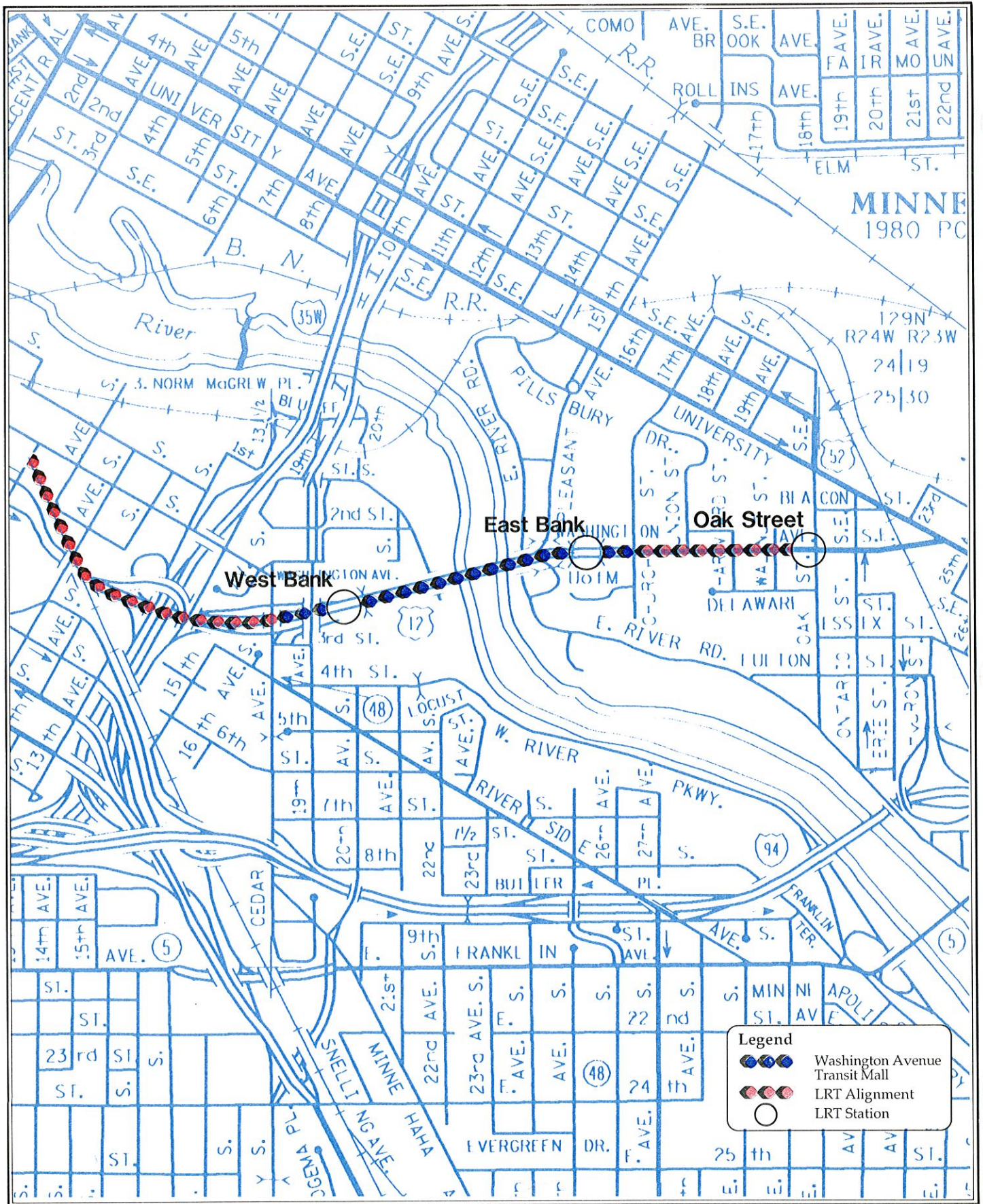


Figure 3.17  
University Corridor

## Washington Avenue Transit Mall

### 3.2.2.5 Central Area Alignments

The Central Area is defined by the points where each of the respective corridors approach and enter the Central Area.

The Central Area boundaries are:

- o Northwest: Bryant Avenue North and TH 55 (Olson Memorial Highway)
- o Southwest Connection: The Saint Louis Park/Minneapolis City limits
- o Hiawatha Connection: Hiawatha Avenue and the 29th Street/Soo Line Corridor
- o University Connection: Third Street between 9th and 10th Avenues

Sections 3.2.2.5.1 and 3.2.2.5.2 describe each of the tunnel and at-grade alignment options originally considered in the Central Area. Alignment options which have been eliminated from further analysis will include a brief discussion regarding factors leading to their elimination.

#### 3.2.2.5.1 Tunnel Options

Three distinct tunnel options were originally identified in the LRT Scoping Decision Document, to be studied in the EIS. Each of the proposed tunnel options is described below. As outlined in the Analysis section of Tunnel Option A and B, these two tunnel options were screened from additional study. Therefore, Tunnel Option C is the tunnel alignment proposed for the Central area.

#### Tunnel Options Screened from Additional Analysis

##### **Tunnel Option A**

This is a long deep tunnel between the Metrodome and 29th Street/Nicollet Avenue with a Northwest connection (Figure 3.18). The tunnel consists of a north/south and east/west segment. A south portal is located at 29th Street and Nicollet Avenue. The north/south segment connects with the east/west segment at a transfer station located in the vicinity of 4th Street and Nicollet. East/west portals would be located in the vicinity of the Metrodome (east) and Glenwood and Currie Avenue (west).

Connections to the corridor lines would be as follows:

- Southwest Line: Continues on the 29th Street/Soo Line Corridor to a portal located at Nicollet and 29th Street

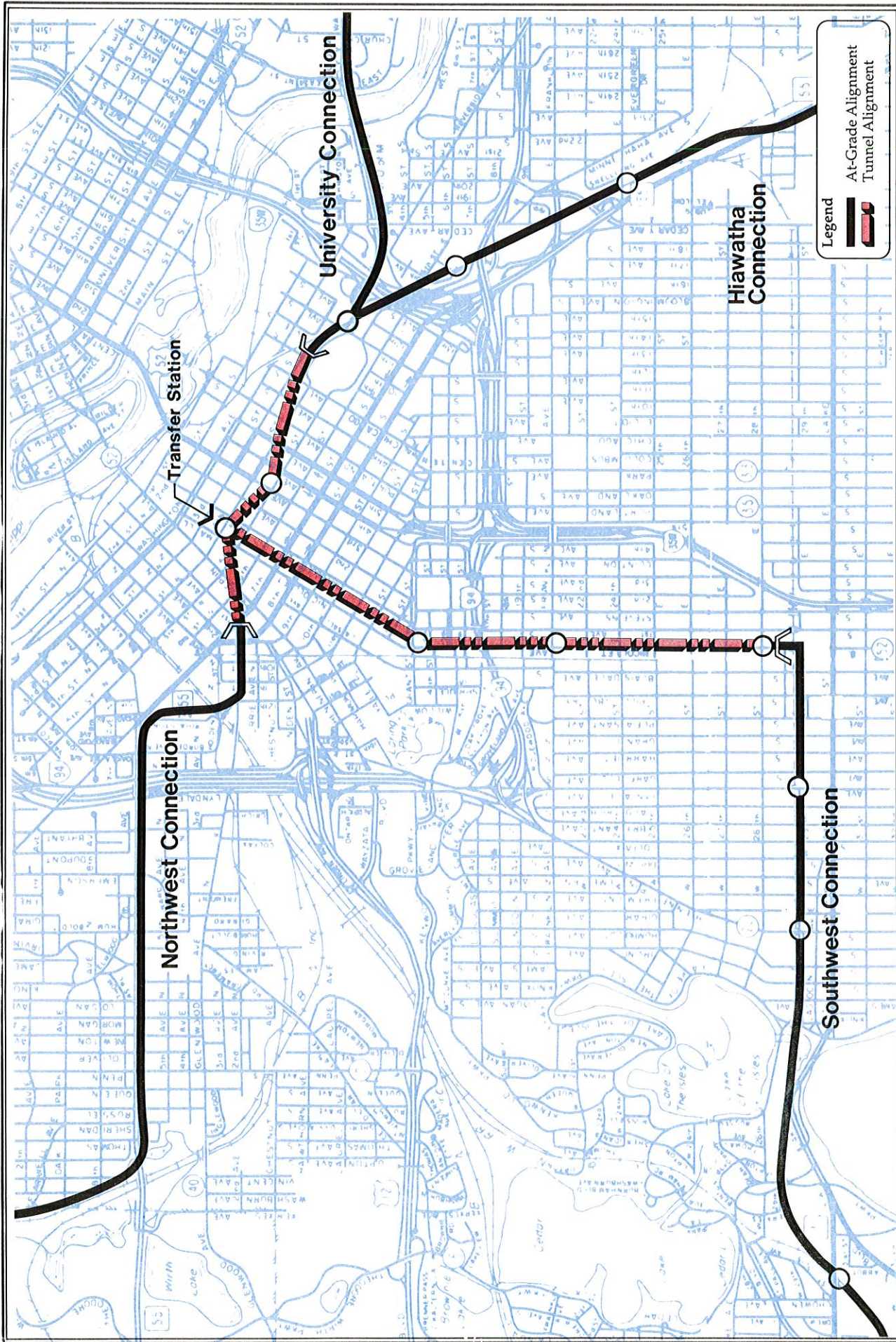


Figure 3.18

# Tunnel Option A with At-Grade Connections

Northwest Line: Connects by way of the portal located at the western edge of the CBD and proceeds in an east/west direction to the transfer station

University and Hiawatha: Both connect to the east/west segment at the Metrodome portal

Stations in the north/south segment of the tunnel would be located at 28th Street and Nicollet Avenue, Franklin and Nicollet Avenue, the Convention Center and at the junction of the east/west and north/south sections. Stations in the east/west segment would be located adjacent to the Metrodome, below the Government Center/City Hall and at the above-mentioned transfer station.

### Analysis

Initial geological analysis revealed that a suitable limestone shelf, which is a necessary component for inexpensive tunnel construction, was not present in the proposed tunnel alignment area. Tunnel Option A also did not provide transfer-free service between all Minneapolis CBD stations and all corridors.

For these reasons, Tunnel Option A was screened from additional environmental analysis.

### **Tunnel Option B**

This tunnel option, termed the short east/west tunnel, is defined by the east and west tunnel portals located near the Metrodome and at Hennepin Avenue near Seventh Street, respectively (Figure 3.19). The Northwest and Southwest Corridor lines would connect to the tunnel through the western portal, with the University and Hiawatha connection by way of the eastern portal adjacent to the Metrodome.

This tunnel route would generally follow below 7th Street to Hennepin Avenue where it would cut diagonally across the center of the Central Business District to 4th Street and the east portal. Stations for this option are proposed to be located in the vicinity of the NBA Arena, the Government Center/City Hall and the Metrodome.

### Analysis

Initial environmental analysis revealed that the geological conditions west of Hennepin Avenue, coupled with the location of the existing and proposed building foundations, precluded the economic construction of a westerly CBD portal. In addition, the east/west tunnel did not complement the City of Minneapolis' north/south development plan.

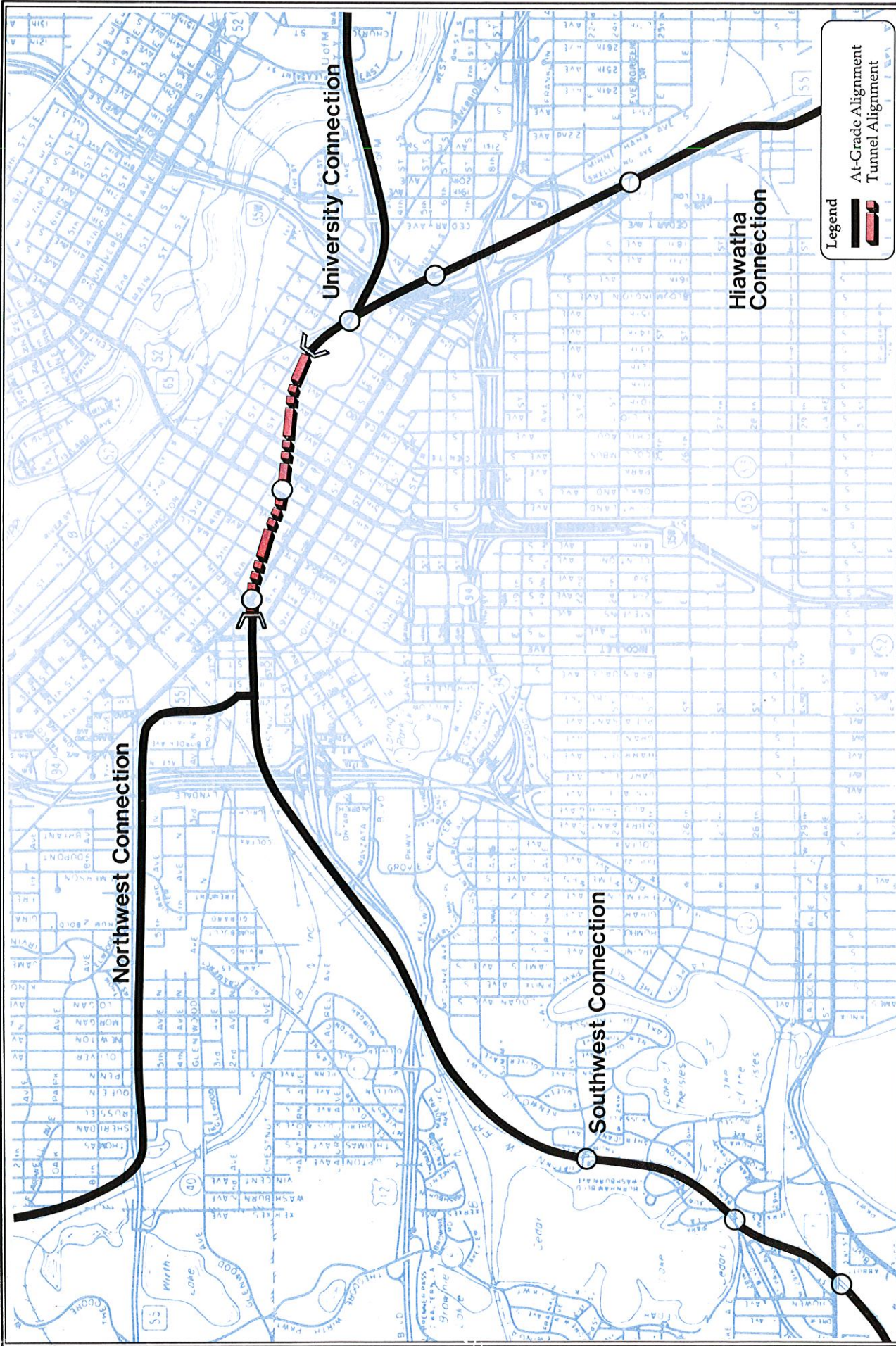


Figure 3.19

Central Area

# Tunnel Option B with At-Grade Connections

For these reasons, Tunnel Option B was screened from additional environmental analysis.

### Tunnel Option to be Studied

#### **Tunnel Option C**

##### **Tunnel Alignment:**

This tunnel option would be approximately 14,000 feet in length. It can be defined by its southern portal located at 29th Street/Soo Line Corridor and Portland Avenue, and the northern portal at First Avenue North and the Mississippi River Parkway (Figure 3.20). The south portal of the tunnel would be located near Portland Avenue South and the 29th Street/Soo Line Corridor. The portal would be designed to adequately accommodate two tracks to serve the Southwest Line and two tracks to serve the Hiawatha Line. These four tracks would then merge within the tunnel just south of 28th Street. The tracks would descend on about a one percent grade from the Soo Line track elevation.

The proposed tunnel would proceed northerly below Portland to about 26th Street where it would head in a northwest direction to 3rd Avenue (crossing under I-35W). At 3rd Avenue and 25th Street the tunnel would proceed north, under 3rd Avenue to the station at approximately Franklin Avenue. From there the tunnel would continue north below 3rd Avenue South, proceeding past the Convention Center station at 3rd Avenue between 11th and 12th Street. The tunnel alignment would continue northwesterly from the Convention Center to about 10th Street and Marquette where it would proceed north under Marquette Avenue to the 7th Street station. The 7th Street station located between 6th and 7th Streets, beneath Marquette Avenue, is expected to be the most heavily utilized in the system. From the station, the LRT tunnel would proceed northeasterly below Marquette to about 5th Street, then northerly to the Library station. From the Seventh Street station to the Library station the tunnel alignment would be approximately 1,400 feet long. From the Library station the tunnel would ascend to the surface, to the north portal at 1st Street and 1st Avenue North.

All tunnel stations would be equipped with an elevator to ensure handicapped patron accessibility, emergency stairs and such mechanical and electrical rooms as determined to be necessary.

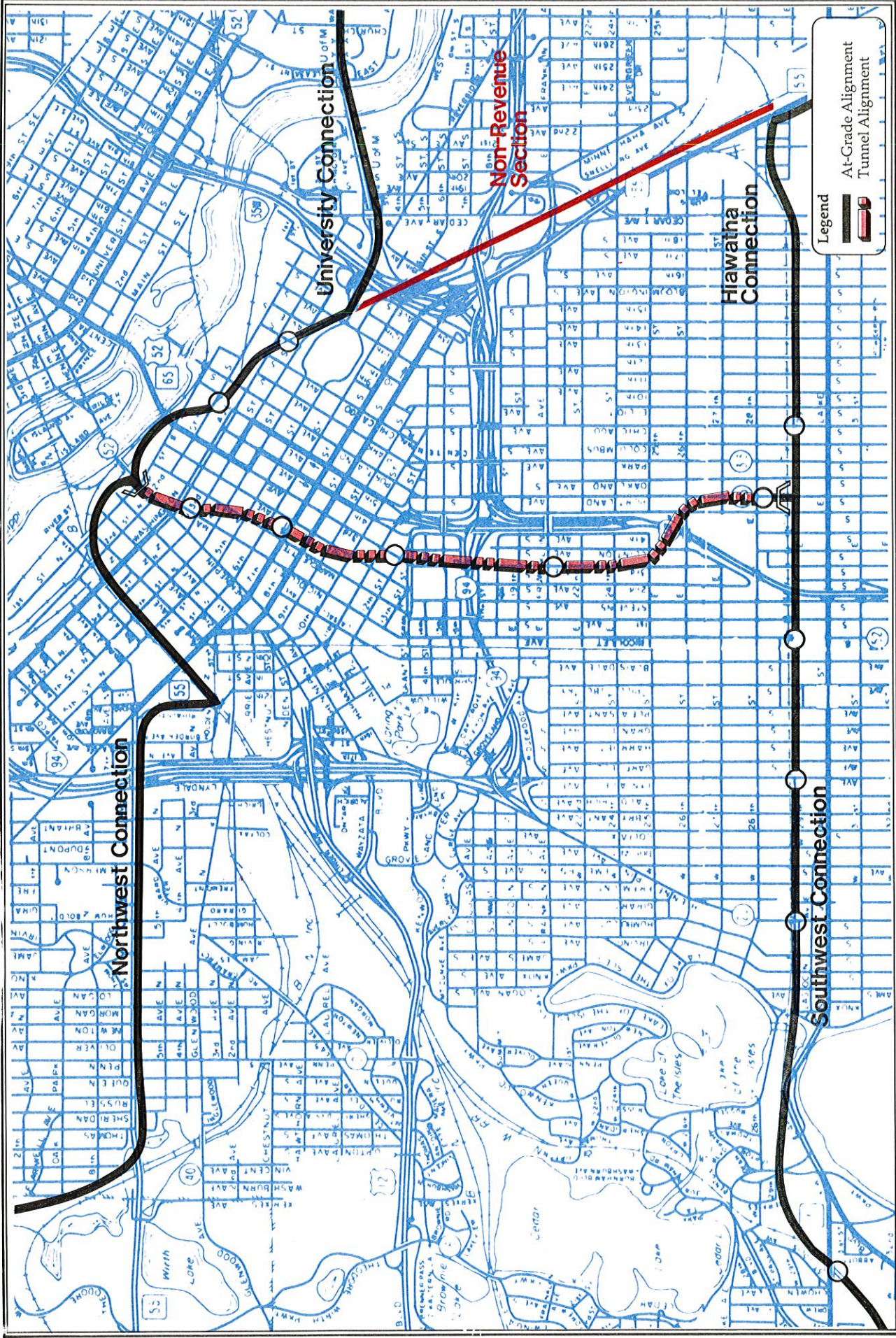


Figure 3.20  
Central Area



# Tunnel Option C with At-Grade Connections



## At-Grade Connections to the Tunnel

### Hiawatha Connection Alignment Description

Proceeding west in the 29th Street/Soo Line Corridor, the LRT track (double-track, two-direction) would cross Layman Avenue, 21st Avenue South, 20th Avenue South and 19th Avenue South at-grade. From Cedar Avenue, the alignment is located in depressed rail corridor. Therefore, the LRT track would pass under a substantial number of north/south bridge structures. They include:

- o Cedar Avenue South
- o 18th Avenue South
- o 17th Avenue South
- o 16th Avenue South
- o Bloomington Avenue South
- o 15th Avenue South
- o 14th Avenue South
- o 13th Avenue South
- o 12th Avenue South
- o 11th Avenue South
- o 10th Avenue South
- o Elliot Avenue South
- o Chicago Avenue South
- o Columbus Avenue South
- o Park Avenue South
- o Oakland Avenue South
- o Portland Avenue South

At Portland Avenue, the LRT track would proceed north, into the south tunnel portal.

### Southwest Connection Alignment Description

From Abbott and 31st Street, the LRT track would immediately pass under West Lake Street and proceed east on existing Soo Line right-of-way. The LRT track would then cross over Calhoun Parkway, Dean Boulevard, Lagoon Creek and Lake of the Isles Parkway on existing bridges. As the LRT track approaches the Uptown area it would cross Girard Avenue South, Humboldt Avenue South, Irving Avenue South and James Avenue South at-grade. West of Hennepin Avenue, the LRT track would head into the depressed 29th Street/Soo Line Corridor. The LRT track from Hennepin Avenue South to Portland Avenue would pass under a substantial number of bridge structures. They include:

- o Hennepin Avenue South
- o Fremont Avenue South
- o Emerson Avenue South
- o Dupont Avenue South
- o Colfax Avenue South

- o Bryant Avenue South
- o Lyndale Avenue South
- o Garfield Avenue South
- o Harriet Avenue South
- o Grand Avenue South
- o Pleasant Avenue South
- o Pillsbury Avenue South
- o Blaisdell Avenue South
- o Nicollet Avenue South
- o 1st Avenue South
- o Stevens Avenue South
- o I-35W/Frontage Road
- o 2nd Avenue South
- o 3rd Avenue South
- o Clinton Avenue South
- o 4th Avenue South

#### Northwest Connection Alignment Description

From the Northwest Corridor/Central Area connecting point at TH 55 and Bryant Avenue North, the LRT track would continue east, adjacent to TH 55. The track would cross West Lyndale Avenue, I-94 (east and westbound), and East Lyndale Avenue at-grade. At a point just west of 7th Street North the LRT tracks would head in a southeast direction on the east side of Royalston Avenue in existing street right-of-way.

From a point approximately 300 feet north of Holden Street, the LRT track would proceed northeast into the Burlington Northern Railroad right-of-way. The LRT track would pass under 7th Street North, 5th Street North, 4th Street North, Washington Avenue North, 2nd Street North and 1st Street North. At approximately 1st Street North and 3rd Avenue North, the track would curve to the east, and continue in the BN right-of-way to the north tunnel portal at 1st Street North and 1st Avenue North.

#### University Connection Alignment Description

From the University line connecting point with the Central area, on Third Street between 9th and 10th Avenue, the LRT track would continue in Soo Line right-of-way, in a north-west direction, crossing Washington and Portland Avenue at-grade. The LRT track would pass through the Mills District station, and continue in the Soo Line right-of-way to 4th Avenue. At 4th Avenue, the LRT track would proceed north-west in Soo Line right-of-way, pass under the 3rd Avenue and Hennepin Avenue bridge, and connect with the north tunnel portal at 1st Avenue and 1st Street.

## Connection to the Coach Yard Site

If the Hiawatha line proceeds west on the 29th Street/Soo Line corridor to connect with the north/south tunnel or the Nicollet Avenue at-grade option, the section from Hiawatha/29th Street would be included as a non-revenue section of the LRT system, providing access to the Yards and Shops Site. At approximately 29th Street, the LRT track would cut diagonally across Hiawatha Avenue, in a depressed track, to the east side of the roadway. The LRT single track would then proceed to the Yard and Shop site between Franklin Avenue and I-94, and connect with the University line near the Metrodome.

### At-grade Central Area stations included in the tunnel option are as follows:

Chicago Avenue South - Because the station at Chicago Avenue and 29th Street is situated in the depressed corridor, vertical accessibility would be provided by both an elevator and stairways. High pedestrian volumes are anticipated for this station.

Abbott Station - The Abbott Station site is proposed to be located in the southwest corner of the Abbott and 31st Street intersection.

Hennepin Avenue/29th Street Station - The Hennepin Avenue Station would be located to the east of Hennepin Avenue and would service the Uptown Area of Minneapolis. The station would be designed to accommodate high pedestrian volumes. Because this station will be depressed, vertical access will be provided by an elevator and stairways.

Lyndale Avenue/29th Street Station - This station would be designed to accommodate high pedestrian volumes. Because this station will be depressed, vertical access will be provided by an elevator and stairways.

Nicollet Avenue/29th Street Station - The Nicollet Avenue Station would be designed to accommodate high pedestrian volumes. Because this station is located in the depressed rail corridor, vertical access will be provided by an elevator and stairways.

Metrodome Station - The proposed Metrodome Station would be located at 9th Avenue on existing railroad right-of-way between 3rd Street and Washington Avenue. The station would serve the eastern edge of the downtown business community and Metrodome events.

Mills District Station - The proposed Mills District Station would be located west of Portland Avenue on 2nd Street South in the historic Mills District. The station would serve the northern edge of the downtown business community and the residents of the area. This station could be developed as a temporary station and then adapted to the character of the developing area.

#### 3.2.2.5.2 At-Grade Options

Two at-grade system options are proposed for the Central area; identified as At-Grade Option A and B. The following alignment descriptions for both options exclude the north/south alignments on Nicollet Avenue, Marquette Avenue and 2nd Avenue between 1st Street and 12th Street. The alignment options considered for the above-mentioned segment will be addressed separately.

#### **AT-GRADE OPTION A (Figure 3.21)**

Hiawatha Connection on the 29th Street Corridor:

Similar to the Hiawatha line connection to the tunnel portal, at 29th Street and Hiawatha Avenue, the LRT line would proceed west in the 29th Street/Soo Line Corridor to Nicollet Avenue.

The LRT track (double-track, two-direction) would cross Layman Avenue, 21st Avenue South, 20th Avenue South and 19th Avenue South at-grade. From Cedar Avenue, the alignment is located in the depressed rail corridor. Therefore, the LRT track would pass under a substantial number of north/south bridge structures. They include:

- o Cedar Avenue South
- o 18th Avenue South
- o 17th Avenue South
- o 16th Avenue South
- o Bloomington Avenue South
- o 15th Avenue South
- o 14th Avenue South
- o 13th Avenue South
- o 12th Avenue South
- o 11th Avenue South
- o 10th Avenue South
- o Elliot Avenue South
- o Chicago Avenue South
- o Columbus Avenue South
- o Park Avenue South
- o Oakland Avenue South
- o Portland Avenue South
- o 4th Avenue South
- o Clinton Avenue South

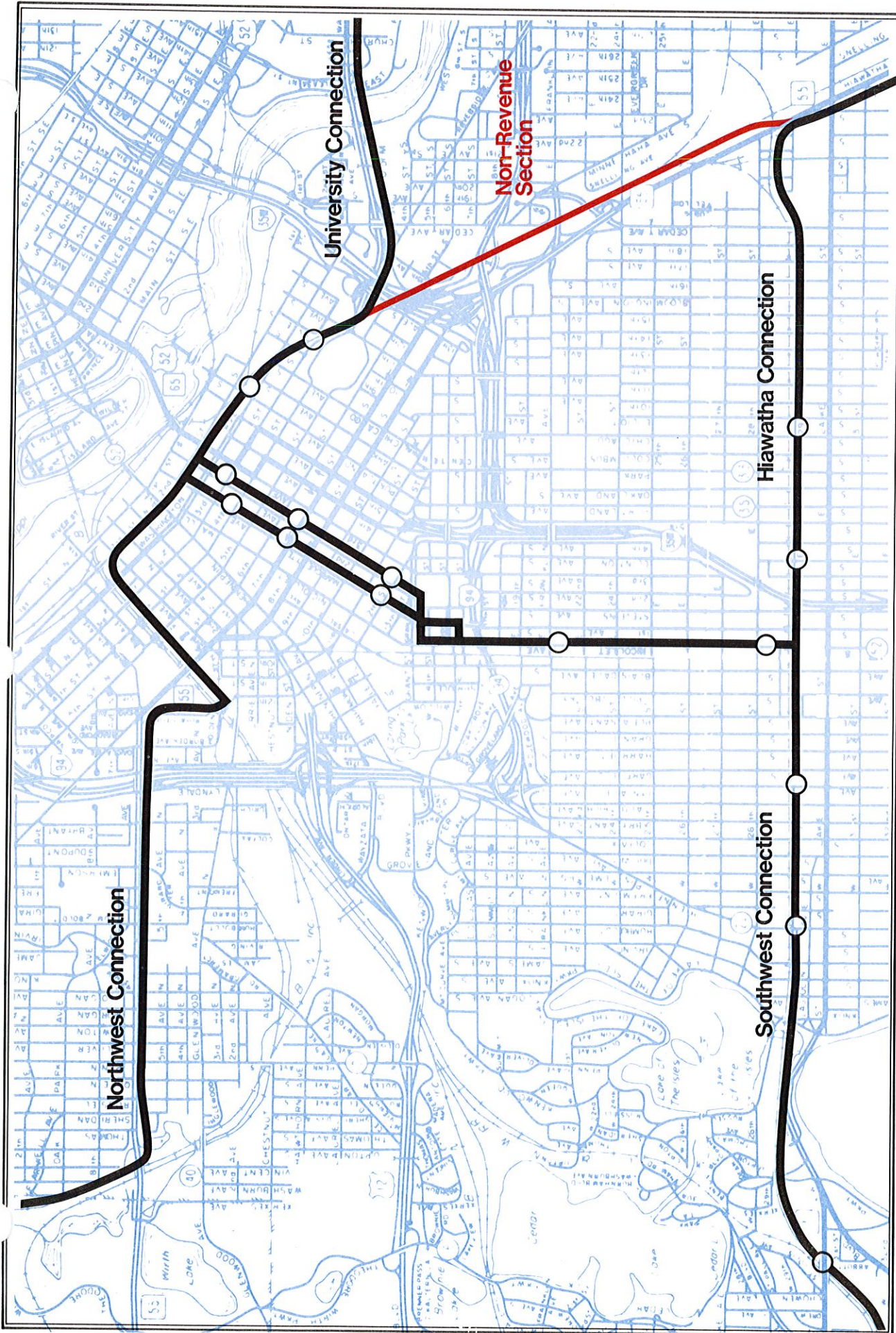


Figure 3.21

Central Area

# At-Grade Option A



- o 3rd Avenue South
- o 2nd Avenue South
- o I-35W
- o Stevens Avenue South
- o 1st Avenue South

Southwest Connection on the 29th Street Corridor:

From Abbott and 31st Street, the LRT track would immediately pass under West Lake Street and proceed east on existing Soo Line right-of-way. The LRT track would then cross over Calhoun Parkway, Dean Boulevard, Lagoon Creek and Lake of the Isles Parkway on existing bridges. As the LRT track approaches the Uptown area it would cross Girard Avenue South, Humboldt Avenue South, Irving Avenue South and James Avenue South at-grade. West of Hennepin Avenue, the LRT track would head into the depressed 29th Street/Soo Line Corridor. The LRT track from Hennepin Avenue South to Nicollet Avenue would pass under a substantial number of bridge structures. They include:

- o Hennepin Avenue South
- o Fremont Avenue South
- o Emerson Avenue South
- o Dupont Avenue South
- o Colfax Avenue South
- o Bryant Avenue South
- o Lyndale Avenue South
- o Garfield Avenue South
- o Harriet Avenue South
- o Grand Avenue South
- o Pleasant Avenue South
- o Pillsbury Avenue South
- o Blaisdell Avenue South

Nicollet Avenue Alignment from the 29th Street Corridor:

At 29th Street and Nicollet Avenue the Hiawatha and Southwest lines would converge and proceed north at-grade, on Nicollet Avenue. The LRT track would be aligned in the center of Nicollet Avenue. At 15th Street the northbound LRT line would turn east (single-track) and then proceed north on 1st Avenue South. Southbound service (single-track) would be located on Nicollet Avenue from Grant Street to 15th Street.

At-grade intersection crossings on Nicollet Avenue would take place at:

- o 28th Street
- o 27th Street
- o 26th Street
- o 25th Street

- o 24th Street
- o 22nd Street
- o Franklin Avenue
- o 19th Street
- o 18th Street
- o 16th Street
- o 15th Street
- o 14th Street
- o Grant Street
- o 13th Street

The LRT track would cross I-94 on an existing bridge.

#### Northwest Connection Alignment Description

Similar to the tunnel connection, at approximately 300 feet north of Holden Street, the LRT track would proceed northeast into the Burlington Northern right-of-way. The LRT track would pass under 7th Street North, 5th Street North, 4th Street North and Washington Avenue North. At 2nd Street North, the track would curve to the east, and proceed on the south side of 2nd Street until it reaches the 2nd Avenue and Marquette Avenue connection. At-grade intersection crossings on 2nd Street North would occur at 3rd Avenue North, 2nd Avenue North, 1st Avenue North, and Hennepin Avenue.

#### University Connection Alignment Description

From the University line connecting point with the Central area, on Third Street between 9th and 10th Avenue, the LRT track would continue in Soo Line right-of-way, in a northwest direction, crossing Washington and Portland Avenue at-grade. The LRT track would pass through the Mills District station, and continue in the Soo Line right-of-way to 4th Avenue. At 4th Avenue the LRT track would proceed west on 2nd Street, crossing 3rd Avenue South at-grade and connect with the north/south alignment on 2nd and Marquette Avenue.

Access to the Coach Yard Site - See tunnel option discussion

#### Stations

The following stations are proposed for the Central Area At-Grade Option A:

Chicago Avenue South Station - See tunnel option discussion.

Honeywell Station - The proposed station site would be located between 4th and 5th Avenues, on the north side of the track right-of-way. High pedestrian volumes are anticipated for this station.

Abbott Station - See tunnel option discussion.

Hennepin Avenue Station - See tunnel option discussion.

Lyndale Avenue Station - See tunnel option discussion.

Nicollet Avenue and 28th Street Station - A center, high platform configuration is proposed for this station. The station will be designed to accommodate high pedestrian volumes.

Nicollet Avenue and Franklin Avenue Station - A center, high platform configuration is proposed for this station. The station will be designed to accommodate high pedestrian volumes.

Metrodome Station - See tunnel option discussion.

Mills District Station - See tunnel option discussion.

### **AT-GRADE OPTION B (Figure 3.22)**

#### **Hiawatha Connection Alignment Description**

Beginning at the 29th Street/Soo Line Corridor, the LRT track would continue on the west side of Hiawatha Avenue in existing roadway right-of-way to approximately 28th Street, where the track would proceed above-grade, in a northeast direction, crossing Hiawatha Avenue. At 26th Street (continued elevated crossing) the LRT track would be aligned on the east side of Hiawatha Avenue in Soo Line right-of-way. The LRT track would then proceed north to the station at 24th Street.

From the 24th Street Station, the LRT track would continue north on Soo Line right-of-way (crossing 24th Street at-grade) until it reaches Cedar Avenue. The LRT track would cross Cedar Avenue, above-grade, on the existing bridge. Continuing north, the track would proceed at-grade until it crosses Franklin Avenue, above-grade, on an existing railroad bridge. From Franklin Avenue, the LRT track would pass under Interstate 94, and continue to the station at 15th Avenue South. Crossing 15th Avenue at-grade, the track continues in a northwest direction, on railroad right-of-way, passing under 35W (north and southbound) and connecting with the University line at 3rd Street between 9th and 10th Avenue South.

From 10th Avenue South and 3rd Street, the LRT line would proceed in the abandoned Soo Line right-of-way, heading northwest, at-grade until it reaches the proposed Metrodome Station site.



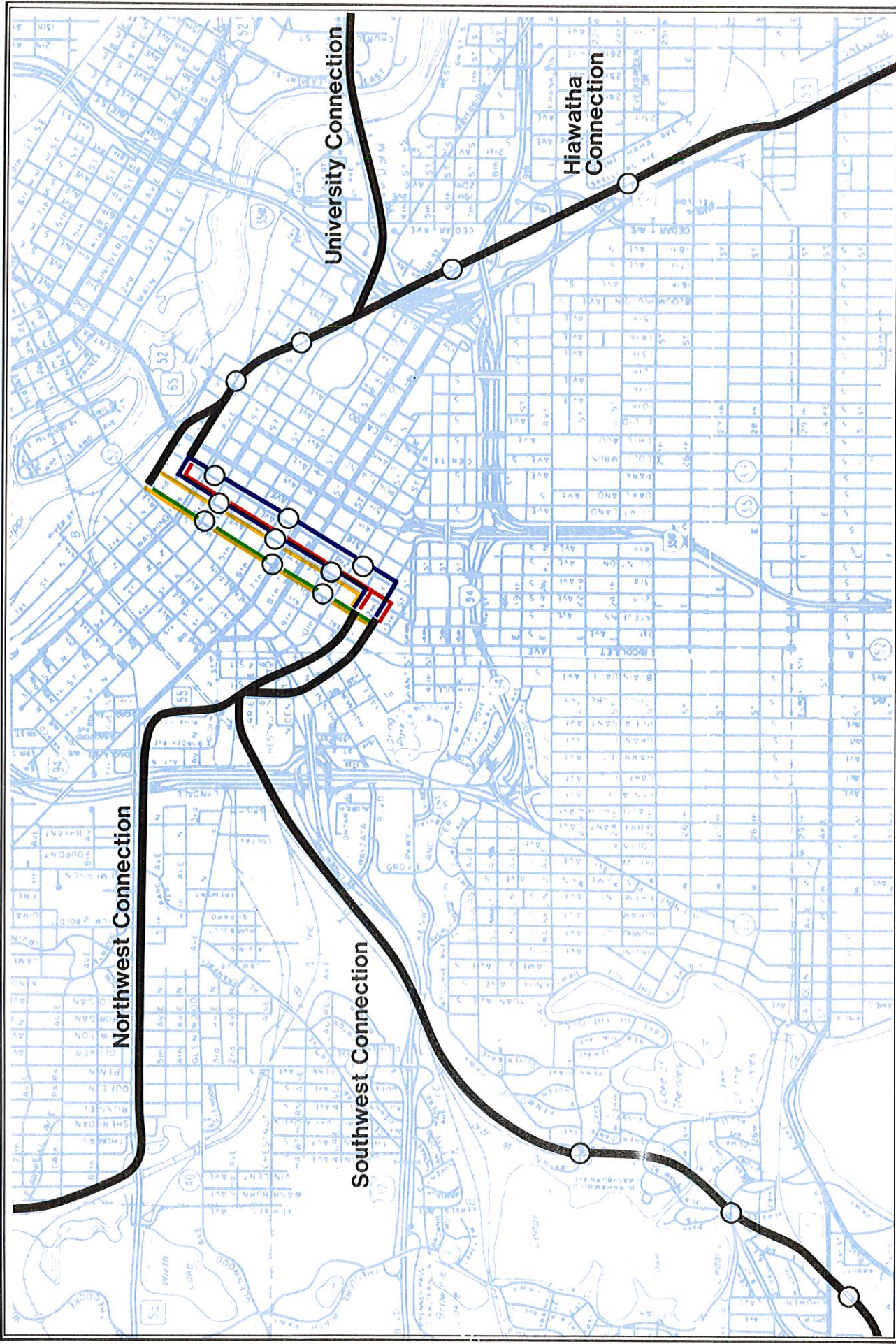


Figure 3.22

Central Area

**At-Grade  
 Option B**

### Southwest Connection Alignment Description

From Abbott and Lake Street the LRT track would proceed in a northeast direction, on existing HCRRA right-of-way until it reaches the proposed station site at Cedar Lake Boulevard.

Continuing in a northeast direction, the LRT track would cross the Kenilworth lagoon on an existing railroad bridge, proceed through the West 26th Street intersection at-grade, and cross under the Burnham Road bridge. The next station stop would be at West 21st Street.

As the LRT track proceeds northeast, it would cross under US Highway 12, and then run parallel to the highway on the northern side. As the track approaches the central business district it would proceed under Interstate 94 (west-and eastbound), the Frontage Road and Glenwood Avenue.

Approximately 200 feet northeast of Glenwood Avenue the LRT double-track system would split, with inbound LRT service to the CBD connecting with the northwest line on the south side of 12th Street. The southwest line would connect with the Central Area outbound LRT service at approximately Glenwood Avenue and 11th Street.

### Northwest Connection Alignment Description

From the Northwest Corridor/Central Area connecting point at TH 55 and Bryant Avenue North, the LRT track would continue east, adjacent to TH 55. The track would cross West Lyndale Avenue, I-94 (east and westbound), and East Lyndale Avenue at-grade. At a point just west of 7th Street North the LRT tracks would head in a southeast direction on the east side of Royalston Avenue in existing street right-of-way. The LRT double-track system would continue on Royalston to approximately 400 feet north of Holden Street, where the track alignment splits. Inbound service would be provided on the west side of Royalston, with outbound service on the east side. The alignment would continue from Royalston to 12th Street, crossing Glenwood and Currie Avenue at-grade. At approximately Currie Avenue the alignment proceeds on the south side of 12th Street (inbound) and on the north side of 11th Street (outbound). At-grade street crossings for inbound LRT service on the 12th Street alignment would take place at: Chestnut Avenue, Linden Avenue, Hennepin Avenue and LaSalle. At-grade street crossings for outbound LRT service on 11th Street would take place at Hawthorne Avenue, Hennepin Avenue, Harmon Place, and LaSalle Avenue.

## University Connection Alignment Description

From the University line connecting point with the Central Area, on Third Street between 9th and 10th Avenue, the LRT track would continue in Soo Line right-of-way, in a north-west direction, crossing Washington and Portland Avenue at-grade. The LRT track would pass through the Mills District station, and continue in the Soo Line right-of-way to 4th Avenue. At 4th Avenue the LRT track would proceed west on 2nd Street, crossing 3rd Avenue South at-grade, and connect with the north/south alignment on 2nd and Marquette Avenue.

### Stations

24th Street Station - The proposed 24th Street Station site would be located on the east side of Hiawatha at 24th Street.

15th Avenue Station - The proposed station would be located at 15th Avenue between 6th and 7th Streets in the West Bank area.

Abbott Station - See tunnel option discussion.

Cedar Lake Boulevard Station - The proposed station site would be south of the HCRRA track and Cedar Lake Boulevard intersection.

21st Street Station - The proposed station site would be located at the southwest corner of the HCRRA railroad and West 21st Street intersection.

Metrodome Station - See tunnel option discussion.

Mills District Station - See tunnel option discussion.

### **NICOLLET AVENUE, MARQUETTE AVENUE AND SECOND AVENUE ALIGNMENT OPTIONS**

Originally, four north/south alignment configurations were considered for the downtown segment of the at-grade options (Figure 3.22).

- o Option 1: Nicollet Avenue Two-Way LRT Service
- o Option 2: Nicollet/Marquette Avenue LRT Service
- o Option 3: Marquette Avenue Two-Way LRT Service
- o Option 4: Marquette/Second Avenue LRT Service

The northern boundary points for this segment are First Street for the Nicollet Avenue alignment configurations and Second Street for the alignment alternatives on Marquette and Second Avenue. The southern boundary points are 11th Street for outbound service and 12th Street for inbound service.

The downtown stations will be designed to accommodate high pedestrian volumes. Platforms that are 300 feet long and ten to sixteen feet wide are proposed for the stations. All downtown stations will be handicapped accessible.

#### At-Grade Alignments Screened from Additional Analysis

**Option 1: Nicollet Two-Way LRT Service:** This alternative consists of two-way LRT service on Nicollet Avenue. The LRT track would be aligned in the center of Nicollet Avenue. At-grade intersection crossings would occur at:

- o 2nd Street
- o Washington Avenue
- o 3rd Street
- o 4th Street
- o 5th Street
- o 6th Street
- o 7th Street
- o 8th Street
- o 9th Street
- o 10th Street
- o 11th Street (12th Street inbound service connection)

Station sites are proposed at:

- o Nicollet between 9th and 10th Streets
- o Nicollet at 7th Street
- o Nicollet between 3rd and 4th Streets

#### Analysis:

Following initial analysis, the Nicollet two-way option was screened from further analysis in the EIS because:

- The LRT service would negatively impact the shuttle service on Nicollet Avenue
- The LRT train frequency (approximately 3-minute headways) would negatively impact the Nicollet Mall setting

**Option 2: Nicollet/Marquette LRT Service:** The LRT service on the Nicollet Mall would be northbound between 12th Street and 1st Street. Southbound LRT service would be on Marquette Avenue, between 2nd Street and 11th Street. LRT tracks would be aligned on the east side of the Nicollet Mall and the west side of Marquette Avenue, in the existing bus lane (contra flow with auto traffic).

Station sites on Marquette Avenue are proposed to be located at:

- o Marquette Avenue between 3rd and 4th Street
- o Marquette Avenue between 6th and 7th Street
- o Marquette Avenue between 9th and 10th Street

Station sites on Nicollet Avenue are proposed to be located at:

- o Nicollet between 4th and 5th Street
- o Nicollet between 7th and 8th Street
- o Nicollet between 9th and 10th Street

Station platforms would be located on the side of roadways, utilizing both bus lane and sidewalk space.

At-grade intersection crossings are similar to those identified for the Nicollet Two-Way option.

Analysis:

Because of the curvilinear design of the new Nicollet Mall, high platforms would not be feasible. Additionally, LRT service on the Nicollet Mall would result in continuous interruptions to the shuttle service. For these reasons, the Nicollet/Marquette LRT service option has been screened from additional analysis.

Option 3: Marquette Two-Way Service: This alternative consists of two-way LRT service on Marquette Avenue. Inbound service would be provided by 12th Street to the south, with an outbound connection at 11th Street. The LRT track would be aligned in the center of Marquette Avenue. One lane of auto traffic would be eliminated.

Station sites on Marquette Avenue would be at the following locations:

- o Marquette between 9th and 10th Street
- o Marquette between 6th and 7th Street
- o Marquette between 3rd and 4th Street

High platforms, positioned in the center of Marquette Avenue, are proposed. Auto traffic would be eliminated on the blocks where stations are located. Emergency vehicle access would remain.

At-grade intersection crossings would take place at:

- o 12th Street
- o 11th Street
- o 10th Street

- o 9th Street
- o 8th Street
- o 7th Street
- o 6th Street
- o 5th Street
- o 4th Street
- o 3rd Street

**Analysis:**

The results of the capacity analysis, conducted by the City of Minneapolis, revealed that locating two-way LRT service on Marquette Avenue, thereby diverting auto traffic onto parallel streets, would cause heavily congested traffic conditions (Level of Service F) to occur during the morning and evening peak hours, at several of the 2nd and 3rd Avenue intersection crossings. For this reason, the Marquette two-way service option has been screened from additional analysis.

North/South Downtown Alignment To Be Studied

Option 4: Marquette/Second Avenue: LRT service on Marquette would be southbound, between Second Street and Grant Street. LRT service on Second Avenue would be northbound, between Grant Street and Second Street. The LRT tracks would be aligned on the west side of Marquette, and the east side of Second Avenue. Both alignments would be in the existing bus lanes (contra flow with auto traffic).

Station sites on Marquette would be located at:

- o Marquette Avenue between 3rd and 4th Street
- o Marquette Avenue between 6th and 7th Street
- o Marquette Avenue between 11th and 12th Street

Station sites on Second Avenue would be located at:

- o Second Avenue between Washington Avenue and 3rd Street
- o Second Avenue between 6th and 7th Street
- o Second Avenue between 11th and 12th Street

At-grade intersection crossings would be similar to those identified for the Marquette two-way option.

The Marquette/Second Avenue alignment will be the alignment option studied for both Central Area at-grade system options.

### 3.2.2.5.3 Yards and Shops Facility

The Light Rail Transit maintenance facility would be located at the Coach Yard. The Coach Yard site, which covers an area of more than thirteen acres, is located approximately 1.7 miles southeast of downtown Minneapolis. It is bordered by 17th Avenue on the west, I-94 and Minnehaha Avenue on the north and northeast, Cedar Avenue on the east and East Franklin Avenue on the south (Figure 3.23).

The Yard and Shop site will accommodate all operations and maintenance facilities listed below:

- o Administrative offices
- o Central control
- o Operator dispatch and comfort facilities
- o LRV storage yard and maintenance shop
- o Facilities maintenance base and component repair shop
- o Parts stores

The LRV storage yard is planned to accommodate a fleet of approximately 60 vehicles.

Based on other recent LRV shops, an allowance of 1,500-2,000 square feet per LRV will be used.

Support equipment in several different categories will be needed to supervise and maintain the LRT system:

- o Shop tools and equipment (including major items such as a wheel truing machine, wheel/axle press, wheel assembly press, car washing equipment, and various cranes, jacks and machine tools)
- o Facilities maintenance machinery (e.g., track repair tools)
- o Maintenance and supervisory vehicles (various size trucks and automobiles)

### **3.3 LRT RIDERSHIP FORECAST**

As a part of the Comprehensive LRT System Plan for Hennepin County, potential LRT ridership was forecasted for both the Full System in the Year 2010, and the Stage I system after two years of operation and again in the Year 2010.

Estimates of future LRT patronage were developed from projections cited in the Study of Potential Transit Capital Investments in Twin Cities Corridor - Long-Range Transit Analysis (LRTA report), published by the Metropolitan Council in December 1986, and the recommendations of the Patronage Forecasting Peer Review Committee (Table 3.2).

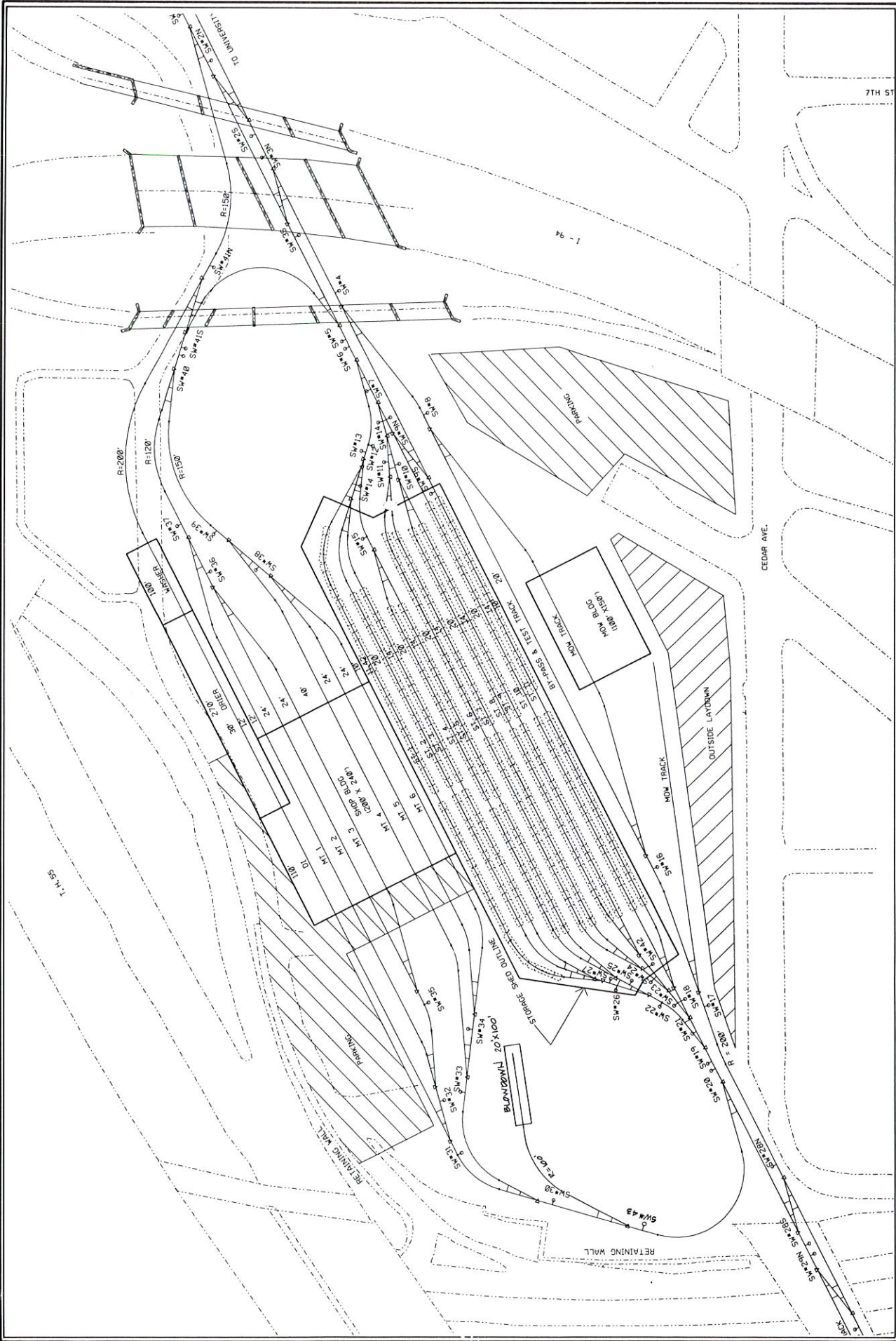


Figure 3.23

# Conceptual Yard & Shop Design



Connector	Full System	Stage I Forecast	
	Year 2010 Forecast	Year 2010	After Two Years of Operation
Hiawatha	17,300 - 22,500	13,000 - 17,000	13,000 - 17,000
South	24,500 - 32,000	15,300 - 20,000	11,400 - 14,900
Southwest	16,600 - 22,000	14,500 - 18,800	13,100 - 17,100
Northwest	19,600 - 25,500	18,000 - 23,500	14,800 - 19,300
University Connector	9,200 - 12,000	9,200 - 12,000	9,200 - 12,000
<b>Total</b>	<b>87,200 - 114,000</b>	<b>70,000 - 91,300</b>	<b>61,500 - 80,300</b>

**Note:** The ridership forecasts are based on work reported in the Metropolitan Council report dated December 1986, "A Study of Potential Transit Capital Investments in Twin Cities Corridors," and the results of the Patronage Forecasting Peer Review Committee work.

TABLE 3.2

## Daily Transit Ridership Forecasts

Source: Comprehensive LRT System Plan for Hennepin County, HCBRA,  
June, 1988.

Based on the LRT corridor projections cited in the Comprehensive LRT System Plan for Hennepin County, daily projected ridership levels were generated for each corridor station. Three scenarios were developed (Tables 3.3A, B, and C) to reflect the variation in ridership levels under the three Central Area options.

Variables which will influence transit ridership include:

- o downtown employment
- o price and availability of gasoline
- o feeder bus service
- o corridor bus service reorientation
- o park-and-ride spaces
- o downtown parking cost

### **3.4 CAPITAL COST**

Based on studies completed to date, capital costs for the alternative LRT systems range from \$478.0 million to \$615.7 million (Table 3.4). The cost estimates include engineering/design and construction of guideways, stations, park-and-ride facilities, and the yard/shop site; utilities relocation; traction/electrification, signals and communications systems; and purchase of light rail vehicles (LRVs). Additional factors included in the capital cost estimates are contingencies (between 15 and 25 percent) and a ten percent reserve LRV capacity.

The estimates each include the four corridors and a Central Area option.

Major features that distinguish the three Central Area options are:

- o Tunnel Option:
  - 2.8 mile tunnel within the Central Area where the cost of tunnel construction includes north and south portals, excavation, excavation support and reinforcement, and extensive utilities relocation
  - Consists of five underground stations within the Central Area with additional costs for vertical circulation, extensive utilities relocation, excavation, excavation support and reinforcement, and tunnel amenities
  - Consists of seven at-grade stations within the Central Area
  - Approximately 35.6 track miles and 38.4 route miles, requiring 44 LRVs during the peak travel period

**TABLE 3.3-A  
AVERAGE WEEKDAY LRT RIDERSHIP FORECASTS - 1995**

Option	Corridor	Station	Average Weekday Patronage	Mode Split (Percent)			
				Walk	Drop- off	Bus	Park- and- Ride
Tunnel	Northwest	85th Avenue	600	16%	52%	16%	16%
		77th Avenue	900	11%	22%	0%	67%
		63rd Avenue	1,200	17%	17%	33%	33%
		Bass Lake Road	1,400	35%	25%	19%	21%
		42nd Avenue	2,000	25%	10%	60%	5%
		36th Avenue	1,200	54%	14%	12%	20%
		Penn Avenue	1,200	62%	18%	20%	0%
		Emerson Avenue	600	79%	21%	0%	0%
		CBD Stations	8,600	100%	0%	0%	0%
			17,700				
	Southwest	Hopkins	1,100	16%	11%	24%	49%
		Blake Road	900	25%	8%	7%	60%
		Louisiana Avenue	500	15%	7%	0%	78%
		Wooddale Avenue	800	26%	7%	41%	26%
		Beltline Boulevard	400	30%	14%	7%	49%
		Abbott Avenue	1,400	44%	6%	50%	0%
		Hennepin Avenue	1,000	84%	6%	10%	0%
		Lyndale Avenue	1,300	84%	6%	10%	0%
		Nicollet	1,000	75%	5%	20%	0%
		28th Street	400	90%	10%	0%	0%
		Franklin Avenue	600	90%	10%	0%	0%
		CBD Stations	7,700	100%	0%	0%	0%
			17,100				
	Hiawatha	Mall of America	1,300	60%	35%	5%	0%
		CDC	300	90%	10%	0%	0%
		80th Street	300	65%	35%	0%	0%
		Northwest Airlines	50	100%	0%	0%	0%
		HHH Terminal	50	100%	0%	0%	0%
		Lindbergh Terminal	2,000	100%	0%	0%	0%
		GSA Building	200	40%	50%	10%	0%
		Crosstown	1,000	9%	26%	5%	60%
		50th Street	100	90%	10%	0%	0%
		46th Street	900	53%	10%	29%	8%
		42nd Street	400	67%	8%	19%	6%
		38th Street	1,600	39%	6%	51%	4%
		Lake Street	2,800	30%	10%	58%	2%
		Chicago Avenue	1,500	74%	11%	15%	0%
		28th Street	1,000	80%	15%	5%	0%
	Franklin Avenue	500	90%	10%	0%	0%	
	CBD Stations	11,500	100%	0%	0%	0%	
			25,500				
	University	Oak Street	2,200	85%	5%	10%	0%
		East Bank	2,900	90%	5%	5%	0%
		West Bank	1,500	90%	5%	5%	0%
		CBD Stations	5,400	100%	0%	0%	0%
			12,000				
			72,300				

**TABLE 3.3-B  
AVERAGE WEEKDAY LRT RIDERSHIP FORECASTS - 1995**

Option	Corridor	Station	Average Weekday Patronage	Mode Split (Percent)			
				Walk	Drop- off	Bus	Park- and- Ride
At-Grade Option A	Northwest	85th Avenue	600	16%	52%	16%	16%
		77th Avenue	900	11%	22%	0%	67%
		63rd Avenue	1,200	17%	17%	33%	33%
		Bass Lake Road	1,400	35%	25%	19%	21%
		42nd Avenue	2,000	25%	10%	60%	5%
		36th Avenue	1,200	54%	14%	12%	20%
		Penn Avenue	1,200	62%	18%	20%	0%
		Emerson Avenue	600	79%	21%	0%	0%
		CBD Stations	8,600	100%	0%	0%	0%
			17,700				
	Southwest	Hopkins	1,100	16%	11%	24%	49%
		Blake Road	900	25%	8%	7%	60%
		Louisiana Avenue	500	15%	7%	0%	78%
		Wooddale Avenue	800	26%	7%	41%	26%
		Beltline Boulevard	400	30%	14%	7%	49%
		Abbott Avenue	1,400	44%	6%	50%	0%
		Hennepin Avenue	1,000	84%	6%	10%	0%
		Lyndale Avenue	1,300	84%	6%	10%	0%
		28th Street	1,400	85%	5%	10%	0%
		Franklin Avenue	600	90%	10%	0%	0%
	CBD Stations	7,700	100%	0%	0%	0%	
			17,100				
	Hiawatha	Mall of America	1,300	60%	35%	5%	0%
		CDC	300	90%	10%	0%	0%
		80th Street	300	65%	35%	0%	0%
		Northwest Airlines	50	100%	0%	0%	0%
		HHH Terminal	50	100%	0%	0%	0%
		Lindbergh Terminal	2,000	100%	0%	0%	0%
		GSA Building	200	40%	50%	10%	0%
		Crosstown	1,000	9%	26%	5%	60%
		50th Street	100	90%	10%	0%	0%
		46th Street	900	53%	10%	29%	8%
		42nd Street	400	67%	8%	19%	6%
		38th Street	1,600	39%	6%	51%	4%
		Lake Street	3,400	30%	10%	58%	2%
		Chicago Avenue	1,000	74%	11%	15%	0%
		Honeywell	700	90%	10%	0%	0%
		28th Street	800	90%	10%	0%	0%
	Franklin Avenue	500	90%	10%	0%	0%	
	CBD Stations	11,500	100%	0%	0%	0%	
			25,500				
	University	Oak Street	2,200	85%	5%	10%	0%
		East Bank	2,900	90%	5%	5%	0%
		West Bank	1,500	90%	5%	5%	0%
		CBD Stations	5,400	100%	0%	0%	0%
			12,000				
			72,300				

**TABLE 3.3-C  
AVERAGE WEEKDAY LRT RIDERSHIP FORECASTS - 1995**

Option	Corridor	Station	Average Weekday Patronage	Mode Split (Percent)			
				Walk	Drop- off	Bus	Park- and- Ride
At-Grade Option B	Northwest	85th Avenue	600	16%	52%	16%	16%
		77th Avenue	900	11%	22%	0%	67%
		63rd Avenue	1,200	17%	17%	33%	33%
		Bass Lake Road	1,400	35%	25%	19%	21%
		42nd Avenue	2,000	25%	10%	60%	5%
		36th Avenue	1,200	54%	14%	12%	20%
		Penn Avenue	1,200	62%	18%	20%	0%
		Emerson Avenue	600	79%	21%	0%	0%
		CBD Stations	8,600	100%	0%	0%	0%
			17,700				
	Southwest	Hopkins	1,100	16%	11%	24%	49%
		Blake Road	900	25%	8%	7%	60%
		Louisiana Avenue	500	15%	7%	0%	78%
		Wooddale Avenue	800	26%	7%	41%	26%
		Beltline Boulevard	400	30%	14%	7%	49%
		Abbott Avenue	1,400	44%	6%	50%	0%
		Cedar Lake Road	400	90%	10%	0%	0%
		22nd Street	400	90%	10%	0%	0%
		CBD Stations	4,900	100%	0%	0%	0%
			10,800				
	Hiawatha	Mall of America	1,300	60%	35%	5%	0%
		CDC	300	90%	10%	0%	0%
		80th Street	300	65%	35%	0%	0%
		Northwest Airlines	50	100%	0%	0%	0%
		HHH Terminal	50	100%	0%	0%	0%
		Lindbergh Terminal	2,000	100%	0%	0%	0%
		GSA Building	200	40%	50%	10%	0%
		Crosstown	1,000	9%	26%	5%	60%
		50th Street	100	90%	10%	0%	0%
		46th Street	900	53%	10%	29%	8%
		42nd Street	400	67%	8%	19%	6%
		38th Street	1,600	39%	6%	51%	4%
		Lake Street	3,400	30%	10%	58%	2%
	24th Street	500	60%	20%	20%	0%	
	15th Avenue	300	90%	10%	0%	0%	
		CBD Stations	10,100	100%	0%	0%	0%
			22,500				
	University	Oak Street	2,200	85%	5%	10%	0%
		East Bank	2,900	90%	5%	5%	0%
		West Bank	1,500	90%	5%	5%	0%
			CBD Stations	5,400	100%	0%	0%
			12,000				
			63,000				

- o Nicollet Alignment, At-Grade Option A:
  - Comprised of 1.7 miles of at-grade, double-track alignment along Nicollet Avenue
  - All stations with the Central Area (14) are at-grade
  - Approximately 35.5 track miles and 38.2 route miles, requiring 50 LRVs during the peak travel period
- o Kenwood Alignment, At-Grade Option B:
  - Includes a relatively inexpensive 3.15 miles of alignment in an existing railroad right-of-way
  - All stations within the Central Area (12) are at-grade
  - Approximately 33.9 track miles and 36.6 route miles, requiring 43 LRVs during the peak travel period

**TABLE 3.4  
CAPITAL COST ESTIMATES**

OPTION	Guideway	Stations	Vehicles	Park-and-Ride	Total
Tunnel Option	\$434.8	\$100.9	\$72.6	\$7.4	\$615.7
At-Grade Option A	379.1	36.7	75.0	7.4	498.2
At-Grade Option B	364.4	35.2	71.0	7.4	478.0

Guideway construction costs (including electrification, signals and communications) were assumed to be \$11 million per mile for double-track alignments where two tracks are to be constructed side-by-side within a single street right-of-way. The costs for single-track alignments (where each track would be constructed within the right-of-way of parallel streets) are estimated to be \$14 million per mile. Construction costs for railroad right-of-way alignments were estimated at \$7.5 million per mile. Tunnel cost estimates were prepared to address each specific proposal.

Station costs were estimated at \$0.73 million per at-grade station. This figure represents an average of the various at-grade station costs. The estimated cost to construct underground stations in the Central Area ranges from \$10.6 to \$17.3 million per station, with the airport tunnel station estimated to cost \$5.3 million.

The estimated cost for each light rail vehicle is \$1.5 million.

### **3.5 OPERATING AND MAINTENANCE COST**

Annual operating and maintenance (O&M) cost for the three system options were computed at \$6.00 per rail vehicle mile of travel (VMT). The \$6.00 figure represents a national, weighted average cost that takes administration, labor (operations and maintenance) and energy into account. Factors contributing to the calculation of each option's total VMT include the following:

- o Length of route miles
- o Average speed
- o Peak period and off-peak period ridership forecasts
- o Maximum 15 minute headways for peak period service (unless a shorter headway is dictated by demand), 15 minute headways during the midday off-peak period, and 30 minute headways for the night-time service period
- o Six hours of peak period service and fourteen hours of off-peak period service per day
- o Deadhead VMT at 10 percent of the combined peak and off-peak VMTs
- o 295 average weekdays per year
- o Proof of payment fare collection

Table 3.5 presents total annualized VMT and O&M costs for each of the system options. It should be noted that each optional LRT system will impact existing bus service in two ways. First there will be a reduction in the level of bus transit service resulting from the implementation of LRT services. Secondly, existing bus transit services will be reorganized to serve as feeders to the LRT system. The result of these service patterns will be a net reduction in bus transit VMT and O&M costs. These O&M savings are not reflected in the table that follows nor in Table 3.4.

**TABLE 3.5  
ANNUAL OPERATING AND MAINTENANCE COST**

OPTION	TOTAL ANNUAL RAIL VMT	O&M (millions)
Tunnel Option	4,151,000	\$ 24,906,000
At-Grade Option A	4,102,000	24,612,000
At-Grade Option B	3,958,000	23,748,000

Table 3.6 outlines distinguishing characteristics of the system options.

### **3.6 COST SUMMARY**

Table 3.7 presents comparative data for each of the system option's total annual costs and provides system profile data in order that costs can be evaluated on a per mile or per passenger basis.

### **3.7 FEEDER BUS SYSTEM GOALS/POLICIES/STANDARDS**

The LRT feeder bus system will be a critical component of the regional transportation system. By integrating light rail transit and bus services, the transit system can:

- o maximize ridership
- o reduce operating expenses
- o extend LRT line service, therefore maximizing transit availability
- o increase transit connectivity

The Metropolitan Transit Commission has developed a preliminary feeder bus system which complements the LRT system and improves the overall quality of transit service.

When developing the feeder bus network, the MTC used existing ridership data as a base for designing the system. Trunk line bus routes were redirected to the feeder bus network in areas where: the existing bus route duplicated the LRT line service area; the LRT line/feeder bus connection would provide improved travel time; and the bus route reorientation would limit the number of transfers to two.

Chapter 5 Transit Service, will review in detail the impact that the proposed feeder bus network would have on the existing system with regard to the number of daily bus miles traveled, daily vehicles required, and reduction of buses entering downtown.



**TABLE 3.6  
SYSTEM CHARACTERISTICS**

OPTION	Average Speed (mph)	Patronage		Headway Minutes		Required Vehicles		Weekday VMT		
		Combined AM/PM Peaks	Off-Peak	Peak Line 1	Off-Peak Line 1 Peak Line 2	Peak	Off-Peak	Peak	Off-Peak	Deadhead
Tunnel Option	29.7 to 30.9	40,086	38,514	12	10	44	13	8,052	4,742	1,279
At-Grade Option A	24.8 to 27.9	40,086	38,514	12	10	50	14	8,136	4,505	1,264
At-Grade Option B	28.7	35,853	34,447	15	10	43	14	7,386	4,811	1,220

Line 1: University and Southwest Lines  
Line 2: Northwest and Hiawatha Lines

**TABLE 3.7  
COST SUMMARY/SYSTEM PROFILE DATA**

OPTION	Annualized Capital Cost (million)	Annual Operating and Maintenance Cost (million)	Total Annual Cost (million)	Daily Patrons Per Route Mile	Daily Patrons Per Vehicle Mile	Capital Cost Per Mile (million)	Annual Capital Cost Per Annual Patron	08M Cost Per Patron	Total Annual Cost Per Patron
Tunnel Option	\$55	\$25	\$80	2,050	6.1	\$15.78	\$2.36	\$1.07	\$3.43
At-Grade Option A	44	25	69	2,060	6.2	13.06	1.91	1.06	2.97
At-Grade Option B	42	24	66	1,918	5.8	13.04	2.05	1.15	3.19