



# CITY OF TUKWILA TRANSPORTATION COMMITTEE AGENDA

DATE: Tuesday, March 10, 1998

TIME: 5:00 p.m.

PLACE: Public Works Conference Room 1

NO.	ITEM	NO.	ACTION TO BE TAKEN
I.	Current Agenda Review	I.	
II.	Presentation(s)	II.	
III.	Business Agenda  A. BNSF Access Draft Report - Page - 1  B. Adopt 1998 WSDOT/APWA Standard Specifications Page - 67	III.	A. Information.  B. Approve Ordinance and move to Council to adopt.
IV.	<u>Old Business</u>		<u>Next Meeting Agenda Items</u> Date: March 24, 1998
V.	<u>Attachments</u> A. Information Memo B. Information Memo		<u>Future Agenda Items:</u> 1. 32 Ave contract closeout 2. 32 Ave underground contract closeout 3. 42/124 contract closeout 4. 51st Ave Bridge contract closeout 5. 42nd Ave Bridge contract closeout 6. 1997 Small Drain contract closeout 7. E. Marginal Way contract closeout 8. Annual traffic count program



## INFORMATION MEMO

To: Mayor Rants  
 From: Public Works Director  
 Date: March 4, 1998  
 Subject: Draft Study  
 BNSF Yard Access Revision  
 Project #95RW-09

**ISSUE**

Accept the draft report and determine the City's recommended alternative for a new access to the BNSF intermodal yard.

**BACKGROUND**

The City's consultant has studied 3 alternatives for access to the BNSF yard in Allentown. The attached draft report details the total project costs as follows:

48 Ave S via a new bridge over the Duwamish	\$2,838,608
Gateway Drive via a new bridge over the Duwamish	6,785,981
East Marginal via S 112 St. (SCL R/W)	8,987,691

The roadway construction cost for the East Marginal connection is close to \$1,500,000. The remaining \$7,500,000 is due to the requirement to reconfigure the rail yard. The 48 Ave S option is the lowest overall cost due to the shorter bridge length required to make the connection.

The consultant's contract includes a public meeting to present the report findings. The Allentown and Foster Point communities will be specifically invited to an open house, scheduled for March or April of this year.

**ISSUE ANALYSIS**

BNSF appears ready to work with the City to get either the 48 Ave S or the Gateway Drive alternative constructed. The 48 Ave S connection is the lowest over all cost alternative that achieves the goal of removing truck traffic from residential streets completely. The railroad has committed \$150,000 and the county \$50,000 for design.

**RECOMMENDATION**

Present to the Transportation Committee for a recommendation of the preferred alternative. Final the report and present it to the public for comment. Proceed on an agreement with the county and BNSF to fund the design report.

## Attachments:

Estimate  
 BNSF Access CIP Sheet

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**Burlington Northern Santa Fe  
Hub Center Access Study  
Tukwila, Washington  
(DRAFT)**

Prepared for

City of Tukwila Public Works Department  
6300 Southcenter Boulevard  
Tukwila, Washington 98188

HLA Project No. 40032

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TUKWILA  
PUBLIC WORKS

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Ronald V. Perrone, P.E.  
Project Manager

February 27, 1998



**Harding Lawson Associates**

One Bellevue Center  
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Bellevue, WA 98004 - (425) 453-5545

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## 1.0 EXECUTIVE SUMMARY

This report, prepared for the City of Tukwila by Harding Lawson Associates Infrastructure, Inc., studies three (3) build alternatives for relocation of the access point for the Burlington Northern Santa Fe (BNSF) Hub Center in Tukwila, Washington.

The existing access to the BNSF Hub Center is South 124th Street in the northern portion of town. South 124th Street is a residential collector street serving the community of Allentown. The street provides convenient access to several residences in the area as well as the new Tukwila Community Center.

The three (3) alternatives analyzed as a part of this study, and shown in Figure 1-1, were:

- *The 48th Avenue Alternative* - This alternative, located near the intersection of Interurban Avenue and I-5, proposes widening 48th Avenue South to three (3) lanes and constructing a new bridge over the Duwamish River to access the BNSF Hub Center at its southernmost point. Also as part of this alternative, a new Interurban Avenue bypass would be constructed for direct access to 48th Avenue South from the southbound I-5 off-ramp. The proposed bridge is a single-span, concrete girder, concrete deck structure.
- *The Gateway Drive Alternative* - This alternative, located one (1) block north of the 48th Avenue Alternative, would access the BNSF Hub Center near its existing gate facility via a new, two-lane roadway from Gateway Drive and a new bridge spanning the Duwamish River. This new roadway would then intersection South 50th Place and enter the BNSF Hub Center. The proposed bridge is a two-span, concrete girder, concrete deck structure.
- *The East Marginal Way Alternative* - This alternative, located at the northern end of the BNSF Hub Center, would access via a new roadway from East Marginal Way South across from South 112th Street and run parallel to the existing Seattle City Light right-of-way. This alternative does not cross the Duwamish River and does not require a bridge structure. Under this alternative, the BNSF would

have to move its gate facility from the southern portion of the Hub Center.

Several impacts were investigated and analyzed as part of this study. The most important of these impacts were the overall costs of construction and the impacts to local traffic patterns.

The costs of construction, discussed in detail in Section 8.0, are summarized in Table 1-1.

**Table 1-1 Summary of Construction Costs for Study Alternatives**

<u>Alternative</u>	<u>Estimated Cost</u>
48th Avenue	\$2,838,608
Gateway Drive	\$6,785,981
East Marginal Way	\$8,987,691

These amounts include the costs for engineering, construction and contingencies. The cost of the East Marginal Way Alternative also includes the cost to relocate the existing recital facility to the northern portion of the Hub Center. As seen in Table 1-1, the 48th Avenue Alternative is 58 percent and 70 percent less expensive than the Gateway Drive and East Marginal Way Alternatives, respectively.

The study of traffic impacts was limited to the 48th Avenue and Gateway Alternatives. Due to the extremely high cost of the East Marginal Way Alternative, the study of traffic impacts in a completely separate area of the City was considered an unproductive utilization of study budget funds and was placed outside the scope of this report.

Impacts to traffic were analyzed for the projected project completion in the Year 2000 with a nominal growth rate of four (4) percent per year. Based on the results of traffic modeling software, the greatest traffic impacts for the 48th Avenue Alternative, the Gateway Drive Alternative, as well as for existing conditions occur at the intersections of Interurban Avenue and 42nd Avenue





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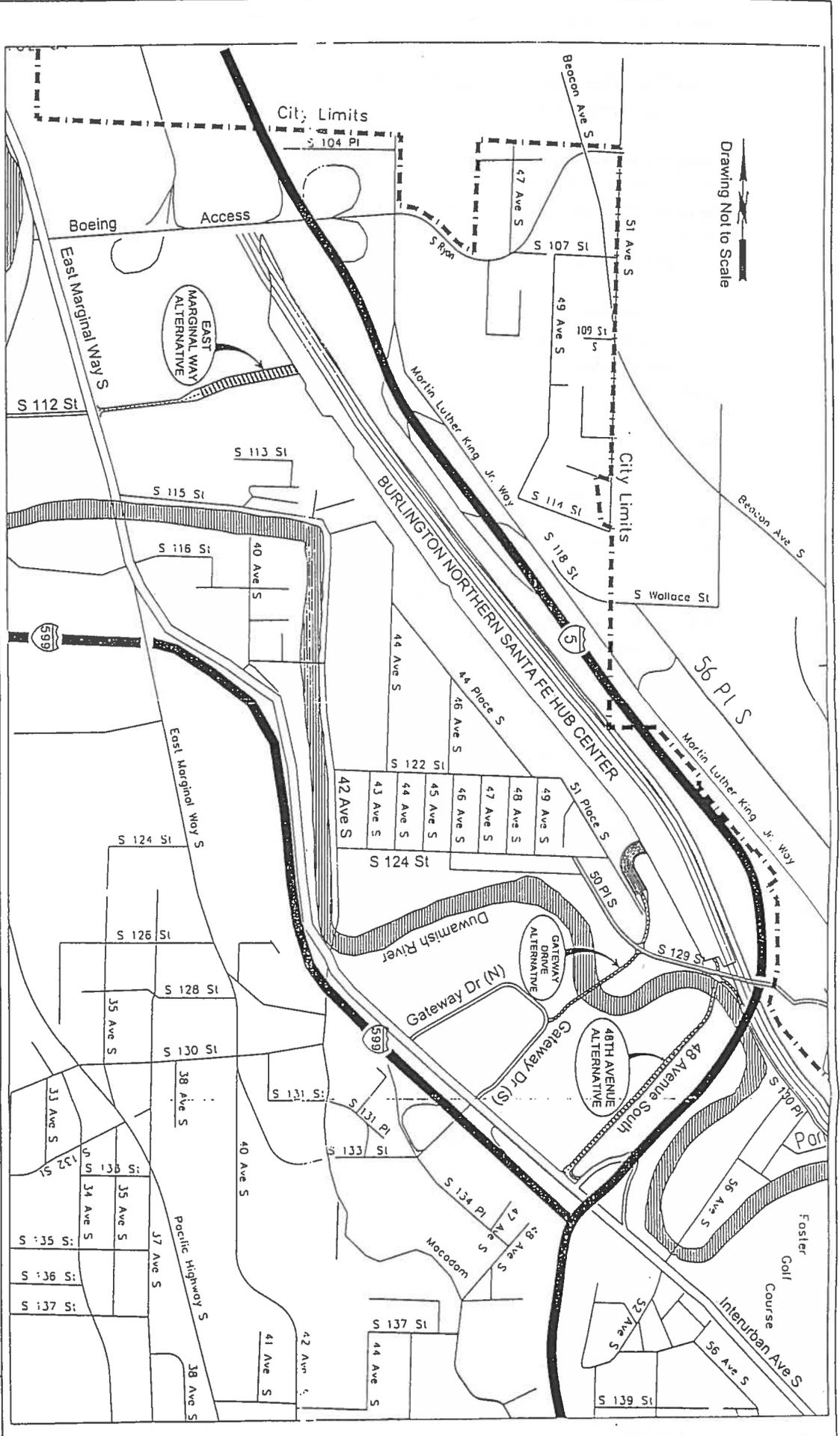


CITY OF TUKWILA  
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BURLINGTON NORTHERN SANTA FE  
HUB CENTER ACCESS STUDY

Primary Build Alternatives

FIGURE  
1-1  
Page  
1-2



South, Interurban Avenue and Gateway Drive (S), and Interurban Avenue and 48th Avenue South.

Under the 48th Avenue and Gateway Alternatives, level of service would improve over the existing conditions at the intersection of Interurban Avenue and 42nd Avenue South. This would be due to the relocation of BNSF truck traffic off of South 124th Street.

The relocation of the BNSF traffic from 42nd Avenue South would cause a decrease in the level of service at the Interurban Avenue's intersections with 48th Avenue South and Gateway Drive (S).

The most dramatic loss in level of service occurs at 48th Avenue South under the 48th Avenue Alternative. This impact occurs because of inadequate turning facilities at this intersection for large truck traffic. Several potential mitigate features for this intersection were explored to improve the flow of traffic, including the addition of a third lane to the approach to Interurban Avenue from 48th Avenue South; the addition of a second left-turn lane from southbound Interurban Avenue to 48th Avenue South; the addition of a third lane on the southbound I-5 off-ramp for the proposed Interurban Avenue bypass; and closing South 130th Place between 52nd Avenue South and South 129th Street on the east side of the Duwamish River to non-Hub Center traffic. Of these options, the additional turn land on Interurban Avenue and the closure of South 130th Place appear to be the most effective.

Other impacts studied as part of this report were environmental impacts, socio-economic impacts, land acquisition issues, utilities relocation and construction, and permitting. These issues produce less dramatic impacts to the project and many of them are related to the cost and traffic impacts.

Based on the results of the analysis summarized in Section 6.0 - Evaluation of the Study Alternatives, Harding Lawson Associates Infrastructure, Inc. recommends that the City of Tukwila proceed with a detailed design report using the 48th Avenue Alternative as the Preferred Build Alternative.

## 2.0 PURPOSE AND SCOPE

### 2.1 Purpose

South 124th Street in Tukwila, Washington is a residential collector street serving the community of Allentown. This street provides convenient access to several residences in the area as well as the new Tukwila Community Center.

South 124th Street also provides access to the Burlington Northern Santa Fe (BNSF) Hub Center for heavy intermodal truck traffic. The BNSF Hub Center is one of the major staging areas for BNSF train and intermodal operations in the region, and the level of traffic utilizing the facility reflects this status.

Due to serious concerns regarding issues such as pedestrian safety and noise in a residential area, the City of Tukwila has contracted with Harding Lawson Associates Infrastructure, Inc. to study various alternatives for relocating heavy truck traffic from South 124th Street and the adjacent street, 42nd Avenue South.

The primary purpose of this study is to determine a recommended alternative that considers the following items:

- 1) relocation of BNSF intermodal truck traffic from South 124th Street and 42nd Avenue South to roadways that can better accommodate heavy truck traffic;
- 2) the cost of construction; and
- 3) the impacts to traffic on the surrounding surface streets.

### 2.2 Scope

The main thrust of this report is to study the cost considerations and traffic impacts of three (3) alternatives. Secondary consideration is given to other impacts including, but not limited to, environmental impacts, socio-economic impacts, land acquisition, utilities, and permitting.

The alternatives are the 48th Avenue Alternative connecting the Hub Center to Interurban Avenue via

48th Avenue South and a new bridge structure; the Gateway Drive Alternative connecting the BNSF Hub Center to Interurban Avenue via Gateway Drive and a new bridge structure; and the East Marginal Way Alternative connecting the Hub Center to East Marginal Way South via a new over-land access corridor.

The Gateway Drive Alternative and the 48th Avenue Alternative are studied in great detail, while discussion of the East Marginal Way alternative is limited to analysis and conclusions provided in the "Report for South Seattle Yard Improvement; Tukwila, Washington". This report is a parallel study prepared by Hanson Wilson, Inc. for the BNSF. The East Marginal Way Alternative selected for this study is "Alternative 4" in the Hanson Wilson report.

In compiling the elements of each alternative, the scope was limited to the development of preliminary concepts for roadway alignment and profile, structure selection and configuration, and traffic improvement/mitigation measures. Once a primary build alternative is selected, a more detailed discussion of the various elements can be addressed in a detailed design report.

## 3.0 EXISTING TRAFFIC CONDITIONS

### 3.1 Traffic Study Area

A vicinity map of the nominal area of interest for this project is shown in Figure 3-1. The principal focus for traffic operations assessment and evaluation in connection with the 48th Avenue and Gateway Drive Alternatives is shown in Figure 3-2. The streets of particular interest are:

- Interurban Avenue from 42nd Avenue South to the northbound I-5 on-ramp and the public street approaches to Interurban Avenue;
- 48th Avenue South and its extension east to South 130th Place as an alternative access for the BNSF Hub Center; and
- Gateway Drive (S) and its extension east to 50th Place South as an alternative access for the Burlington Northern Santa Fe (BNSF) Hub Center.

The 48th Avenue and Gateway Drive Alternatives will variously alter traffic volume patterns on these city streets, but will have little or no impact on traffic volumes on the two (2) freeways (I-5 and SR-599) and their access ramps. Accordingly, review of existing traffic operations and traffic operations impact analysis for the alternatives is restricted to the above surface streets and their intersections, including surface street/freeway ramp intersections.

The 48th Avenue and Gateway Drive Alternatives would significantly reduce traffic volume on South 124th Street between its 42nd Avenue South link to Interurban Avenue and its connection to the BNSF Hub Center. The Gateway Drive Alternative would also reduce traffic volume on 50th Place South north of its intersection with the Gateway Drive extension. The 48th Avenue Alternative would increase traffic on 50th Place South/South 130th Place north of its intersection with the 48th Avenue extension. The operational and safety benefits of the above volume reduction elements, however significant, are not addressed in this report, nor are the existing conditions along the current Hub Center access link.

As a precursor to this study, the construction costs for each of the build alternatives were investigated and estimated. The result of this cost analysis was that the East Marginal Way Alternative is significantly more expensive than the 48th Avenue and Gateway Drive Alternatives. Based on this initial evaluation of the alternatives, the cost of conducting a traffic study in a completely different area was considered an unproductive utilization of study budget funds and was placed outside the scope of this report.

### 3.2 Existing Street Classifications and Land Use

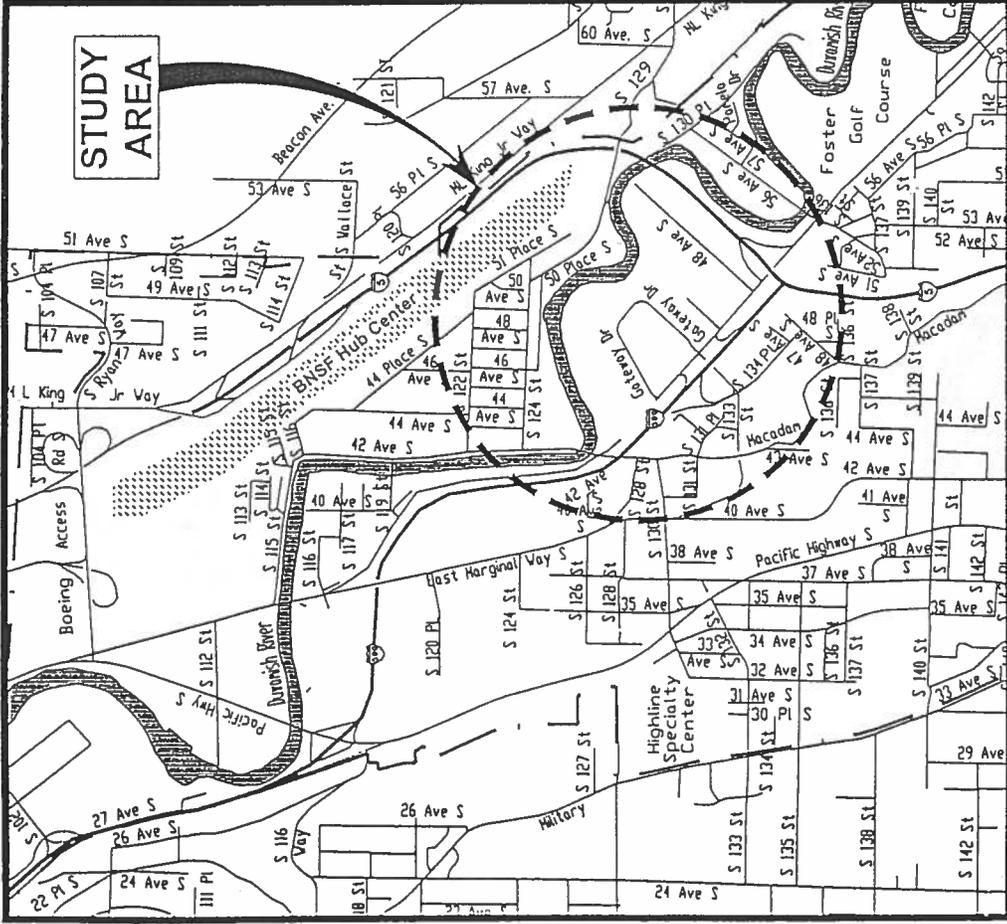
Interurban Avenue and South 133rd Street are minor arterials and 42nd Avenue South and South 124th and 129th Streets are collector arterials in the City's street functional classification system. The remaining public streets in the study area are classed as either residential or commercial access local streets; those of primary interest for this study are those intersecting Interurban Avenue and South 133rd Street at SR-599.

Interurban Avenue is the sole continuous north-south arterial east of the Pacific Highway South (SR-99) arterial and links the City's northernmost industrial area (via a segment of East Marginal Way South) to Interstate 405, where the arterial continues south along the east edge of the Southcenter commercial and industrial district as the West Valley Highway (SR-181). Most of the land uses with fronting access to Interurban Avenue over its length are commercial and industrial, with several major park/recreational areas south of I-5 and direct residential access streets at 40th, 52nd, 56th, and 58th Avenues South.

Forty-Second Avenue South south of South 124th Street accommodates local residential traffic, community center traffic, traffic from the BNSF Hub Center, and traffic traveling on South 129th Street from its intersection with Martin Luther King, Jr. Way South (SR-900) in unincorporated King County (Black River and Skyway areas and the City of Renton to the southeast).



REGIONAL LOCATION



VICINITY MAP



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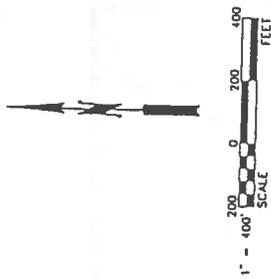
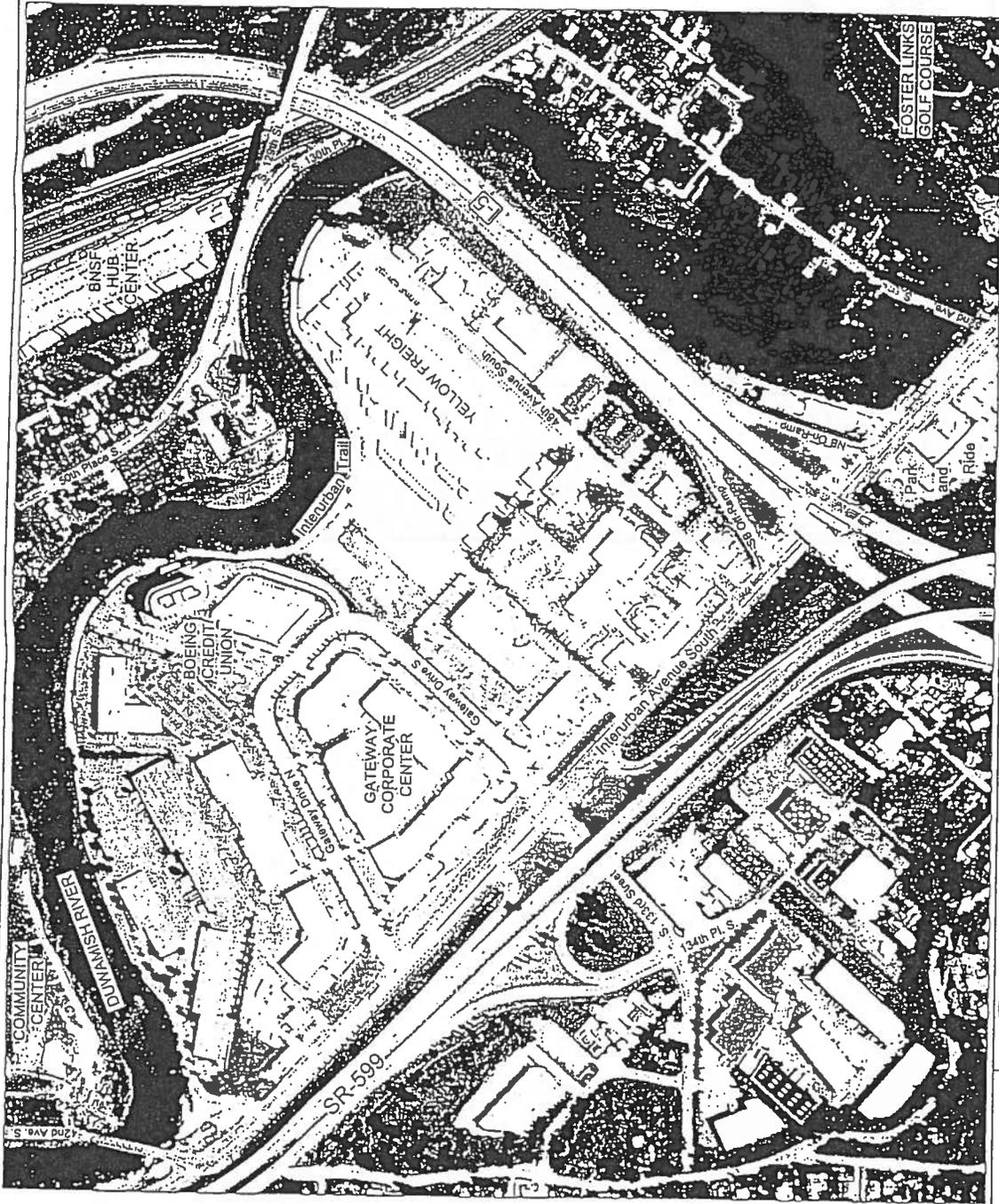


FIGURE 3-2  
Page 3-3

Study Area Aerial View  
Existing Conditions

BURLINGTON NORTHERN SANTA FE  
HUB CENTER ACCESS STUDY

CITY OF TUKWILA  
PUBLIC WORKS DEPARTMENT



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Figure 3-3 shows existing development pattern and land uses in the study area as of September 1995.

### 3.3 Roadway Features and Traffic Control

Figure 3-4 schematically depicts the principle roadway features and traffic control for the City's streets and intersections within the study area.

Interurban Avenue south of 42nd Avenue South is a five-lane facility with additional turning lanes at several intersections. Interurban Avenue becomes four lanes in a short segment just south of the 42nd Street intersection and in a short segment under the I-5 bridges. Interurban Avenue is an important truck route and carries a number of arterial transit routes to the park-and-ride lot at South 52nd/56th Street as well as transit routes which use I-5 and SR-599. In circa 1992, Interurban Avenue was redeveloped in this area to a five-lane arterial with a new sidewalk on the east side, new urban drainage facilities, and a new traffic control system with additional traffic signals.

The Interurban Avenue traffic signal system is an interconnected, traffic-actuated system with NEMA eight-phase controllers. Field observations on January 2, 1998 showed the following:

- The signals at the Interurban Avenue / southbound I-5 off-ramp intersection and the Interurban Avenue / 46th Avenue South Intersection are interconnected with an average cycle length of 83 seconds and a maximum observed cycle length of 128 seconds.
- The signals at the Interurban Avenue / northbound SR-599 off-ramp intersection, the Interurban Avenue / northbound SR-599 on-ramp, and the Interurban Avenue / Gateway Drive intersection are interconnected with an average cycle length of 101 seconds and a maximum observed cycle length of 118 seconds.
- The signal at the Interurban Avenue / South 42nd Street intersection functions as an isolated signal with an average cycle length of 67 seconds and a maximum observed cycle length of 103 seconds.

Gateway Drive is a loop street through the Gateway Corporate Center development with a 48-foot wide, four-lane roadway and a curb and a sidewalk on both sides of the street. The Boeing Credit Union is the single largest traffic generator on Gateway Drive; the Credit Union's 8-bay drive-up facility is a major component of the traffic generation and is accessed by a major driveway located at the south corner of the Gateway Drive loop. (See Figure 3-2.)

South 133rd Street is a 4/5-lane street extending west from Gateway Drive (S) to its intersection with SR-599 opposite South 134th Place. South 134th Place provides access to an important light industrial/warehouse area. South 133rd Street narrows to two (2) lanes to the west of the intersection and leads to Pacific Highway South.

Forty-Eighth Avenue South is a 2,000-foot long dead-end street. It is a 28-foot wide, two-lane curbed street which is widened and channelized with left turn and right turn lanes at the approach to Interurban Avenue. There is a continuous sidewalk along the south side of 48th Avenue and along portions of the north side. It provides access for two (2) gas station minimarts, a restaurant, a motel, a truck rental firm, several other businesses, and a Yellow Freight Lines truck terminal (see Figure 3-3). A parking lot with six (6) spaces is located at the east end of 48th Avenue with access to the adjacent Interurban trail.

Fiftieth Place South becomes South 129th Street and the latter crosses over the BNSF Mainline and I-5 on a steep southeasterly upgrade and both streets have collector route status. These streets are two-lane roadways with little or no shoulder or walkways.

South 130th Place is a local street which intersects 50th Place South and South 129th Street near the south end of their curved connection. The geometry for passenger cars turning between South 130th Place and 50th Place South / South 129th Street is deficient and the movement from "northbound" (westbound) South 130th Place to "southbound" (eastbound) South 129th Street in particular entails significant encroachment on adjacent lanes. South 130th Place is a narrow 2-lane facility which lacks shoulders and walkways and narrows to one lane as it passes underneath the I-5 bridges via a narrow space between the BNSF Mainline and the Duwamish River.



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**CITY OF TUKWILA**  
PUBLIC WORKS DEPARTMENT

**BURLINGTON NORTHERN SANTA FE**  
HUB CENTER ACCESS STUDY

Traffic Study Area  
Interurban Avenue Corridor Aerial

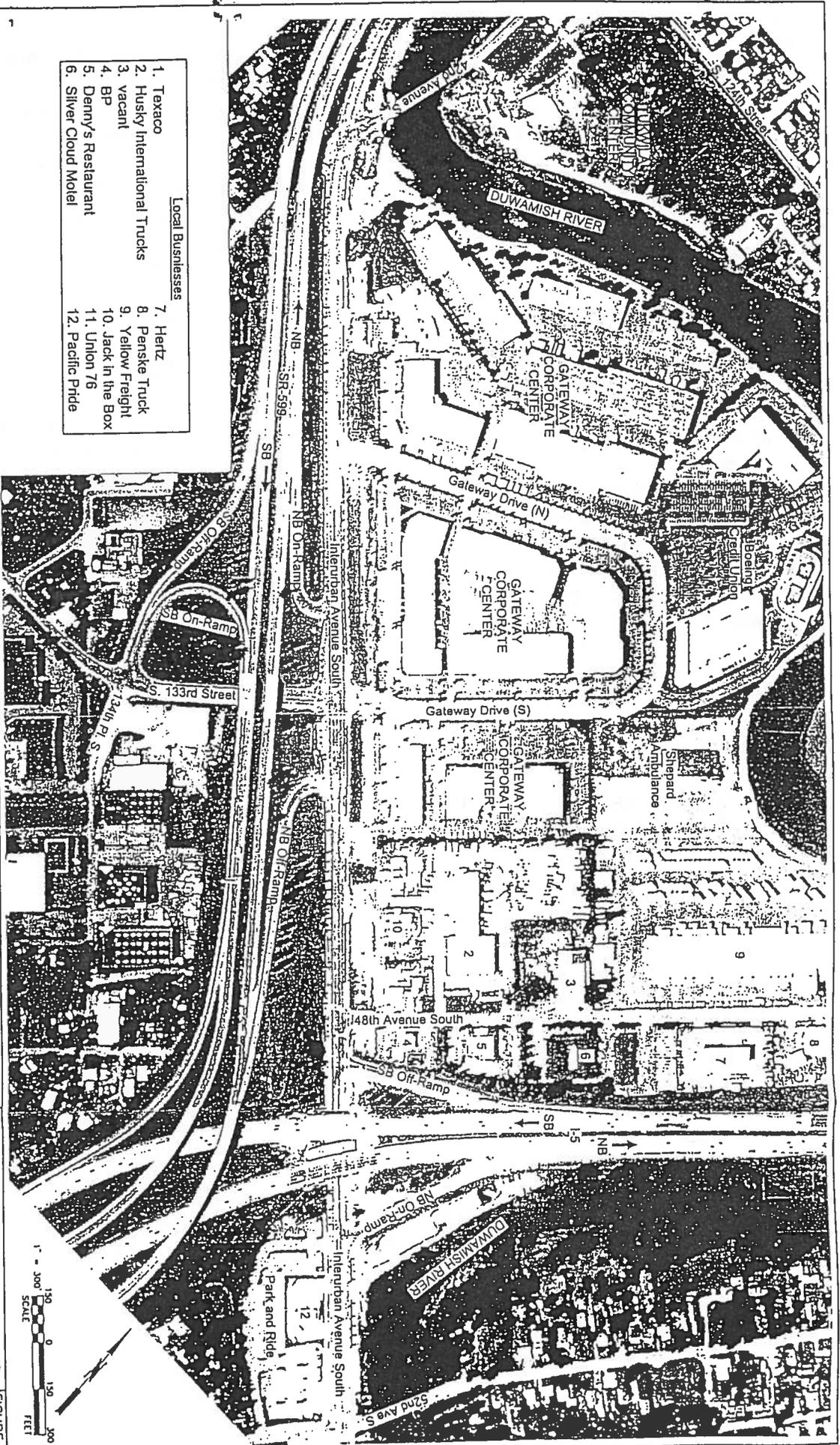
FIGURE

3-3

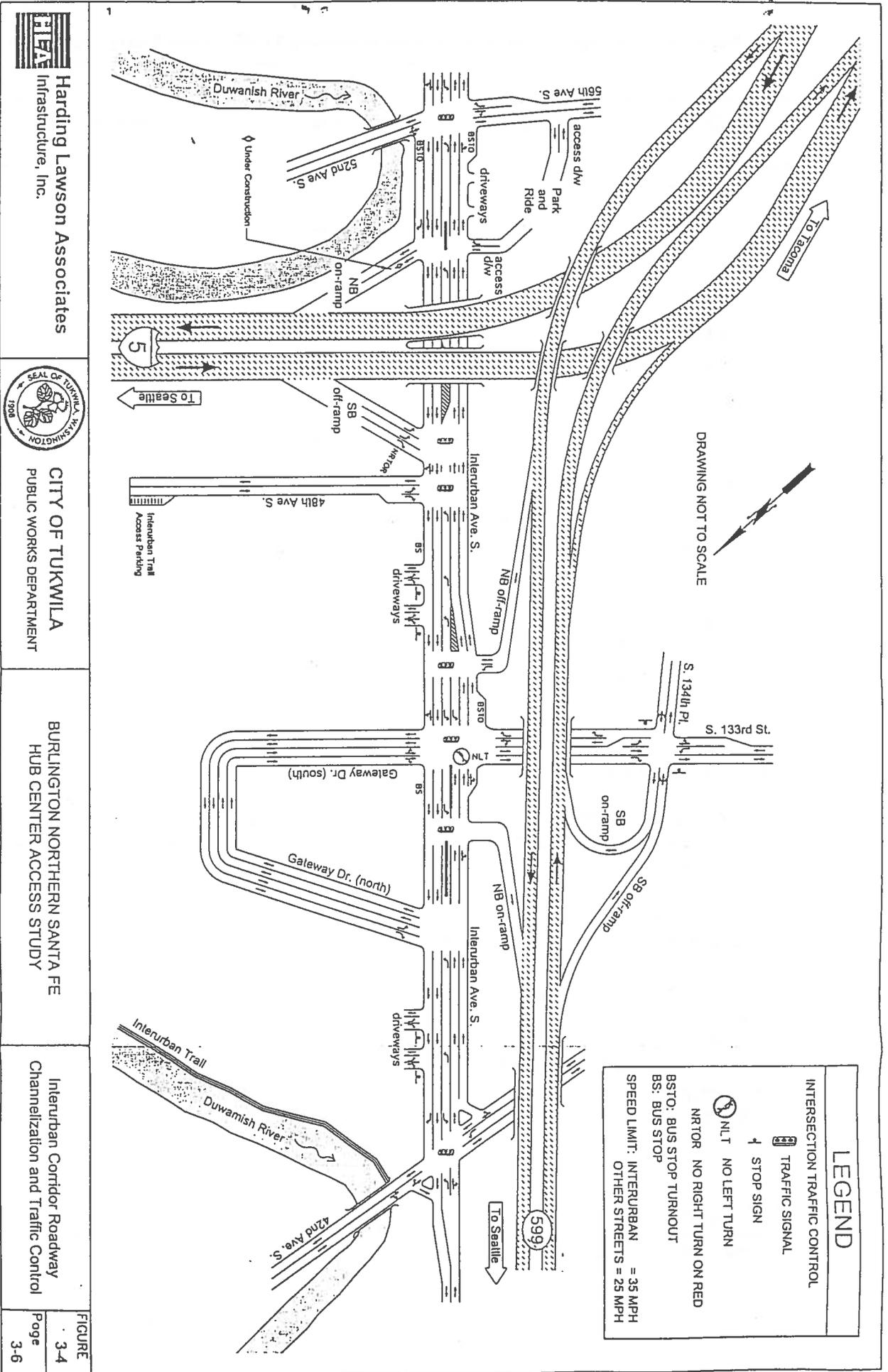
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- Local Businesses**
1. Texaco
  2. Husky International Trucks
  3. vacant
  4. BP
  5. Denny's Restaurant
  6. Silver Cloud Motel
  7. Hertz
  8. Penske Truck
  9. Yellow Freight
  10. Jack in the Box
  11. Union 76
  12. Pacific Pride



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PUBLIC WORKS DEPARTMENT

BURLINGTON NORTHERN SANTA FE  
HUB CENTER ACCESS STUDY

Interurban Corridor Roadway  
Channelization and Traffic Control

**Table 3-1 Monthly Variation in Mid-weekday Traffic Count on Interurban Avenue <sup>1</sup>**

Date	Daily Traffic Count			Percent of Annual Average
	Northbound	Southbound	Two-Way Total	
1/16/97	6,770	6,246	13,016	90.5
2/13/97	7,218	6,525	13,743	95.5
3/13/97	7,701	6,558	14,259	99.1
4/10/97	8,175	6,965	15,140	105.2
5/8/97	7,983	5,886	13,869	96.4
6/12/97	8,296	6,648	14,944	103.8
7/17/97	6,954	5,789	12,743	88.6
8/14/97	8,305	6,461	14,766	102.6
9/11/97	7,945	6,434	14,379	99.9
10/9/97	8,195	7,325	15,520	107.9
11/13/97	8,075	7,505	15,580	108.3
12/11/97	7,777	6,939	14,716	102.3
Average	7,783	6,607	14,390	100.0

<sup>1</sup> City of Tukwila control count location: Interurban Avenue South just north of Gateway Drive (N)

### 3.4 Traffic Volume

The traffic volume data presented here is for traffic counts made in mid-December 1997, unless otherwise noted. Daily (24-hour), machine counted traffic volumes are shown for representative locations in Figure 3-5. Traffic volume reaches nearly 21,000 vehicles per day (vpd) on Interurban Avenue within the study area<sup>2</sup>, over 9,000 vpd on Gateway Drive (S); and nearly 6,000 vpd on 48th Avenue South.

There are several directional imbalances in daily volume apparent in Figure 3-5. For Interurban Avenue this is due in part to the freeway ramp location pattern, including the presence of a half-diamond interchange on Interurban Avenue. For Gateway Drive the prohibition of a southbound Interurban Avenue-to-

eastbound Gateway Drive (S) movement at the 133rd Street intersection is a factor. That movement is accommodated at Gateway Drive (N). At 48th Avenue South, the gas station/minimarts at the corner are responsible for imbalanced directional volume. The estimated volume for traffic east of those generators is of the order of 3,000 to 4,000 vpd.

Owing to the high percentage of multi-axle trucks, the machine count values shown in Figure 3-5 should be reduced by six (6) to eight (8) percent on the arterials and ramps on Interurban Avenue to convert to actual traffic volume. Similarly, values should be discounted by about 17 percent on 48th Avenue South, eight (8) percent on 42nd Avenue South, and one (1) percent on Gateway Drive.

Table 3-1 (above) shows 1997 monthly variation in mid-weekday daily traffic counts for the City's control

<sup>2</sup> A 2010 projected volume is 24,000 vehicles per day per the Entranco Engineers design study (circa 1989) for the Interurban multilaning project.



**Table 3-2 BNSF Hub Center Gate-Counted/Check-In Semi-Trailer Truck Hourly Volume Tuesday, September 30, 1997<sup>3</sup>**

Hour Ending	In	Out	Total	Hour Ending	In	Out	Total
1 AM	12	13	25	1 PM	28	26	54
2	9	18	27	2	26	35	61
3	13	12	25	3	28	27	55
4	18	10	28	4	20	19	39
5	11	19	30	5	31	21	52
6 AM	15	22	37	6 PM	23	20	43
7	12	26	28	7	15	19	34
8	13	21	34	8	6	9	15
9	18	32	50	9	13	10	23
10	26	27	53	10	13	12	25
11	37	27	64	11	19	7	26
12 NOON	31	36	67	12 MIDNIGHT	13	25	38
				TOTAL	450	493	943

<sup>3</sup> Excludes bobtails, single-unit trucks, and some vendor/delivery trucks and Conex Company trucks who do not check in.

count location on Interurban Avenue north of Gateway Drive (N). Manual intersection turning-movement traffic counts were conducted from 7:00AM to 9:00AM, 11:30AM to 1:30PM, and 4:00PM to 6:00PM at nine (9) intersections in the study area on Tuesday and Wednesday, December 9 and 10, 1997. Counts were made for total traffic on Tuesday and trucks-only on Wednesday, with the latter broken down into two (2) truck classes: combination trucks and single-unit trucks. Figure 3-6 summarizes the total traffic volumes on a directional basis for the associated peak hour within each of the three (3) count periods. Figure 3-7 shows the same information for truck traffic. Additional detail for these intersection counts is provided in the Appendix. These truck volumes exceed the Hub Center reported values (Table 3-2 above) for AM and noon peak periods and are about the same for the PM rush hours.

Based on field observations and a review of the traffic volume patterns in the study area it was determined that the PM peak hour would be an appropriate basis for the traffic analysis and traffic evaluation of the project alternatives. Figures 3-8 and 3-9 present intersection turning movement volumes for total vehicles and for trucks, respectively, for this PM peak hour.

Figure 3-10 maps the percent heavy vehicle (trucks and buses) pattern for the PM peak hour directional

volumes. Bus volumes are discussed under "Transit and Nonmotorized Vehicles," below.<sup>4</sup> Table 3-3 provides vehicle classification volumes for representative locations for the PM peak hour (cars, buses, single-unit trucks, and combination trucks).

### 3.5 Transit and Nonmotorized Traffic

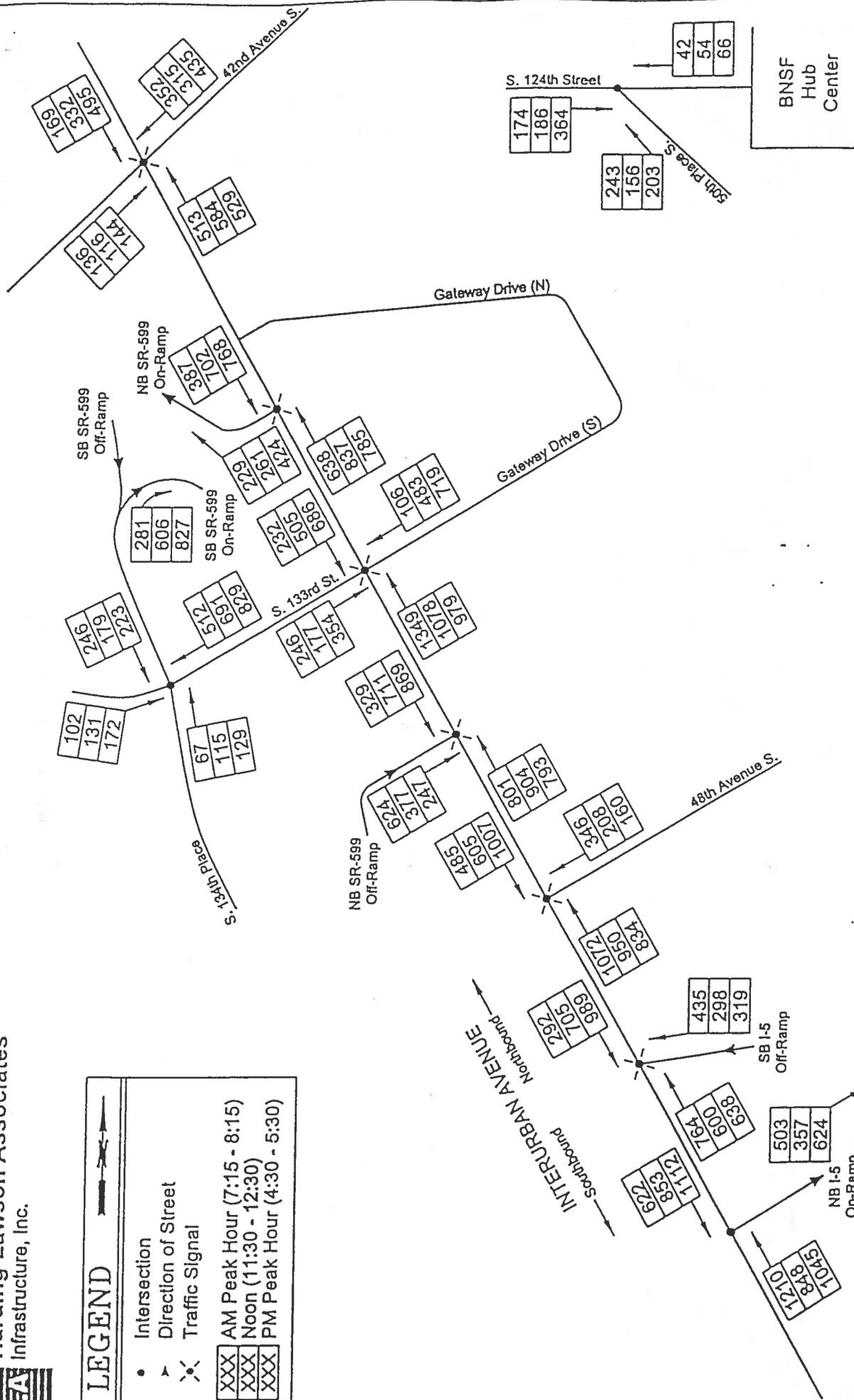
Figure 3-4 shows existing bus stops and the Tukwila Park-and-Ride lot location at 52nd/56th Avenue South. Four (4) Metro Transit bus routes use all or portions of the study area segment of Interurban Avenue, and three of those routes enter Gateway Drive (north) and traverse the Gateway Drive loop in a clockwise direction until 5:00PM. Forty-Second Avenue South has bus service east of Interurban Avenue. All of the study area freeway ramps are used by one or more active routes and/or by deadhead / positioning bus movements for the park-and-ride lot. (Metro Transit's south bus base is located about one (1) mile north, to the east of SR-599 at South 121st Street/East Marginal Way.)

<sup>4</sup> Minor variations in volume continuities between adjacent count intersections and in some of the truck percentages in this report are due to the presence of intervening driveways and whether the volumes in the particular depiction or database were continuity-balanced or not.

**LEGEND**

- Intersection
- Direction of Street
- ⊗ Traffic Signal

XXX	AM Peak Hour (7:15 - 8:15)
XXX	Noon (11:30 - 12:30)
XXX	PM Peak Hour (4:30 - 5:30)



1997 AM, Noon, PM  
Peak Hour  
Total Traffic Volume

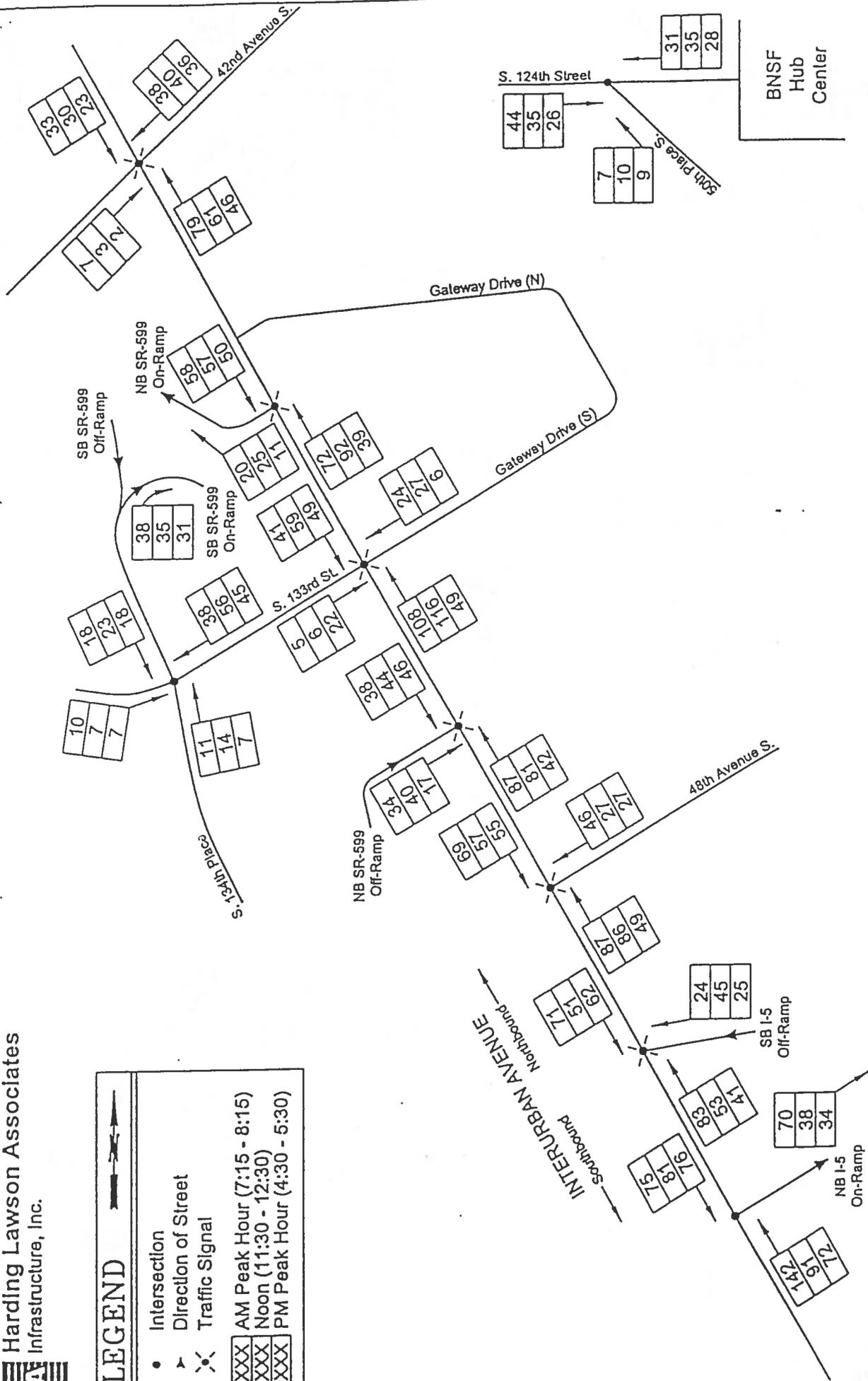
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**LEGEND**

- Intersection
- Direction of Street
- Traffic Signal
- XXX AM Peak Hour (7:15 - 8:15)
- XXX Noon (11:30 - 12:30)
- XXX PM Peak Hour (4:30 - 5:30)



1997 AM, Noon, PM  
Peak Hour  
Truck Traffic Volume

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Notes:  
 Existing Conditions  
 Balanced Traffic Network  
 Vehicle Type: All Passenger and Truck  
 Peak Hour: 4:50pm - 5:30pm (PM Peak)  
 Traffic Count Date: 12/9/97

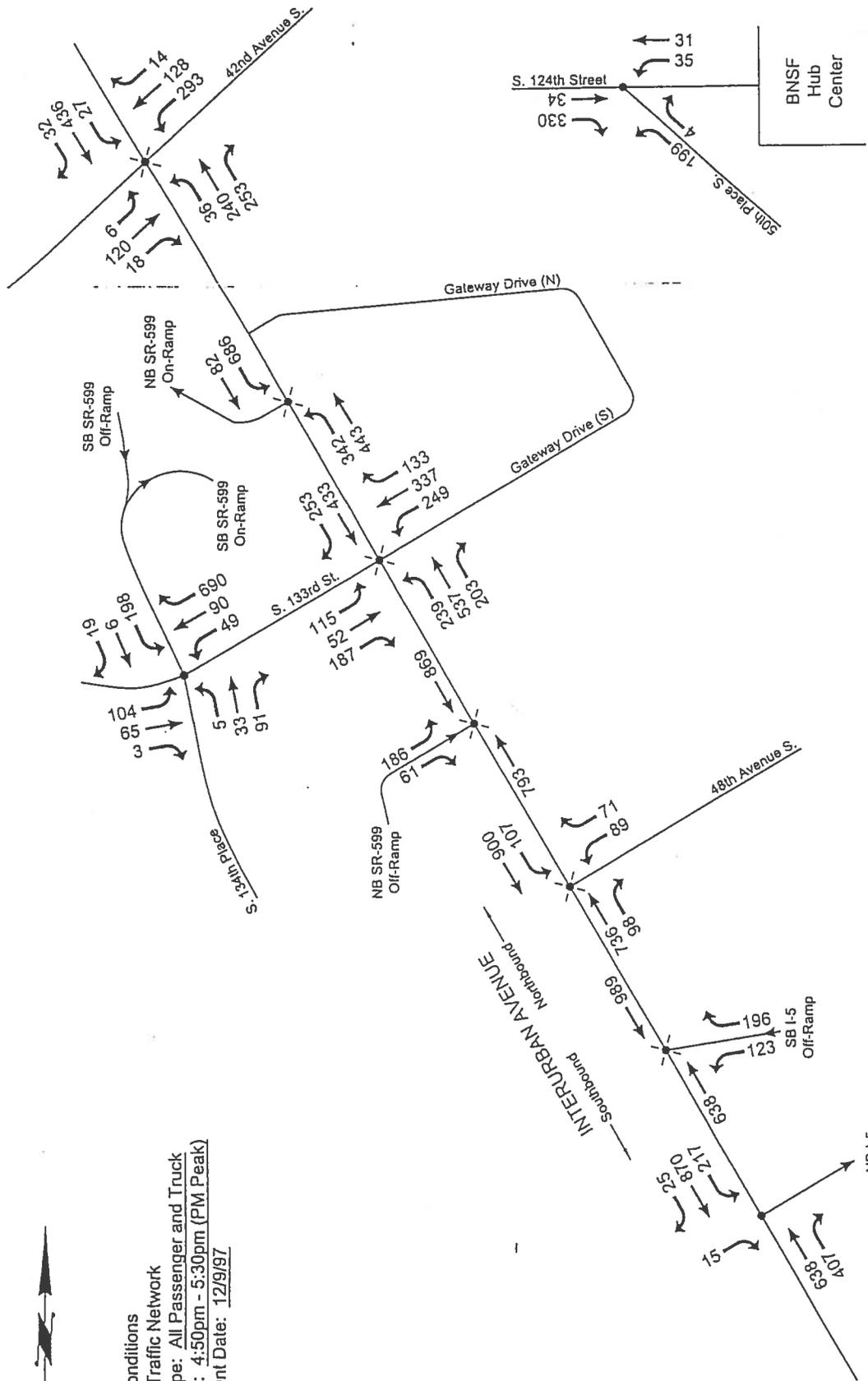
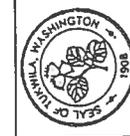


FIGURE 3-8  
 Page 3-12

1997 PM Peak Hour  
 Total Traffic Turning  
 Movement Volumes

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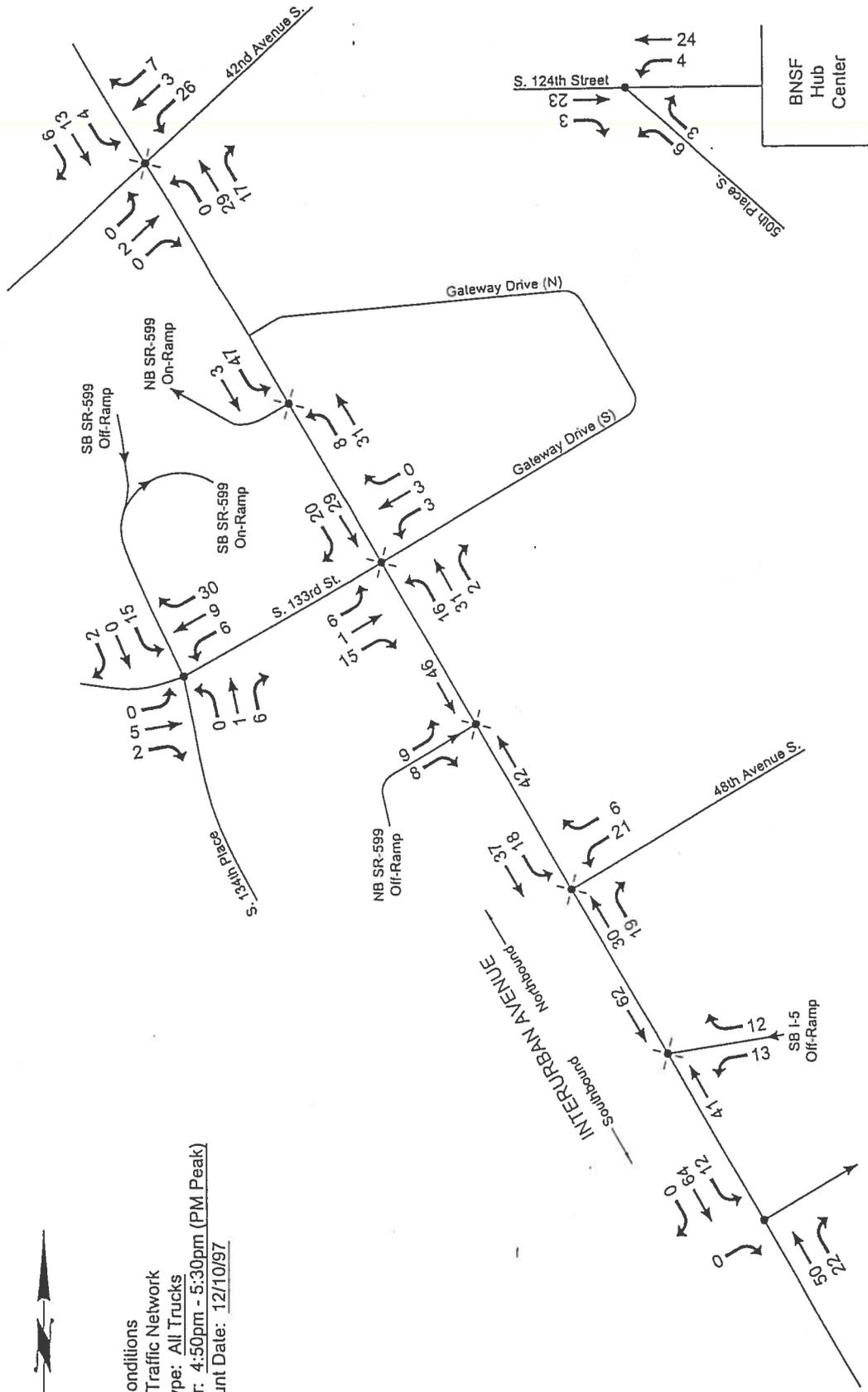


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Notes:  
 Existing Conditions  
 Balanced Traffic Network  
 Vehicle Type: All Trucks  
 Peak Hour: 4:50pm - 5:30pm (PM Peak)  
 Traffic Count Date: 12/10/97

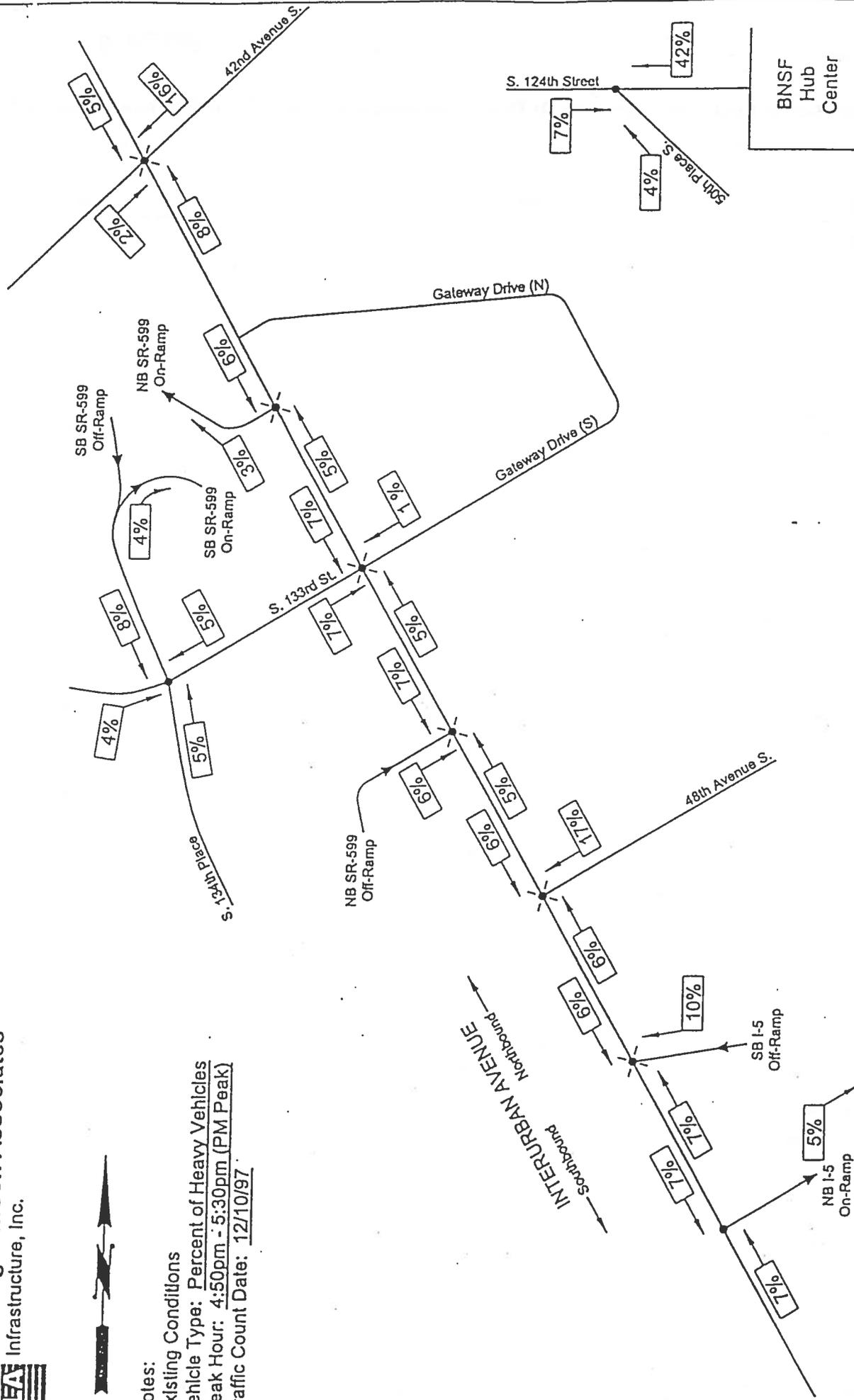


 <b>Harding Lawson Associates</b> Infrastructure, Inc.	 <b>CITY OF TUKWILA</b> PUBLIC WORKS DEPARTMENT	BURLINGTON NORTHERN SANTA FE HUB CENTER ACCESS STUDY	1997 PM Peak Hour Truck Traffic Turning Movement Volumes	FIGURE 3-9
				Page 3-13

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Notes:  
Existing Conditions  
Vehicle Type: Percent of Heavy Vehicles  
Peak Hour: 4:50pm - 5:30pm (PM Peak)  
Traffic Count Date: 12/10/97



1997 PM Peak Hour  
Percent Heavy Vehicles

BURLINGTON NORTHERN SANTA FE  
HUB CENTER ACCESS STUDY

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**Table 3-3 Vehicle Classification At Representative Locations for 1997 PM Peak Hour <sup>5</sup>**

Location	Vehicle Classification <sup>6</sup>	Vehicles	
		Number	Percent
42nd Avenue South east of Interurban Avenue	P	676	91.5
	B	4	0.5
	SU	25	3.4
	C	34	4.6
	Total	739	100.00
48th Avenue South east of Interurban Avenue	P	301	82.5
	B	—	—
	SU	24	6.6
	C	40	10.9
	Total	365	100.0
Gateway Drive (S) east of Interurban Avenue	P	896	98.4
	B	6	0.6
	SU	9	1.0
	C	—	—
	Total	911	10.0
I-5 Southbound Off-Ramp	P	222	86.4
	B	10	3.9
	SU	14	5.4
	C	11	4.3
	Total	257	100.0
South 133rd Street west of Interurban Avenue	P	1,076	94.5
	B	2	0.2
	SU	21	1.8
	C	40	3.5
	Total	1,139	100.0
Interurban Avenue south of Southbound I-5 Off-Ramp	P	1,716	92.6
	B	22	1.2
	SU	52	2.8
	C	64	3.4
	Total	1,854	100.0

**Table 3-3 Vehicle Classification At Representative Locations for 1997 PM Peak Hour<sup>5</sup>  
(Continued.)**

Location	Vehicle Classification <sup>6</sup>	Vehicles	
		Number	Percent
Interurban Avenue south of South 133rd Street	P	1,752	93.5
	B	25(7)	1.3
	SU	41	2.2
	C	55	3.0
	Total	1,873	100.0
Interurban Avenue north of South 133rd Street	P	1,270	91.8
	B	27	2.0
	SU	27	2.0
	C	59	4.2
	Total	1,383	100.0

<sup>5</sup> Passenger cars counted Tuesday, December 9; trucks counted Wednesday, December 10; bus volumes supplied by Metro Transit; no day-of-week or balancing adjustments made.

<sup>6</sup> P = Passenger cars  
B = Buses (in-service and out-of-service)  
SU = Single-unit trucks  
C = Combination trucks

<sup>7</sup> 23 of these bus movements are out-of-service originating from the SR 599 northbound off-ramp.

The heaviest in-service bus volumes are between the I-5 access ramps and southward (outside of the traffic study area). On Interurban Avenue, about 8 to 20 buses per hour use the area depending on direction and time of day (AM or PM peak hour). Lower bus volumes occur between I-5 and Gateway Drive (S), and the lowest peak volumes (1-2 per hour) occur north of Gateway Drive (S). Patronage of the bus stops north of the park-and-ride lot is low. Of additional importance for traffic operations on Interurban Avenue is the high volume of deadhead buses during the PM peak hour from the northbound SR-599 off-ramp northward: 23 such buses turn left from that ramp in the PM peak hour to join four (4) other northbound buses from the park-and-ride lot to exit the study area on Interurban northbound from 42nd Avenue South.

Pedestrian volumes observed in November and December 1997 along or crossing Interurban Avenue during peak hours were only a few per hour and appear to be generated mostly by the bus stops. This also

holds for the other study area streets. Larger pedestrian volumes are associated with the Interurban Trail along the Duwamish River (Figure 3-2 aerial) and are more associated with lunch time and after-hours/weekend recreational use, particularly during the mild and warm seasons.

### 3.6 BNSF Hub Center Traffic Generation

BNSF Hub Center truck traffic data was provided by the BNSF for trucks checking through the site gate on a typical fall weekday and weekend. The data excludes trucks that bypass the gate checkpoint, including delivery trucks, vendor trucks, and some of the trucks from a site tenant (Conex Company). The data includes only semi-trailer/combo trucks. Tractor ("bobtail") movements and other single-unit truck movements are excluded. Table 3-2 shows the gate checkpoint hour-by-hour tally for a typical fall weekday. The average hourly two-way volume is 39

trucks (943/24). Volume peaks during the late morning-noon-early afternoon hours (67 trucks/hour), but volume is also seen to be continuously heavy (about 50 trucks/hour) for most of the period from 9:00AM to 5:00PM. Table 3-4 compares weekday and weekend gate-check volumes, and Table 3-5 shows monthly volume pattern.

**Table 3-4 BNSF Hub Center Gate-Counted/Check-In Semi-Trailer Truck Daily Volume for Weekday and Weekend**

Weekday	In	Out	Total	Total as Percent of Weekday
Tuesday, 9/30/97	450	493	943	100%
Saturday, 10/18/97	204	158	362	38%
Sunday, 10/19/97	95	165	260	28%

**Table 3-5 Monthly Variation in BNSF Hub Center Gate-Counted Semi-Trailer Truck Volume**

Month, Year	Volume (veh.)
October, 1996	22,380
November, 1996	17,241
December, 1996	17,634
January, 1997	20,768
February, 1997	19,592
March, 1997	20,403
April, 1997	19,424
May, 1997	20,233
June, 1997	20,202

A six-hour traffic count conducted by HLA at the South 124th Street/50th Place South intersection provides more complete data on Hub Center traffic volumes. The results are summarized in Table 3-6. (Note that the data may include a small amount of traffic generated by the few residences to the east of 50th Place South.) Table 3-7 summarizes vehicle classification for the six hours in aggregate. Trucks accounted for 67 percent of

the volume; and of the 390 trucks counted, nearly two-thirds (250) were combination vehicles (nearly all being semi-trailer trucks).

### 3.7 Traffic Operations - Field Studies

Traffic operations along the study area segments of Interurban Avenue and South 133rd Street were assessed in mid-November 1997 by drive-through runs and on-foot observations from 6:30AM to 10:00AM, 11:30AM to 2:00PM, and 4:00PM to 6:00PM. Each of the analysis intersections were observed for 5-10 minutes several times at intervals during these periods along with driveway operations and other spot observations on Gateway Drive and 48th Avenue South. Spot traffic observations were also made at various times throughout the day over the period from August 1997 to January 1998 (the last month included field checking of signal phase and cycle lengths).

Operations at the signalized intersections were observed for traffic flow performance in terms of percent utilization of green phase, cycle length, delays, approach lane storage adequacy, conflict problems, right-turn-on-red and other traffic flow elements. This provided an important real-time visual assessment of overall flow performance, hazard assessment, and approximate level of service. This together with observations at driveways and drive-along runs revealed the following:

- Level of service is C or better at all locations (and B at most) with occasional borderline C/D flow at the Interurban/Gateway/133rd intersection.
- The signal system is well-timed for efficient, coordinated flow. Through traffic receives excellent progressive ("green band") treatment.
- Storage capacity is occasionally reached at the following key short storage-length segments of northbound Interurban Avenue:
  1. Between the I-5 access ramps: AM peak hour

**Table 3-6 BNSF Hub Center Rush Hours and Noon Hours Total Traffic Volume <sup>8</sup>**

		Inbound to BNSF Yard	Outbound From BNSF Yard	Total
8:00 AM	Trucks	38	27	65
	Cars	19	16	35
	<i>Total</i>	<i>57</i>	<i>43</i>	<i>100</i>
9:00 AM	Trucks	37	43	80
	Cars	14	6	20
	<i>Total</i>	<i>51</i>	<i>49</i>	<i>100</i>
12:30 PM	Trucks	27	35	62
	Cars	20	19	39
	<i>Total</i>	<i>47</i>	<i>54</i>	<i>101</i>
1:30 PM	Trucks	49	41	90
	Cars	17	16	33
	<i>Total</i>	<i>66</i>	<i>57</i>	<i>122</i>
5:00 PM	Trucks	28	28	56
	Cars	13	22	35
	<i>Total</i>	<i>41</i>	<i>50</i>	<i>91</i>
6:00 PM	Trucks	20	17	37
	Cars	13	21	34
	<i>Total</i>	<i>33</i>	<i>38</i>	<i>71</i>

<sup>8</sup> HLA count Wednesday, December 10, 1997. Volume is for South 124th Street east of 50th Place South and therefore may include a small amount of traffic generated by a few residences located to the east of 50th Place South.

**Table 3-7 Vehicle Classification for Hub Center Rush Hour Traffic <sup>9</sup>**

	Vehicles	
	Number	Percent
Cars	196	33%
Trucks		
Semi-trailers/combination	250	43%
Single-unit	140	24%
Total Trucks	390	67%
<i>Total Vehicles</i>	<i>586</i>	<i>100%</i>

<sup>9</sup> Reference Table 3-5. Total 2-way vehicles for 6 hours (7-9 AM, 11:30 AM-1:30 PM, 4-6 PM) for Wednesday, December 10, 1997. Data is for South 124th Street east of 50th Place South, and therefore may include a small amount of traffic generated by residences located to the east of 50th Place South.

2. The double left-turn lane between the SR 599 northbound off-ramp and Gateway Drive-133rd Street: AM peak hour
3. The northbound through lanes at location 2, above: AM and PM peak hour
4. The northbound left-turn lane to the SR-599 northbound on-ramp: PM peak hour

Operational breakdowns do not occur owing to the otherwise favorable geometry of the roadway/signal system and the highly efficient and responsive signal system.

- For southbound Interurban Avenue, the storage capacity of the uncontrolled left-turn movement to the northbound I-5 on-ramp is occasionally reached during the AM peak hour, but it clears quickly due to gaps generated by the signal at 52nd Avenue and no disruption occurs for southbound through-flow.
- The northbound SR-599 off-ramp traffic frequently queues back to within 300 feet of the ramp gore, but vehicles do not have to wait more than one cycle to clear the signalized intersection. Left-turning trailer trucks occasionally straddle both lanes of the south ends of the two-lane left-turn lane group (to westbound 133rd Street) or the two-lane northbound Interurban through-lane group.
- Good coordination of the southbound I-5 off-ramp movement to northbound Interurban Avenue and from 48th Avenue South to southbound Interurban Avenue exists so that those vehicles clear the adjacent signal without being trapped in these short segments (these two intersections are controlled as one intersection in this regard).
- Combination trucks turning into eastbound 48th Avenue South from both directions on Interurban Avenue encroach of the westbound left-turn lane on 48th Avenue South and also on the southeast corner curb. The radii and throat width for the 48th Avenue South exit lane (eastbound) are substandard for turns by medium and large trucks.
- The No-Left-Turn prohibition for southbound Interurban to Gateway (south) is critical in

enabling that intersection and the closely adjacent SR 599 ramp intersections to operate adequately.

### 3.8 Level of Service

Level of service (LOS) for intersections was determined using HCS-94 software, which is based on the *Highway Capacity Manual*, together with *TRANSYT-7F* software to represent the coordinated signal system along Interurban Avenue under an optimum signal cycle basis. Intersection delay calculated from the *TRANSYT-7F* analysis was converted to delay consistent with the *Highway Capacity Manual* level of service definitions by dividing by 1.3.

Figure 3-11 shows the level of service for the current PM peak hour traffic volumes. These calculated LOS values show close agreement with the "visual" assessment of LOS made during site visits.

### 3.9 Traffic Accidents

Study of the impacts of traffic accidents was outside the scope of this study. This information is better suited for discussion in the detailed design report.

### 3.10 Planned and Programmed Improvements

Planned and programmed transportation facility and service improvements in the project study area having potential near medium term impact on the study area traffic and transportation are:

- Ramp metering controls and a second ramp lane for an HOV bypass lane have been constructed on the northbound I-5 on-ramp from Interurban Avenue, but have not been placed in operation.
- The City of Tukwila 6-Year Transportation Improvement Program (TIP) includes signalization.
- Drainage, and crosswalk improvements for the southbound SR-599 ramps/South 133rd Street intersection for the period 2000-2002.

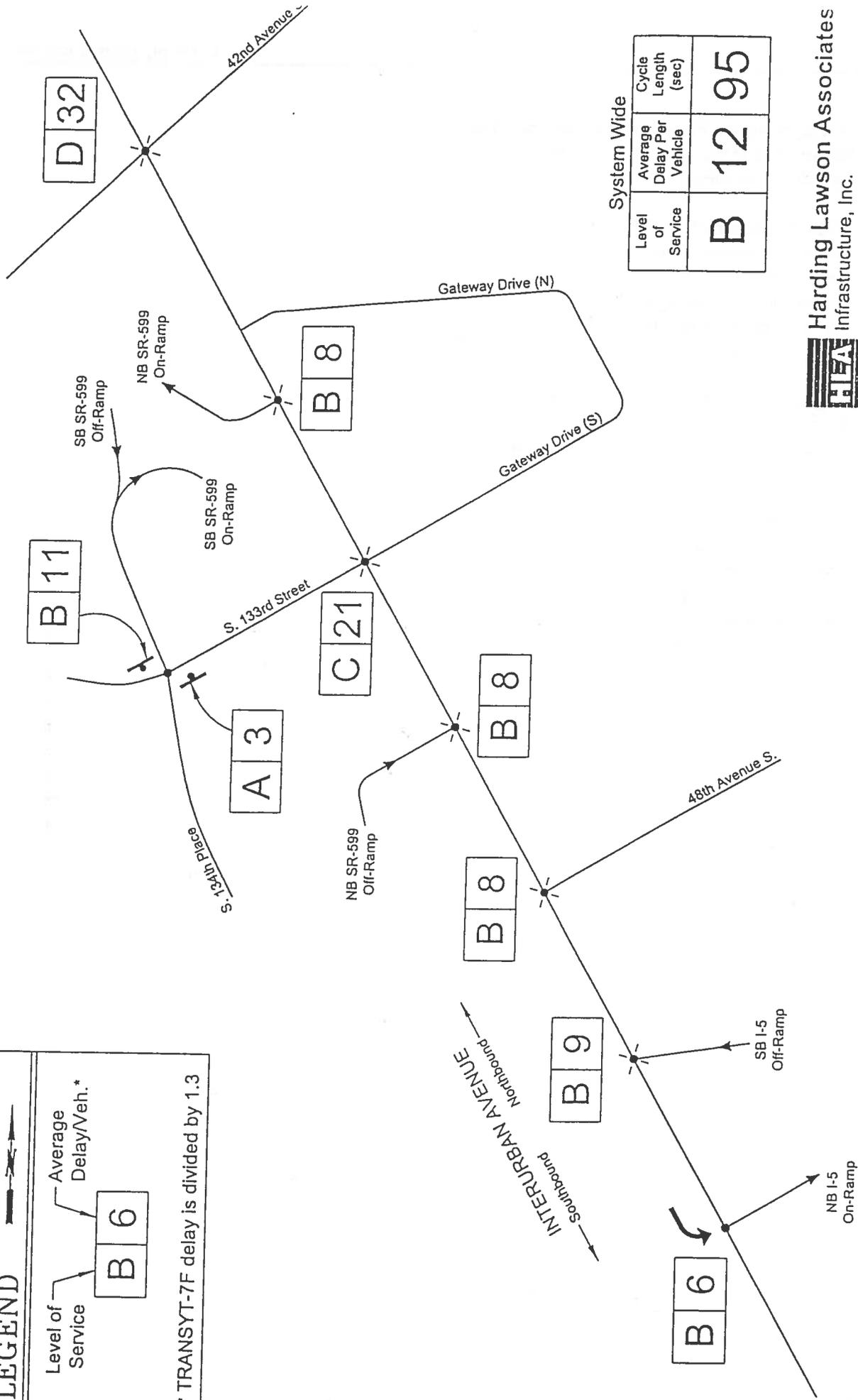
The "missing link" in the Interurban Trail has been constructed between the trails present terminus at 48th

**LEGEND**

Level of Service: **B 6**

Average Delay/Veh.\*: **6**

\* TRANSYT-7F delay is divided by 1.3



System Wide

Level of Service	Average Delay Per Vehicle	Cycle Length (sec)
<b>B</b>	<b>12</b>	<b>95</b>



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HUB CENTER ACCESS STUDY

1997 PM Peak Hour  
Level of Service

FIGURE 3-11  
Page 3-2C

Avenue South and the adjacent trail segment along the west side of Interurban Avenue running south from the I-5 on-ramp.

- When the Regional Transit Authority (RTA) commences commuter rail service circa 2001, Metro Transit will shift some of the transit routes now serving the Tukwila park-and-ride to the proposed commuter rail station at South 180th Street, thus reducing bus volumes in the study area.
- RTA is commencing design study of several alignment alternatives for its light rail service to SeaTac station. One of the alternatives is via Interurban Avenue south of the Interurban/East Marginal Way intersection. At this time it is believed that the west side of Interurban Avenue (in or adjacent to the SR-599 right-of-way) is the more likely alignment location in connection with the Interurban route alternative. The light rail system will open in phased segments with the earliest phases circa 2006.

## 4.0 ROADWAY AND BRIDGE DESIGN CRITERIA

### 4.1 Roadways

The roadway design criteria for the primary build alternatives are consistent with the requirements of the vehicles used to transport intermodal cargo. In the design of the roadway facilities, the following criteria were used:

- The design vehicle is an AASHTO WB50,
- the design speed is 35 mph,
- the minimum radius of curvature is 300 feet,
- the minimum lane width is 12 feet,
- the maximum grade is four (4) percent, and
- the sidewalk minimum width is five (5) feet.

The Interurban Trail will be impacted under two (2) of the alternative, the 48th Avenue Alternative and the Gateway Drive Alternative. Safe passage and access to the Trail under each of these alternatives will be maintained.

### 4.2 Bridges

For the bridges, a minimum freeboard of 3.5 feet above high water mark and a minimum vertical clearance of 16.5 feet for grade separation is maintained.

## 5.0 DISCUSSION OF STUDY ALTERNATIVES

### 5.1 Study Alternatives

#### 5.1.1 48th Avenue Alternative

##### 5.1.1.1 Preliminary Design Concept

###### Overview

This alternative accesses the BNSF Hub Center at the south end of the facility via a new route from Interurban Avenue along 48th Avenue South. From 48th Avenue South, traffic would cross a new bridge over the Duwamish River; then proceed across 130th Place South via a new intersection; then under the South 129th Street bridge and into the BNSF Hub Center. All traffic would access this route from Interurban Avenue except for traffic exiting from southbound I-5. This traffic would access 48th Avenue South directly from the I-5 off-ramp via a new bypass. A conceptual plan of the route is shown on Figure 5-1. The new bypass is shown on Figure 5-2.

The proposed bridge, shown in Figure 5-3, is a single-span girder structure with a cast-in-place concrete deck. A single span was chosen to keep any portion of the bridge substructure out of the Duwamish River when at flood stage, thereby not increasing the backwater effect upstream of the bridge. This design feature causes the bridge span to be approximately 180 feet long. The minimum design vertical clearance between the soffit of the bridge girders and the predicted 100-year flood elevation of the Duwamish River is set at four (4) feet.

A reinforced concrete approach slab spans the Interurban Trail on the west end of the structure, providing a short span bridge to accommodate the trail width of ten (10) feet. This approach slab is supported by the bridge pier at the river's edge and by the fill for the approach embankment retaining walls. These retaining walls on the west end are required to keep the bridge approach embankment within the right-of-way. The east side approach is an earth embankment with wing walls attached to the bridge abutment. Retaining walls are not required on this end of the structure.

No embankment fill or rip-rap encroaches into the river.

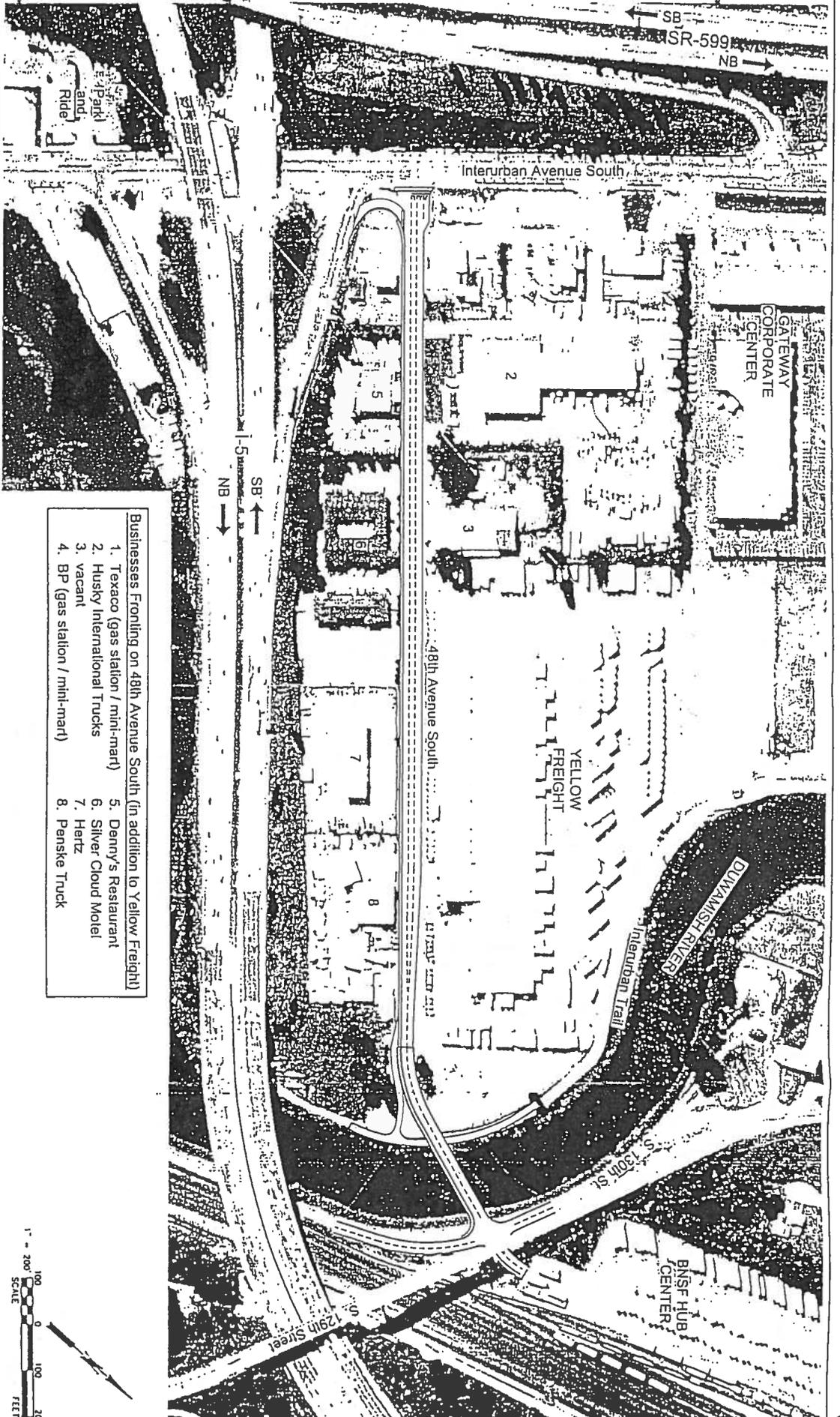
### Roadways

Under this alternative, the following roadway modifications would be undertaken:

- Between Interurban Avenue and the existing BP gas station a new bypass would be constructed off of the southbound I-5 off-ramp. This bypass would be 20 feet wide with a minimum turning radius of 62 feet.
- 48th Avenue South from Interurban Avenue to the new bridge approach would be widened to the south to accommodate a three-lane roadway with a six-foot sidewalk located on the south side. The traveled way would consist of two (2), 14-foot wide uni-directional lanes and one (1), 12-foot bi-directional turning lane.
- 48th Avenue South's intersection with Interurban Avenue would be modified to consist of a left-turn-only lane, a lane turning left and right, a right-turn-only lane. (The crosswalk and ADA facilities of the intersection would also be modified to fit the new changes.)
- The roadway on top of the bridge deck would be 26 feet wide with a six-foot sidewalk on the south side. The traveled way would consist of two (2), 13-foot wide uni-directional lanes. Traffic barriers would be provided on both sides of the bridge with 4'-6" high BP railing to accommodate the safety needs of bicyclists.

The existing alignment of 130th Place South would shift to the north to accommodate the new intersection with the 48th Avenue extension. This intersection would most likely be controlled with a four-way stop. Further traffic analysis in a detailed design report is needed to study the impacts at this intersection.

The existing Interurban trail is realigned to cross under the new bridge structure as well as provide an at-grade crossing of 48th Avenue South in the event that the Duwamish River floods the trail. ADA access from 48th Avenue South is also provided from the south side of the street.



- Businesses Fronting on 48th Avenue South (in addition to Yellow Freight)
1. Texaco (gas station / mini-mart)
  2. Husky International Trucks
  3. vacant
  4. BP (gas station / mini-mart)
  5. Denny's Restaurant
  6. Silver Cloud Motel
  7. Hertz
  8. Penske Truck



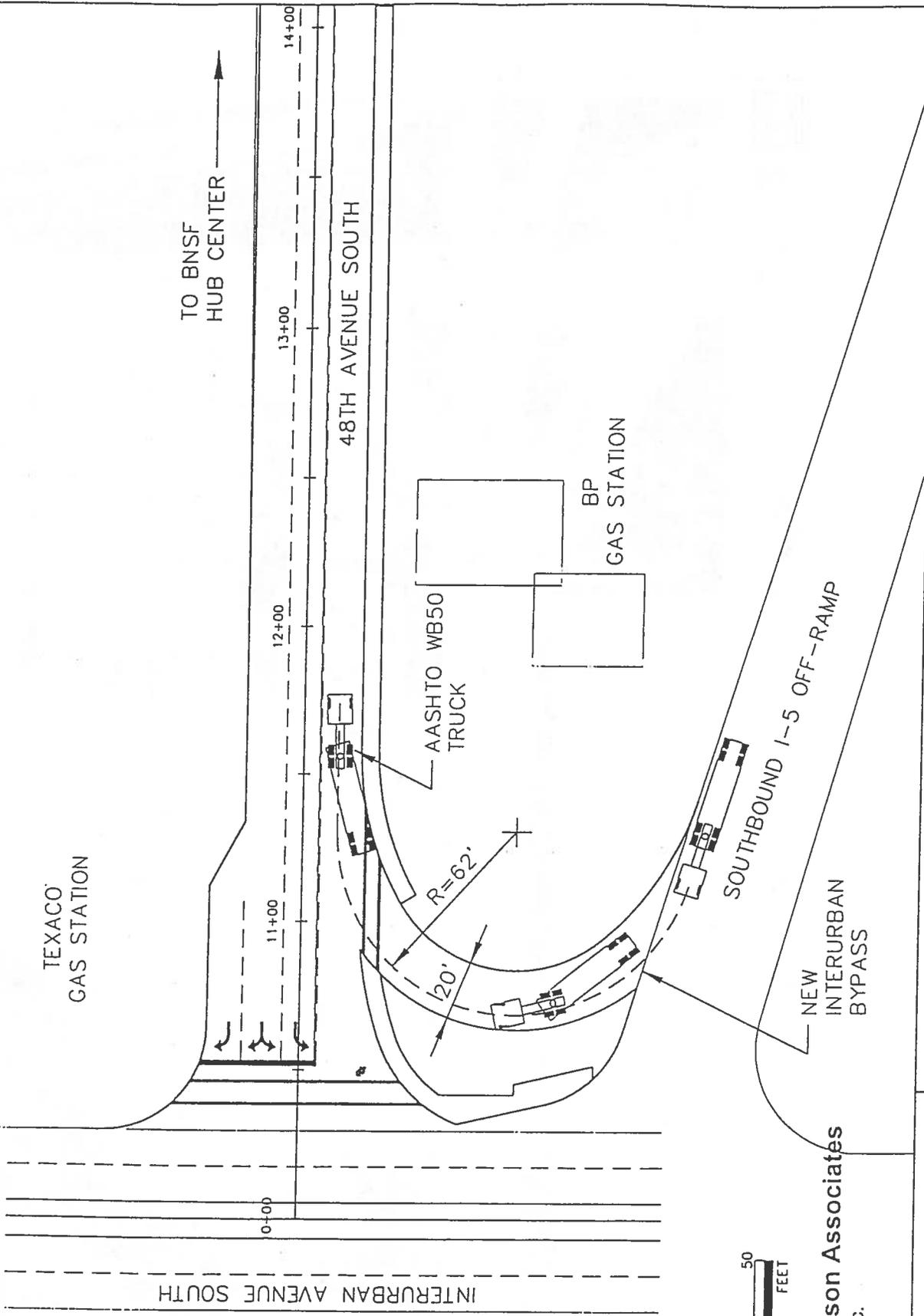
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**48th Avenue Alternative**  
 Aerial

**FIGURE**  
 5-1  
 Page  
 5-2



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**BURLINGTON NORTHERN SANTA FE**  
HUB CENTER ACCESS STUDY

**48th Avenue Alternative**  
Interurban Avenue Bypass

FIGURE 5-2  
Page 5-3



## Bridge

Only one (1) superstructure alternative has been investigated in this initial study. It is a simple span girder requiring no falsework within the Duwamish River. This study will give the client a budget cost that can be refined at a later stage of design, when a steel superstructure could also be reviewed and the present concrete design further refined to provide more accurate construction costs. In addition, due to our previous experience on similar crossings of the Duwamish River and other water crossings, we have only investigated the cost of installing drilled shafts for the substructure; thereby eliminating driven piles, cofferdams, and expensive concrete seals. These latter type of foundations tend to be 30 percent more expensive than drilled shafts and cause potential problems associated with working in the river (i.e. working within a fish window). For this reason, we did not investigate these foundations. If desired, analysis of these foundations can be studied in a detailed design report.

## Foundations

We have located the foundations outside of the 100-year floodway, thus they can be installed in the dry and outside of the river channel. Essentially, we have looked at eight-foot diameter drilled shafts extending 100 feet below the mudline. On the bridge spanning the Green (Duwamish) River north of South 212th Street in Kent, we have experienced drilled shafts of 90 to 120 feet in depth. These shafts have encountered some obstructions caused by buried logs resulting from mudflows thousands of years ago from Mount Rainier. Owing to similar site conditions observed at the 48th Avenue site, 100-foot long drilled shafts can reasonably be expected. From our previous experience on river crossings and especially over the Green (Duwamish) River, these shafts will require temporary steel caissons for the installation of the shafts. The top part of these caissons may have to be left in place due to the proximity to the river and the caving problems that may occur if they are withdrawn too soon. When we have better soils information, we will be able to refine the design to better fit the site. A depth of 100 feet may appear excessive at this time, but it may be entirely justified when the physical geology of the site is determined. Good soils information is essential to the successful design and construction of these foundations.

There are three (3) drilled shaft contractors in the Puget Sound region. Two (2) of them can install shafts ten (10) feet in diameter, while the other can only drill up to six (6) feet in diameter. One (1) of the contractors can install shafts twelve (12) feet in diameter up to 120 feet deep.

## Superstructure

Due to the span requirements dictated by a "zero" backwater criteria, a span of approximately 180 feet is required. Until recently this would have ruled out a precast, prestressed concrete girder. However, there is now available a new series of girders based on metric dimensions and that can span up to 200 feet. They are considerably deeper than the largest current Washington State Department of Transportation (WSDOT) Standard girders and are approved by WSDOT. We essentially have two (2) new girders available. They are designated W2100MG and W2400MG and are 2.1 meters and 2.4 meters deep, respectively. We are considering using the latter girder for this crossing. Each girder can be provided in a one-piece span or segmented and then post-tensioned together. The longest girder that can be transported is 172 feet long and weighs 200 kips. We are assured by Concrete Technology Corporation and Van Dyke Trucking that they can build and transport this girder in a single piece.

The W2100MG girder will be used on the South 274th Street Corridor bridge in Kent later this year, and the W2400MG girder will be used for a bridge in Mount Vernon in 1999.

For this alternative, we will need four (4) girders for the Duwamish River crossing. A cast-in-place concrete slab with transverse reinforcing steel will be standard for the deck.

Due to the length of the bridge (under 250 feet), no expansion joints will be needed.

## Retaining Walls

Retaining walls are only required on the west side of the bridge for the west approaches. These are approximately 100 feet long in plan length. Fill will be placed between these walls, compacted and topped off with a regular pavement section. Since the majority of the wall is 10 and under in height, the most economical

type of wall will probably be a reinforced concrete cantilever. Mechanically Stabilized Earth (MSE) walls tend to be more economical when the wall is over ten (10) feet in height and no significant excavation is needed to place the footings. At the edge of the Interurban Trail, the retaining wall is about 15 feet in height due in part to the trail and the bridge abutment footings. This higher section of wall is only 35 feet in plan length.

### 5.1.1.2 Existing Conditions

Currently 48th Avenue South consists of a two-lane road, which terminates at the Interurban Trail. Six automobile parking stalls exist near the trail access for trail users. This street currently serves several businesses, including Yellow Freight, Penske Trucks, Hertz Rental, two gas stations (BP and Texaco), and the Silver Cloud Motel.

## 5.1.2 Gateway Drive Alternative

### 5.1.2.1 Preliminary Design Concept

#### Overview

This alternative accesses the BNSF Hub Center at the south end of the facility via a new route from Interurban Avenue along Gateway Drive (S). From Gateway Drive, traffic would cross the Duwamish River over a new bridge; then proceed across 50th Place South via a new intersection and into the BNSF Hub Center. Figure 5-4 shows a conceptual plan of this alternative.

The proposed bridge span, shown in in Figure 5-5, is a two-span girder structure with a cast-in-place concrete deck continuous for live load over the center pier. This span is designed is to keep any portion of the abutments out of the river during flooding events. However, the center pier will be submerged at flood stage and will cause a minor backwater effect. Each span of the new structure will be approximately of 170 feet long. The minimum design vertical clearance between the soffit of the bridge girders and the predicted 100-year flood elevation of the Duwamish River is set at four (4) feet.

On the west end of the bridge, a reinforced concrete approach slab will span the Interurban Trail, providing a short span bridge to accommodate the trail width of ten (10) feet. This approach slab will be supported by the

bridge pier at the river's edge and by the fill for the approach embankment retaining walls. On the west side of the river, approach retaining walls are needed to keep the approaches within the right-of-way. The east side approach is an earth embankment wing walls attached to the bridge abutment. No retaining walls are required on this side of the bridge.

No embankment fill or rip-rap encroaches into the river.

### Roadways

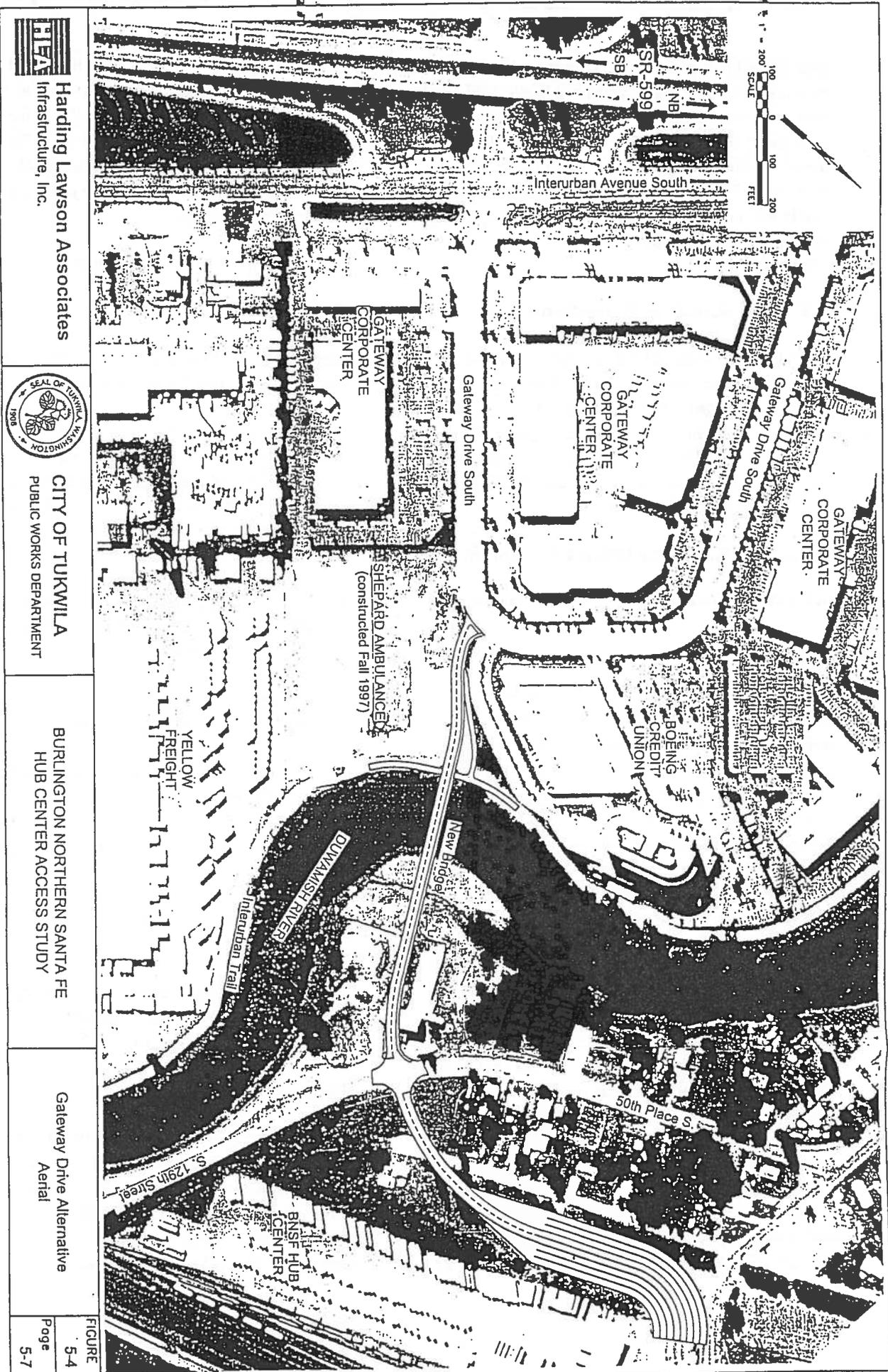
Under this alternative, the following roadway modifications would be undertaken:

- A new access (intersection) would be created off of Gateway Drive (S) just as it turns to the west to meet Gateway Drive (N). This access would be located between the existing Boeing Credit Union driveway and the new Shepard Ambulance building.
- The new access roadway from the new intersection at Gateway Drive (S) to the new intersection with 50th Place South would be 24 feet wide with a six-foot sidewalk located on the west side of the roadway. The traveled way would accommodate two (2), 12-foot wide uni-directional lanes.
- The roadway over the new bridge structure would be consistent with the rest of the roadway and provide traffic barriers on both sides of the bridge with 4'-6" high BP railing to accommodate the safety needs of bicyclists.
- The new intersection with 50th Place South would probably be controlled as a four-way stop.

The existing Interurban trail would be realigned to cross under the bridge. An access from Gateway Drive would be provided from the west side of the street.

### Bridge

Only one (1) superstructure alternative has been investigated in this initial study. It is a two (2) span girder bridge requiring no falsework in the Duwamish River. This study will give the client a budget cost that can be refined at a later stage of design, when a steel superstructure could also be reviewed and the present



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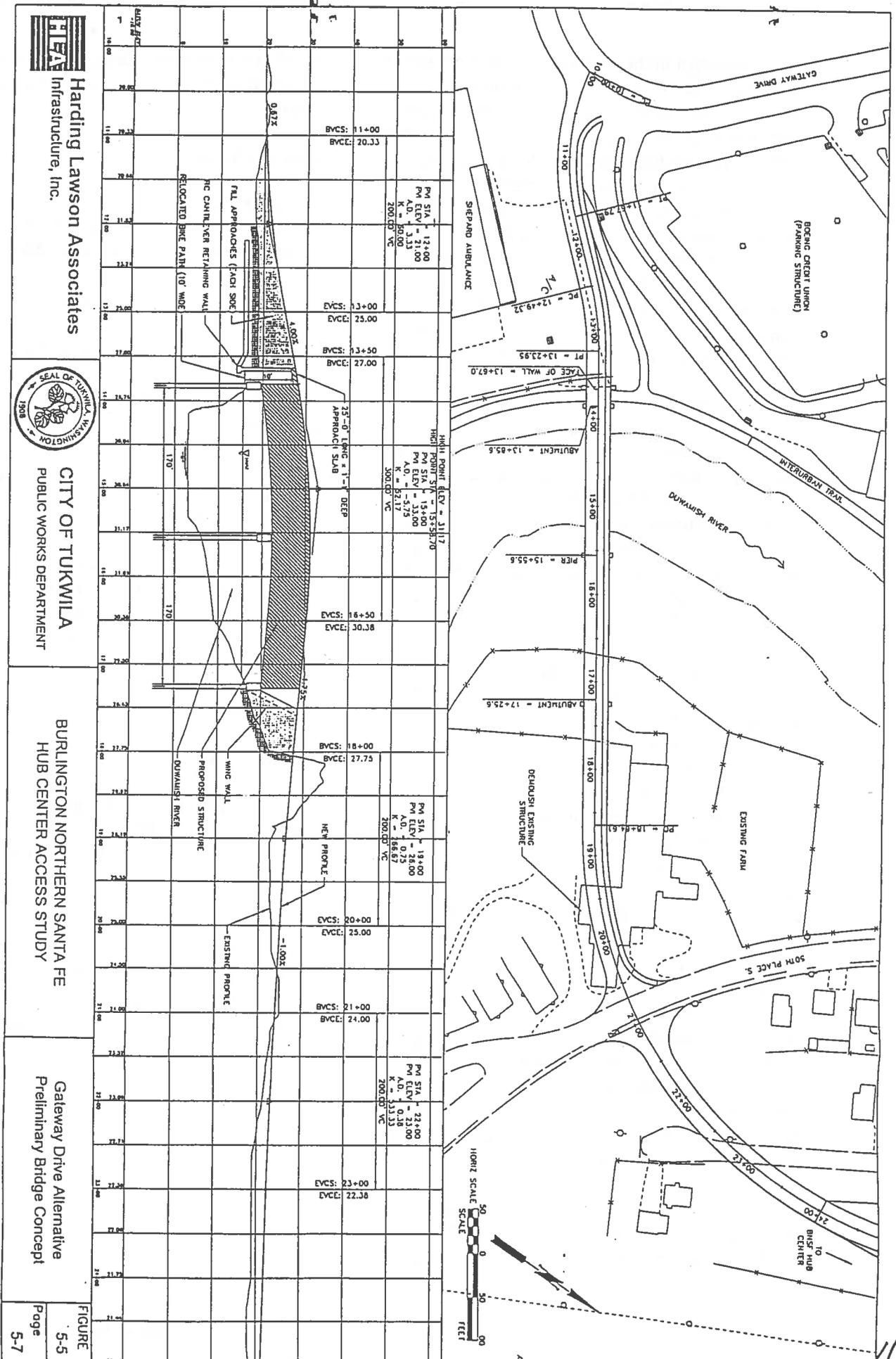


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BURLINGTON NORTHERN SANTA FE  
HUB CENTER ACCESS STUDY

Gateway Drive Alternative  
Aerial

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Gateway Drive Alternative  
Preliminary Bridge Concept

concrete design further refined to provide more accurate construction costs. In addition, due to our previous experience on similar crossings of the Duwamish River and other water crossings, we have only investigated the cost of installing drilled shafts for the substructure; thereby eliminating driven piles, cofferdams, and expensive concrete seals. These latter type of foundations tend to be 30 percent more expensive than drilled shafts and cause potential problems associated with working in the river (i.e. working within a fish window). For this reason, we did not investigate these foundations. If desired, analysis of these foundations can be studied in a detailed design report.

### **Foundations**

We have located the foundations outside of the 100-year floodway, thus they can be installed in the dry and outside of the river channel. Essentially, we have looked at eight-foot diameter drilled shafts extending 100 feet below the mudline. On the bridge spanning the Green (Duwamish) River north of South 212th Street in Kent, we have experienced drilled shafts of 90 to 120 feet in depth. These shafts have encountered some obstructions caused by buried logs resulting from mudflows thousands of years ago from Mount Rainier. Owing to similar site conditions observed at the 48th Avenue site, 100-foot long drilled shafts can reasonably be expected at this site. From our previous experience on river crossings and especially over the Green (Duwamish) River, these shafts will require temporary steel caissons for the installation of the shafts. The top part of these caissons may have to be left in place due to the proximity to the river and the caving problems that may occur if they are withdrawn too soon. For the center pier, the joint between the column and the shaft can be set a little below ground level and a cast-in-place column poured above and contiguous with the shaft. This column(s) would be viewed by the public from the from the adjacent Interurban Trail. When we have better soils information, we will be able to refine the design to better fit the site. A depth of 100 feet may appear excessive at this time, but it may be entirely justified when the physical geology of the site is determined. Good soils information is essential to the successful design and construction of these foundations.

There are three (3) drilled shaft contractors in the Puget Sound region. Two (2) of them can install shafts ten (10) feet in diameter, while the other can only drill up to

six (6) feet in diameter. One (1) of the contractors can install shafts twelve (12) feet in diameter and up to 120 feet deep.

### **Superstructure**

Due to the span requirements dictated by a "zero" backwater criteria, two (2) spans of 170 feet are needed. We are considering using the W2400MG girder for this crossing. They can be provided in a one-piece segment or multiple segments that can be post-tensioned together. The longest girder that can be transported is 172 feet long and weighs 200 kips. We are assured by Concrete Technology Corporation and Van Dyke Trucking that they can build and transport this girder in a single piece.

For this alternative, we will need four (4) girders per span, each approximately 162 feet long for the Duwamish River crossing.

A cast-in-place concrete slab with transverse reinforcing steel will be the standard deck. Longitudinal reinforcing steel will be placed in the deck over the center pier to take account of continuity for live load.

Due to the length of the bridge (over 250 feet), an expansion joint will be needed at one (1) end only.

### **Retaining Walls**

Retaining walls are only required on the west side of the bridge for the west approaches. These are approximately 150 feet long in plan length. Fill will be placed between these walls, compacted and topped off with a regular pavement section. Since the majority of the wall is ten (10) feet and under in height, the most economical type of wall will probably be a reinforced concrete cantilever. Mechanically Stabilized Earth (MSE) walls tend to be more economical when the wall is over ten (10) feet in height and no significant excavation is needed to place the footings. At the edge of the Interurban Trail, the retaining wall is about 15 feet in height due in part to the trail and the bridge abutment footings. This higher section of wall is only 35 feet in plan length.

**5.1.2.2 Existing Conditions**

Currently Gateway Drive is a four-lane collector loop serving the businesses of the Gateway Corporate Center, located on both sides of the road. Currently, there is not access to the Interurban Trail from the Gateway Drive.

The property in the area of the east bridge approach currently contains a barn structure.

**5.1.3 East Marginal Way Alternative**

All of the information contained in this section has been referenced directly from the "Report for South Seattle Yard Improvement; Tukwila, Washington; Prepared for Burlington Northern Santa Fe Railway Company" prepared by Hanson Wilson Incorporated in September 1997.

The East Marginal Way Alternative selected for this study is "Alternative 4" in the Hanson Wilson report.

**5.1.3.1 Preliminary Design Concept**

This alternative, shown in Figure 5-6 <sup>10</sup>, would access the BNSF Hub Center from the northwest corner from East Marginal Way South. The proposed entrance would be located opposite of 112th Street South at East Marginal Way South and would be routed adjacent to the Seattle City Light right-of-way.

Property and buildings along this route would have to be acquired for this alternative, and building demolition would be required to construct the entrance roadway. Tree removal and brush clearing will be minimal. There will be no rock excavation involved, but some earthwork will be necessary since the difference in elevation between the Hub Center and the tract of land directly to the west is about six (6) feet.

**5.1.3.2 Existing Conditions**

**Land Use**

The land use patterns in the City of Tukwila are split between commercial, light industrial manufacturing and heavy industrial manufacturing. The land directly north

of this alternative is zoned Manufacturing Industrial Center / Heavy (MIC/H); the land south of the this route is zone both Manufacturing Industrial Center / Light (MIC/L) and Low Density Residential.

**Streets and Highways**

Based on the guidelines prepared by the U.S. Federal Highway Administration (FHWA), the following classifications of streets and highways exist in the area of this alternative:

- Freeways and Expressways: Interstate 5
- Major Arterials: Boeing Access Road
- Minor Arterials: Airport Way South and East Marginal Way South
- Collectors: Interurban Avenue
- Local Streets: All streets in Allentown except for South 124th Street and South 112th Street

**Traffic Patterns**

As this area is zoned MIC/H, all of the major access routes leading to this alternative's route support high volumes of heavy truck traffic as well as passenger and light truck traffic.

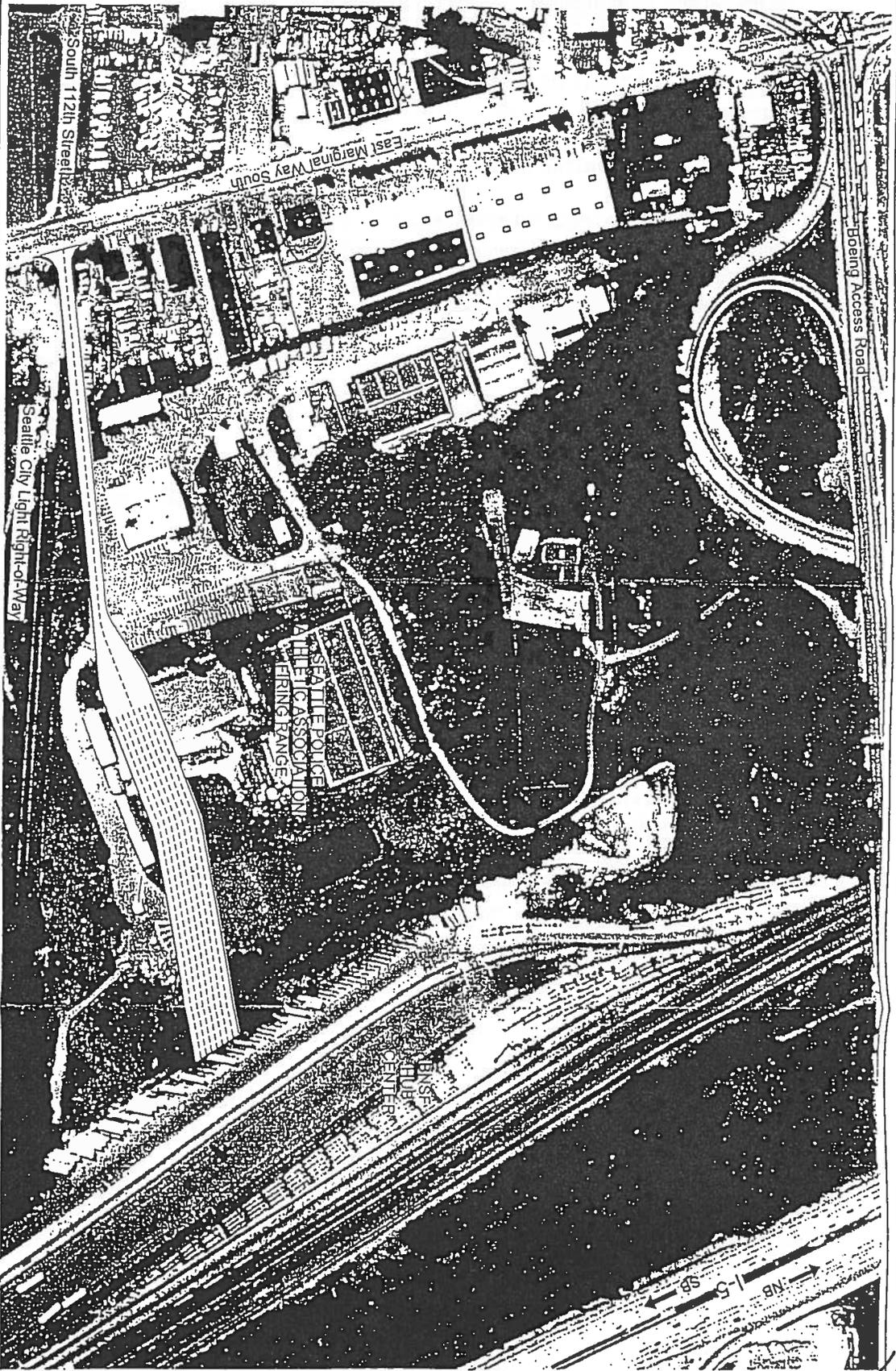
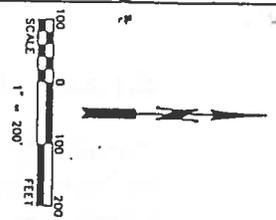
**5.2 Traffic Impacts**

**5.2.1 Introduction**

The transportation assessment of the alternatives presented in this report is not intended to serve as an environmental traffic impact assessment of alternatives, but rather as a key element of this predesign study for selection of a preferred alternative among the alternatives. Accordingly, the traffic evaluation in this section focuses only on segments of Interurban Avenue, South 133rd Street, Gateway Drive, 48th Avenue South, 50th Place South, South 129th Street, and South 130th Place as impacted by the 48th Avenue and Gateway Drive Alternatives. (See Figures 3-1, 3-2 and 3-3 for the location and configuration of these streets.) The opening year traffic volume is appropriate for this purpose and its estimation basis is presented in the next subsection followed by a

<sup>10</sup> This figure was reproduced by Harding Lawson Associates Infrastructure, Inc. based on the Figure 3-5 in the Hanson Wilson, Inc. report.

11.2



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HUB CENTER ACCESS STUDY

North Approach Alternative  
Aerial

FIGURE 5-6  
Page 5-11

comparative operations assessment of the primary build alternatives in terms of traffic volume pattern impacts, level of service, and related traffic operations analysis.

As a precursor to this study, a preliminary estimate of construction costs was conducted for each of the primary build alternatives. The analysis of the costs revealed that the East Marginal Way Alternative is significantly more expensive to construct than the 48th Avenue and Gateway Drive Alternatives; 230 percent and 40 percent more expensive, respectively (see Section 8.0). As a result, a study of the traffic impacts for a completely different area was considered an unproductive utilization of study budget funds.

**5.2.2 Traffic Forecast for Alternatives Assessment**

For the purpose of this study, an appropriate traffic volume basis for evaluating the alternatives is for the opening year traffic. A Year 2000 opening year is assumed for this purpose.

For a conservative approach to analysis of traffic operations impacts for the alternatives we have assumed that all study area traffic (both Hub Center and non-Hub Center, or background, traffic) will increase at an annual rate of 4% which is an aggregate ten (10) percent increase to the year 2000 open date for the alternatives. All Hub Center traffic now destined to Interurban Avenue was assigned to the alternatives based on studying the comprehensive surveys of the intersection turning movement volumes, the generalized origin-destination pattern information from Hub Center officials, field observations, the study area arterial network and land use patterns, and the subregional network geography of the area freeways and the location of their access ramps.

Assumptions were also necessary about potential traffic diversion from South 129th Street and future traffic growth on that route. It was assumed that the opening of an alternative would not cause an increase in South 129th Street traffic beyond the modest rate noted above; i.e. that there is no latent traffic demand. (Traffic that would shift to that route and/or new trips which would be generated in tributary areas which would utilize South 129th Street as a result of the new network link represented by the 48th Avenue or Gateway Drive

alternatives). Analysis of possible latent demand can be studied in a detailed design report.

Table 5-1 summarizes the traffic forecast and traffic assignment assumptions. The appendix to this study

**Table 5-1. Principal Assumptions for Traffic Volume Projections**

48th Avenue Alternative

1. 50th Place South traffic diversion to 48th Avenue: 175 eastbound passenger vehicles and 104 westbound passenger vehicles diverted from 42nd Avenue South to 48th Avenue South (i.e. 50% of 50th Place South traffic).
2. Traffic Growth (Hub Center at 10% total): All the Hub Center trucks and passenger vehicles are diverted from 42nd Avenue South to 48th Avenue South.

Other: two (2) eastbound and two (2) westbound non-Hub Center trucks are diverted from South 42nd Street to 48th Avenue South via 50th Place South / South 130th Place.

Gateway Drive Alternative

1. 50th Place South traffic diversion to Gateway: 207 eastbound passenger vehicles and 123 westbound passenger vehicles diverted from South 42nd Street to Gateway Drive (i.e. 60% of 50th Place South traffic).
2. Traffic Growth (same as 48th Avenue Alternative): All the Hub trucks and Passenger vehicles are diverted from South 42nd Street to Gateway Drive (S).

Other: two (2) eastbound and two (2) westbound non-Hub Center trucks are diverted from South 42nd Street to Gateway Drive via 50th Place South.

Existing Conditions

1. 50th Place Traffic Diversion - not applicable
2. Traffic Growth (same as 48th Avenue Alternative): Traffic remains on 42nd Avenue South.

provides supplementary detail on both current traffic volumes and the development of the traffic diversion assignments and Year 2000 traffic volumes for the alternatives.

### 5.2.3 Year 2000 PM Peak Hour Traffic Volumes

Figures 5-7 and 5-8 present for total vehicles and trucks, respectively, the Year 2000 PM peak hour directional traffic volumes for the 48th Avenue and Gateway Drive Alternatives. These figures are helpful in comparing overall changes in traffic volumes associated with the alternatives.

Figure 5-9 shows those intersection turning movements related to the Hub Center which would be significantly altered by the alternatives. Hub Center traffic volume entering and leaving the study area via Interurban Avenue and the freeway ramps remains the same among the alternatives. What does change is the turning movement pattern. For example, in the outbound half of Figure 5-9, Hub Center vehicles destined to SR-599 northbound under the existing conditions make a left turn from 42nd Avenue South to southbound Interurban Avenue and then a right turn into the northbound SR-599 on-ramp. Under the 48th Avenue Alternative that demand would be made via right turn from 48th Avenue South to northbound Interurban Avenue and then a left turn into the northbound SR-599 on-ramp.

The greatest changes are expected on 42nd and 48th Avenues and on Gateway Drive (S), with smaller changes on Interurban Avenue, and no change in traffic volumes on the freeway ramps. However, as noted above and from examining the turning movement volume diagrams in Figures 5-10 to 5-12, some significant changes occur approaching or exiting the SR-599 on- and off-ramps, where there is a change in the left versus right-turn volume, although total ramp volume is unchanged.

Associated with these differences in traffic volumes will be differences in traffic operations performance as well as implications for environmental impacts associated with changes in traffic volume patterns (noise, visual impact, etc.). Our focus is traffic operations, which is addressed in the next section.

### 5.2.4 Year 2000 Traffic Operations

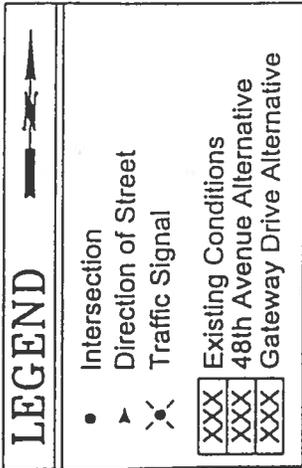
Figure 5-13 compares level of service (LOS) for the alternatives. The alternatives significantly improve LOS at the 42nd Avenue intersection of Interurban Avenue and reduce LOS significantly at the Gateway Drive (S)/South 133rd Street intersection and 48th Avenue intersection of Interurban Avenue. LOS at the ramp intersections remain good under all the alternatives.

The most severe impact is at the 48th Avenue South intersection with Interurban Avenue under the 48th Avenue Alternative, where LOS E is obtained, largely due to the significant increase in turning movements into and out of 48th Avenue and the constraints posed by the interconnected signal phasing for the 48th Avenue intersection and the I-5 off-ramp intersection 100 feet to the south.

Significant increase in peak period queuing and lane storage are not expected on the study area arterials under the alternatives. Excessive queues and long delay would occur, however, for westbound traffic on 48th Avenue South at the approach to Interurban Avenue. These queues would also interfere with driveway access for the adjacent minimart/filling stations. Somewhat less severe friction for driveway traffic could be expected on the Gateway Drive (S)/Interurban Avenue intersection. These driveway conflicts could increase traffic hazard as well as cause traffic delay and discomfort for the affected motorists.

Increased traffic volumes on Gateway Drive (S) and 48th Avenue South as alternative accesses for the Hub Center would also increase traffic frictions and delay at the other driveways on those streets. Although with two exceptions the changes would not be significant. First, under the 48th Avenue Alternative, Yellow Freight Company's traffic between its 48th Avenue terminal and the Hub Center will be removed from 48th Avenue between the Yellow Freight terminal and Interurban Avenue, with an associated benefit of reduced Yellow Freight traffic frictions with driveways on that street segment.

Second, the Boeing Credit Union drive-up windows driveway is heavily trafficked during the PM peak hour. Queues on the inbound drive have been observed to back up westward to within 200 feet of the driveway

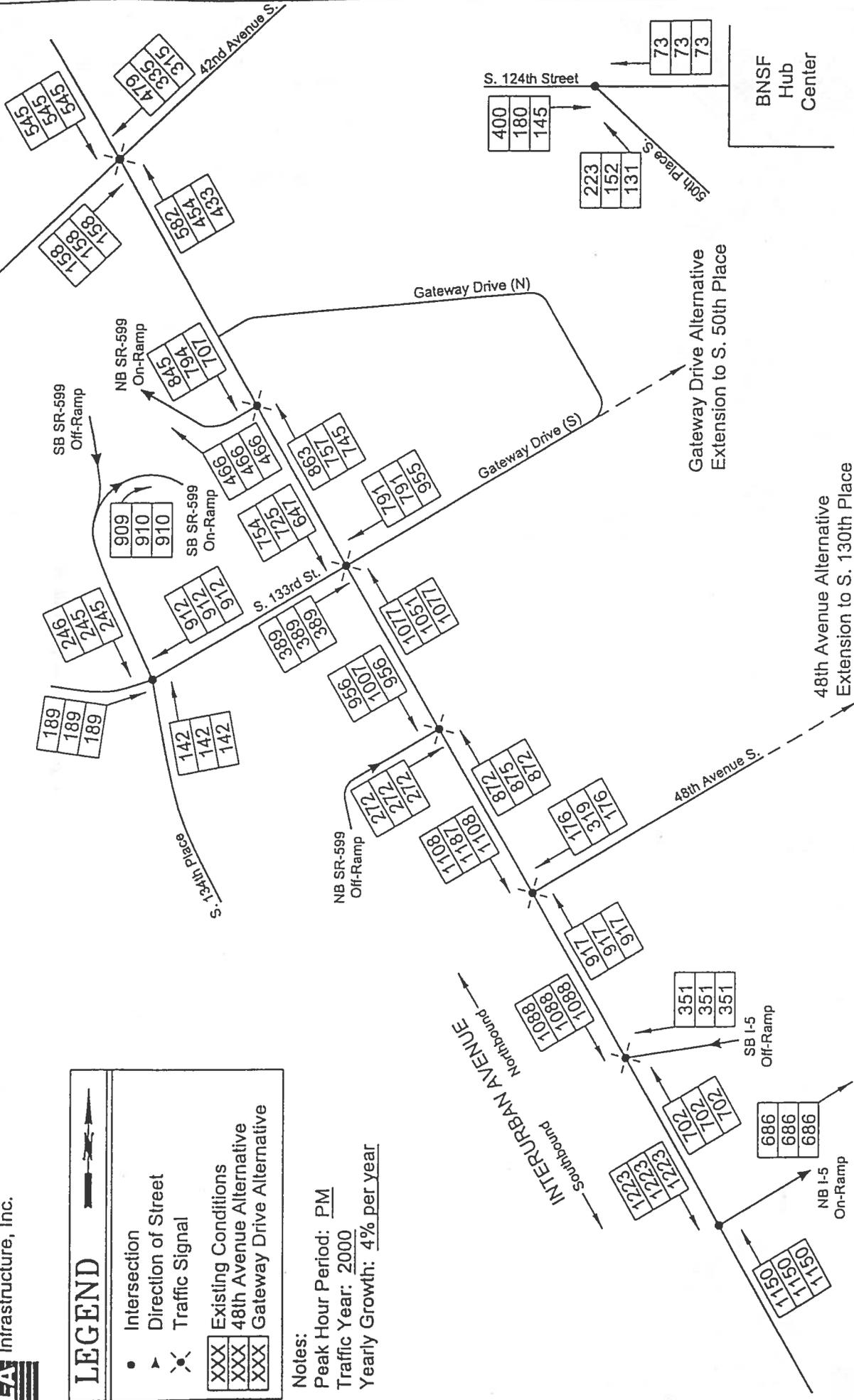


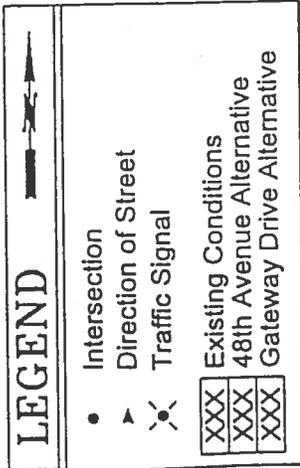
**Notes:**

Peak Hour Period: PM

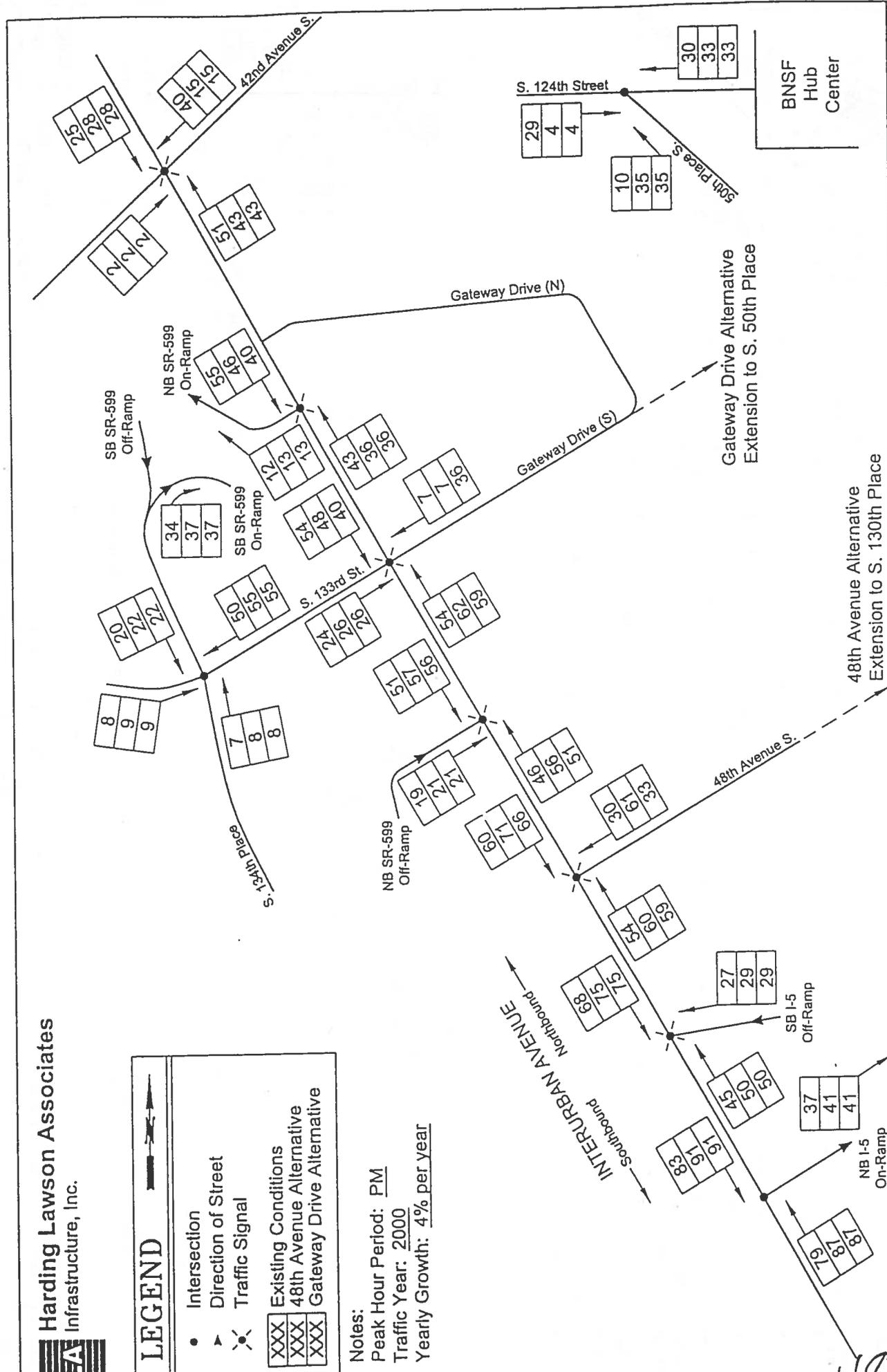
Traffic Year: 2000

Yearly Growth: 4% per year

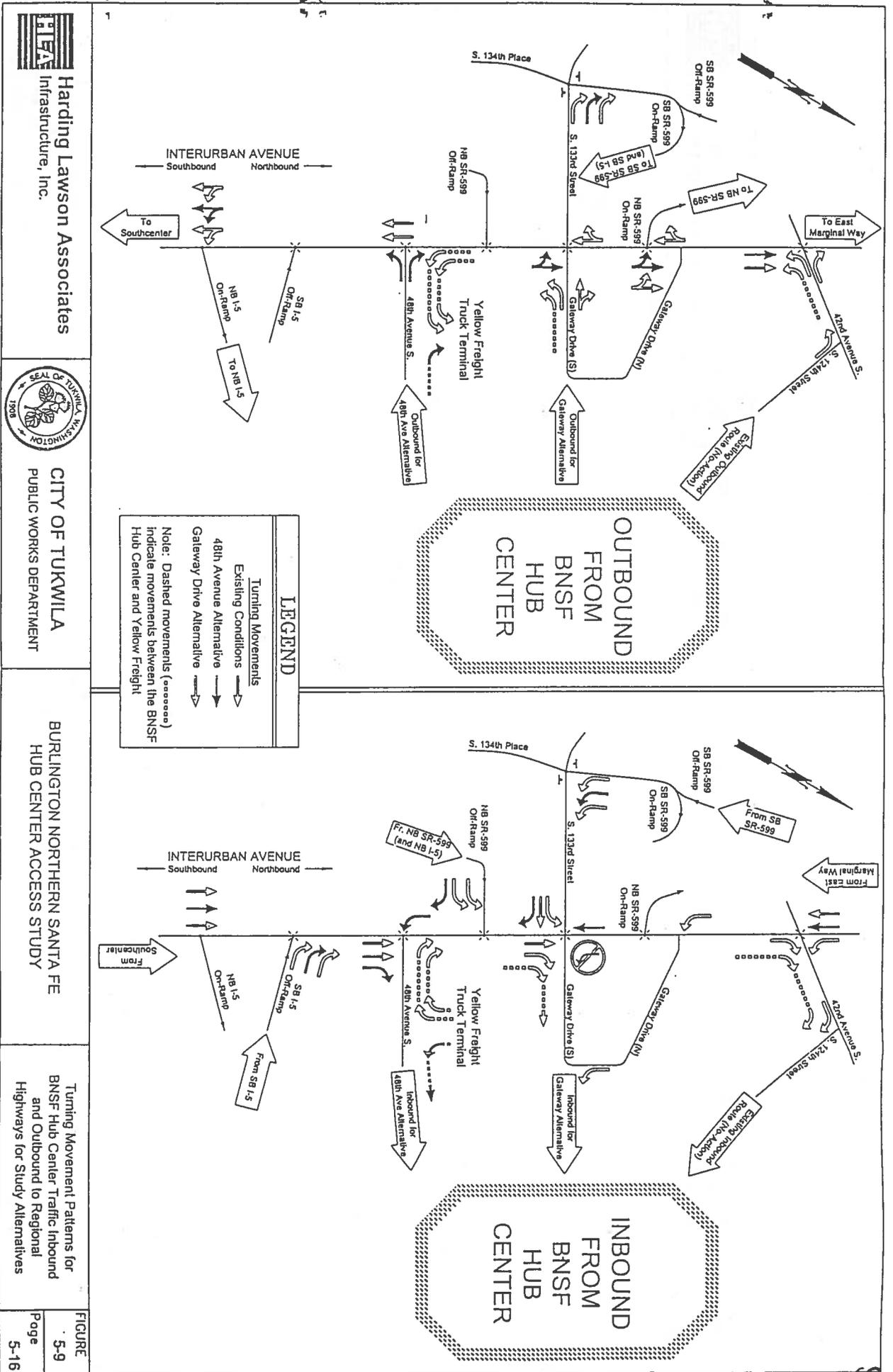




**Notes:**  
 Peak Hour Period: PM  
 Traffic Year: 2000  
 Yearly Growth: 4% per year



**Year 2000 PM Peak Hour Truck Traffic Directional Volumes for Study Alternatives**



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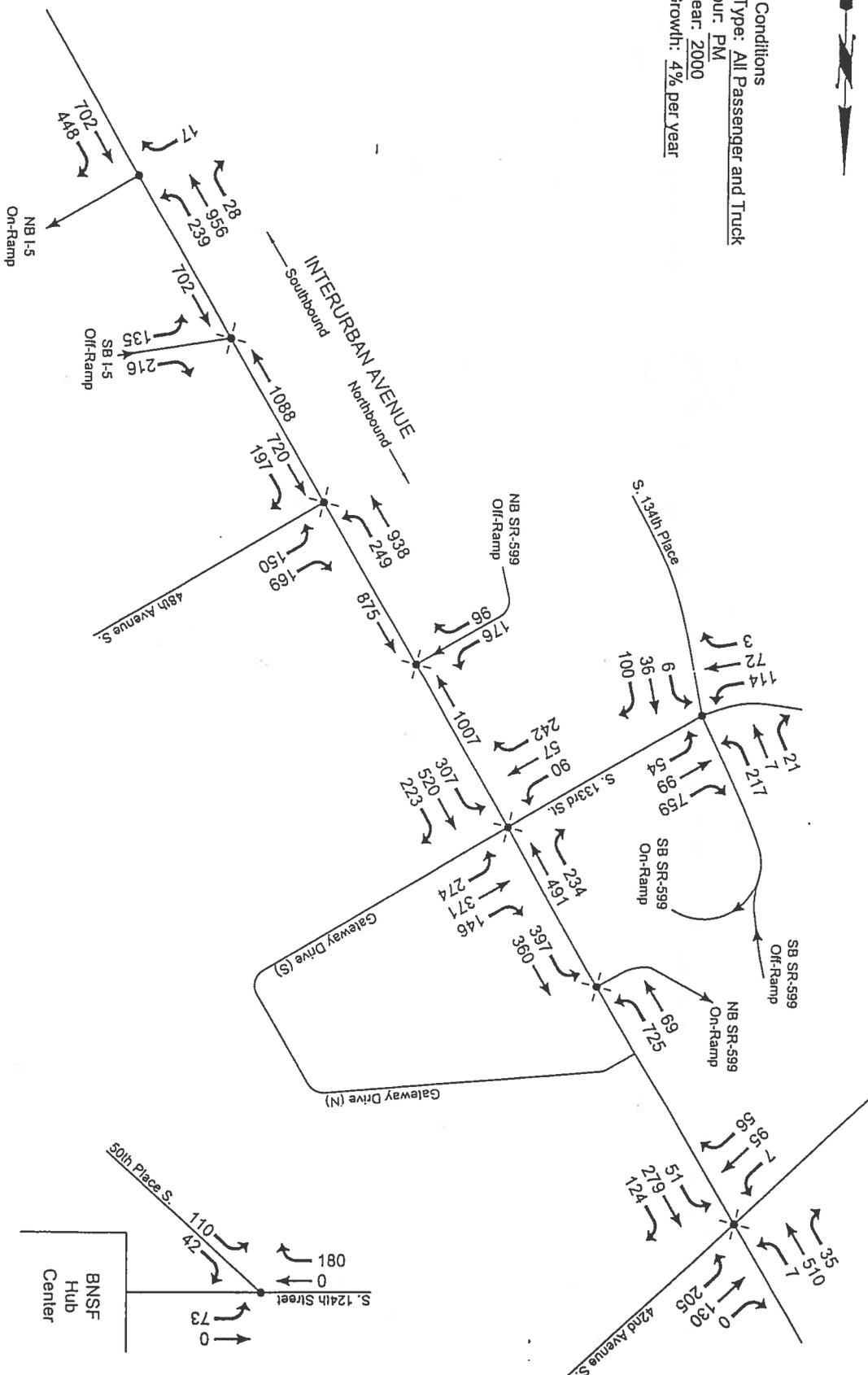
**BURLINGTON NORTHERN SANTA FE**  
HUB CENTER ACCESS STUDY

Turning Movement Patterns for  
BNSF Hub Center Traffic Inbound  
and Outbound to Regional  
Highways for Study Alternatives





Notes:  
 Existing Conditions  
 Vehicle Type: All Passenger and Truck  
 Peak Hour: PM  
 Traffic Year: 2000  
 Yearly Growth: 4% per Year



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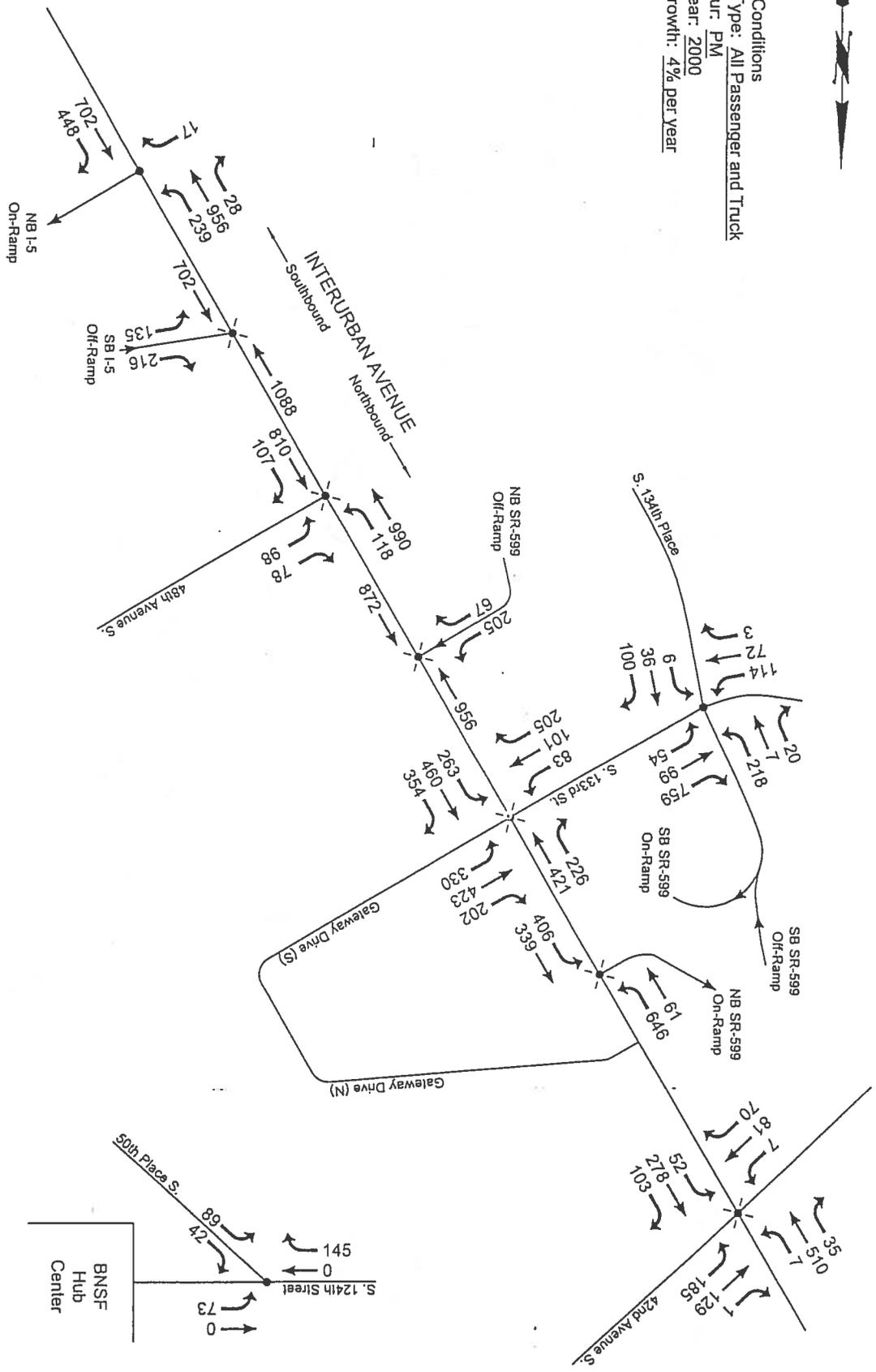
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BURLINGTON NORTHERN SANTA FE  
 HUB CENTER ACCESS STUDY

Year 2000 PM Peak Hour Traffic  
 Turning Movement Volumes  
 for 48th Avenue Alternative



Notes:  
 Existing Conditions  
 Vehicle Type: All Passenger and Truck  
 Peak Hour: PM  
 Traffic Year: 2000  
 Yearly Growth: 4% per year



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Year 2000 PM Peak Hour Traffic  
 Turning Movement Volumes  
 for Gateway Drive Alternative

**LEGEND**

Level of Service

A	2
B	6
C	24

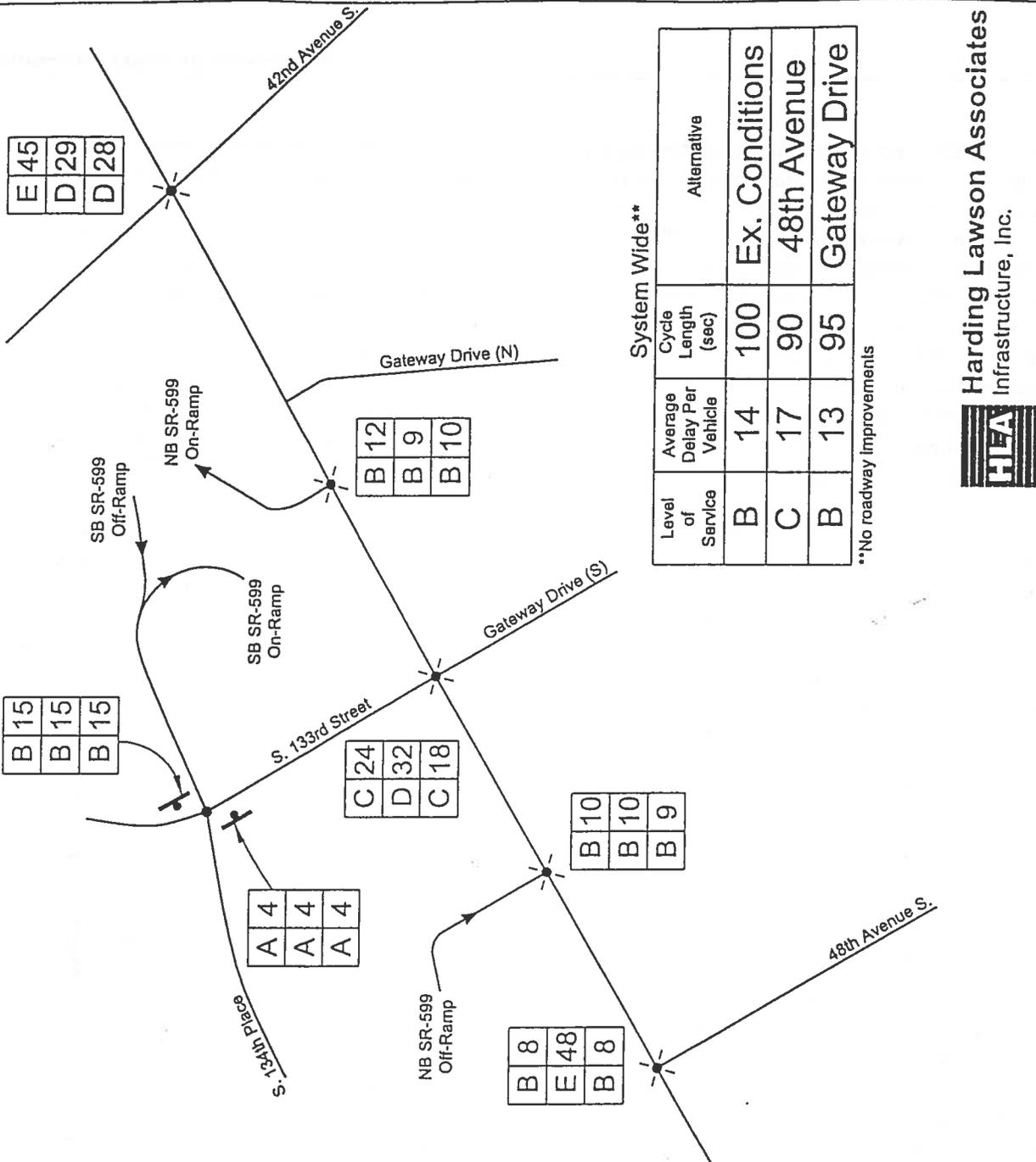
Average Delay/Veh.\*

Existing Conditions

48th Avenue Alternative

Gateway Drive Alternative

\* TRANSYT-7F delay is divided by 1.3



System Wide\*\*

Level of Service	Average Delay Per Vehicle	Cycle Length (sec)	Alternative
B	14	100	Ex. Conditions
C	17	90	48th Avenue
B	13	95	Gateway Drive

\*\*No roadway improvements



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Year 2000 PM Peak Hour  
Level of Service  
for Study Alternatives

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entrance at the curve on Gateway Drive (see Figure 5-2 aerial). Traffic entering and leaving this driveway, however the driveway is reconfigured in association with the new Gateway Drive extension roadway, will undoubtedly be subjected to significantly increased delay and traffic friction in comparison to the existing conditions and the 48th Avenue Alternative. Some alternatives for that reconfiguration may involve eliminating left-turn egress from the drive-up exit roadway and rerouting that movement through the Credit Union garage aisles to enter Gateway Drive at the driveway just north of the garage.

The east public road termini of the alternatives will create new intersections which will represent new points of potential delay and hazard on the street network. In the Gateway Drive Alternative there would be a new 4-leg intersection at 50th Place South as it turns to become South 129th Street. The Gateway Drive extension approaches would likely be placed under stop-sign control, and left-turn channelization may be provided on the South 129th Street/50th Place South approaches.

The increased traffic turning volumes at the South 129th Street/South 130th Place intersection under the 48th Avenue alternative will increase traffic delay and hazard at that severely skewed intersection, even with some improvement in the intersection geometry.

Both alternatives will comparably decrease vehicle-miles of Hub Center travel along Interurban Avenue as compared to the existing conditions. This represents a positive contribution to traffic safety on Interurban Avenue as well as generating for Hub Center traffic a significant savings in travel time and vehicle operating cost. Similar benefit will occur for Yellow Freight Company traffic between its 48th Avenue terminal and the Hub Center.

No Significant impacts to transit and nonmotorized travel on Interurban Avenue and along Gateway Drive and 48th Avenue South are anticipated under the alternatives except for potential increased delay to transit buses on Interurban Avenue at the 48th Avenue intersection (see Section 5.2.5).

### 5.2.5 Possible Traffic Improvements

The poor level of service at the 48th Avenue South / Interurban Avenue intersection under the 48th Avenue

Alternative was addressed by formulating and assessing potential mitigating roadway and traffic control measures at that location. These measures included providing additional lanes on 48th Avenue at the intersection and/or providing a second left-turn lane for the movement from southbound Interurban Avenue into eastbound 48th Avenue. These measures would contribute to a modest improvement in LOS (Table 5-2). They would also entail additional project cost and could adversely impact access and parking for the minimart/filling stations located on both sides of 48th Avenue South at this location.

A much more significant benefit to LOS at the 48th Avenue/Interurban Avenue intersection would stem from closing the 48th Avenue extension to non-Hub Center traffic by closing South 130th Place at South 129th Street on the north and at 52nd Avenue South on the south end (see Table 5-2). Provisions would be made for emergency vehicle and nonmotorized travel access at those two (2) locations. This would mean that only Hub Center traffic would use the extension and existing non-Hub Center traffic patterns would be unchanged. This measure would avoid the cost of constructing additional intersection lanes under options 1 to 3 of Table 5-2 and would reduce overall traffic volume and associated impacts to 48th Avenue abutters and their site traffic. There would, however, be less reduction in traffic volume on 42nd Avenue South and South 124th Street.

Operations at the southbound I-5 off-ramp intersection under the alternatives may benefit from a revision in the off-ramp channelization lane designations. The ramp terminal presently consists of two (2) lanes for left-turn to southbound Interurban Avenue and one (1) lane for the right-turn to northbound Interurban Avenue. Right-turn-on-red is prohibited. Currently 58 percent of the ramp's AM peak hour traffic turns right, 62 percent turns right in the NOON peak hour, and 41 percent turns right during the PM peak hour. Traffic flow may benefit from designating the center lane as optional left or right turn. This could particularly benefit the 48th Avenue Alternative by promoting more balanced lane utilization among the three lanes whereby: 1) the right (north)-most lane would largely be occupied by traffic destined to 48th Avenue South via the proposed new turning roadway to 48th Avenue South; 2) traffic destined to northbound Interurban Avenue (beyond 48th Avenue

**Table 5-2. Level of Service at 48th Avenue Alternative's Interurban Avenue Intersection for Potential Mitigation/Design Treatment Measures**

Case	Level of Service	Average Delay per Vehicle (s)
I. With No Mitigation	E	48.0
II. With Mitigation Measures		
1. Add a third lane (a left, a left&right, and a right turn lanes) to 48th Avenue approach at Interurban Avenue	E	42.5
2. Add a second Interurban Avenue southbound left turn lane at 48th Avenue	C	15.3
3. Add a third I-5 SB off-ramp lane ( a left, a left&right, and a right turn lanes).	D/E	38.2
4. Close S. 130th Place between 52nd Avenue S. and S. 129th Street (BNSF Hub Center traffic only on 48th Avenue extension).	B	8.1

South) would occupy the center lane (with, at times, some of the demand for left to southbound Interurban Avenue).

Current excessive queuing on the northbound SR-599 off-ramp (AM and NOON peak hours) with its heavy left-turn movement to northbound Interurban Avenue could benefit under the alternatives by changing the existing short right-turn-only lane to an option left-turn/right-turn lane. Further improvement would appear to be readily attainable at low cost by minor widening to provide a full three-lane ramp terminal instead of the present two-lane configuration, with two left-turn-only lanes plus a right-turn-only lane.

**5.2.6 East Marginal Way Alternative**

Hanson Wilson, Inc. did not complete a detailed traffic analysis of this alternative similar to the analyses for the 48th Avenue and Gateway Drive Alternatives. However, they did make the observation that traffic using this alternative can travel north on East Marginal Way South to the Boeing Access Road and then head east to access the I-5 corridor. To access the I-5 corridor, traffic must use two (2) signalized intersections.

**5.3 Environmental Impacts**

Potential environmental issues and permits identified for this alternative are based on a site visit to the project

area, limited discussion with regulatory agency personnel, and professional experience. A review of environmental and historical databases was outside the scope of this study and was not conducted.

Potentially hazardous sites in the vicinity of the project should be investigated further to determine their status and potential impacts. A site reconnaissance and review of historic and archeological databases should be conducted to determine if the impacted properties and/or structures are listed or eligible for listing on the National Register of Historic Places. No wetland delineations were conducted for this study, but potential wetlands associated with the banks of the Duwamish River were observed. Coordination with the Duwamish Tribe should occur if the proposed bridge structure will be below the ordinary high water mark (OWHM) of the Duwamish River. A State Environmental Policy Act (SEPA) environmental checklist will need to be completed for the City of Tukwila (lead agency) once a preferred alternative has been determined and the additional environmental/historic investigations have been completed.

**5.3.1 48th Avenue Alternative**

**5.3.1.1 Hazardous Materials**

Potential hazardous materials issues are associated with the properties and businesses along 48th Avenue South and South 130th Street. Two (2) gasoline service

stations (BP and Texaco) and a truck rental facility with underground storage tanks (USTs) are located along 48th Avenue South. Potential soil and ground water contamination may be associated with these USTs. The construction yard used to store equipment and supplies for Mowat Construction located under the South 129th Street bridge has stained soil at the surface. Potential soil and ground contamination may exist for this property.

**5.3.1.2 Wetlands**

Potential wetland and river impacts may be associated with the new bridge crossing of the Duwamish River. These impacts can be avoided if the bridge is located above the OHWM.

**5.3.1.3 Water Quality Issues**

Potential water quality issues may exist associated with construction and storm water.

**5.3.2 Gateway Drive Alternative**

**5.3.2.1 Hazardous Materials**

Potential hazardous materials issues may be associated with the barn property located along 50th Place South and the residences along 51st Place South. The barn property contains an old fuel pump and may still contain an old UST. Potential soil and ground water contamination may be associated with this UST. The structures to be demolished for this alternative may also contain hazardous materials such as asbestos, lead-based paint, and/or heating oil tanks.

**5.3.2.2 Wetlands**

Potential wetland and river impacts may be associated with the new bridge crossing of the Duwamish River. These impacts can be avoided if the bridge is located above the OHWM.

**5.3.2.3 Water Quality Issues**

Potential water quality issues may exist associated with construction and storm water.

**5.3.3 East Marginal Way Alternative**

This alternative will not have any impact on environmental issues.

**5.4 Socio-Economic Impacts**

**5.4.1 48th Avenue Alternative**

This alternative directly impacts the parking spaces for trail users, access to the Penske yard, and reduces the number of employee parking stalls for Yellow Freight. There is also impact to the two gas stations, due to any additional widening required for turning movements at the intersection and increased traffic volumes at the 48th Avenue South / Interurban Avenue intersection.

Interurban Trail requires horizontal and vertical realignment and crosses under the proposed Duwamish River bridge as well as an at-grade crossing.

**5.4.2 Gateway Drive Alternative**

This design significantly impacts the access into the Boeing Credit Union, as well as parking for the Shepard Ambulance building. This alternative requires removal of several houses and a farming type facility (barn). The Interurban Trail requires horizontal and vertical realignment and crosses under the proposed Duwamish River bridge.

**5.4.3 East Marginal Way Alternative**

This alternative will require some commercial displacements in the immediate area. The Seattle Police Athletic Association's firing range and a taxi cab operation will be displaced. To the west of East Marginal Way South it is recommended that the intersection of the proposed entrance and South 112th Street be aligned to form a four-way intersection. This may require South 112th Street to be realigned. The commercial property located to the northwest of this intersection may have to be acquired to make this a viable alternative.

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**5.5 Land Acquisition**

**5.5.1 48th Avenue Alternative**

The following portions of land will either have to be acquired to an agreement will have to be made with the current owner(s):

- The small parcel of land bounded by the BP gas station, Interurban Avenue, 48th Avenue South, and the southbound I-5 off-ramp to Interurban Avenue;
- The strip of land on the south side of 48th Avenue South from Interurban Avenue to the Duwamish River required to widen the right-of-way;
- A small portion of Yellow Freight's existing parking facility bounded by their existing trailer lot, the extension of 48th Avenue South to the River and the Duwamish River; and
- Land to the north of 130th Place South required to realign 130th Place South.

**5.5.2 Gateway Drive Alternative**

The following portions of land will either have to be acquired to an agreement will have to be made with the current owner(s):

- The strip of land between the existing Boeing Credit Union driveway off of Gateway Drive (S) and the new Shepard Ambulance Building;
- The farm property on the eastern side of the new bridge structure; and
- property on the north side of 50th Place South required to access the BNSF Hub Center (some of this property may be residential).

**5.5.3 East Marginal Way Alternative**

As discussed in the preceding sections, this alternative will involve the acquisition of land that is currently used by the Seattle Police Athletic Association and a taxi cab operation. Also, since this alternative is routed along the existing Seattle City Light right-of-way, an easement or right-of-way agreement may have to be obtained. Finally, if the intersection of South 112th

Street and East Marginal Way must be reconfigured, some or all of the properties bordering the existing intersection may have to be acquired.

**5.6 Utilities**

**5.6.1 48th Avenue Alternative**

Under this alternative, the existing roadway lighting facilities on 48th Avenue South will have to be extended over the proposed bridge structure to the new intersection with 130th Place South.

The existing storm drainage facilities on 48th Avenue South and 130th Place South will have to be expanded to accommodate the new roadway and bridge.

**5.6.2 Gateway Drive Alternative**

Under this alternative, new roadway lighting and storm drainage facilities will have to be constructed and connected to the existing facilities on Gateway Drive and 50th Place South to accommodate the new roadway and bridge structure.

**5.6.3 East Marginal Way Alternative**

All utilities (sewer, water, and power) that will be required for modifications to the BNSF Hub Center are available from East Marginal Way South of from the acquired property.

**5.7 Permitting**

**5.7.1 48th Avenue Alternative**

For this alternative the following permits, at a minimum, will have to be obtained.

**5.7.1.1 Federal**

- Section 404 Permit from the U.S. Army Corps of Engineers (Corps). This permit will not be required if the bridge is constructed above the OHWM and wetlands associated with the bank of the Duwamish River.
- Section 10 Permit from the Corps



- Coast Guard Bridge Permit. Coordination will be necessary as this alternative may be exempt from this permit.

#### 5.7.1.2 State of Washington

- Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife.
- Section 401 Water Quality Certification from the Washington State Department of Ecology (Ecology). This permit will not be required if there is no discharge of materials into the Duwamish River or associated wetlands.
- Temporary Modification of Water Quality Criteria (Water Quality Modification) from Ecology. This permit may not be required if construction will not violate state water quality standards; especially if there is no in-water construction that would temporarily increase turbidity.
- Aquatic Use Authorization (Aquatic Lease) from the Washington State Department of Natural Resources (DNR).

#### 5.7.1.3 City of Tukwila

- Shoreline Management Act Permit (Shoreline Permit)
- Floodplain Development Permit
- Building Permit
- Conditional Use Permit

#### 5.7.2 Gateway Drive Alternative

For this alternative the following permits, at a minimum, will have to be obtained.

##### 5.7.2.1 Federal

- Section 404 Permit from the U.S. Army Corps of Engineers (Corps). This permit will not be required if the bridge is constructed above the OHWM and wetlands associated with the bank of the Duwamish River.
- Section 10 Permit from the Corps

- Coast Guard Bridge Permit. Coordination will be necessary as this alternative may be exempt from this permit.

#### 5.7.2.2 State of Washington

- Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife.
- Section 401 Water Quality Certification from the Washington State Department of Ecology (Ecology). This permit will not be required if there is no discharge of materials into the Duwamish River or associated wetlands.
- Temporary Modification of Water Quality Criteria (Water Quality Modification) from Ecology. This permit may not be required if construction will not violate state water quality standards; especially if there is no in-water construction that would temporarily increase turbidity.
- Aquatic Use Authorization (Aquatic Lease) from the Washington State Department of Natural Resources (DNR).

- Puget Sound Air Pollution Control Authority (PSAPCA) Demolition Application will be required for the demolition of the existing structures.

- PSAPCA Asbestos Project Application may be required if the structures to be demolished contain asbestos-containing building materials.

- UST Closure Permit from Ecology if existing USTs are found and removed.

#### 5.7.2.3 City of Tukwila

- Shoreline Management Act Permit (Shoreline Permit)
- Floodplain Development Permit
- Building Permit
- Conditional Use Permit



### 5.7.3 East Marginal Way Alternative

Determining a list of potential permits for this alternative was outside the scope of this report, and the information was not contained in the Hanson Wilson, Inc. report.

## 6.0 EVALUATION OF STUDY ALTERNATIVES

### 6.1 Evaluation Criteria

Given the items listed in Section 2 - Purpose and Scope, the following scoring system was developed by Harding Lawson Associates Infrastructure, Inc:

- Traffic impacts will be scored from 1 to 5 (1 = major traffic impacts, 5 = minor traffic impacts) and this score will be weighted by a factor of 2.
- Cost impacts will be scored from 1 to 5 (1 = high

construction costs, 5 = low construction costs) and this score will be weighted by a factor of 2.

- Environmental impacts, socio-economic impacts, land acquisition (not including costs), utilities and permitting will each be scored from 1 to 5 (1 = major negative impact, 5 = minor negative impact) and will be weighted by a factor of 1.

Table 6-1 summarizes the results of the evaluation process described in this section.

**Table 6-1 - Evaluation Matrix and Alternative Scores**

Criterion	48th Avenue Alternative	Gateway Drive Alternative	East Marginal Way Alternative
Removal of Heavy Truck Traffic	Pass	Pass	Pass
Cost	$5 \times 2 = 10$	$3 \times 2 = 6$	$2 \times 2 = 4$
Traffic Impacts	$3 \times 2 = 6$	$5 \times 2 = 10$	$4 \times 2 = 8$
Environmental Impacts	3	2	4
Socio-Economic Impacts	4	4	2
Land Acquisition	5	3	3
Utilities	4	3	3
Permitting	3	2	4
Total Score	35	30	28

Note: High marks indicate favorable results.

### 6.2 Cost

For this evaluation criterion, the alternatives are scored consecutively according to cost. The 48th Avenue Alternative is, by a large margin, the least expensive of the build alternatives and receives a score of 5. The Gateway Drive Alternative is the next least expensive and receives a score of 3. The East Marginal Way Alternative is the most expensive and receives a score of 2. Table 6-2 shows a summary of the construction costs.

**Table 6-2 Summary of Construction Costs for Study Alternatives**

<u>Alternative</u>	<u>Estimated Cost</u>
48th Avenue	\$2,838,608
Gateway Drive	\$6,785,981
East Marginal Way	\$8,987,691

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### 6.3 Traffic Impacts

Comparing the levels of service in the design year provided by the primary build alternatives summarized in Figure 5-13 and the current levels of services shown in Figure 3-11, it is apparent that the Gateway Drive Alternative is slightly better of the studied alternatives and receives a score of 5. The 48th Avenue Alternative, because of the potential problems created at its intersection with Interurban Avenue receives a score of 3.

A detailed traffic study of the East Marginal Way Alternative was outside the scope of this study. However, based on the information provided in the Hanson Wilson, Inc. report, this alternative receives a score of 4.

### 6.4 Environmental Impacts

The East Marginal Way Alternative has no environmental impacts. However, since the existing conditions will change under this alternative there is the possibility - how ever remote - that environmental issues will surface. As a result, this alternative receives a score of 4.

The 48th Avenue Alternative has potential minor environmental impacts associated with stained soil on the Mowat Construction storage site. As a result, this alternative receives a score of 4.3

The Gateway Alternative has a potential moderate environmental impact associated with a possible UST on the existing farm property. As a result, this alternative receives a score of 2.

### 6.5 Socio-Economic Impacts

The Gateway Drive Alternative creates potential adverse socio-economic impacts associated with traffic congestion at the Boeing Credit Union drive-up facility. As a result, this alternative receives a score of 4.

The 48th Avenue Alternative creates potential adverse socio-economic impacts associated with traffic congestion around the two (2) gas stations at the intersection of 48th Avenue South and Interurban Avenue, with the modification of access to the Penske

Truck yard, and with the loss of employee parking stalls for Yellow Freight. As a result of these impacts, this alternative receives a score of 4.

The East Marginal Way Alternative creates serious adverse socio-economic impacts for users and proprietors of the Seattle Police Athletic Association and the taxi cab operation that will have to be relocated to accommodate the new access roadway. As a result, this alternative receives a score of 2.

### 6.6 Land Acquisition

Land acquisition for the 48th Avenue Alternative is limited to small parcels at both ends of 48th Avenue South and expansion of the right-of-way for the widening of 48th Avenue South. As a result, this alternative receives a score of 5.

Land acquisition for the Gateway Drive Alternative is slightly more involved with the land between the Boeing Credit Union and the Shepard Ambulance Building and the residential land on the east side of the Duwamish River having to be acquired. As a result, this alternative receives a score of 3.

Like the Gateway Drive Alternative, land acquisition for the East Marginal Way Alternative is extensive relative to the 48th Avenue Alternative. The land that currently houses the taxi cab operation and portions of the Seattle Police Athletic Association firing range will have to be acquired. As a result, this alternative also receives a score of 3.

### 6.7 Utilities

Utilities for the 48th Avenue Alternative involve minor expansion of existing roadway lighting and storm drainage facilities on 48th Avenue South. As a result, this alternative receives a score of 4.

Utilities for both the Gateway Drive and East Marginal Way Alternatives are slightly more involved since the entire access roadway for each alternative is new. As a result, each of these alternative receives a score of 3.

### 6.8 Permitting

Of the three build alternatives, the East Marginal Way Alternative would require the fewest number of permits

(since construction over a navigable water way will not occur.) As a result, this alternative receives a score of 4.

The 48th Avenue Alternative will potentially require permits associated with construction in or near a navigable waterway. As a result, this alternative receives a score of 3.

The Gateway Drive Alternative will potentially require the most number of permits. These permits are associated with construction near a river, removal of UST, and possible removal of asbestos. As a result, this alternative receives a score of 2.

## **7.0 CONCLUSIONS AND RECOMMENDATIONS**

### **7.1 Conclusions**

Of the three build alternatives, the 48th Avenue Alternative scored the highest, indicating the better alternative.

### **7.2 Recommendations**

Based on the results of the evaluation, Harding Lawson Associates Infrastructure, Inc. recommends that the City of Tukwila proceed with detail design report based on the 48th Avenue Alternative.

## 8.0 COST ESTIMATES

Table 8-1 shows a summary of the costs associated with each of the build alternatives.

**Table 8-1 Cost Estimate Matrix**

No.	Work Item	Unit	Unit Price	48th Avenue Alt.		Gateway Drive Alt.		E. Marginal Wy. Alt	
				Quantity	Total Cost	Quantity	Total Cost	Quantity	Total Cost
<i>Land Acquisition</i>									
1	Building & Land Acquis.	ac	76,000	0.10	7,600	16.89	1,284,000	35.58	2,704,000
2	Easement Acquisition	ac	2	0	0	6,000	12,000	0	0
<i>Land Acquisition Total</i>					7,600		1,296,000		2,704,000
<i>Construction</i>									
3	Residential Bldg Demo.	sf	15	0	0	18,000	270,000	27,900	418,500
4	Clearing and Grubbing	ac	5,000	0 <sup>(11)</sup>	0	5	25,000	4	20,000
5	Tree Removal	in-dia	30	0	0	200	6,000	200	6,000
6	Grading	cy	12	500	6,000	2,500	30,000	3,200	38,400
7	Imported Fill Material	cy	15	1,100	16,500	1,500	22,500	1,500	22,500
8	Excavation	cy	10	1,400	14,000	1,600	16,000	13,500	135,000
9	Storm Sewer	lf	35	2,900	101,500	2,000	70,000	1,600	56,000
10	Catch Basins	ea	1,500	13	19,500	20	30,000	16	24,000
11	Water Main	lf	55	0	0	0	0	500	27,500
12	Fire Hydrants	ea	5,000	0	0	0	0	2	10,000
13	Pavement Removal	sy	25	2,400	60,000	2,000	50,000	1,500	37,500
14	Sanitary Sewer	lf	30	0	0	0	0	0	0
15	Fencing for BNSF Areas	lf	20	0	0	2,500	50,000	3,200	64,000
16	Bridge	sf	156	6,650	1,105,000	11,709	1,963,500	0	0
17	Retaining Walls	cy	489	180	94,605	230	120,700	0	0
18	Traffic Signal	ea	100,000	0	0	0	0	1	100,000
19	Asphalt Paving	cy	70	1,000	70,000	2200 <sup>(12)</sup>	154,000	2300 <sup>(13)</sup>	161,000
20	Aggregate Base Course	cy	40	1,100	44,000	2,300	92,000	2,300	92,000
21	Sidewalk Removal	sf	1	10,000	10,000	300	300	300	300
22	Curb & Gutter Removal	lf	6	2,000	12,000	50	300	50	300
23	Catch Basin Removal	ea	200	10	2,000	0	0	0	0
24	Storm Sewer Removal	lf	2	2,000	4,000	0	0	0	0
25	Sidewalk Installation	sf	2	11,000	22,000	7,700	15,400	8,000	16,000
26	Curb & Gutter Installation	lf	7	2,000	14,000	3,500	24,500	3,100	21,700
27	Erosion Control	ls	n/a	n/a	25,000	n/a	25,000	n/a	25,000
<i>Construction Subtotal</i>					1,620,105		2,965,200		1,275,700
28	Mobilization @ 10% of Construction Subtotal				162,011		296,520		127,570
<i>Construction Total</i>					1,782,116		3,261,720		1,403,270
<i>Engineering</i>									
29	Preliminary Engineering @ 15% of Construction				267,317		489,258		210,491
30	Construction Engineering @ 12% of Construction				213,854		391,406		168,392
<i>Engineering Total</i>					481,171		880,664		378,883
<i>Subtotal (Land + Construction + Engineering)</i>					2,270,887		5,438,384		4,486,153
31	Contingencies @ 25% of Subtotal				567,722		1,359,596		1,121,538
<i>Total</i>					2,838,608		6,785,981		5,607,691
32	Hub Center Improvements <sup>12</sup>								3,380,000
<i>Total for Alternative</i>					2,838,608		6,785,981		8,987,691

- 11 Since there is no paving over large vegetated areas, there is minimal clearing and grubbing for this alternative. As a result, the clearing and grubbing has been made incidental to this portion of the estimate.
- 12 These are the estimated costs that will be incurred by the BNSF to move the receiving and storage facilities to the north portion of the Hub Center. This cost was given in the Hanson Wilson report.
- 13 Quantity includes asphalt for new queuing area

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## REFERENCES

Hanson Wilson, Inc. September 1997. *Report for South Seattle Yard Improvement; Tukwila, Washington.*  
Prepared for Burlington Northern Santa Fe Railway Company.