Appendix A

Greenhouse Gas Emission Worksheets

Alternative 1 - No Build
Section I: Buildings

Type (Residential) or Principal Activity (Commercial)	# Units	Square Feet (in thousands of square feet)	Emissions Per Unit or Per Thousand Square Feet (MTCO2e) Embodied	Energy	Transportation	Lifespan Emissions (MTCO2e)
Single-Family Home............................	0		98	672	792	0
Multi-Family Unit in Large Building	0		33	357	766	0
Multi-Family Unit in Small Building	0		54	681	766	0
Mobile Home.......................................	0		41	475	709	0
Education		0.0	39	646	361	0
Food Sales		0.0	39	1,541	282	0
Food Service		0.0	39	1,994	561	0
Health Care Inpatient		1,200.0	39	1,938	582	3070321
Health Care Outpatient		0.0	39	737	571	0
Lodging		0.0	39	777	117	0
Retail (Other Than Mall).......................		0.0	39	577	247	0
Office		0.0	39	723	588	0
Public Assembly		0.0	39	733	150	0
Public Order and Safety		0.0	39	899	374	0
Religious Worship		0.0	39	339	129	0
Service		0.0	39	599	266	0
Warehouse and Storage		0.0	39	352	181	0
Other		0.0	39	1,278	257	0
Vacant		0.0	39	162	47	0

Section II: Pavement.........................

Pavement..		0.00				0

Total Project Emissions: **3070321**

Alternatives 5, 6, and 7
Section I: Buildings

Type (Residential) or Principal Activity (Commercial)	# Units	Square Feet (in thousands of square feet)	Emissions Per Unit or Per Thousand Square Feet (MTCO2e) Embodied	Energy	Transportation	**Lifespan Emissions (MTCO2e)**
Single-Family Home............................	0		98	672	792	**0**
Multi-Family Unit in Large Building	0		33	357	766	**0**
Multi-Family Unit in Small Building	0		54	681	766	**0**
Mobile Home.......................................	0		41	475	709	**0**
Education		0.0	39	646	361	**0**
Food Sales		0.0	39	1,541	282	**0**
Food Service		0.0	39	1,994	561	**0**
Health Care Inpatient		3,100.0	39	1,938	582	**7931663**
Health Care Outpatient		0.0	39	737	571	**0**
Lodging		0.0	39	777	117	**0**
Retail (Other Than Mall)......................		0.0	39	577	247	**0**
Office		0.0	39	723	588	**0**
Public Assembly		0.0	39	733	150	**0**
Public Order and Safety		0.0	39	899	374	**0**
Religious Worship		0.0	39	339	129	**0**
Service		0.0	39	599	266	**0**
Warehouse and Storage		0.0	39	352	181	**0**
Other		0.0	39	1,278	257	**0**
Vacant		0.0	39	162	47	**0**

Section II: Pavement.........................

Pavement..		0.00				**0**

Total Project Emissions: **7931663**

126906.6

King County Department of Development and Environmental Services
SEPA GHG Emissions Worksheet
Version 1.7 12/26/07 (Introduction Revised March 2011)

Introduction

The Washington State Environmental Policy Act (SEPA) requires environmental review of development proposals that may have a significant adverse impact on the environment. If a proposed development is subject to SEPA, the project proponent is required to complete the SEPA Checklist. The Checklist includes questions relating to the development's air emissions. The emissions that have traditionally been considered cover smoke, dust, and industrial and automobile emissions. With our understanding of the climate change impacts of greenhouse gas (GHG) emissions, King County requires the applicant to also estimate these emissions.

Emissions created by Development

GHG emissions associated with development come from multiple sources:

- The extraction, processing, transportation, construction and disposal of materials and landscape disturbance (Embodied Emissions)
- Energy demands created by the development after it is completed (Energy Emissions)
- Transportation demands created by the development after it is completed (Transportation Emissions)

GHG Emissions Worksheet

King County has developed a GHG Emissions Worksheet that can assist applicants in answering the SEPA Checklist question relating to GHG emissions.

The SEPA GHG Emissions worksheet estimates all GHG emissions that will be created over the life span of a project. This includes emissions associated with obtaining construction materials, fuel used during construction, energy consumed during a buildings operation, and transportation by building occupants.

The SEPA GHG Emissions worksheet should not be used to estimate GHG emissions from large, complex projects, such as urban planned developments, major infrastructure projects, or projects that require an Environmental Impact Statement (EIS). For more sophisticated tools that may help with assessing the GHGs of these actions, see the Washington State Department of Ecology's (Ecology) SEPA and climate change website: http://www.ecy.wa.gov/climatechange/sepa.htm

Using the Worksheet

1. Descriptions of the different residential and commercial building types can be found on the second tabbed worksheet ("Definition of Building Types"). If a development proposal consists of multiple projects, e.g. both single family and multi-family residential structures or a commercial development that consists of more than on type of commercial activity, the appropriate information should be estimated for each type of building or activity.
2. For paving, estimate the total amount of paving (in thousands of square feet) of the project.
3. The Worksheet will calculate the amount of GHG emissions associated with the project and display the amount in the "Total Emissions" column on the worksheet. The applicant should use this information when completing the SEPA checklist.

4. The last three worksheets in the Excel file provide the background information that is used to calculate the total GHG emissions.
5. The methodology of creating the estimates is transparent; if there is reason to believe that a better estimate can be obtained by changing specific values, this can and should be done. Changes to the values should be documented with an explanation of why and the sources relied upon.
6. Print out the "Total Emissions" worksheet and attach it to the SEPA checklist. If the applicant has made changes to the calculations or the values, the documentation supporting those changes should also be attached to the SEPA checklist.

Disclaimer – March 2011

This worksheet has not been updated 2007. Since then, new resources have become available that more accurately estimate the greenhouse gas emissions impacts of projects. This worksheet can still be used to provide a coarse estimate of a typical project's climate change impact, but should be used with caution. See Ecology's SEPA and climate change website for additional resources:
http://www.ecy.wa.gov/climatechange/sepa.htm

Definition of Building Types

Type (Residential) or Principal Activity (Commercial)	Description
Single-Family Home..................................	Unless otherwise specified, this includes both attached and detached buildings
Multi-Family Unit in Large Building	Apartments in buildings with more than 5 units
Multi-Family Unit in Small Building	Apartments in building with 2-4 units
Mobile Home...	
Education	Buildings used for academic or technical classroom instruction, such as elementary, middle, or high schools, and classroom buildings on college or university campuses. Buildings on education campuses for which the main use is not classroom are included in the category relating to their use. For example, administration buildings are part of "Office," dormitories are "Lodging," and libraries are "Public Assembly."
Food Sales	Buildings used for retail or wholesale of food.
Food Service	Buildings used for preparation and sale of food and beverages for consumption.
Health Care Inpatient	Buildings used as diagnostic and treatment facilities for inpatient care.
Health Care Outpatient	Buildings used as diagnostic and treatment facilities for outpatient care. Doctor's or dentist's office are included here if they use any type of diagnostic medical equipment (if they do not, they are categorized as an office building).
Lodging	Buildings used to offer multiple accommodations for short-term or long-term residents, including skilled nursing and other residential care buildings.
Retail (Other Than Mall)............................	Buildings used for the sale and display of goods other than food.
Office	Buildings used for general office space, professional office, or administrative offices. Doctor's or dentist's office are included here if they do not use any type of diagnostic medical equipment (if they do, they are categorized as an outpatient health care building).
Public Assembly	Buildings in which people gather for social or recreational activities, whether in private or non-private meeting halls.
Public Order and Safety	Buildings used for the preservation of law and order or public safety.
Religious Worship	Buildings in which people gather for religious activities, (such as chapels, churches, mosques, synagogues, and temples).
Service	Buildings in which some type of service is provided, other than food service or retail sales of goods
Warehouse and Storage	Buildings used to store goods, manufactured products, merchandise, raw materials, or personal belongings (such as self-storage).
Other	Buildings that are industrial or agricultural with some retail space; buildings having several different commercial activities that, together, comprise 50 percent or more of the floorspace, but whose largest single activity is agricultural, industrial/ manufacturing, or residential; and all other miscellaneous buildings that do not fit into any other category.
Vacant	Buildings in which more floorspace was vacant than was used for any single commercial activity at the time of interview. Therefore, a vacant building may have some occupied floorspace.

Sources: ....

Residential
2001 Residential Energy Consumption Survey
Square footage measurements and comparisons
http://www.eia.doe.gov/emeu/recs/sqft-measure.html

Commercial
Commercial Buildings Energy Consumption Survey (CBECS),
Description of CBECS Building Types
http://www.eia.doe.gov/emeu/cbecs/pba99/bldgtypes.html

Embodied Emissions Worksheet

Section I: Buildings

Type (Residential) or Principal Activity (Commercial)	# thousand sq feet/ unit or building	Life span related embodied GHG missions (MTCO2e/ unit)	Life span related embodied GHG missions (MTCO2e/ thousand square feet) - See calculations in table below
Single-Family Home................................	2.53	98	39
Multi-Family Unit in Large Building	0.85	33	39
Multi-Family Unit in Small Building	1.39	54	39
Mobile Home...	1.06	41	39
Education	25.6	991	39
Food Sales	5.6	217	39
Food Service	5.6	217	39
Health Care Inpatient	241.4	9,346	39
Health Care Outpatient	10.4	403	39
Lodging	35.8	1,386	39
Retail (Other Than Mall)..........................	9.7	376	39
Office	14.8	573	39
Public Assembly	14.2	550	39
Public Order and Safety	15.5	600	39
Religious Worship	10.1	391	39
Service	6.5	252	39
Warehouse and Storage	16.9	654	39
Other	21.9	848	39
Vacant	14.1	546	39

Section II: Pavement.............................

All Types of Pavement............................			50

	Columns and Beams	Intermediate Floors	Exterior Walls	Windows	Interior Walls	Roofs	Total Embodied Emissions (MTCO2e)	Total Embodied Emissions (MTCO2e/ thousand sq feet)
Average GWP (lbs CO2e/sq ft): Vancouver, Low Rise Building	5.3	7.8	19.1	51.2	5.7	21.3		
Average Materials in a 2,272-square foot single family home	0.0	2269.0	3206.0	285.0	6050.0	3103.0		
MTCO2e	0.0	8.0	27.8	6.6	15.6	30.0	88.0	38.7

Sources

All data in black text — King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov

Residential floorspace per unit — 2001 Residential Energy Consumption Survey (National Average, 2001)
Square footage measurements and comparisons
http://www.eia.doe.gov/emeu/recs/sqft-measure.html

Floorspace per building — EIA, 2003 Commercial Buildings Energy Consumption Survey (National Average, 2003)
Table C3. Consumption and Gross Energy Intensity for Sum of Major Fuels for Non-Mall Buildings, 2003
http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003excel/c3.xls

Average GWP (lbs CO2e/sq ft): Vancouver, Low Rise Building — Athena EcoCalculator
Athena Assembly Evaluation Tool v2.3- Vancouver Low Rise Building
Assembly Average GWP (kg) per square meter
http://www.athenasmi.ca/tools/ecoCalculator/index.html
Lbs per kg 2.20
Square feet per square meter 10.76

Average Materials in a 2,272-square foot single family home — Buildings Energy Data Book: 7.3 Typical/Average Household
Materials Used in the Construction of a 2,272-Square-Foot Single-Family Home, 2000
http://buildingsdatabook.eren.doe.gov/?id=view_book_table&TableID=2036&t=xls
See also: NAHB, 2004 Housing Facts, Figures and Trends, Feb. 2004, p. 7.

Average window size — Energy Information Administration/Housing Characteristics 1993
Appendix B, Quality of the Data. Pg. 5.
ftp://ftp.eia.doe.gov/pub/consumption/residential/rx93hcf.pdf

Pavement Emissions Factors MTCO2e/thousand square feet of asphalt or concrete pavement	50 (see below)

Embodied GHG Emissions……………………Worksheet Background Information

Buildings
Embodied GHG emissions are emissions that are created through the extraction, processing, transportation, construction and disposal of building materials as well as emissions created through landscape disturbance (by both soil disturbance and changes in above ground biomass).

Estimating embodied GHG emissions is new field of analysis; the estimates are rapidly improving and becoming more inclusive of all elements of construction and development.

The estimate included in this worksheet is calculated using average values for the main construction materials that are used to create a typical family home. In 2004, the National Association of Home Builders calculated the average materials that are used in a typical 2,272 square foot single-family household. The quantity of materials used is then multiplied by the average GHG emissions associated with the life-cycle GHG emissions for each material.

This estimate is a rough and conservative estimate; the actual embodied emissions for a project are likely to be higher. For example, at this stage, due to a lack of comprehensive data, the estimate does not include important factors such as landscape disturbance or the emissions associated with the interior components of a building (such as furniture).

King County realizes that the calculations for embodied emissions in this worksheet are rough. For example, the emissions associated with building 1,000 square feet of a residential building will not be the same as 1,000 square feet of a commercial building. However, discussions with the construction community indicate that while there are significant differences between the different types of structures, this method of estimation is reasonable; it will be improved as more data become available.

Additionally, if more specific information about the project is known, King County recommends two online embodied emissions calculators that can be used to obtain a more tailored estimate for embodied emissions: www.buildcarbonneutral.org and www.athenasmi.ca/tools/ecoCalculator/.

Pavement
Four recent life cycle assessments of the environmental impacts of roads form the basis for the per unit embodied emissions of pavement. Each study is constructed in slightly different ways; however, the aggregate results of the reports represent a reasonable estimate of the GHG emissions that are created from the manufacture of paving materials, construction related emissions, and maintenance of the pavement over its expected life cycle. For specifics, see the worksheet.

Special Section: Estimating the Embodied Emissions for Pavement

Four recent life cycle assessments of the environmental impacts of roads form the basis for the per unit embodied emissions of pavement. Each study is constructed in slightly different ways; however, the aggregate results of the reports represent a reasonable estimate of the GHG emissions that are created from the manufacture of paving materials, construction related emissions, and maintenance of the pavement over its expected life cycle.

The results of the studies are presented in different units and measures; considerable effort was undertaken to be able to compare the results of the studies in a reasonable way. For more details about the below methodology, contact matt.kuharic@kingcounty.gov.

The four studies, Meil (2001), Park (2003), Stripple (2001) and Treolar (2001) produced total GHG emissions of 4-34 MTCO2e per thousand square feet of finished paving (for similar asphalt and concrete based pavements). This estimate does not including downstream maintenance and repair of the highway. The average (for all concrete and asphalt pavements in the studies, assuming each study gets one data point) is ~17 MTCO2e/thousand square feet.

Three of the studies attempted to thoroughly account for the emissions associated with long term maintenance (40 years) of the roads. Stripple (2001), Park et al. (2003) and Treolar (2001) report 17, 81, and 68 MTCO2e/thousand square feet, respectively, after accounting for maintenance of the roads.

Based on the above discussion, King County makes the conservative estimate that 50 MTCO2e/thousand square feet of pavement (over the development's life cycle) will be used as the embodied emission factor for pavement until better estimates can be obtained. This is roughly equivalent to 3,500 MTCO2e per lane mile of road (assuming the lane is 13 feet wide).

It is important to note that these studies estimate the embodied emissions for roads. Paving that does not need to stand up to the rigors of heavy use (such as parking lots or driveways) would likely use less materials and hence have lower embodied emissions.

Sources:

Meil, J. A Life Cycle Perspective on Concrete and Asphalt Roadways: Embodied Primary Energy and Global Warming Potential. 2006. Available: http://www.cement.ca/cement.nsf/eee9ec7bbd630126852566c40052107b/6ec79dc8ae03a782852572b90061b914/$FILE/ATTK0WE3/athena%20report%20Feb.%202%202007.pdf

Park, K, Hwang, Y., Seo, S., M.ASCE, and Seo, H. , "Quantitative Assessment of Environmental Impacts on Life Cycle of Highways," Journal of Construction Engineering and Management , Vol 129, January/February 2003, pp 25-31, (DOI: 10.1061/(ASCE)0733-9364(2003)129:1(25)).

Stripple, H. Life Cycle Assessment of Road. A Pilot Study for Inventory Analysis. Second Revised Edition. IVL Swedish Environmental Research Institute Ltd. 2001. Available: http://www.ivl.se/rapporter/pdf/B1210E.pdf

Treloar, G., Love, P.E.D., and Crawford, R.H. Hybrid Life-Cycle Inventory for Road Construction and Use. Journal of Construction Engineering and Management. P. 43-49. January/February 2004.

Energy Emissions Worksheet

Type (Residential) or Principal Activity (Commercial)	Energy consumption per building per year (million Btu)	Carbon Coefficient for Buildings	MTCO2e per building per year	Floorspace per Building (thousand square feet)	MTCE per thousand square feet per year	MTCO2e per thousand square feet per year	Average Building Life Span	Lifespan Energy Related MTCO2e emissions per unit	Lifespan Energy Related MTCO2e emissions per thousand square feet
Single-Family Home..............................	107.3	0.108	11.61	2.53	4.6	16.8	57.9	672	266
Multi-Family Unit in Large Building	41.0	0.108	4.44	0.85	5.2	19.2	80.5	357	422
Multi-Family Unit in Small Building	78.1	0.108	8.45	1.39	6.1	22.2	80.5	681	489
Mobile Home...	75.9	0.108	8.21	1.06	7.7	28.4	57.9	475	448
Education	2,125.0	0.124	264.2	25.6	10.3	37.8	62.5	16,526	646
Food Sales	1,110.0	0.124	138.0	5.6	24.6	90.4	62.5	8,632	1,541
Food Service	1,436.0	0.124	178.5	5.6	31.9	116.9	62.5	11,168	1,994
Health Care Inpatient	60,152.0	0.124	7,479.1	241.4	31.0	113.6	62.5	467,794	1,938
Health Care Outpatient	985.0	0.124	122.5	10.4	11.8	43.2	62.5	7,660	737
Lodging	3,578.0	0.124	444.9	35.8	12.4	45.6	62.5	27,826	777
Retail (Other Than Mall)........................	720.0	0.124	89.5	9.7	9.2	33.8	62.5	5,599	577
Office	1,376.0	0.124	171.1	14.8	11.6	42.4	62.5	10,701	723
Public Assembly	1,338.0	0.124	166.4	14.2	11.7	43.0	62.5	10,405	733
Public Order and Safety	1,791.0	0.124	222.7	15.5	14.4	52.7	62.5	13,928	899
Religious Worship	440.0	0.124	54.7	10.1	5.4	19.9	62.5	3,422	339
Service	501.0	0.124	62.3	6.5	9.6	35.1	62.5	3,896	599
Warehouse and Storage	764.0	0.124	95.0	16.9	5.6	20.6	62.5	5,942	352
Other	3,600.0	0.124	447.6	21.9	20.4	74.9	62.5	27,997	1,278
Vacant	294.0	0.124	36.6	14.1	2.6	9.5	62.5	2,286	162

Sources

All data in black text	King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov
Energy consumption for residential buildings	2007 Buildings Energy Data Book: 6.1 Quad Definitions and Comparisons (National Average, 2001) Table 6.1.4: Average Annual Carbon Dioxide Emissions for Various Functions http://buildingsdatabook.eren.doe.gov/ Data also at: http://www.eia.doe.gov/emeu/recs/recs2001_ce/ce1-4c_housingunits2001.html
Energy consumption for commercial buildings and Floorspace per building	EIA, 2003 Commercial Buildings Energy Consumption Survey (National Average, 2003) Table C3. Consumption and Gross Energy Intensity for Sum of Major Fuels for Non-Mall Buildings, 2003 http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003excel/c3.xls
	Note: Data in plum color is found in both of the above sources (buildings energy data book and commercial buildings energy consumption survey).
Carbon Coefficient for Buildings	Buildings Energy Data Book (National average, 2005) Table 3.1.7. 2005 Carbon Dioxide Emission Coefficients for Buildings (MMTCE per Quadrillion Btu) http://buildingsdatabook.eere.energy.gov/?id=view_book_table&TableID=2057 Note: Carbon coefficient in the Energy Data book is in MTCE per Quadrillion Btu. To convert to MTCO2e per million Btu, this factor was divided by 1000 and multiplied by 44/12.
Residential floorspace per unit	2001 Residential Energy Consumption Survey (National Average, 2001) Square footage measurements and comparisons http://www.eia.doe.gov/emeu/recs/sqft-measure.html

average lief span of buildings, estimated by replacement time method

	Single Family Homes	Multi-Family Units in Large and Small Buildings	All Residential Buildings	
New Housing Construction, 2001	1,273,000	329,000	1,602,000	
Existing Housing Stock, 2001	73,700,000	26,500,000	100,200,000	
Replacement time:	57.9	80.5	62.5	(national average, 2001)

Note: Single family homes calculation is used for mobile homes as a best estimate life span.
Note: At this time, KC staff could find no reliable data for the average life span of commercial buildings.
Therefore, the average life span of residential buildings is being used until a better approximation can be ascertained.

Sources:

New Housing Construction, 2001 Quarterly Starts and Completions by Purpose and Design - US and Regions (Excel)
http://www.census.gov/const/quarterly_starts_completions_cust.xls
See also: http://www.census.gov/const/www/newresconstindex.html

Existing Housing Stock, 2001 Residential Energy Consumption Survey (RECS) 2001
Tables HC1:Housing Unit Characteristics, Million U.S. Households 2001
Table HC1-4a. Housing Unit Characteristics by Type of Housing Unit, Million U.S. Households, 2001
Million U.S. Households, 2001
http://www.eia.doe.gov/emeu/recs/recs2001/hc_pdf/housunits/hc1-4a_housingunits2001.pdf

Transportation Emissions Worksheet

Type (Residential) or Principal Activity (Commercial)	# people/ unit or building	# thousand sq feet/ unit or building	# people or employees/ thousand square feet	vehicle related GHG emissions (metric tonnes CO2e per person per year)	MTCO2e/ year/ unit	MTCO2e/ year/ thousand square feet	Average Building Life Span	Life span transportation related GHG emissions (MTCO2e/ per unit)	Life span transportation related GHG emissions (MTCO2e/ thousand sq feet)
Single-Family Home..................................	2.8	2.53	1.1	4.9	13.7	5.4	57.9	792	313
Multi-Family Unit in Large Building	1.9	0.85	2.3	4.9	9.5	11.2	80.5	766	904
Multi-Family Unit in Small Building	1.9	1.39	1.4	4.9	9.5	6.8	80.5	766	550
Mobile Home..	2.5	1.06	2.3	4.9	12.2	11.5	57.9	709	668
Education	30.0	25.6	1.2	4.9	147.8	5.8	62.5	9247	361
Food Sales	5.1	5.6	0.9	4.9	25.2	4.5	62.5	1579	282
Food Service	10.2	5.6	1.8	4.9	50.2	9.0	62.5	3141	561
Health Care Inpatient	455.5	241.4	1.9	4.9	2246.4	9.3	62.5	140506	582
Health Care Outpatient	19.3	10.4	1.9	4.9	95.0	9.1	62.5	5941	571
Lodging	13.6	35.8	0.4	4.9	67.1	1.9	62.5	4194	117
Retail (Other Than Mall)............................	7.8	9.7	0.8	4.9	38.3	3.9	62.5	2394	247
Office	28.2	14.8	1.9	4.9	139.0	9.4	62.5	8696	588
Public Assembly	6.9	14.2	0.5	4.9	34.2	2.4	62.5	2137	150
Public Order and Safety	18.8	15.5	1.2	4.9	92.7	6.0	62.5	5796	374
Religious Worship	4.2	10.1	0.4	4.9	20.8	2.1	62.5	1298	129
Service	5.6	6.5	0.9	4.9	27.6	4.3	62.5	1729	266
Warehouse and Storage	9.9	16.9	0.6	4.9	49.0	2.9	62.5	3067	181
Other	18.3	21.9	0.8	4.9	90.0	4.1	62.5	5630	257
Vacant	2.1	14.1	0.2	4.9	10.5	0.7	62.5	657	47

Sources

All data in black text — King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov

people/ unit — Estimating Household Size for Use in Population Estimates (WA state, 2000 average)
Washington State Office of Financial Management
Kimpel, T. and Lowe, T. Research Brief No. 47. August 2007
http://www.ofm.wa.gov/researchbriefs/brief047.pdf
Note: This analysis combines Multi Unit Structures in both large and small units into one category;
the average is used in this case although there is likely a difference

Residential floorspace per unit — 2001 Residential Energy Consumption Survey (National Average, 2001)
Square footage measurements and comparisons
http://www.eia.doe.gov/emeu/recs/sqft-measure.html

employees/thousand square feet — Commercial Buildings Energy Consumption Survey commercial energy uses and costs (National Median, 2003)
Table B2 Totals and Medians of Floorspace, Number of Workers, and Hours of Operation for Non-Mall Buildings, 2003
http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set1/2003excel/b2.xls

Note: Data for # employees/thousand square feet is presented by CBECS as square feet/employee.
In this analysis employees/thousand square feet is calculated by taking the inverse of the CBECS number and multiplying by 1000.

vehicle related GHG emissions

Estimate calculated as follows (Washington state, 2006)_

56,531,930,000 2006 Annual WA State Vehicle Miles Traveled

Data was daily VMT. Annual VMT was 365*daily VMT.
http://www.wsdot.wa.gov/mapsdata/tdo/annualmileage.htm

6,395,798 2006 WA state population

http://quickfacts.census.gov/qfd/states/53000.html

8839 vehicle miles per person per year

0.0506 gallon gasoline/mile

This is the weighted national average fuel efficiency for all cars and 2 axle, 4 wheel light trucks in 2005. This includes pickup trucks, vans and SUVs. The 0.051 gallons/mile used here is the inverse of the more commonly known term "miles/per gallon" (which is 19.75 for these cars and light trucks).
Transportation Energy Data Book. 26th Edition. 2006. Chapter 4: Light Vehicles and Characteristics. Calculations based on weighted average MPG efficiency of cars and light trucks.
http://cta.ornl.gov/data/tedb26/Edition26_Chapter04.pdf
Note: This report states that in 2005, 92.3% of all highway VMT were driven by the above described vehicles.
http://cta.ornl.gov/data/tedb26/Spreadsheets/Table3_04.xls

24.3 lbs CO_2e/gallon gasoline

The CO_2 emissions estimates for gasoline and diesel include the extraction, transport, and refinement of petroleum as well as their combustion.
Life-Cycle CO_2 Emissions for Various New Vehicles. RENew Northfield.
Available: http://renewnorthfield.org/wpcontent/uploads/2006/04/CO2%20emissions.pdf
Note: This is a conservative estimate of emissions by fuel consumption because diesel fuel,

2205 with a emissions factor of 26.55 lbs CO_2e/gallon was not estimated.

4.93 lbs/metric tonne

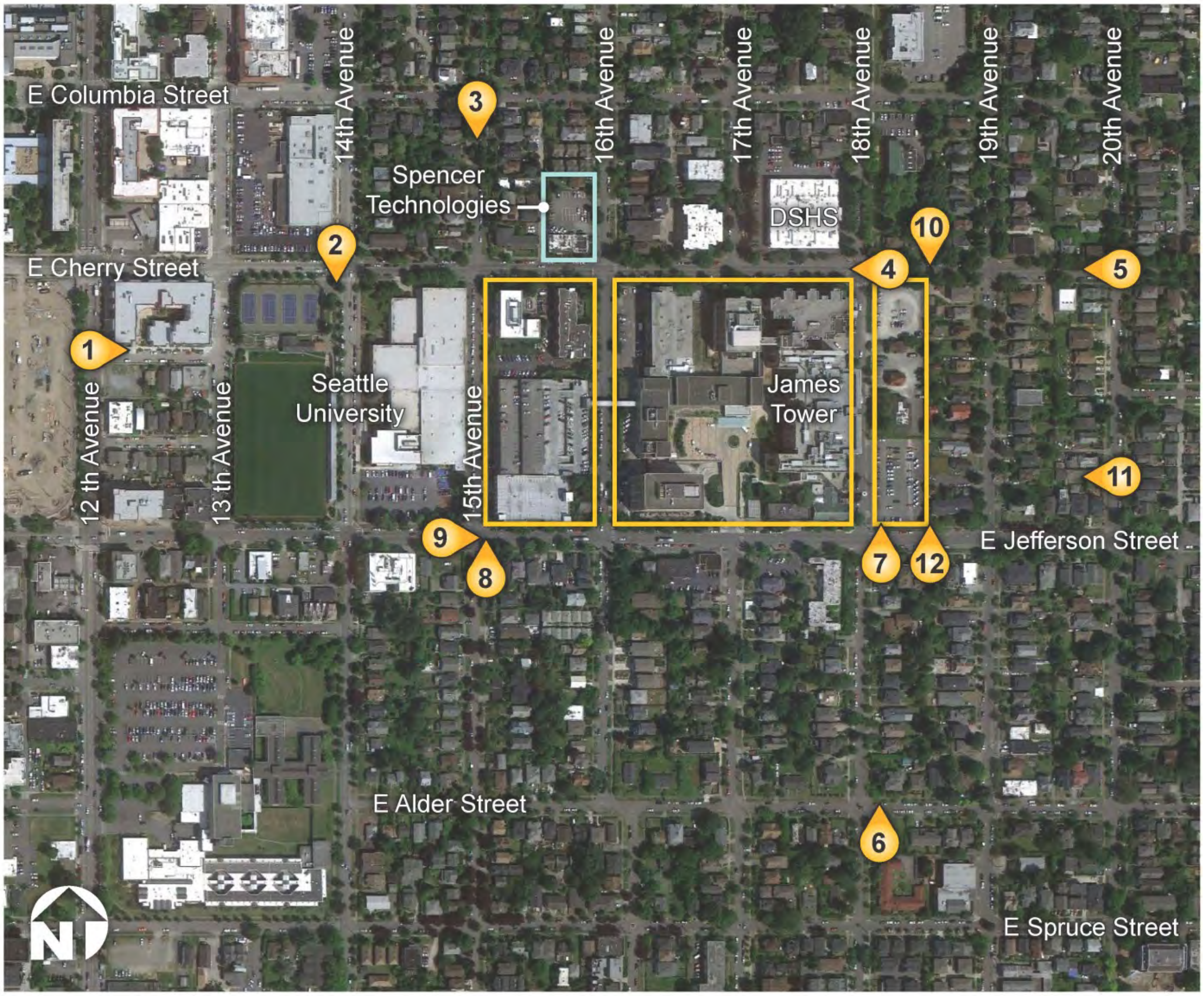
vehicle related GHG emissions (metric tonnes CO_2e per person per year)

average lief span of buildings, estimated by replacement time method — See Energy Emissions Worksheet for Calculations

Commercial floorspace per unit — EIA, 2003 Commercial Buildings Energy Consumption Survey (National Average, 2003)
Table C3. Consumption and Gross Energy Intensity for Sum of Major Fuels for Non-Mall Buildings, 2003
http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003excel/c3.xls

Appendix B

Visual Simulations and Shadow Diagrams



Source: Google Earth Pro

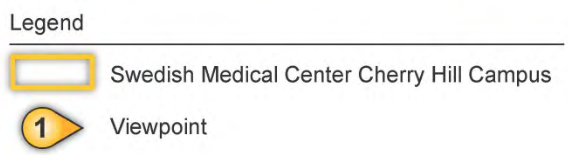


Figure B-1

Viewpoint Locations

Viewpoints

Affected Environment

Figure B-2

Viewpoint 1: East on E James Court at 12th Avenue

Figure B-3

Viewpoint 2: South on 15th Avenue at E Cherry Street

Figure B-4

Viewpoint 3: 16th Avenue between E Cherry & E Columbia Streets

Figure B-5

Viewpoint 4: West on E Cherry at 18th Avenue

Figure B-6

Viewpoint 5: West on E Cherry Street at 19th Avenue

Figure B-7

Viewpoint 6: North on 18th Avenue at E Alder Street

Figure B-8

Viewpoint 7: North on 18th Avenue at E Jefferson Street

Figure B-9

Viewpoint 8: North on 16th Avenue at E Jefferson Street

Figure B-10

Viewpoint 9: East on E Jefferson Street at 16th Avenue

Figure B-11

Viewpoint 10: South midblock between 18th & 19th Avenues at E Cherry Street

Figure B-12

Viewpoint 11: West at 19th Avenue between E Jefferson & E Cherry Streets

Figure B-13

Viewpoint 12: North on Jefferson midblock between 18th & 19th Avenues

Shadow Diagrams

Shadow Analysis – June 21, 8:00 a.m.

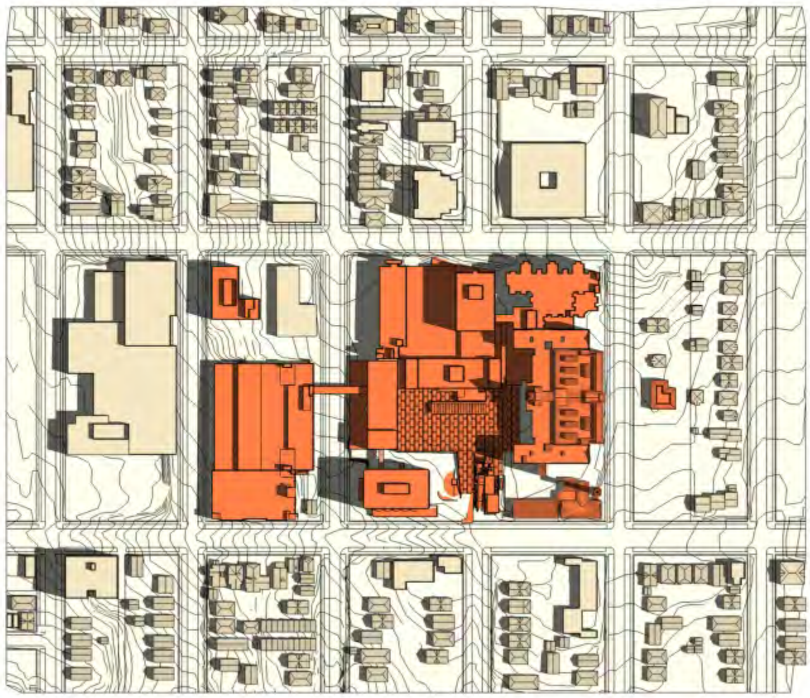


Figure S-1
Alternative 1 – No Build

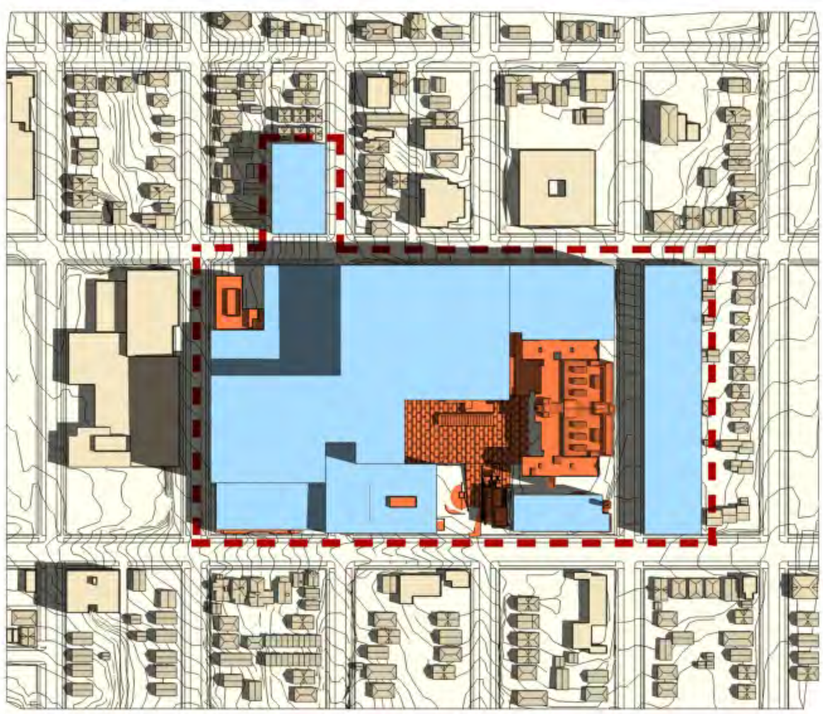


Figure S-2
Alternative 5

Shadow Analysis - June 21, 8:00 a.m.

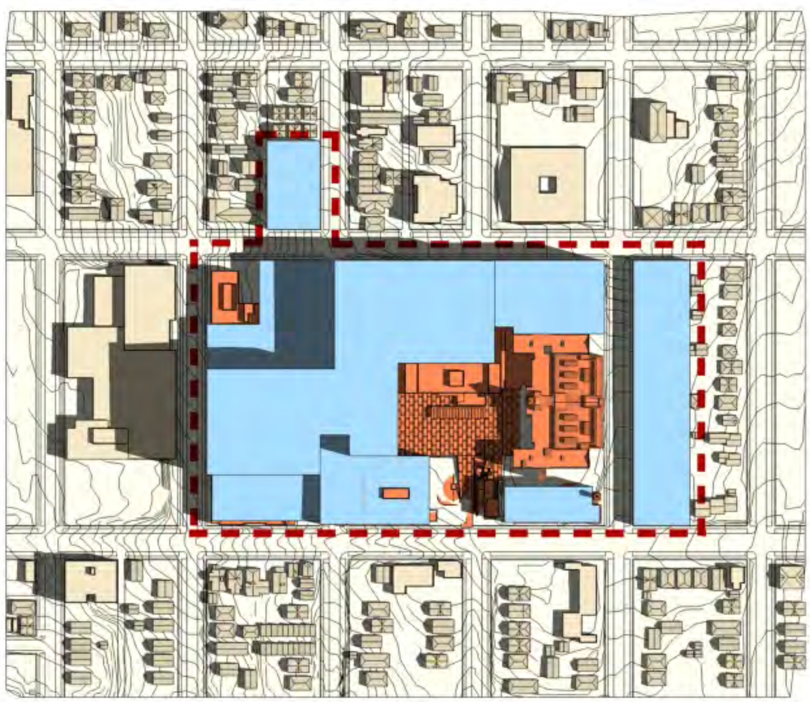


Figure S-3
Alternative 6

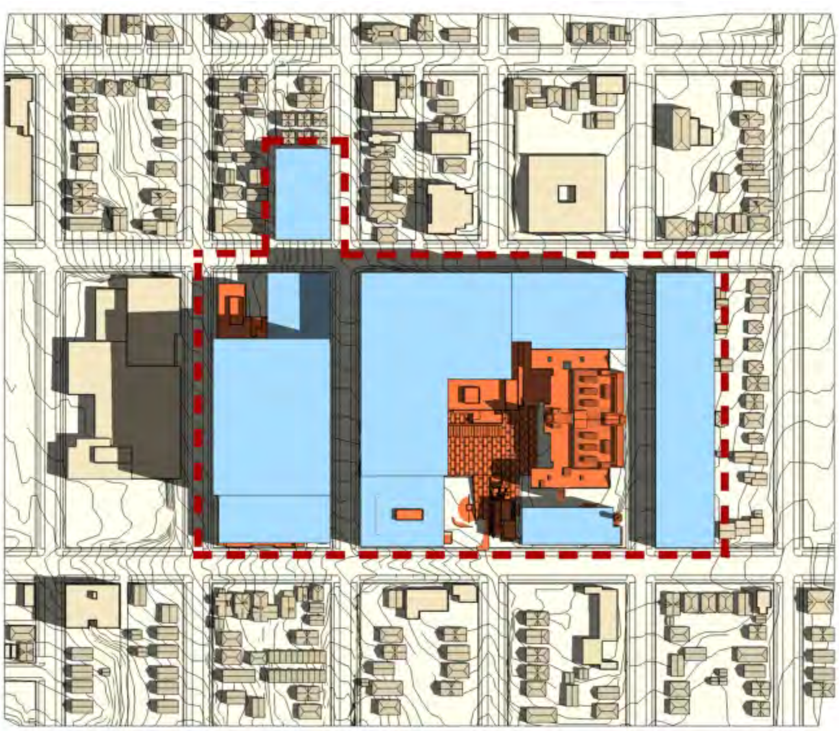


Figure S-4
Alternative 7

Shadow Analysis – June 21, Noon

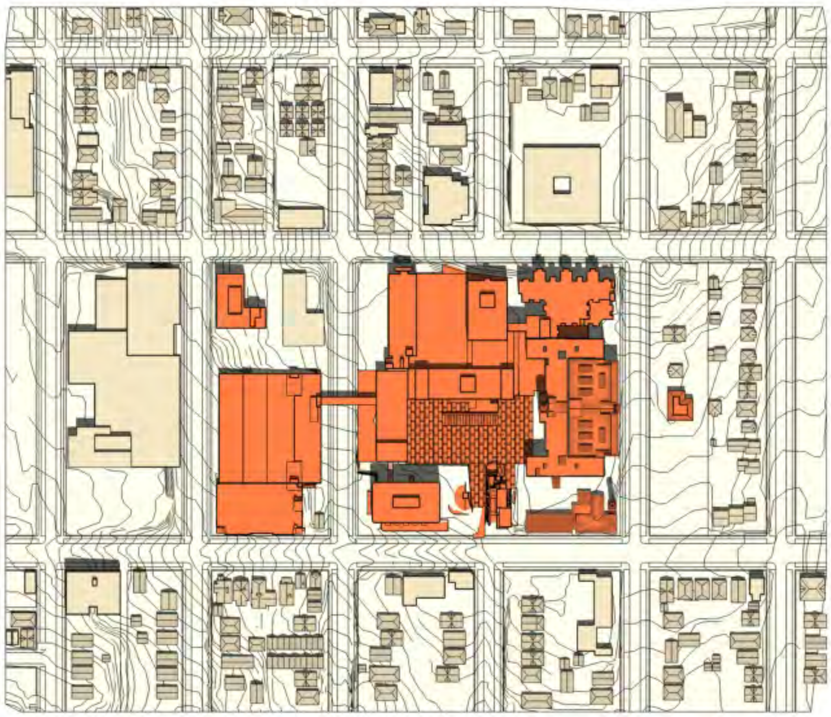


Figure S-5
Alternative 1 – No Build

Figure S-6
Alternative 5

Shadow Analysis - June 21, Noon

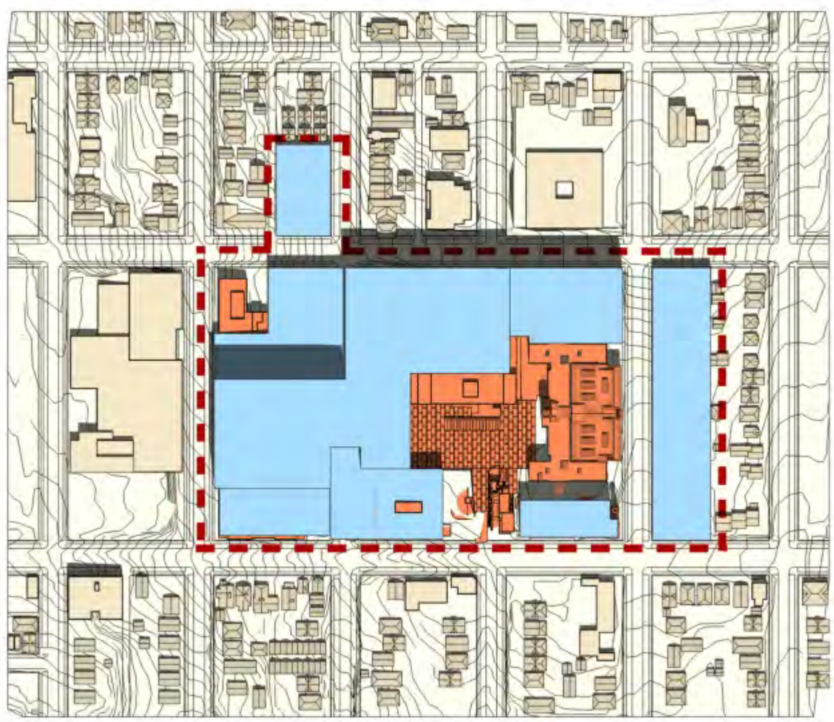


Figure S-7
Alternative 6

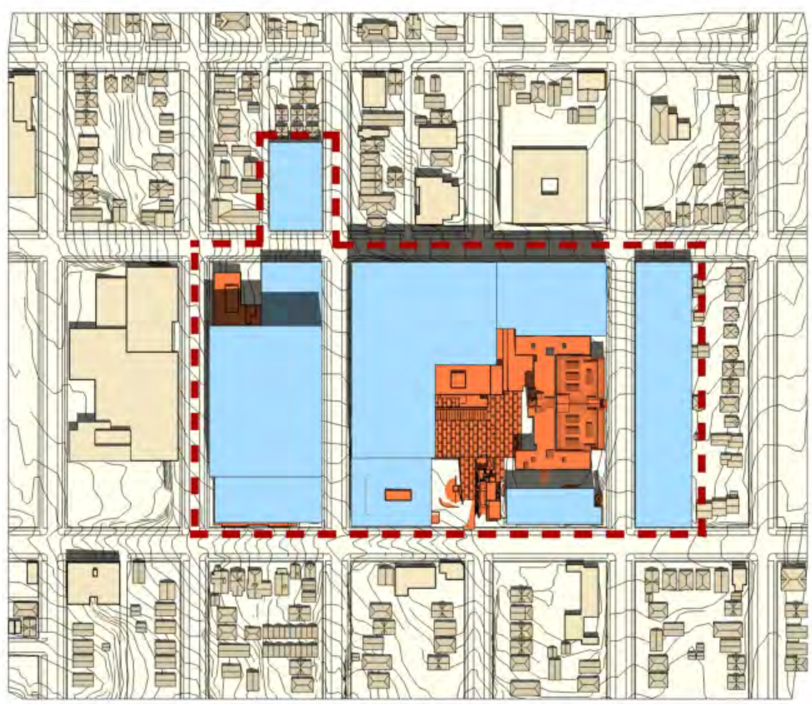


Figure S-8
Alternative 7

Shadow Analysis - June 21, 4:00 p.m.

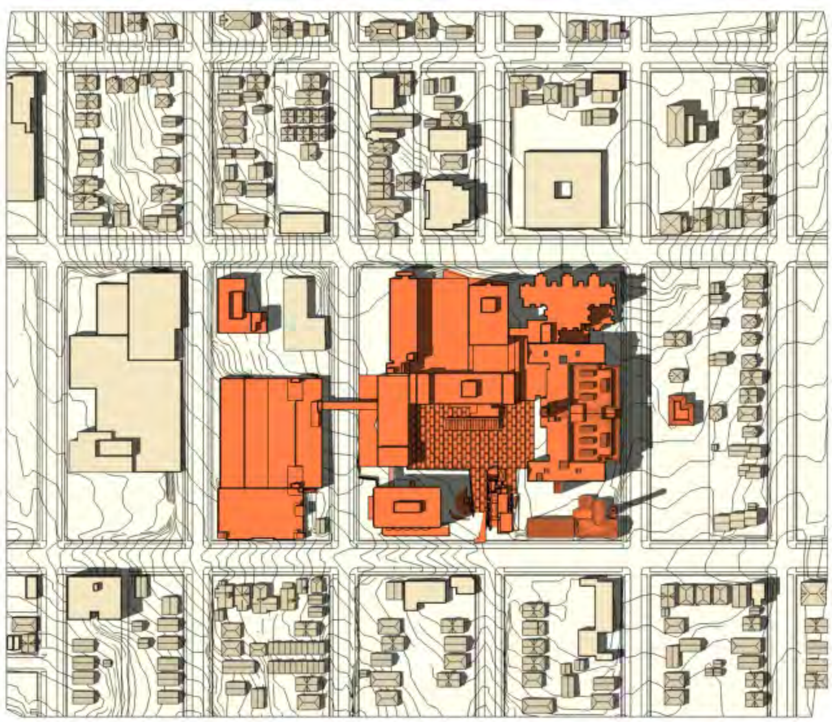


Figure S-9
Alternative 1 – No Build

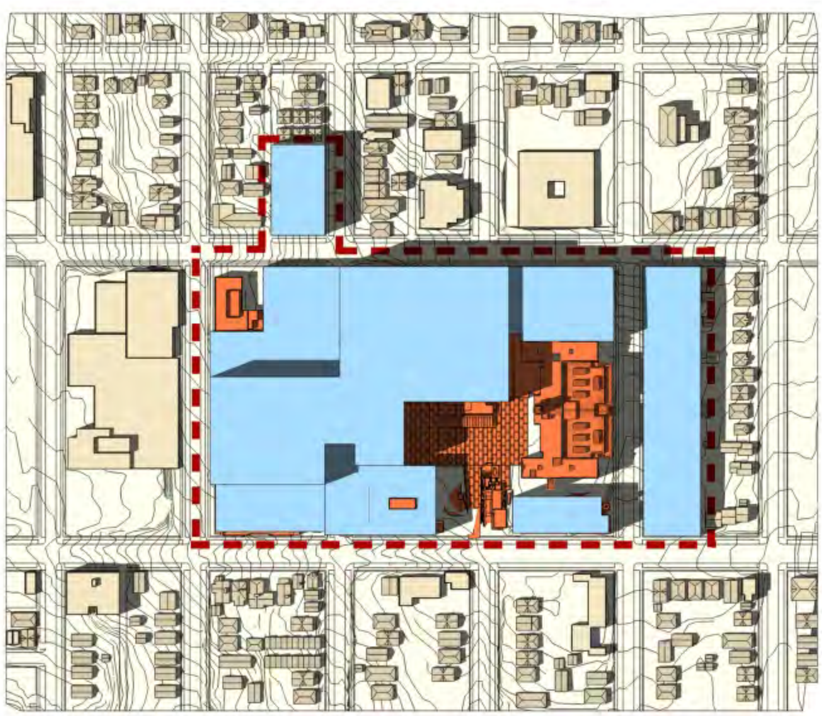


Figure S-10
Alternative 5

Shadow Analysis - June 21, 4:00 p.m.

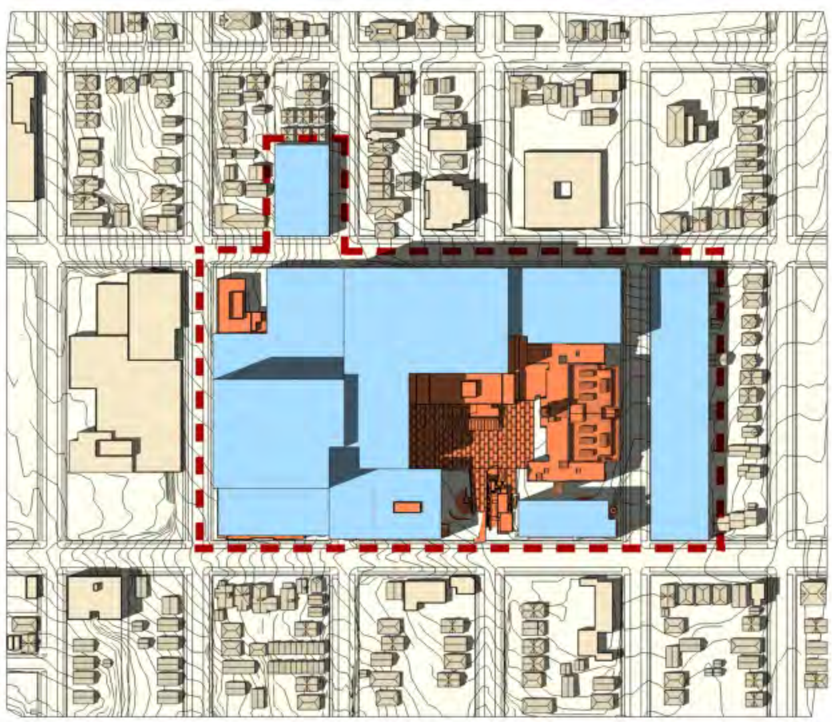


Figure S-11
Alternative 6

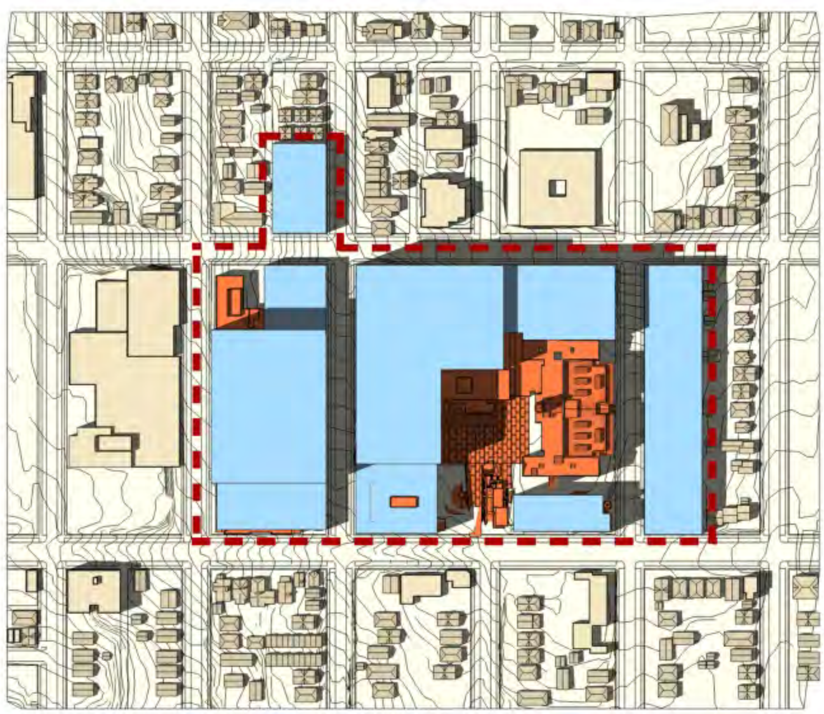


Figure S-12
Alternative 7

Shadow Analysis – December 21, 9:00 a.m.

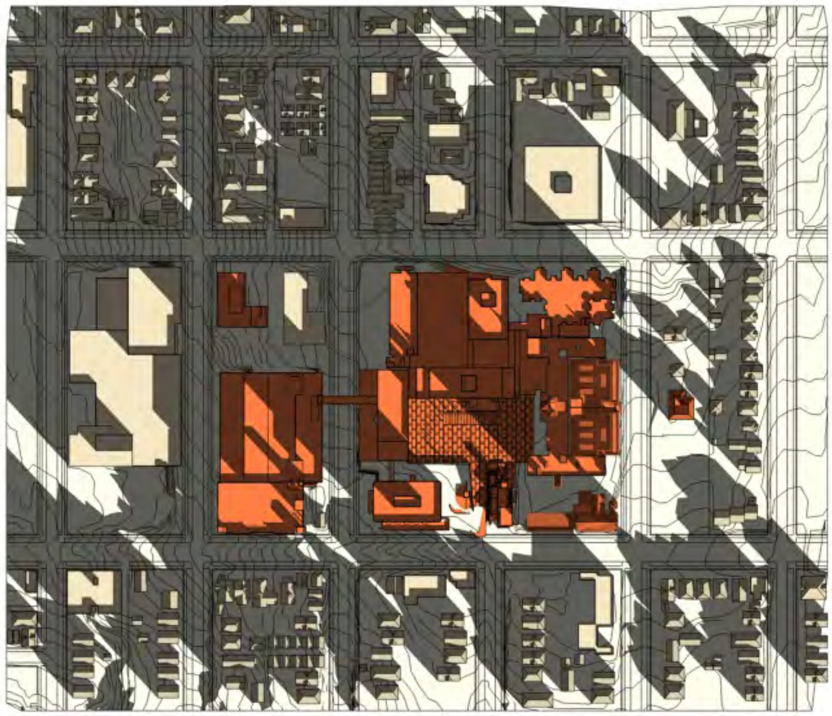


Figure S-13
Alternative 1 – No Build

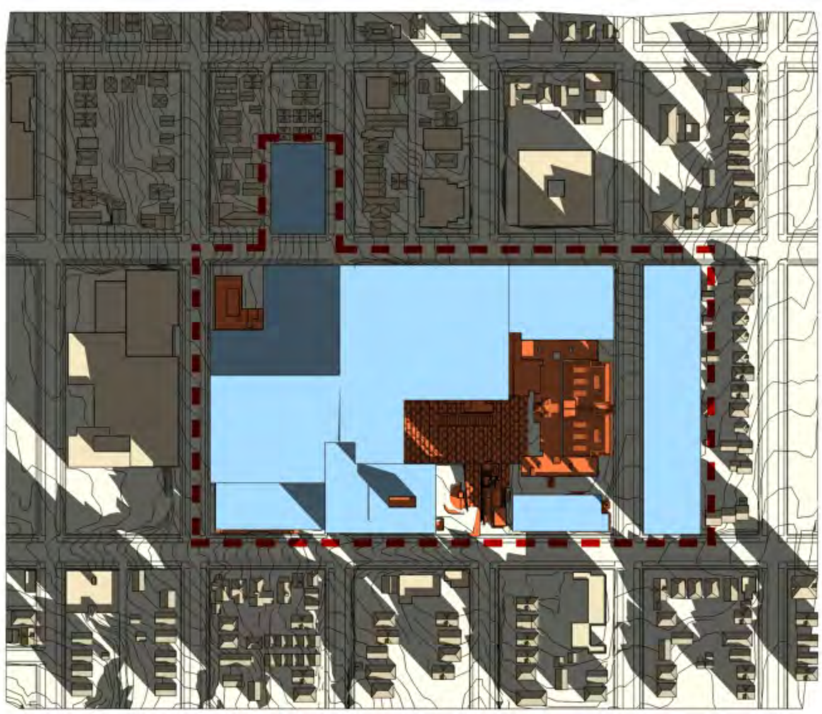


Figure S-14
Alternative 5

Shadow Analysis – December 21, 9:00 a.m.

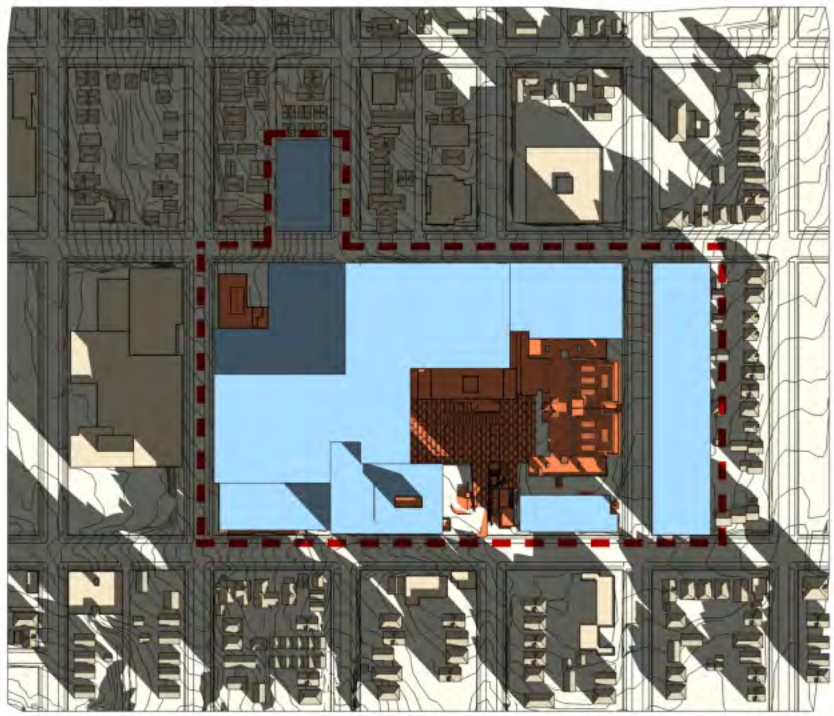


Figure S-15
Alternative 6

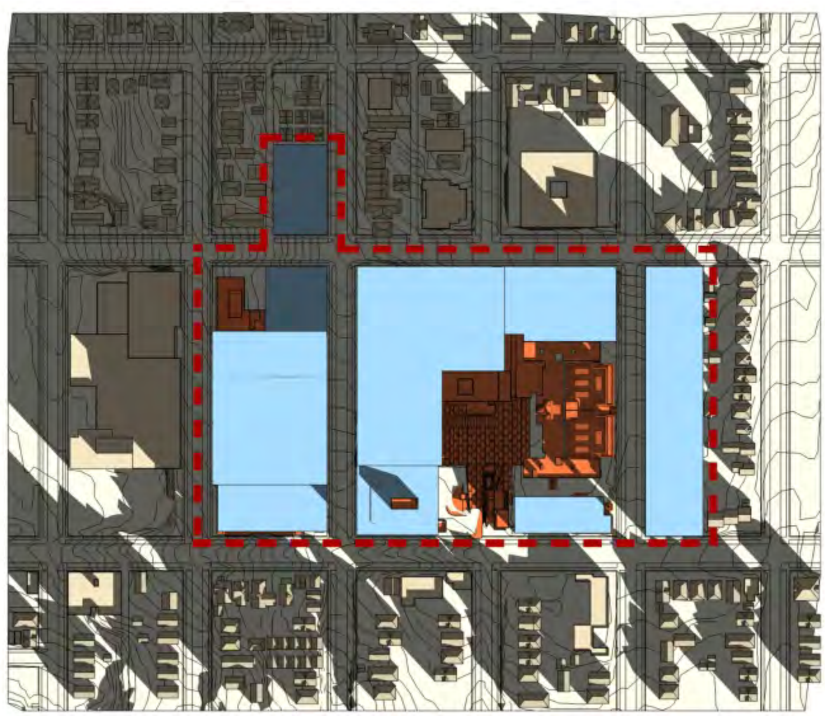


Figure S-16
Alternative 7

Shadow Analysis – December 21, Noon

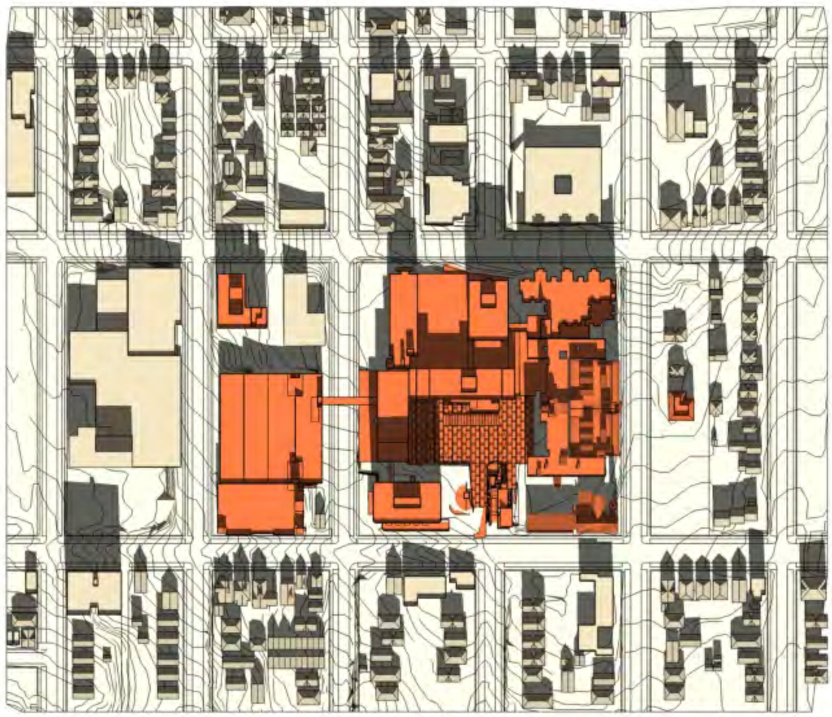


Figure S-17
Alternative 1 – No Build

Figure S-18
Alternative 5

Shadow Analysis – December 21, Noon

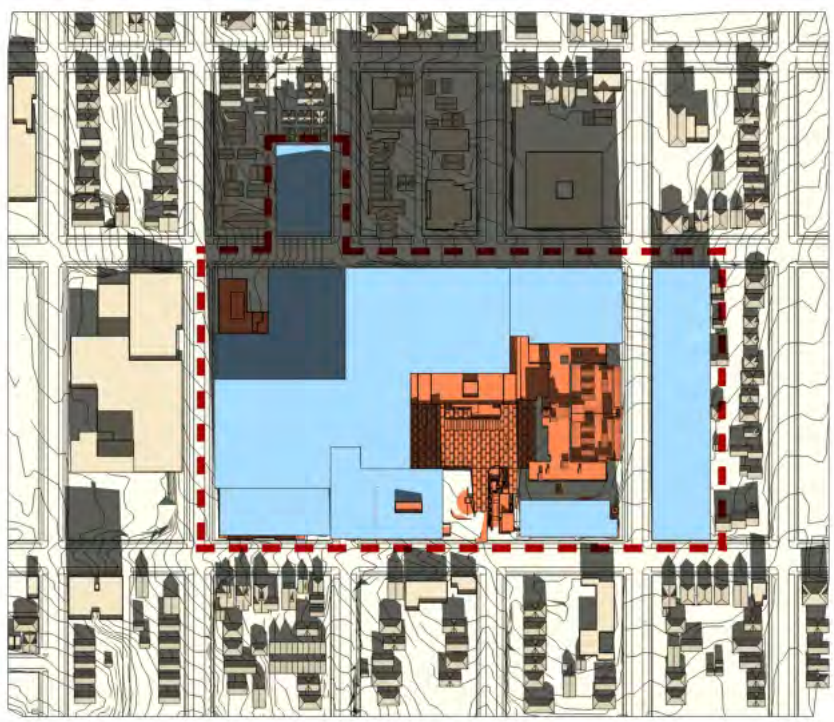


Figure S-19
Alternative 6

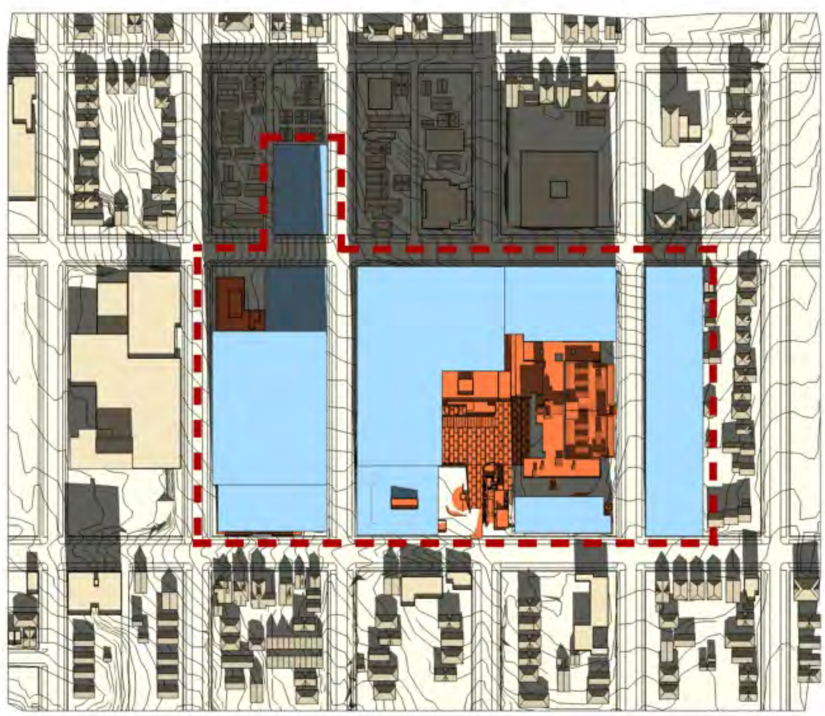


Figure S-20
Alternative 7

Shadow Analysis – December 21, 3:00 p.m.

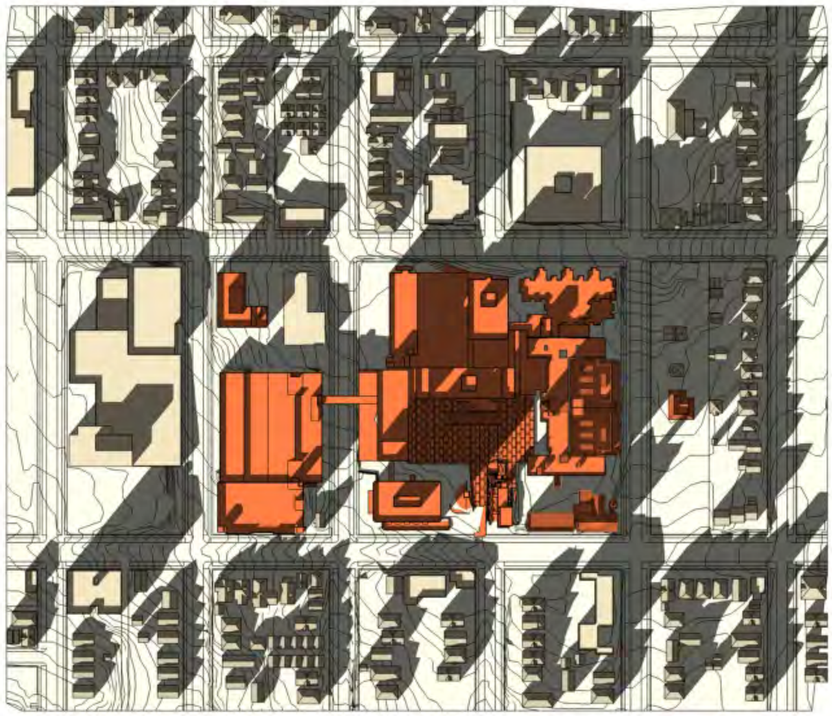


Figure S-21
Alternative 1 – No Build

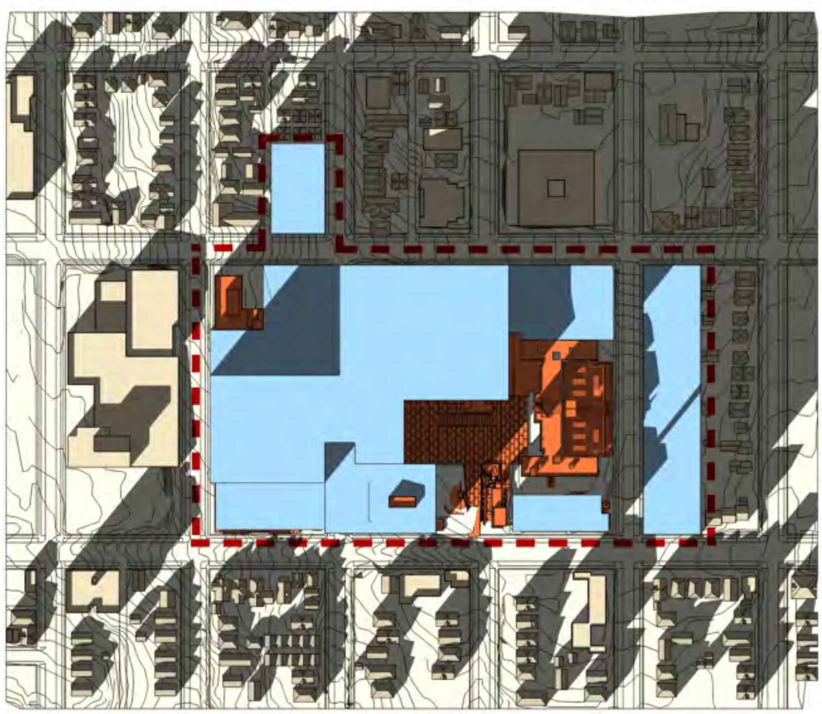


Figure S-22
Alternative 5

Shadow Analysis – December 21, 3:00 p.m.

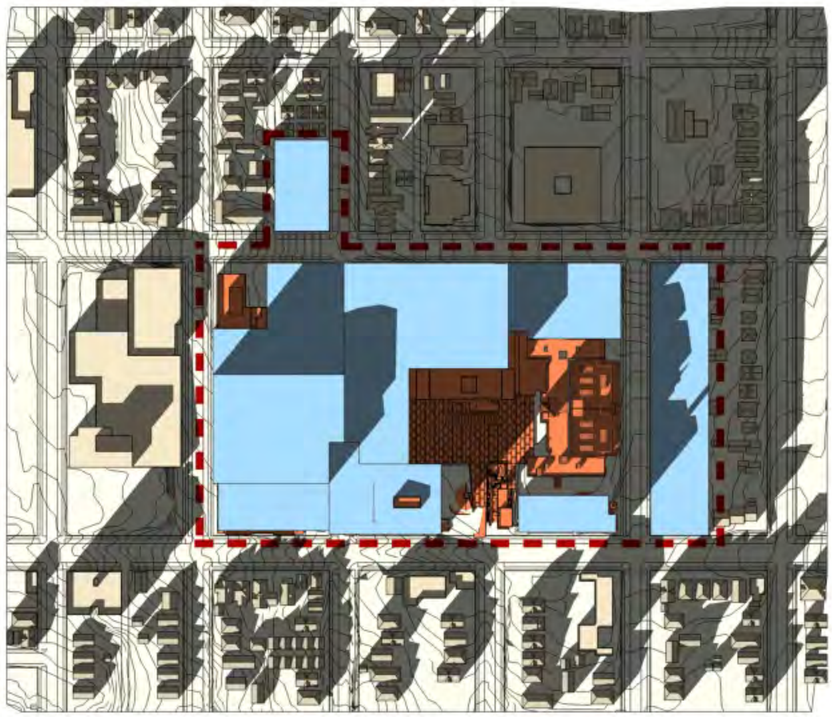


Figure S-23
Alternative 6

Figure S-24
Alternative 7

Viewpoints

Visual Simulations

Viewpoint 1

Figure 3D-1
Alternative 1 – No Build

Figure 3D-2
Alternative 5

Viewpoint 1

Figure 3D-3
Alternative 6

Figure 3D-4
Alternative 7

Viewpoint 2

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Alternative 1 – No Build

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Viewpoint 2

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Figure 3D-9
Alternative 1 – No Build

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Viewpoint 3

Figure 3D-11
Alternative 6

Figure 3D-12
Alternative 7

Viewpoint 4

Figure 3D-13
Alternative 1 – No Build

Figure 3D-14
Alternative 5

Viewpoint 4

Figure 3D-15
Alternative 6

Figure 3D-16
Alternative 7

Viewpoint 5

Figure 3D-17
Alternative 1 – No Build

Figure 3D-18
Alternative 5

Viewpoint 5

Figure 3D-19
Alternative 6

Figure 3D-20
Alternative 7

Viewpoint 6

Figure 3D-21
Alternative 1 – No Build

Figure 3D-22
Alternative 5

Viewpoint 6

Figure 3D-23
Alternative 6

Figure 3D-24
Alternative 7

Viewpoint 7

Figure 3D-25
Alternative 1 – No Build

Figure 3D-26
Alternative 5

Viewpoint 7

Figure 3D-27
Alternative 6

Figure 3D-28
Alternative 7

Viewpoint 8

Figure 3D-29
Alternative 1 – No Build

Figure 3D-30
Alternative 5

Viewpoint 8

Figure 3D-31
Alternative 6

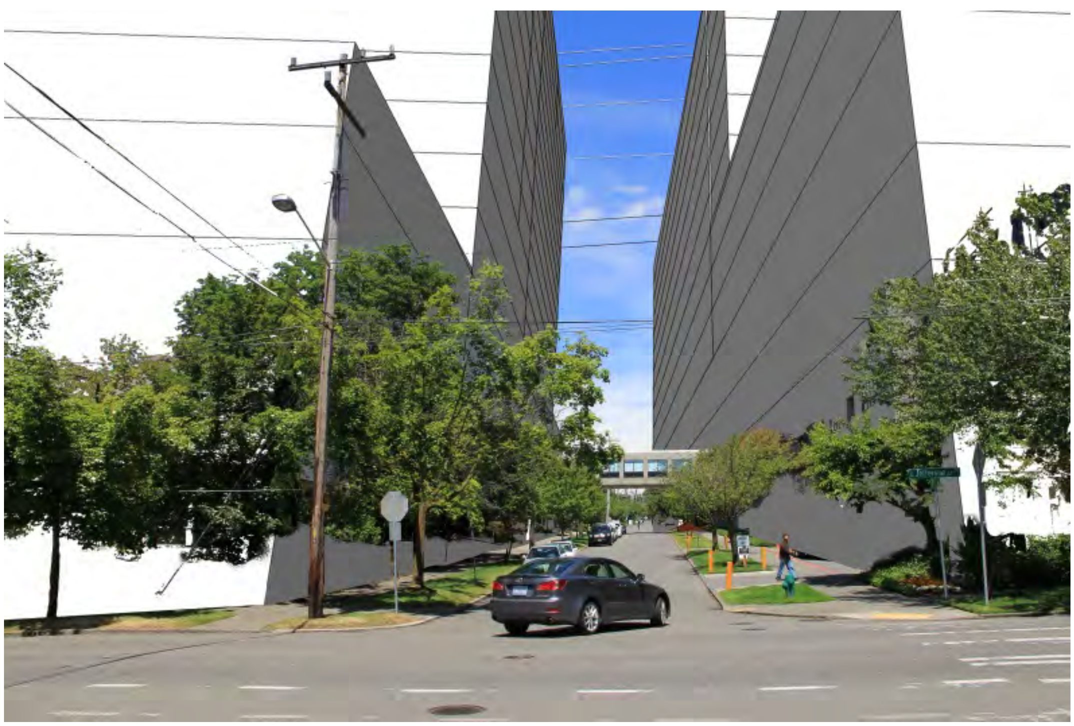


Figure 3D-32
Alternative 7

Viewpoint 9

Figure 3D-33
Alternative 1 – No Build

Figure 3D-34
Alternative 5

Viewpoint 9

Figure 3D-35
Alternative 6

Figure 3D-36
Alternative 7

Viewpoint 10

Figure 3D-37
Alternative 1 – No Build

Figure 3D-38
Alternative 5

Viewpoint 10

Figure 3D-39
Alternative 6

Figure 3D-40
Alternative 7

Viewpoint 11

Figure 3D-41
Alternative 1 – No Build

Figure 3D-42
Alternative 5

Viewpoint 11

Figure 3D-43
Alternative 6

Figure 3D-44
Alternative 7

Viewpoint 12

Figure 3D-45
Alternative 1 – No Build

Figure 3D-46
Alternative 5

Viewpoint 12

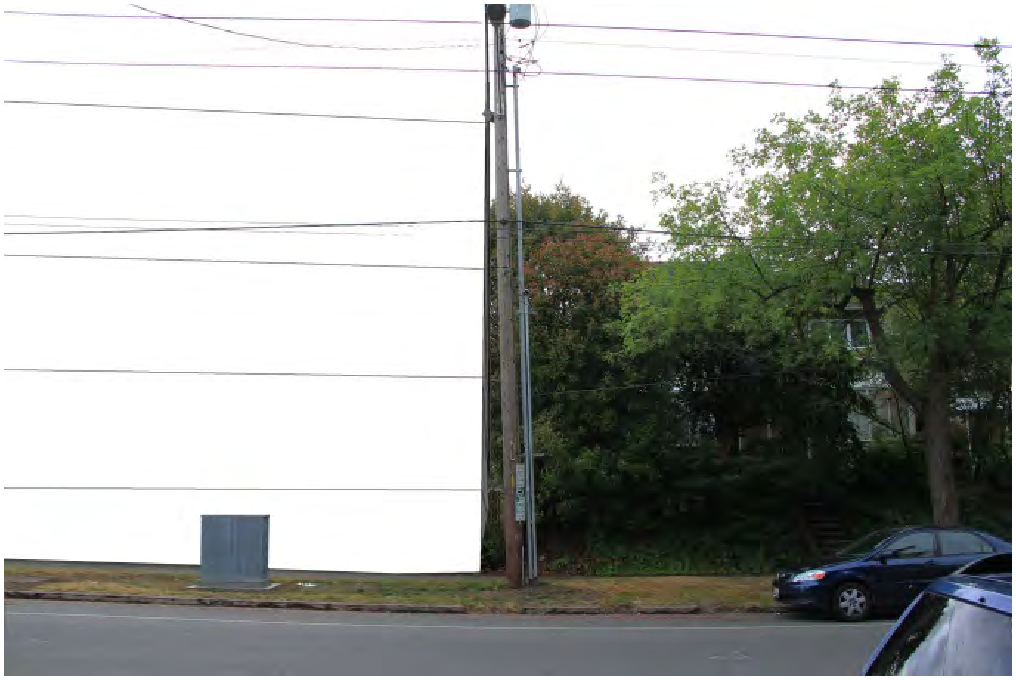


Figure 3D-47
Alternative 6

Figure 3D-48
Alternative 7

Appendix C

Transportation Resource Report

Preliminary Draft Environment Impact Statement

for the

Swedish Cherry Hill

Major Institution Master Plan

Appendix C: Transportation Technical Report

November 5, 2013

Table of Contents

List of Figures

List of Tables

Transportation

1 Introduction

This document provides technical information in support of the transportation element of the Environmental Impact Statement (EIS) for the proposed expansion of the Swedish Cherry Hill Medical Center campus in Seattle through a Major Institution Master Plan (MIMP). The following provides an overview of the project description and analysis approach. Further details are provided in subsequent sections that are specific to key transportation elements.

Four alternatives have been identified for evaluation in the Draft EIS. These include:

- Alternative 1 – No Build
- Alternative 5 – Expansion to Spencer Technologies Site; Vacation of 16th Avenue
- Alternative 6 - Expansion to Spencer Technologies Site; Vacation of 16th Avenue; Lower Heights to the East and West
- Alternative 7 - Expansion to Spencer Technologies Site; No Street Vacation

From a land use perspective, Alternatives 5, 6, and 7 include up to approximately 3.1 million square-feet of development at build-out. The primary difference between the Build Alternatives from a transportation perspective is the vacation of 16th Avenue between E Cherry and E Jefferson Streets, which would occur with Alternatives 5 and 6. Given the similarities in land use, transportation impacts are evaluated for three future scenarios, No Build (Alternative 1), Build with Vacation of 16th Avenue (Alternatives 5 and 6), and Build No Vacation of 16th Avenue (Alternative 7). Alternatives 2 – 4 were removed from consideration and are not evaluated within this technical analysis.

Swedish is proposing a MIMP for development over the next fifteen to twenty-five years, or longer. Construction phasing would be dependent upon the boundaries and height limits approved by the City Council in the MIMP, and the need to create an “empty chair” (empty developable space) in which to develop new buildings without first having to demolish an existing building that is still in use. Early development potential may include the east side of the campus along 18th Avenue and the redevelopment of the site of the existing west side parking garage, or the site of the Cherry Hill Professional Building on the northeast corner of E Cherry Street and 16th Avenue.

The scope of the technical analysis has been based on information outlined in the August 2013 scoping document as well as direction from staff from the Seattle Department of Transportation and the Department of Planning and Development.

Given the timeframe of the MIMP, two horizon years have been identified for analysis. This includes a long-term horizon year of 2040 as well as a short-term horizon year of 2023. This short-term horizon year evaluates the impacts of the early development potential. The short-term development potential for the project includes the development along the east side of 16th Avenue and the east side of 18th Avenue. This information was provided by the applicant.

Development assumed by 2023 includes approximately 930,000 square-feet for a total of approximately 1.9 million square-feet.

The following transportation elements are evaluated in this report:

- Street System
- Campus Access and Circulation
- Pedestrians and Bicycle Transportation
- Transit/Shuttle Service
- Traffic Volumes
- Traffic Operations
- Traffic Safety
- Parking

This report is organized into the following sections:

- **Introduction –** This section outlines project background, description of alternatives, and overall approach and scope to the transportation analysis completed for the project.
- **Transportation Management Program (TMP) –** This section outlines the current TMP in place for the campus. Information regarding program objectives and program elements are summarized. This establishes an institutional framework to understand the existing transportation conditions.
- **Affected Environment –** This section documents the existing transportation conditions focusing on the transportation elements noted above.
- **No Action –** This section documents future conditions (2023 and 2040) *without* the completion of the proposed expansion. This analysis reflects growth in traffic associated with approved development projects in the area and general growth in background traffic. The analysis also includes transportation improvements planned by the City or projects that are anticipated to be completed as part of developments in the area. Similar to the Affected Environment this section focuses on the transportation elements noted previously.
- **Alternatives 5 and 6 (with 16th Ave NE street vacation) –** This section describes the impacts of the proposed project on the transportation elements identified, addressing scoping comments noted in the EIS scoping document. As noted, Alternatives 5 and 6 assume the vacation of 16th Avenue. Access to the 16th Avenue garage would be provided from the north and south, but overall north/south travel between E Cherry Street and E Jefferson Street would be restricted with the development.
- **Alternative 7 (No 16th Ave NE street vacation) –** This section describes the impacts of the proposed project, focusing on the same transportation elements as described above for Alternatives 5 and 6, but without a street vacation.

2 Existing Transportation Management Program

The Swedish Cherry Hill Medical Center in coordination with Sabey development has adopted a transportation management program (TMP) targeted at reducing the employee single occupancy vehicle (SOV) rate. The success of this program is reported through the commute trip reduction (CTR) surveys. The current goal of the program is a 50 percent SOV rate. This goal excludes medical staff who visit multiple medical facilities in a day. Existing program elements are discussed below. As discussed in subsequent sections, the current mode-split and SOV rates reported in these surveys were used in developing traffic forecasts associated with the expansion. Enhancement of the existing TMP would be used to further promote a reduction in SOV rates considering the future expansion. More details related to TMP enhancements are discussed in the mitigation section of this report.

Elements that are required as part of the existing approved TMP as well as program enhancements that Swedish Cherry Hill provides beyond those required include:

1. Establish and continuously maintain a Building Transportation Coordinator
2. Provide a transit subsidy equal to 50 percent of the cost of an Orca Passport for both bus and ferry
3. Provide preferential parking for vanpool and carpools, carpools of three or more people or vanpools park on campus at no cost
4. Provide off-street parking for SOV at a monthly fee equal to or greater than the market rate for peak period one-zone monthly transit passes
5. Provide weather protected and secured bicycle parking
6. Subsidize the cost of the RPZ stickers for areas surrounding the campus
7. Encourage and support alternative work schedules, where possible
8. Participate in the guaranteed ride home program
9. Conduct one to three transportation fairs per year on-campus to promote the trip reduction programs
10. Provide a flex-car on campus
11. Operate an inter-campus shuttle (see additional discussion in the Affected Environment)

The entities on-campus that complete CTR surveys include LabCorp/Dynacare, Swedish Medical Center, and Sabey. The most recent surveys completed indicate an average SOV rate of approximately 58 percent, which is greater than the current 50 percent SOV goal set for the Swedish Cherry Hill campus.

3 Affected Environment

This section provides an overview of the existing conditions within the defined study area. **Figure 1** shows the overall study area defined for the analysis and highlights the study area intersections. The study area was determined by Department of Planning and Development (DPD) and Seattle Department of Transportation (SDOT) in recognition of the primary travel patterns for Swedish Cherry Hill traffic. The study area encompasses the area east of I-5, west of 23rd Avenue, north of S Dearborn Street and south of Pike Street. The key arterials of E Madison Street, E Cherry Street, James Street, and E Jefferson Street corridors as well as Broadway, 12th Avenue, and 23rd Avenue are included in the evaluation. The ensuing transportation analysis fully encompasses these corridors and includes the evaluation of 41 study intersections.

This analysis included a review the existing transportation system elements including the street system, campus access and circulation, pedestrian and bicycle transportation, transit service/facilities, traffic volumes, traffic operations, traffic safety and parking.

3.1 Street System

Swedish Cherry Hill is surrounded by residential neighborhoods to the north, east, and south. West of the Swedish Cherry Hill campus lies the Seattle University campus. The neighborhoods located adjacent to the campus are served by residential streets, which include on-street parking and sidewalks. With parking permitted on both sides of the roadways, travel way widths are narrow and often only one car can pass at a time, depending on the how vehicles are parked on the street. Access to and from the regional roadways such as I-5 to the west is provided via E Cherry Street and E Jefferson Street. Local connections to the neighborhood from these roadways are generally provided via stop controlled intersections, with E Cherry and E Jefferson Streets having the right-of-way. However, to serve the neighborhoods north of the campus, traffic signals exist at the E Cherry Street/18th Avenue and E Cherry Street/14th Avenue intersections. No traffic signals exist along E Jefferson Street in the vicinity of the campus. Access to the campus north (SR 520) and south (I-90) of the local neighborhoods is provided via collector arterials such as E Madison Street, Rainier Avenue, and Broadway. These roadways range from 3 to 5 lane cross-sections.

An inventory of the streets serving the Swedish Cherry Hill campus is provided in **Table 1**. This inventory includes a summary of travel lanes, parking, sidewalks, and posted speed limit. For the key streets utilized by staff and patients to access the campus, a more comprehensive summary following the table is provided.

Study Area and Intersections

Swedish Cherry Hill MIMP-Preliminary DEIS

\\srv-dfs-wa\MM_Projects\Projects\11\11244.00 Swedish Providence Cherry Hill Campus\Graphics\Swedish_Graphic01 <01-Study Intersections> Jessical 11/05/13 09:23

FIGURE 1

Table 1
Characteristics of Major Roadways in Study Area

Roadway	Arterial Classification	Posted Speed Limit	Number of Travel Lanes	On-Street Parking?	Sidewalks?	Bicycle Facilities?
E Madison Street (Boren Avenue to 23rd Avenue)	Principal Arterial	30 mph	4 to 5 lanes	No	Yes	No
E Pike Street (Broadway to 12th Avenue)	Minor Arterial	30 mph	2 to 3 lanes	Most Blocks	Yes	No
E Union Street (E Madison Street to 23rd Avenue)	Minor Arterial	30 mph	2 to 3 lanes	Most Blocks	Yes	Yes
E Marion Street	Access Street	25 mph	2 lanes	Most Blocks	Yes	No
E Columbia Street	Access Street	25 mph	2 lanes	Most Blocks	Yes	No
Cherry Street (6th Avenue to 7th Avenue)	Principal Arterial	30 mph	2 lanes	No	Yes	Yes
James Street (6th Avenue to Broadway)	Principal Arterial	30 mph	4 lanes	No	Yes	No
E Cherry Street (James Street to 23rd Avenue)	Minor Arterial	30 mph	2 to 4 lanes	Some Blocks	Yes	Yes
E Jefferson Street (Broadway to 23rd Avenue)	Collector Arterial	30 mph	2 lanes	Most Blocks	Yes	Yes
Boren Avenue	Principal Arterial	30 mph	4 lanes	No	Yes	No
Rainier Avenue SE	Principal Arterial	30 mph	4 to 6 lanes	No	Yes	No
S Dearborn Street (I-5 to Rainier Avenue SE)	Principal Arterial	30 mph	2 to 4 lanes	Few Blocks	Yes	Yes
E Yesler Way (12th Avenue to 23rd Avenue)	Minor Arterial	30 mph	2 lanes	Most Blocks	Yes	Yes
S Jackson Street (12th Avenue to 23rd Avenue)	Minor Arterial	30 mph	2 to 4 lanes	Some Blocks	Yes	Yes
Broadway	Minor Arterial	30 mph	4 to 5 lanes	Some Blocks	Yes	Yes
6th Avenue	Principal Arterial	30 mph	3 to 4 lanes	Few Blocks	Yes	No
7th Avenue	Principal Arterial	30 mph	1 to 3 lanes	Some Blocks	Yes	Yes
12th Avenue (Madison Street to Boren Avenue)	Minor Arterial	30 mph	2 to 4 lanes	Some Blocks	Yes	Yes
13th Avenue	Access Street	25 mph	2 lanes	Most Blocks	Yes	No

Table 1 (Cont'd)
Characteristics of Major Roadways in Study Area

Roadway	Arterial Classification	Posted Speed Limit	Number of Travel Lanes	On-Street Parking?	Sidewalks?	Bicycle Facilities?
14th Avenue	Collector Arterial	30 mph	2 lanes	Most Blocks	Yes	No
15th Avenue	Access Street	25 mph	2 lanes	Most Blocks	Yes	No
16th Avenue	Access Street	25 mph	2 lanes	Most Blocks	Yes	No
18th Avenue	Access Street	25 mph	2 lanes	Most Blocks	Yes	No
23rd Avenue	Principal Arterial	30 mph	4 lanes	Few Blocks	Yes	No

Source: Seattle Department of Transportation and Transpo Group, 2013.

E Cherry Street forms the northern border of the campus and is classified as a minor arterial by the City. In the vicinity of the hospital, sidewalks and parking are provided on both sides of this two-lane roadway. In addition, sharrows (i.e., indicating shared vehicle/bicycle travel ways) are provided along both sides of the roadway as well as bicycle lanes on the uphill portion of the corridor. The majority of the intersections along this corridor within the site vicinity are stop controlled. Parking for the hospital or clinics can be accessed along 15th Avenue, 16th Avenue, and 18th Avenue off of E Cherry Street. As noted previously, E Cherry Street provides a connection to/from I-5 to the west.

E Jefferson Street forms the southern boundary of the campus. In the vicinity of Swedish Hospital campus, E Jefferson Street is classified as a collector arterial. Sidewalks and parking are provided on both sides of this two-lane roadway. In addition, sharrows are provided along the corridor as well as bicycle lanes along the uphill portions from 12th Avenue to 19th Avenue. All intersections between 12th Avenue and 23rd Avenue are stop controlled. There are also seven bus routes that operate along E Jefferson Street within the site vicinity. Access to the Swedish parking areas is at 15th Avenue, 16th Avenue, and 18th Avenue off of E Jefferson Street.

15th Avenue provides access to existing parking structures and surface lots for the hospital and forms the western border of the Swedish campus. Seattle University facilities are located on the west side of the roadway. In the vicinity of Swedish, 15th Avenue is classified as an access street. Sidewalks are provided on both sides of this two-lane roadway and parking is permitted along the west side of the roadway only.

16th Avenue provides access to existing parking structures and surface lots for the campus. It also extends provides a north/south vehicular, pedestrian, and bicycle connection to and from the neighborhood. In the vicinity of Swedish, 16th Avenue is classified as an access street. Sidewalks are provided on both sides of this two-lane roadway with some on-street parking allowed.

18th Avenue forms the eastern boundary of the campus with access to two Swedish surface lots. In the vicinity of Swedish, 18th Avenue is classified as an access street. Sidewalks are provided on both sides of this two-lane roadway as well as on-street parking along the west side. 18th Avenue is adjacent to the signed bicycle route that runs along 19th Avenue. A traffic signal exists at the E Cherry Street/18th Avenue intersection, providing a signalized connection for neighborhood traffic.

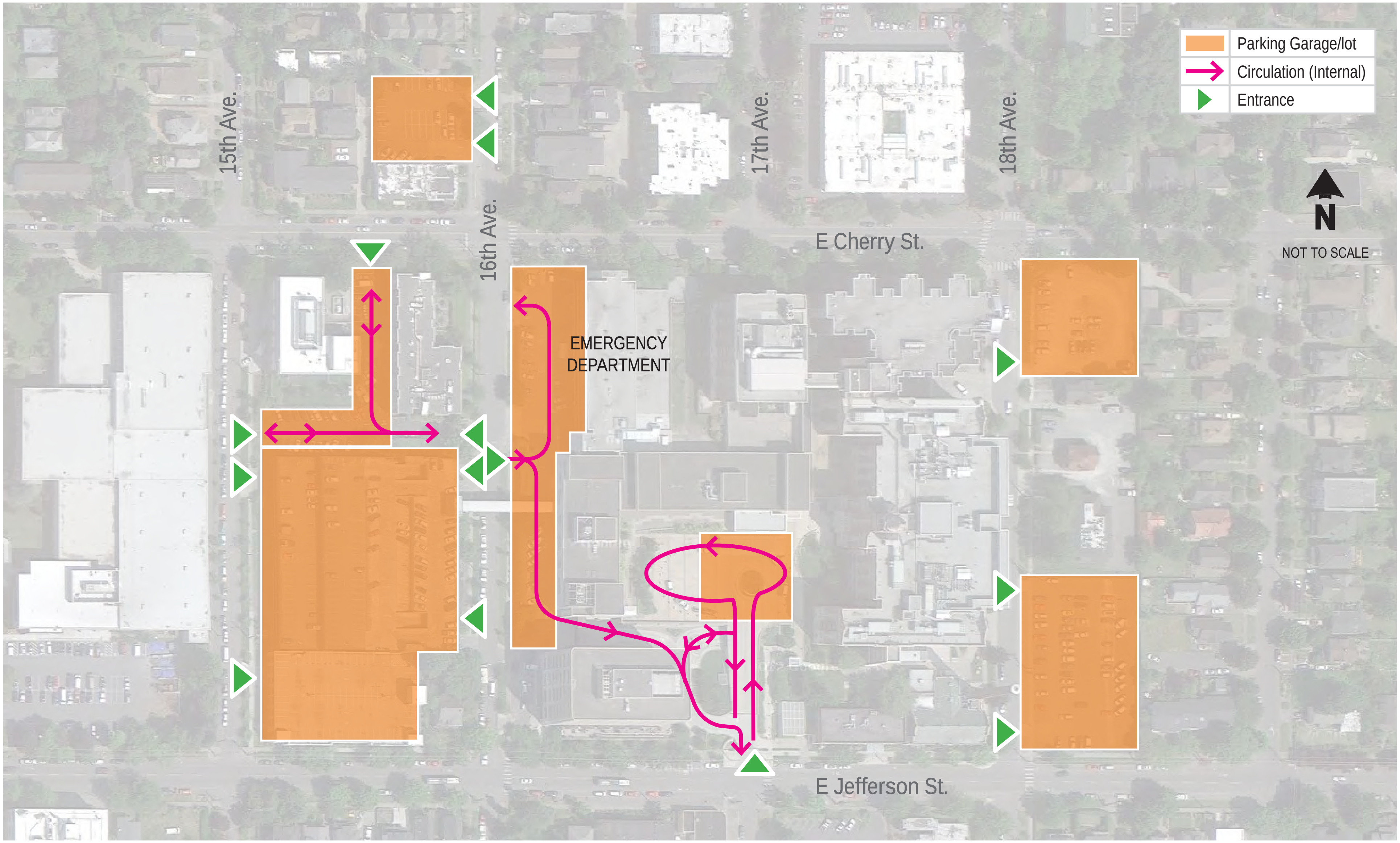
12th Avenue is a main arterial to the west of the campus and is classified as a minor arterial by the City. Near Swedish this roadway is three-lanes with sidewalks and parking on both sides. Bicycle lanes are also provided along both sides of the corridor from E Madison Street to E Yesler Way.

23rd Avenue is a main arterial to the east of Swedish, and is classified as a principal arterial by the City. Sidewalks are provided on both sides of this four-lane roadway and no parking is allowed. Directly east of Swedish along 23rd Avenue, there is a 20 mph school zone, for Garfield High School, that starts at E Spruce Street and ends at E Cherry Street.

3.2 Campus Access and Circulation

There are several parking areas within the Cherry Hill campus that are available to staff, patients, and visitors. **Figure 2** highlights these parking lots and garages and the campus access and circulation. As shown in **Figure 2**, access points to the Swedish Cherry Hill parking garages and surface lots are located primarily on 15th Avenue, 16th Avenue, and 18th Avenue between E Cherry Street and E Jefferson Street. Designated parking is provided for patients of the Northwest Kidney Center within a separated portion of the 16th Garage with vehicular access along 15th Avenue.

The primary access to the emergency department is provided via 16th Avenue. The entry to the emergency department is located south of E Cherry Street at the second driveway, which is one-way inbound only. Ambulances and other emergency vehicles including patients enter the same driveway. In front of the emergency entrance, there are two parking spaces for ambulances and seven parking spaces for emergency room visitors. North of the emergency department entrance is the service delivery area. This area includes multiple truck docks, parking for funeral home use, postal service, twelve general parking spaces, and four handicap spaces. There are two exits for vehicles in this area, one to the north, which connects to 16th Avenue and one to the south exiting on to E Jefferson Street at 17th Avenue.



Existing Access and Circulation Routes

Swedish Cherry Hill MIMP –Preliminary DEIS

FIGURE
2

transpoGROUP

Q:\Projects\11\11244.00 Swedish Providence Cherry Hill Campus\Graphics\Figures\11244 Fig 2 Swedish Circulation.pdf

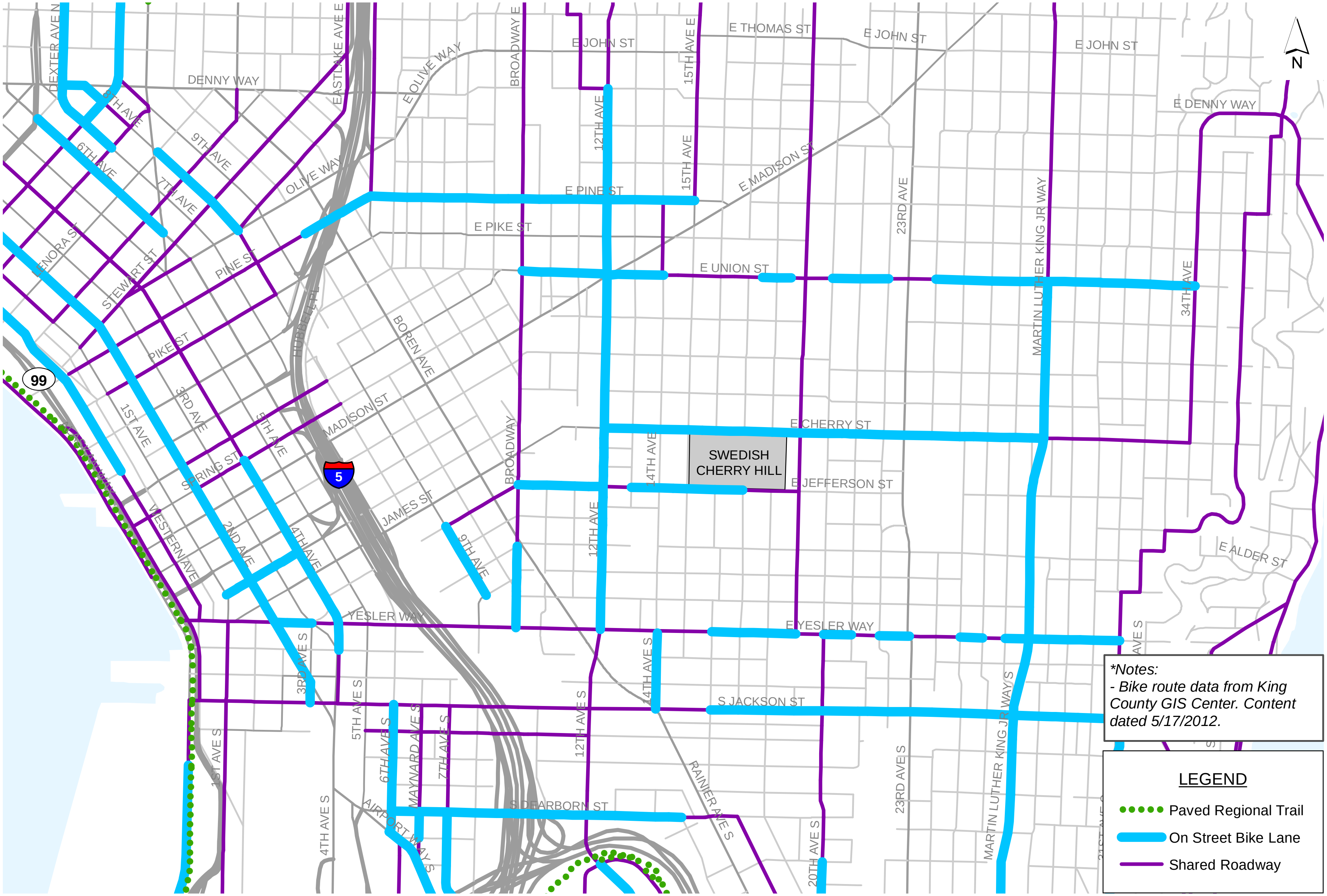
3.3 Pedestrian and Bicycle Transportation

Figure 3 illustrates the bicycle network within the study area. The primary north-south bike corridors included Broadway and 19th Avenue E, which are delineated with sharrows. 19th Avenue is a signed bicycle route. A bicycle lane is provided along 12th Avenue E.

East-west bicycle connections in the study area are provided via E Cherry Street and E Jefferson Street, and predominantly identified by sharrows; however, bicycle lanes are provided along portions of E Cherry Street traveling in the uphill direction, E Jefferson Street west 19th Avenue, and E Yesler Way. Union Street, a signed bike route, has a combination of sharrows and bicycle lanes. The E Yesler Way bicycle route goes into the downtown.

All of the streets within the vicinity of Swedish Cherry Hill campus generally have five-foot wide sidewalks on both sides. There are a limited number of pedestrian crossings along E Cherry Street and E Jefferson Street. Signalized pedestrian crossings are provided at the E Cherry Street/ 18th Avenue intersection. Unsignalized pedestrian crosswalks are also provided across E Cherry Street at 16th Avenue and across E Jefferson Street at 16th, 17th, and 18th Avenues.

Traffic counts conducted at the study intersections included pedestrian counts. The highest concentration of pedestrians in the study area is in the vicinity of the schools including Seattle University (west of Swedish Cherry Hill) and Garfield High School (east of the campus). The lowest number of pedestrian in the study area is near along E Cherry Street and E Jefferson Street between 15th Avenue to 20th Avenue immediately west of the campus frontage.



Existing Bicycle Facilities

Swedish Cherry Hill MIMP Preliminary DEIS

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FIGURE
3

3.4 Transit/Shuttle Service

King County Metro operates several routes within the vicinity of Swedish. There are eight King County Metro Transit routes within a half mile (or 10- to 12-minute) walking distance of Swedish Cherry Hill. The service areas, operating hours, and headways are summarized in **Table 2**. As shown in the table, the headways range from 5 to 30 minutes during the weekday peak periods. Route 84 operates at night, running from 2:00 AM to 4:30 AM. The routes serve the neighborhoods of Seattle as well as Issaquah and Federal Way. Routes 3/4, 64, 84, 193, 211, and 303 serve Swedish Cherry Hill directly with a stop in each direction along E Jefferson Street at 17th Avenue adjacent to the campus. The routes serving Swedish Cherry Hill directly provide viable options for travelling to and from the campus.

Table 2
Existing Transit Service to Swedish Cherry Hill Campus

Route	Area Served	Approximate Operating Hours	AM Peak Period Transit Trips NB / EB[2]	AM Peak Period Transit Trips SB / WB[2]	AM Peak Period Headway (minutes)	PM Peak Period Transit Trips NB / EB[2]	PM Peak Period Transit Trips SB / WB[2]	PM Peak Period Headway (minutes)
3/4	Judkins Park - Downtown Seattle - Queen Anne Hill	5:00 AM - 1:30 AM	13	16	5 - 10	15	17	5 - 10
27	Colman Park - Downtown Seattle	5:30 AM - 10:30 PM	4	4	30	4	4	30
48	Mount Baker - University District - Loyal Heights	5:30 AM - 12:00 AM	11	11	5 - 15	12	12	10
64	First Hill - Downtown - Lake City	6:30 AM - 9:00 AM 3:30 PM - 6:00 PM	-	5	15 - 30	5	-	15 - 30
84	Madison Park - Madrona	2:00 PM - 4:30 AM	-	-	-	-	-	-
193	First Hill - Federal Way	6:30 AM - 9:00 AM 3:30 PM - 7:00 PM	5	-	20 - 30	-	4	30
211	First Hill - Issaquah Highlands	6:00 AM - 9:30 AM 2:30 PM - 6:00 PM	4	-	30	-	4	30
303	First Hill - Shoreline	6:00 AM - 9:00 AM 3:30 PM - 7:30 PM	-	8	15 - 20	6	-	15 - 30
Total Transit Trips During Peak Period			**37**	**44**		**42**	**41**	

1. Based on data King County Metro Transit (2013).
2. General direction of travel NB = northbound, EB = eastbound, SB = southbound, and WB = westbound.

The inter-campus shuttle operated by Swedish serves the Swedish First Hill campus, Cherry Hill campus, and the Metropolitan Park offices. This service is offered free to staff and patients and runs Monday through Friday, except on holidays. This service operates between 6:30 AM and

5:30 PM. The service operates with 20 minutes headways within the core hours of 10:00 AM to 2:00 PM and 40 minutes outside those hours.

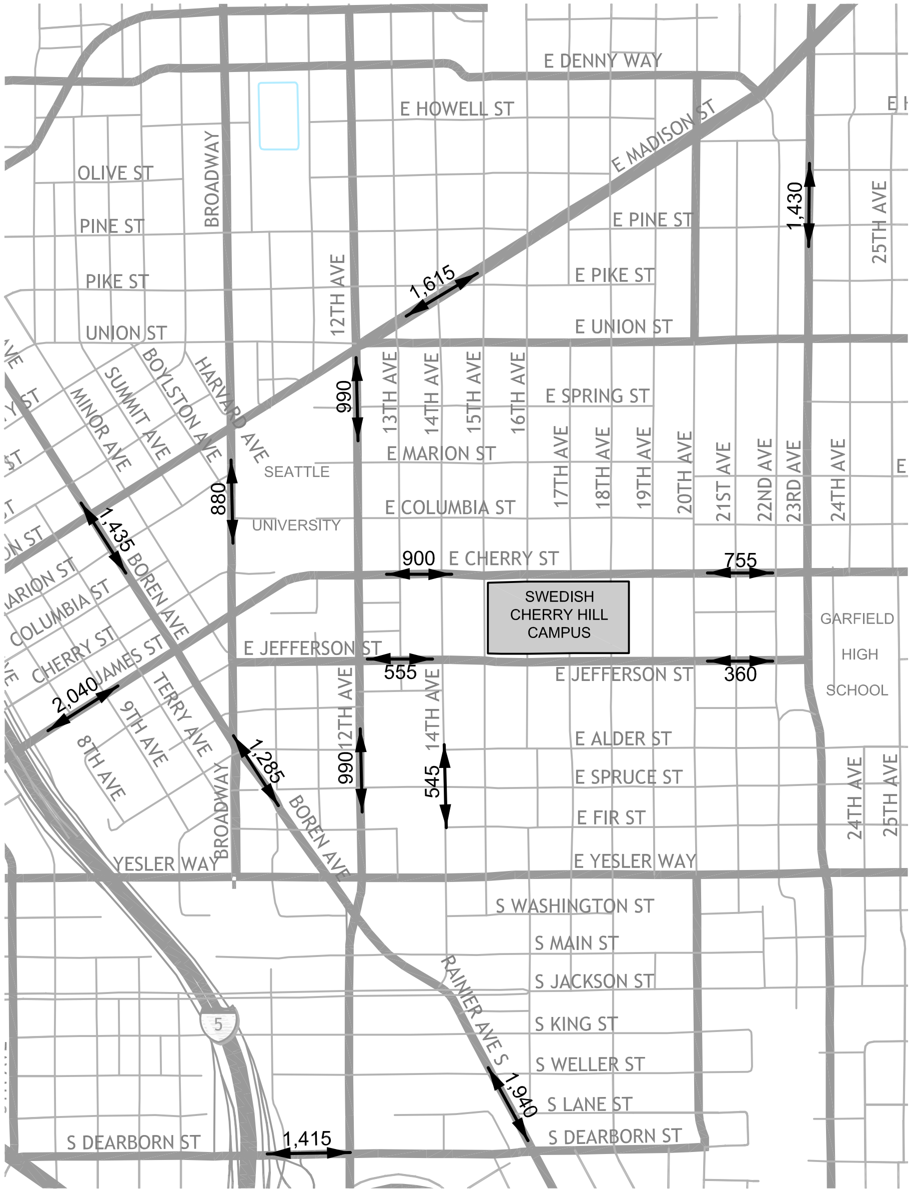
3.5 Traffic Volumes

Study area traffic volume data were compiled for the weekday AM and PM peak hours. Intersection turning movement counts were conducted in May, September, and October 2013. In addition to vehicles, the counts include bicycle and pedestrian volumes. Seattle University, located adjacent to the Swedish Cherry Hill campus, was in session during all counts. **Figure 4** summarizes the weekday AM and PM peak hour link volumes on the major roadways surrounding the campus, respectively. The turning movement count summaries are included in **Attachment C-1**. Count worksheets for each location are available upon request.

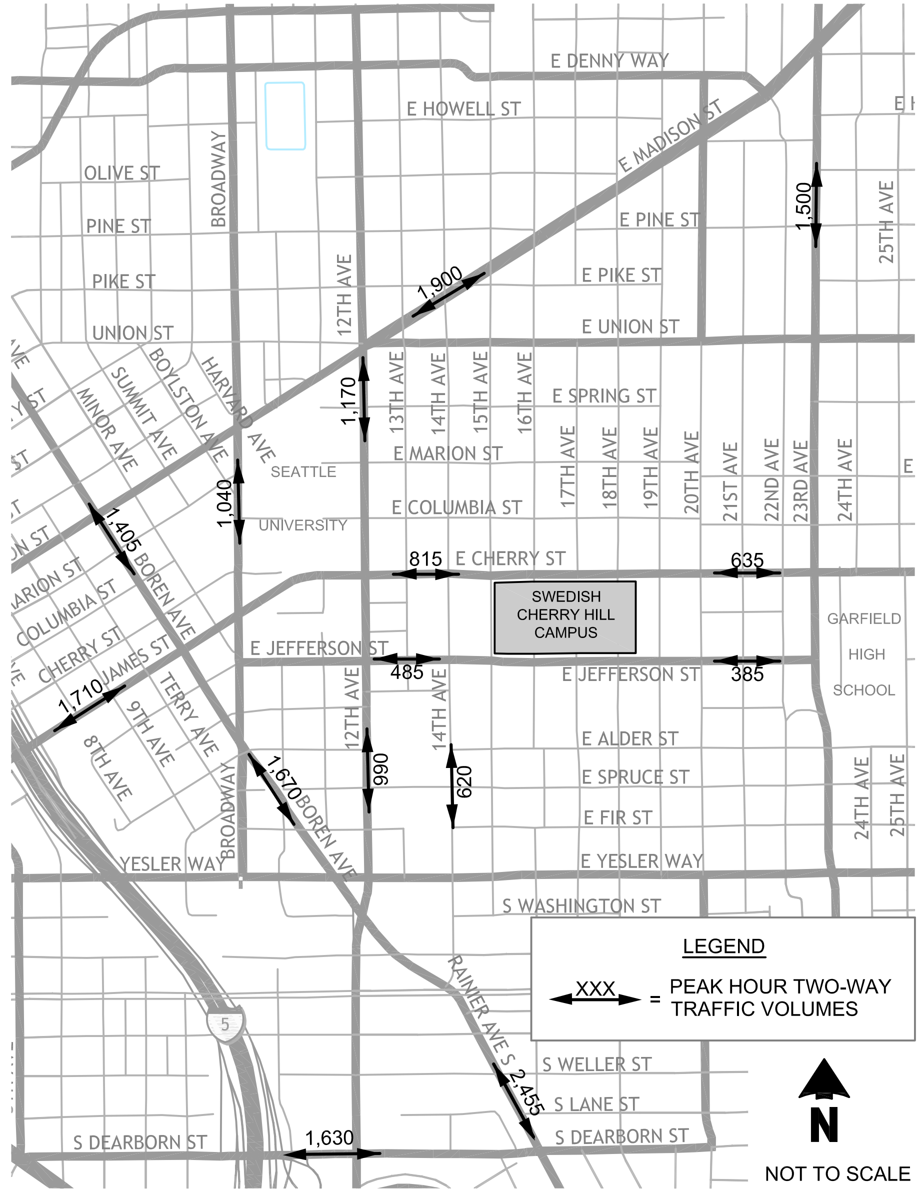
The traffic volumes shown on the figures represent the sum of both directions of travel. Weekday AM peak hour volumes, shown on **Figure 4**, are generally lower than the weekday PM peak hour volumes with the exception of along James Street/E Cherry Street between I-5 and 23rd Avenue and along E Jefferson Street in the immediate vicinity of Swedish. Weekday AM peak hour traffic volumes along James Street/E Cherry Street range between 755 near 23rd Avenue to 2,040 vehicles per hour (vph) near I-5. These existing weekday AM peak hour traffic volumes are approximately 20 percent higher than the existing James Street/E Cherry Street traffic volumes during the weekday PM peak hour. Traffic volumes along E Jefferson Street between Broadway and 23rd Avenue range from 360 to 555 vph during the weekday AM peak hour. Near 12th Avenue, the weekday AM peak hour traffic volumes along E Jefferson Street are 15 percent higher than weekday PM peak hour traffic volumes.

As shown on **Figure 4**, during the weekday PM peak hour, traffic volumes along E Cherry Street, adjacent to the campus, range between 635 to 815 vph depending on the individual block. Left-turns from E Cherry Street range between 10 to 50 vph depending on the intersection. West of Broadway, where E Cherry Street transitions to James Street, traffic volumes are higher with volumes as high as 1,710 near the I-5 interchange. These volumes decrease as you proceed east of the interchange. Traffic volumes along E Jefferson Street are lower than E Cherry Street. Traffic volumes along E Jefferson Street between Broadway and 23rd Avenue range from 385 to 485 vph. Traffic volumes generally decrease along the corridor from the west to east as traffic distributes to the local residential neighborhoods north and south of the corridor.

WEEKDAY AM PEAK HOUR



WEEKDAY PM PEAK HOUR



Existing Weekday Peak Hour Two-Way Link Volumes

FIGURE
4

Swedish Cherry Hill MIMP-Preliminary DEIS

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3.6 Traffic Operations

The scope of the traffic operations analysis included an evaluation of individual intersection performance as well as corridor operations along E Cherry Street/James Street between 6th Avenue and Broadway and Broadway and 18th Avenue. This analysis provides a basis for not only understanding future impacts to general traffic operations, but also how the proposed project affects neighborhood traffic and circulation patterns and access. The purpose of this corridor analysis is to assess the impacts of intersection delay and queuing on travel time and corridor progression. The E Cherry Street/James Street corridor was identified for analysis based on the anticipated travel patterns to/from the site and connectivity to I-5 as well as existing observations.

3.6.1 Intersection Operations

The operational performance of an intersection was determined by calculating the intersection level of service (LOS) based on the procedures presented in *Highway Capacity Manual* (HCM) 2000 rather than the most recent HCM 2010. The use of HCM 2000 for this analysis is due to limitations related to the HCM 2010 methodology for some conditions, analysis software coding bugs, a desire to apply a consistent methodology throughout the study area, and long-term acceptance of the previous HCM results. Specific limitations of the HCM 2010 methodology include the inability to model five-legged intersections as well as restrictions related to signal phasing that result in the inability to model some of the study area signalized locations. As a consistent approach to measuring intersection and corridor performance, the LOS analysis was completed using the HCM 2000 methodologies as implemented in the Synchro version 8 software program.

The HCM method uses peak hour traffic volumes, intersection geometry, intersection control, and roadway characteristics as inputs to evaluate operations. The intersection as a whole and its individual turning movements can be described with a range of levels of service (A through F), with LOS A indicating free-flowing traffic and LOS F indicating extreme congestion and long vehicle delays. At signalized and all-way stop controlled intersections, LOS is measured in average total delay per vehicle and is typically reported for the intersection as a whole. At side-street stop controlled intersections, LOS is measured in average movement delay per vehicles and is typically reported for the worst movement. **Attachment C-2** provides a more detailed explanation of intersection LOS.

Figure 5 summarizes the existing AM and PM peak hour levels of services. Existing weekday peak hour LOS for each study intersection is displayed on **Figures 6 and 7** with detailed LOS calculations provided in **Attachment C-3**.

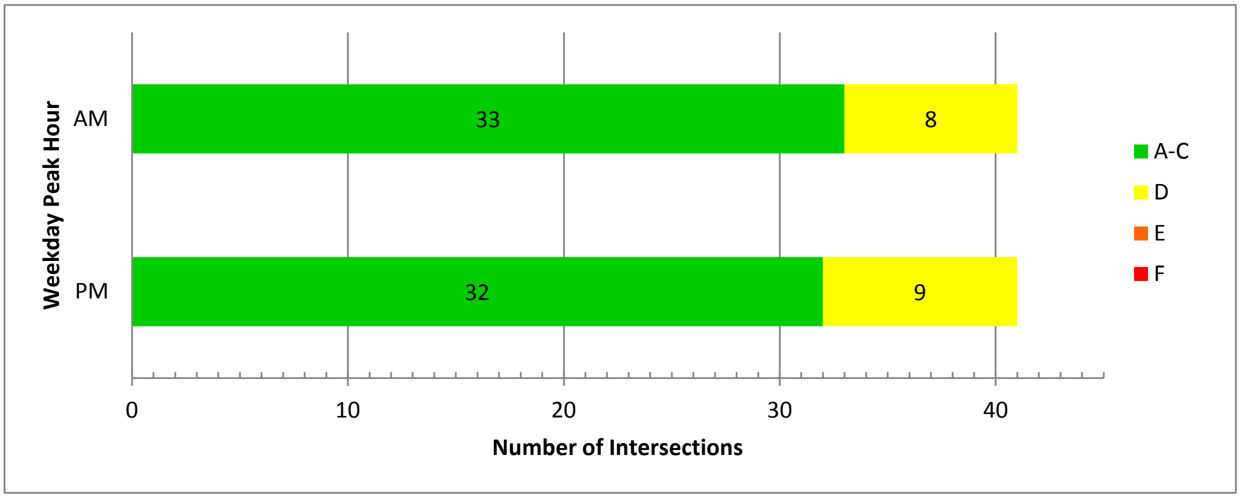
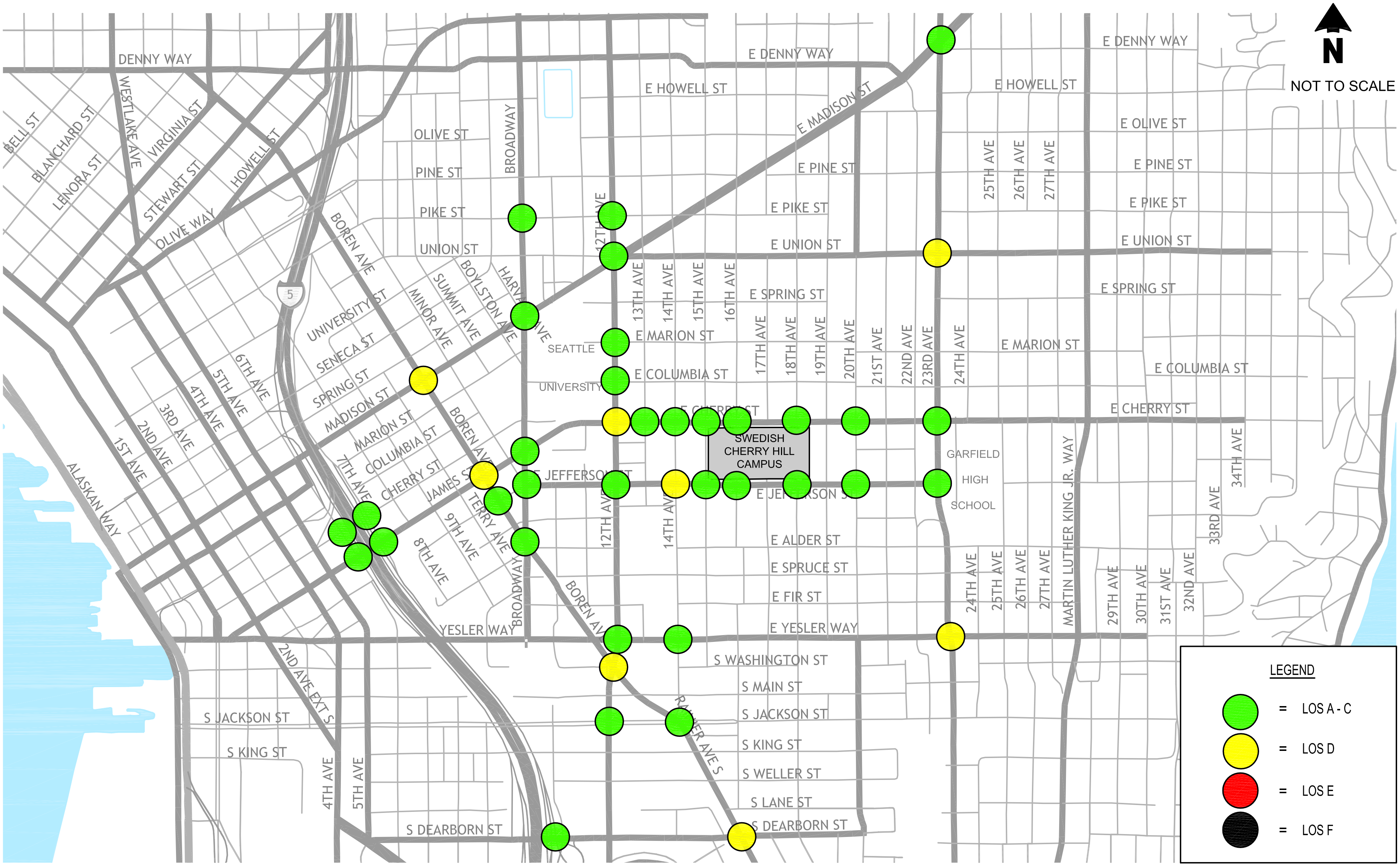


Figure 5 Existing Weekday Peak Hour Intersection Level of Service Comparison

As shown on **Figure 5**, approximately 80 percent of the study intersections currently operate at LOS C or better. No intersections in the study area currently operate at LOS E or F. During the weekday AM peak hour, as shown on **Figure 6,** study intersections proximate to Swedish are currently operating at LOS C or better with the exception of 14th Avenue/E Jefferson Street, which is currently operating at LOS D. Results of the weekday PM peak hour analysis, shown on **Figure 7**, are similar to the weekday AM peak hour analysis, with all intersections operating at LOS D or better. Proximate to the campus, all intersections operate at LOS C or better with the exception of 14th Avenue/E Jefferson Street, which is currently operating at LOS D. Previous studies and field observations of the 6th Avenue/James Street intersection suggest this intersection has operated worse than currently shown under these existing conditions.

Along the James Street corridor, intersection LOS alone may not provide an adequate assessment of the corridor operations. Field observations indicate that congestion along the corridor results in queuing that has been observed to extend to adjacent intersections. The following section provides a detailed analysis of the E James Street/E Cherry Street corridor from 6th Avenue to 18th Avenue. This corridor analysis, focusing on corridor travel speeds and travel times, accounts for intersection queuing, pedestrian activity, and overall driver behavior.



Existing Weekday AM Peak Hour Levels of Service Summary

FIGURE
6

Swedish Cherry Hill MIMP-Preliminary DEIS

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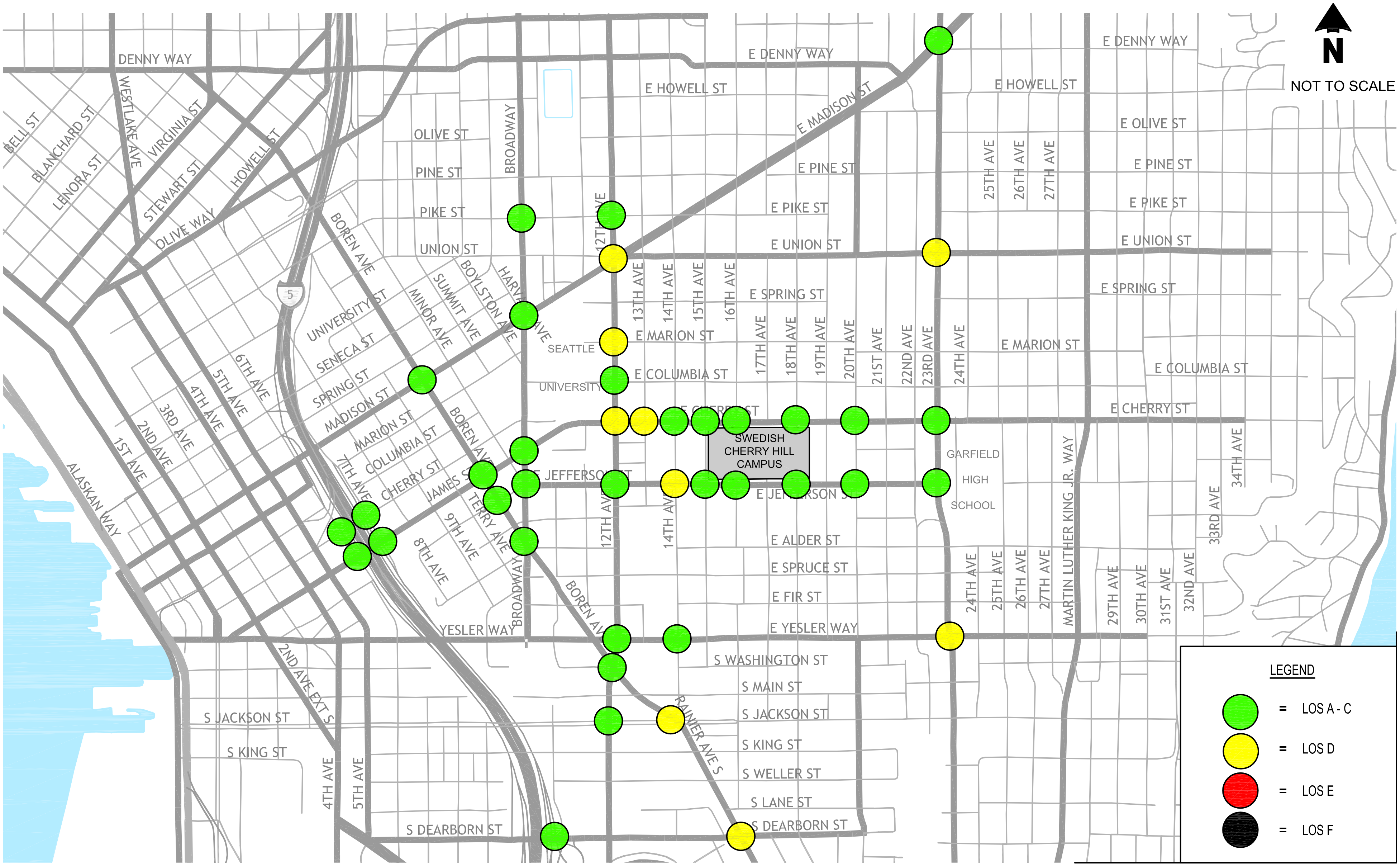

Existing Weekday PM Peak Hour Levels of Service Summary

FIGURE **7**

Swedish Cherry Hill MIMP-Preliminary DEIS

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3.6.2 Corridor Operations

To present a more complete picture of existing conditions, the main route to the Swedish Cherry Hill campus along E Cherry Street/James Street was evaluated with respect to travel time and travel speeds. The E Cherry Street/James Street corridor was divided into two segments for purposes of this analysis. The first segment (James Street) extends from 6th Street to Broadway and the second segment (E Cherry Street) extends from Broadway to 18th Avenue.

The analysis was conducted using Synchro 8, consistent with the intersection LOS methodology. Existing travel times along the corridor were measured in the field using Bluetooth technology to track travel times for vehicles along the corridor. This technology provides a more robust data set then the typical floating car data collection methodologies. Two-days of data was collected in the field and averaged. During the AM and PM peak hours, existing travel time data shown below is based on approximately 10 – 50 data points for the AM peak hour period depending on the segment and direction and 10 – 30 data points for the PM peak hour period. Travel time projections and average speeds reported from the Synchro model were calibrated to data measured in the field. **Table 3** provides a summary of the existing travel times measured in the field, existing travel times from the Synchro model, and the adjustment factor. The adjustment or calibration factor accounts for operational impacts from vehicle queuing, mid-block pedestrian crossing, on-street parking maneuvers, etc. not accounted for in Synchro.

As shown in the table, during the weekday AM peak hour the field data shows that travel times along James Street/E Cherry Street, within the defined segments, are approximately three to five minutes for both directions. During the weekday PM peak hour, travel times along E Cherry Street are less than three minutes while along James Street travel times range between four and six minutes. Average travel speeds are generally slow ranging from 6 to 14 mph. These average travel speeds take into account free-flow travel times and intersection related delay. Overall the travel times and speeds indicate congestion along both corridors during the weekday AM and PM peak hours.

Table 3
Existing Weekday Peak Hour James Street/E Cherry Street Travel Time Analysis

Segment	Direction	Field Data		Traffic Model (Synchro)		Adjustment Factor[1]	
		Travel Time (m:ss)[2]	Average Speed (mph)	Travel Time (m:ss)[2]	Average Speed (mph)	Travel Time	Average Speed
AM Peak Hour							
James Street (6th Ave to Broadway)	EB	4:17	7	1:35	15	2.2	0.5
	WB	3:31	9	2:26	10	1.3	0.9
E Cherry Street (Broadway to 18th Ave)	EB	5:22	10	1:49	13	2.0	0.8
	WB	3:01	12	1:56	13	1.2	0.9
PM Peak Hour							
James Street (6th Ave to Broadway)	EB	4:03	7	1:40	14	2.0	0.5
	WB	5:40	6	2:26	12	2.3	0.5
E Cherry Street (Broadway to 18th Ave)	EB	2:29	14	2:03	12	0.9	1.2
	WB	2:43	13	2:09	15	1.2	0.9

Source: Transpo Group, 2013.
1. The adjustment factor is based on the field data divided by the traffic model results and is be used to help calibrate the traffic model future condition travel times and speeds to existing conditions.
2. m:ss = minutes and seconds

3.7 Traffic Safety

Records of reported collisions were obtained from SDOT for the three-year period between January 1, 2010, and December 31, 2012. A summary of the total and average annual reported accidents at each study intersection is provided in **Table 4**. The City of Seattle has adopted criteria for assigning high accident location status to signalized intersections with 10 or more reported collisions per year and unsignalized intersections with 5 or more reported collisions per year. Intersections designated as high accident locations are targeted for future safety improvements in an effort to reduce the occurrence of accidents.

Fewer than 5 collisions per year were reported at each of the unsignalized study intersections. At the signalized study area intersection, only the 6th Avenue/James Street intersection had an average more than 10 collisions per year. A review of the collisions at the 6th Avenue/James Street intersection shows the majority of the collisions at this location involved left-turning vehicles along James Street not granting right-of-way to vehicles traveling the opposite direction. These collisions are likely occurring as a result of the high traffic volume and the permitted left-turn phasing on the westbound approach of James Street. Drivers may not be yielding to oncoming eastbound traffic, which is typical of intersections with dual left-turn lanes with higher levels of turning traffic. The left turning collisions at this location could likely be reduced by providing protected left-turn phasing. However, projected left-turn phasing may degrade traffic operations, likely causing more delay that could increase other types of collisions such as rear-end.

Table 4
Three-Year Collision Summary – 2010-2012

Intersection	Traffic Control	Number of Collisions			Total	Annual Average
		2010	2011	2012		
1. Broadway/E Pike Street	Signalized	4	2	3	9	3.00
2. 12th Avenue/E Pike Street	Signalized	3	4	6	13	4.33
3. Boren Avenue/Madison Street	Signalized	4	5	4	13	4.33
4. Broadway/Madison Street	Signalized	5	6	5	16	5.33
5. 12th Avenue/Madison Street	Signalized	9	5	11	25	8.33
6. 23rd Avenue/Madison Street	Signalized	6	3	0	9	3.00
7. 23rd Avenue/E Union Street	Signalized	2	3	4	9	3.00
8. 12th Avenue/E Marion Street	Stop Control	1	2	0	3	1.00
9. 12th Avenue/E Columbia Street	Signalized	0	1	1	2	0.67
10. 6th Avenue/Cherry Street	Signalized	5	10	7	22	7.33
11. 7th Avenue/Cherry Street	Signalized	2	1	1	4	1.33
12. 6th Avenue/James Street	Signalized	13	8	14	35	11.67
13. 7th Avenue/James Street	Signalized	9	1	4	14	4.67
14. Boren Avenue/James Street	Signalized	2	0	5	7	2.33
15. Broadway/James Street	Signalized	1	4	4	9	3.00
16. 12th Avenue/E Cherry Street	Signalized	4	3	4	11	3.67
17. 13th Avenue/E Cherry Street	Stop Control	2	2	1	5	1.67
18. 14th Avenue/E Cherry Street	Signalized	3	1	4	8	2.67
19. 15th Avenue/E Cherry Street	Stop Control	1	1	0	2	0.67
20. 16th Avenue/E Cherry Street	Stop Control	1	0	0	1	0.33
21. 18th Avenue/E Cherry Street	Signalized	1	0	0	1	0.33
22. 20th Avenue/E Cherry Street	Stop Control	1	1	2	4	1.33
23. 23rd Avenue/E Cherry Street	Signalized	7	5	1	13	4.33
24. Boren Avenue/E Jefferson Street	Signalized	2	3	5	10	3.33
25. Broadway/E Jefferson Street	Signalized	1	3	3	7	2.33
26. 12th Avenue/E Jefferson Street	Signalized	3	3	3	9	3.00
27. 14th Avenue/E Jefferson Street	Stop Control	3	4	4	11	3.67
28. 15th Avenue/E Jefferson Street	Stop Control	4	1	0	5	1.67
29. 16th Avenue/E Jefferson Street	Stop Control	3	0	1	4	1.33
30. 18th Avenue/E Jefferson Street	Stop Control	4	1	2	7	2.33
31. 20th Avenue/E Jefferson Street	Stop Control	2	1	0	3	1.00
32. 23rd Avenue/E Jefferson Street	Signalized	4	2	5	11	3.67
33. Broadway/Boren Avenue	Signalized	2	1	2	5	1.67
34. 12th Avenue/E Yesler Way	Signalized	9	7	3	19	6.33
35. 14th Avenue/E Yesler Way	Signalized	4	1	2	7	2.33
36. 23rd Avenue/E Yesler Way	Signalized	4	2	4	10	3.33
37. 12th Avenue/Boren Avenue	Signalized	2	1	3	6	2.00
38. 12th Avenue/S Jackson Street	Signalized	3	5	6	14	4.67
39. 14th Avenue / Boren Avenue / Rainier Avenue S/S Jackson Street	Signalized	5	8	1	14	4.67
40. I-5 NB Ramps/S Dearborn Street	Signalized	1	2	0	3	1.00
41. Rainier Avenue S/S Dearborn Street	Signalized	6	1	7	14	4.67

The data were also reviewed for fatalities as well as collisions involving pedestrians or bicyclists. The 7th Avenue/Cherry Street and 16th Avenue/E Jefferson Street intersections both had fatalities. The fatalities at these intersections resulted from a vehicle colliding with a pedestrian in the crosswalk. At the 16th Avenue/E Jefferson Street intersection, the pedestrian was struck by a southbound left-turning vehicle while crossing the east leg of E Jefferson Street. At the 7th Avenue/Cherry Street intersection, the pedestrian was struck by a northbound through vehicle while crossing the south leg of 7th Avenue. The cause of these accidents do not appear to be related to the design of the intersection as adequate sight distance exists for the vehicle movements. In addition to these two pedestrian fatalities, 33 of the 41 study locations had collisions involving pedestrians and bicyclists. Of the 33 locations, 6 locations averaged more than one collision per year involving a pedestrian or bicyclists. These include:

- 12th Avenue / E Pike Street
- 12th Avenue / Madison Street
- 12th Avenue / E Jefferson Street
- 12th Avenue / S Jackson Street
- 23rd Avenue / E Jefferson Street
- 23rd Avenue / E Yesler Way

Within the immediate vicinity of the campus, the frequency of collisions is reported to be higher along E Jefferson Street then along E Cherry Street. Along E Cherry Street from 14th Avenue to 18th Avenue there were a total of 12 collisions over the three-year period. Six of the 12 collisions resulted in an injury and the remaining resulted in property damage only. The most common collision type along E Cherry Street from 14th Avenue to 18th Avenue was related to vehicles turning into the traffic stream. Two of the collisions involved pedestrians or bicyclists. Along E Jefferson Street from 14th Avenue to 18th Avenue there were a total of 27 collisions. Fourteen of the 27 collisions resulted in an injury and one collision resulted in a fatality as previously discussed. Four collisions involved a pedestrian or a bicyclist. Similar to E Cherry Street, the most common collision type were related to vehicles turning into the traffic stream. The cause of these types of collisions is likely due to the unsignalized control at the majority of the intersections and limited sight distance due to on-street parking along both corridors.

3.8 Parking

Designated parking for the Swedish Cherry Hill campus is provided through off-street facilities. There is also on-street parking within the neighborhood surrounding the campus which may be used by visitors and staff. The nature of the on-street parking includes unrestricted areas, residential parking zones (RPZ), and metered parking. The following describes the existing parking supply and utilization in the vicinity of the Swedish Cherry Hill campus. The parking demand associated with the Swedish campus is also discussed.

Supply

This section describes the off- and on-street parking supply subject to use by Swedish.

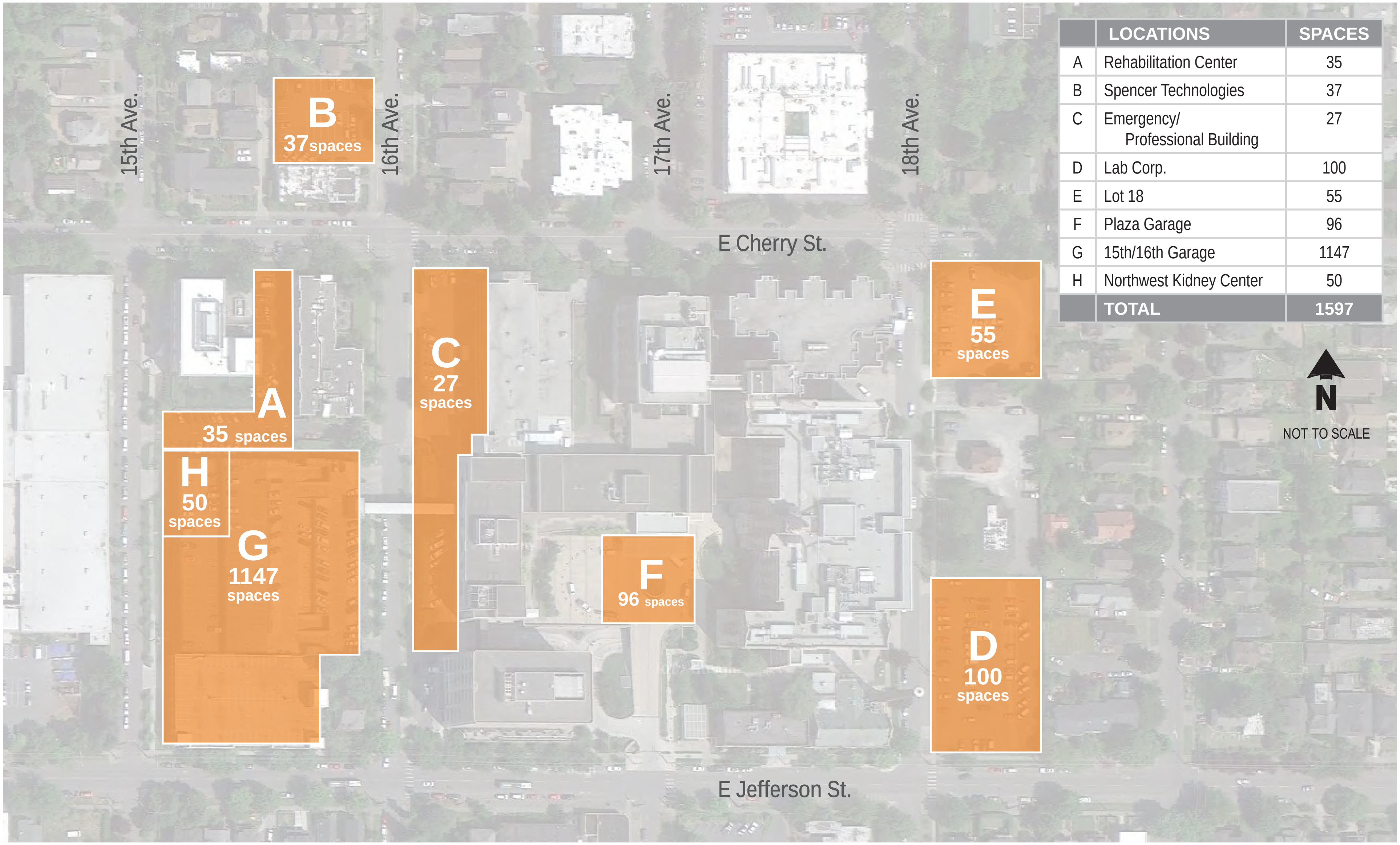
Off-Street. There are several off-street facilities in the vicinity of the Swedish Cherry Hill campus that are operated by Swedish or Sabey. There are also some smaller public parking facilities along 14th Avenue. This evaluation of off-street parking focuses on the on-campus facilities, which are most proximate for employee and patient use and have capacity to accommodate (see utilization discussion below).

Figure 8 shows the existing parking facilities associated with Swedish Cherry Hill. The overall parking supply is approximately 1,547 parking spaces with 1,293 garage spaces and 247 surface spaces. All of the off-street parking is paid parking whether through monthly permits, leasing, or hourly/daily pay by use. Generally, parking is unreserved and open for both staff and patient parking; however, there are some reserved lots and spaces including:

- Surface Lot (Northeast Corner of E Jefferson Street/18th Avenue) – This gravel parking lot can accommodate approximately 100 vehicles and is designed for LabCorp employees.
- Surface Lot (Southeast Corner of E Cherry Street/18th Avenue) – This parking lot has 55 reserved parking spaces for staff.
- 15th/16th Garage – This parking garage has 1,197 spaces with 50 of the spaces secured and reserved for the Northwest Kidney Center. In addition, there are some reserved parking spaces for physicians and staff.
- Spencer Technologies (Northwest Corner of E Cherry Street/16th Avenue) – This surface parking lot has 37 spaces with 9 of the spaces reserved for employees of Spencer Technologies.
- Rehabilitation Center – This surface parking lot has 35 parking spaces that are dedicated to the rehabilitation center.

On-Street. The on-street parking study area incorporates all the RPZ blocks in the vicinity as well as parking within 1,000-feet or an approximate five minute walk of the campus. This study area represents the on-street parking most likely impacted by the MIMP.

Figure 9 illustrates the on-street parking surrounding Swedish Cherry Hill. The majority of the neighborhood surrounding the campus is part of a residential permit zone (RPZ), which restricts on-street parking to a two-hour time limit unless the vehicle has a residential permit. On the streets adjacent to the campus, there is paid parking along E Jefferson Street between 17th and 18th Avenues, 18th Avenue between E Cherry and E Jefferson Streets, and E Cherry Street between 16th and 17th Avenues on the south side and 17th and 18th Avenues on both sides. There is also two-hour time limited parking on the north side of E Jefferson Street between 16th and 17th Avenues and 18th and 19th Avenues as well as on both sides of 14th Avenue between E Jefferson and E Cherry Streets.



	LOCATIONS	SPACES
A	Rehabilitation Center	35
B	Spencer Technologies	37
C	Emergency/ Professional Building	27
D	Lab Corp.	100
E	Lot 18	55
F	Plaza Garage	96
G	15th/16th Garage	1147
H	Northwest Kidney Center	50
	TOTAL	**1597**

Existing Off-Street Swedish Parking Facilities

FIGURE
8

Swedish Cherry Hill MIMP – Preliminary DEIS

transpoGROUP

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Utilization and Demand

Hourly data was collected in September 2013 to evaluate the parking utilization for the Swedish off-street parking facilities and the on-street parking in the vicinity of the campus. The results of the utilization study showed that the peak utilization in the study area occurred between approximately 10:00 a.m. and 1:00 p.m.

Off-Street. As discussed previously, there are 1,547 off-street parking spaces. The off-street facilities had a peak occupancy of 828 vehicles or approximately 54 percent of the total off-street parking supply. The smaller public parking facilities (Plaza Garage, Rehabilitation Center, Spencer Technology, and Northwest Kidney Center parking) had the highest utilization ranging from 80 to 90 percent. Both the Rehabilitation and Northwest Kidney Center parking have free parking for patients/visitors of those uses, which likely contributes to the high utilization. The least utilized parking lot was LabCorp, which is restricted to LabCorp employees and could be underutilized due to employee alternative mode use. The peak parking demand of the 16th Avenue garage during the observation period was approximately 50 percent.

On-Street. Figure 9 illustrates the parking utilization by block for the on-street study area. As shown on the figure, the blocks immediately adjacent to campus are generally highly utilized with 10:00 AM occupancies of approximately 70 percent or higher; this reflects less than two spaces available per block. One block north and south of the campus along 16th, 17th, and 18th Avenues utilizations are also high with limited availability. Further from the campus, along 15th and 19th Avenues, observed utilizations are less than 70 percent. There is one block adjacent to the campus along E Cherry Street between 17th and 18th Avenues, which has a utilization of less than 55 percent; this is a paid parking block. Overall the data shows a peak utilization of approximately 75 percent and approximately 160 spaces available within one to two blocks of the campus.

This data as well as field observations indicate the Swedish off-street parking facilities are generally not full, while on-street parking utilization in the adjacent neighborhoods and within the paid and unrestricted parking areas is high.

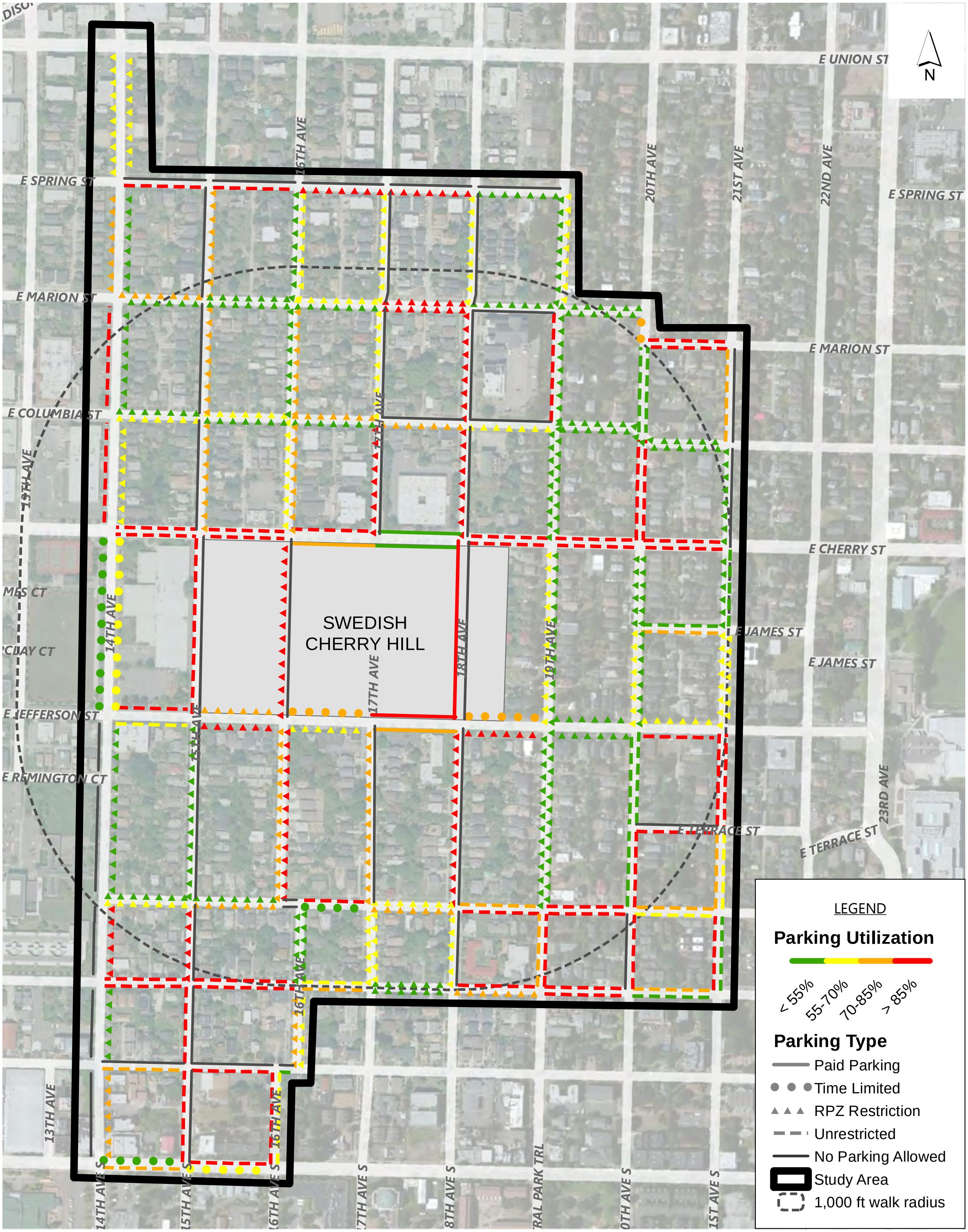


FIGURE
9

Existing On-Street Parking Supply and Utilization

Swedish Cherry Hill MIMP Preliminary DEIS

transpoGROUP

Existing Demand. The off- and on-street parking data collected in September 2013 was used to estimate the parking demand associated with Swedish Cherry Hill. While the off-street parking demands can be reliably associated with the Swedish Cherry Hill campus, the level of parking in the neighborhood associated with Swedish is more difficult to assign. A number of conservative assumptions were made in assessing the on-street parking demand associated with Swedish. These conservative assumptions result in a higher number of vehicles parked in the neighborhoods being assigned to Swedish. On-street parking demand assigned to Swedish for purposes of this analysis included:

- All vehicles parked in paid parking spaces within the study area
- All vehicles parked in time limited spaces adjacent to the campus
- All non-RPZ vehicles parking adjacent to the campus and within one block.

In addition, to the parking utilization the parking study tracked the movement of vehicles throughout the study area and those vehicles that were moved frequently were assumed to be associated with Swedish. Considering the on-street and off-street parking demands, the resultant parking demand for the campus is estimated at approximately 1,370. While this estimated campus peak parking demand is presented in the Preliminary Draft EIS, further refinement is possible based on additional review of campus parking demand and the on-street parking characteristics.

Compared to the existing supply off-street parking supply of 1,547, the existing parking demand could be fully accommodated within the off-street parking facilities. As previously noted, the 16th Avenue garage parking structure had a peak utilization of approximately 50 percent resulting in approximately 600 available parking stalls. Sabey and Swedish continue to monitor the pricing structure of the parking garages. The garages are operated pursuant to the current TMP. Thus, the pricing structure is intended to promote the use of alternative travel modes, which can have an unintended consequence of parking spillover in the surrounding neighborhood.

4 Impacts of Alternative 1 No Build

This section describes the future traffic conditions for the years 2023 and 2040 without the approval of the Master Plan and no further expansion of the campus. For Alternative 1, No Build, no expansion of the campus is assumed, thus employee population, and patient population is assumed to be consistent with existing levels. Therefore, no change in trip generation or parking demand is assumed under this alternative. While some growth/change in staffing is possible without Master Plan approval, an assumption of no increase provides a conservatively low baseline condition against which the impacts of the build alternatives can be measured. The impacts of additional growth in patient activity or employment are addressed within Sections 5 and 6 (Impacts of Alternatives 5 and 6 and Impacts of Alternative 7).

The evaluation of future conditions reflect increases in traffic attributed to known, and approved, developments in the area as well as modifications to the street system to reflect planned transportation improvement projects.

4.1 Street System

A review of local and regional capital improvement programs and long-range transportation plans was conducted to determine planned funded and unfunded transportation projects that would impact the transportation network within the defined study area. The review included, but was not limited to, transportation plans from the Washington State Department of Transportation (WSDOT), City of Seattle, and King County. Some of the key planning documents reviewed for the City of Seattle include the *Draft Seattle Bicycle Master Plan* (June 2013), *City Seattle Department of Transportation Transit Master Plan* (April 2012), *First Hill Streetcar Transportation Technical Report* (August 27, 2010)**,** and *Seattle Pedestrian Master Plan* (2009).

Table 5 provides a summary of key planned transportation projects in the study area and identifies how these transportation projects were incorporated into the Alternative 1 No Build 2023 and 2040 evaluations. As is shown in the Table, the primary projects that have been identified focus on pedestrian and bicycle transportation and public transit. Most of the major street system projects impacting vehicular movements would be completed by 2023. Following the table is a more detailed discussion on how specific transportation projects impact the study area.

Table 5
Transportation Improvement Projects

Project Description	Responsible Agency	Expected Completion Date	Funded?[1]	Assumed in Analysis?[2] 2023	Assumed in Analysis?[2] 2040
First Hill Streetcar: Two-mile streetcar line serving Capitol Hill, First Hill and International District with connections to Link Light Rail, Sounder commuter rail and bus service.	SDOT	2014	Yes	✓	✓
Link Light Rail: Extension of the regional light rail system. All segments are funded in ST2, but the year of completion may vary depending on revenue available to fund construction. The segments include:	Sound Transit				
North—University District and Capitol Hill		2016	Yes	✓	✓
North—Northgate		2021	Yes	✓	✓
North—Lynnwood		2023	Yes	✓	✓
East—Bellevue and Redmond		2023	Yes	✓	✓
South—Extension to S. 200th Street		2016	Yes	✓	✓
South—Extension to Kent-Des Moines Road		2023	Yes	✓	✓
23rd Avenue Transit Priority Corridor Improvement: 23rd Avenue Urban Village Transit Network (UVTN) Corridor from John to Jackson Streets	SDOT	2013	Yes	✓	✓
Madison High Capacity Transit (HCT): Electric trolley buses (ETBs) serving First Hill, the Central Area, and downtown Seattle with connections to the First Hill Streetcar, ferry service at the Colman Dock Ferry Terminal, and bus service. This is currently in the study phase.	SDOT	Unknown	Partial		
SR 520 Bridge Replacement: Construction of a new SR 520 floating bridge with two general purpose lanes and one HOV / transit lane per direction. Transit and non-motorized transportation projects between SR 202 and I-5. The eastside and floating bridge segments are funded. The westside projects in the Montlake Interchange vicinity are not funded.	WSDOT	2015	Partial	✓	✓
Electric Trolleybus Fleet Replacement: King County Metro Transit will replace its fleet of 159 trolleybus with modern low-floor vehicles providing more capacity on these routes	King County Metro Transit	2015	Yes	✓	✓
23rd Avenue Corridor Neighborhood Greenway: Creation of a neighborhood greenway between Roanoke Street and Rainer Avenue along either 21st or 22nd Avenues including pavement markings, improved crossings, way-finding, traffic calming and signage.	SDOT	Phase 1: 2014	Partial	✓	✓

Planned projects assumed in the 2023 and 2040 analyses are described in more detail below:

- **First Hill Streetcar:** The project is a new streetcar line along S. Jackson Street, 14th Avenue, Yesler Way, and Broadway connecting Capitol Hill to Pioneer Square. The line will operate 7 days a week with 10-minute headways during the weekday peak commute hours and 15-minute headways during other periods. Service is anticipated by spring of 2014 with more than 3,000 trips per day expected. This project also includes installing a two-way cycle track along Broadway between Yesler Way and Denny Way, a portion of which recently opened to cyclists. Modifications to intersections along the route are required. Adjustments in intersection geometry and signal operations has been incorporated into this analysis where appropriate.
- **Link Light Rail:** The regional light rail system is anticipated to extend beyond Seattle by 2023 with five extensions planned:
    - **North Link Light Rail – University:** This extension will connect the UW and Capitol Hill neighborhood to downtown Seattle via the Westlake Station. The project includes two stations; one near Seattle Central Community College on Capitol Hill and one near Husky Stadium. Construction is underway and service is anticipated in 2016.
    - **Northgate (North):** The light rail will extend between the University extension and Northgate. The three locations where stations are planned are the U-District near NE 45th Street and Brooklyn Avenue NE, Roosevelt High School near 12th Avenue NE and NE 65th Street, and Northgate Mall / Transit Center near NE 103rd Street. This project is under construction and service is expected in 2021.
    - **Lynnwood (North):** This segment will connect from the northern point of the Northgate extension and terminate in Lynnwood. Several stations are planned along the route at NE 130th / 145th / 155th Street in Seattle / Shoreline, NE 185th Street in Shoreline, 236th Street SW in Mountlake Terrace, and 200th Street SW in Lynnwood which follows the I-5 corridor. Construction would begin in 2018 with service expected to begin in 2023.
    - **East –** This extension will link Bellevue and Mercer Island to the International District / Chinatown Station in Seattle. Several stations are planned along the route: Rainier Avenue S.; Mercer Island; South Bellevue, East Main, Bellevue Transit Center, Overlake Hospital, 120th Avenue NE, and 130th Avenue NE in Bellevue; and Overlake Village and Overlake Transit Center in Redmond. Construction is expected to begin in 2015 with service in 2023.
    - **South Link Light Rail – S. 200th Extension:** This extension will add one additional station and a new park-and-ride facility to the system south of SeaTac Airport. The project is scheduled to open for service in 2016.
    - **South –** This segment would extend from S. 200th Street in SeaTac to add one additional station at Kent-Des Moines Road in the vicinity of Highline Community College. The project is anticipated to open for service in 2023.
- **23rd Avenue Transit Priority Corridor Improvement:** This project provides a dedicated transit-only lane in both directions along 23rd Avenue between John and

Jackson Streets. As a result of the project, 23rd Avenue will become a three-lane roadway with a two-way center left-turn lane.

- **Madison High Capacity Transit (HCT):** This creates a bus rapid transit corridor along Madison Street using electronic trolley buses (ETBs). The HCT would serve First Hill and downtown Seattle with connections to the First Hill Streetcar, Colman Dock Ferry Terminal, and bus service. This project is in the study phase only and no plans have been developed.
- **23rd Avenue Corridor Neighborhood Greenway**: 23rd Avenue is a heavily travelled transportation corridor. SDOT plans to install a neighborhood greenway near this busy arterial to provide a more comfortable pedestrian and bicycle transportation environment. This project would create a neighborhood greenway between Roanoke Street and Rainer Avenue along either 21st or 22nd Avenues. Features of the greenway could include pavement markings, improved crossings, way-finding, traffic calming and signage. The planning process is underway for this project and it is anticipated that Phase 1 would be implemented in 2014 providing a greenway between S Jackson Street and E John Street.

4.2 Campus Access and Circulation

Access and circulation patterns to and from the Swedish Cherry Hill campus would not change under No Build conditions. With growth in traffic along E Cherry Street and E Jefferson Street, access to the off-street parking facilities along 16th Avenue and 18th Avenue would become progressively more challenging as vehicle delays on the minor street approaches increase.

4.3 Pedestrian and Bicycle Transportation

Pedestrian and bicycle facilities within the vicinity of the campus would generally remain the same under No Build conditions as described for existing conditions. In addition, there are no planned pedestrian or bicycle improvements in the *immediate* vicinity of Swedish Cherry Hill. There are number of transit improvements and development projects within the larger study area and as these occur it is likely that pedestrian facilities (i.e. sidewalks) along the frontages of the development projects would be improved where deficient. More information on the location of these development projects is described in section 4.5. Specific planned improvements include:

- **First Hill Streetcar:** Existing sidewalks will be maintained as part of this project; however, crosswalk enhancements will be added to provide connections to the streetcar including five signalized pedestrian crossings along Broadway, E Yesler Way, and S Jackson Street and improve pedestrian curb ramps along the route to comply with Americans with Disability Act (ADA) requirements. In addition, bicycle facilities are being upgraded along the entire streetcar route including changing sharrows to bicycle lanes along 14th Avenue S and E Yesler Way and adding a two-way cycle track along Broadway. Bicycle boxes would also be provided at intersection providing a designated area for bicycles to wait at traffic signals.
- **23rd Avenue Corridor Neighborhood Greenway:** As discussed previously, this project would create a greenway on either 21st or 22nd Avenues. Features of the greenway could include pavement markings, improved crossings, way-finding, traffic calming and signage. The planning process is underway for this project and it is anticipated that Phase

1 would be implemented in 2014 providing a greenway between S Jackson Street and E John Street.

Along with these specific improvements in the study area, the City's Pedestrian Master Plan identifies high priority areas for making pedestrian improvements. Priority corridors within the study area are Broadway, Boren Avenue, S Dearborn Street and portions of E Cherry Street, and 12th Avenue.

4.4 Transit/Shuttle Services

To be conservative, the analysis of traffic volume and operation impacts assumed no change (increase) in the level of use of transit as part of the No Build alternative. It is likely that over time, as these modes become more accessible and congestion increases, transit use would increase. In addition, as described in the Street System section, there are number of transit improvements within the study area including the First Hill Streetcar, the Link Light Rail, 23rd Avenue UVTN corridor, and the electronic trolleybus fleet replacement.

4.5 Traffic Volumes

Traffic forecasts were developed by applying a general growth rate and adding the traffic associated with known "pipeline" (planned/approved) development projects identified by the city. This methodology is used consistently in the evaluation of traffic impacts of development projects throughout the city. An annual growth rate of 0.25 percent was assumed throughout the study area, with the exception of the Madison Street corridor. Along this corridor a 0.50 percent annual growth rate was used to reflect a higher level of anticipated development. This approach and specific assumptions is consistent with that taken for recent MIMP EIS's completed in the vicinity for Seattle University and Virgina Mason Medical Center. The pipeline development specifically accounted for includes:

- Virginia Mason Medical Center MIMP
- Seattle University MIMP
- Swedish Medical Center Fist Hill MIMP
- Seattle NBA/NHL Arena
- 550 Broadway
- 500 Terry
- 1124 Columbia
- 1414 10th Avenue
- 1424 11th Avenue
- 1111 E Union Street
- Yesler Terrace

All of the pipeline projects are anticipated to be completed by 2023 except for the Virginia Mason Medical Center MIMP, which would be completed by approximately 2040[1]. The 2023 forecasts accounts for the portion of the Virginia Mason Medical Center MIMP that would be completed by 2023, as this project would be phased over approximately 30 years. Assumptions on the level of development to be completed by 2023 were based on a linear rate of development through the life of the master plan. **Figures 10 and 11** summarize the No-Build weekday AM

[1] *Final Environmental Impact Statement Virginia Mason Medical Center Major Institution Master Plan Section 3.9 Transportation*, December 2012.

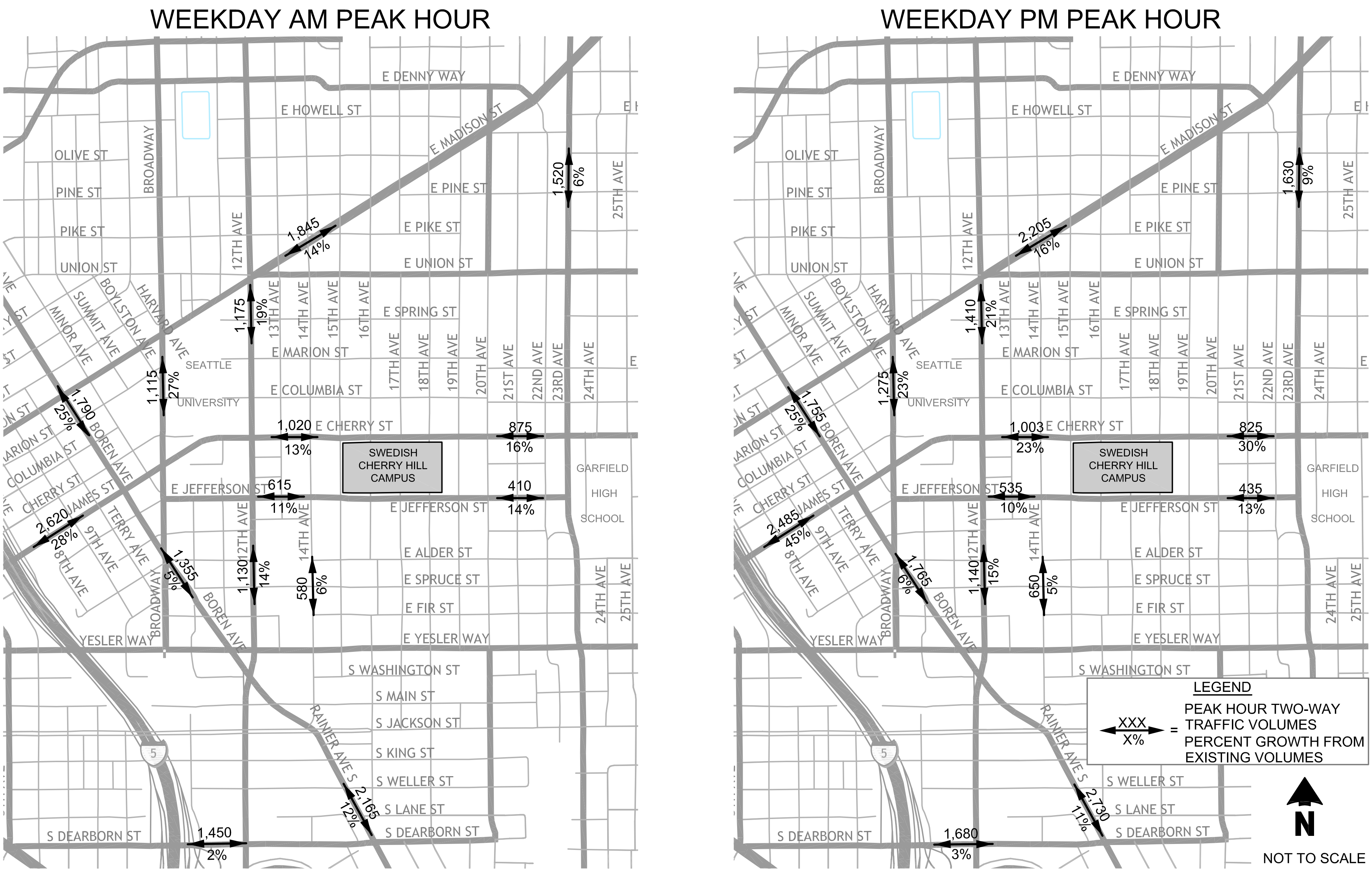
and PM peak hour link volumes on the major roadways surrounding the campus for 2023 and 2040. The intersection turning movement summaries are included in **Attachment C-1**.

Figure 10 summarizes the weekday AM and PM peak hour forecasts for the 2023 horizon year. During the AM peak hour, growth attributed to pipeline projects and general increases in background traffic results in traffic volumes increases of between 2 and 28 percent in the study area. The largest percent increase is forecast along James Street west of Broadway where traffic volumes are anticipated to increase by 28 percent. Increases in traffic volumes along Broadway are forecast to be approximately 27 percent. These large increases in background traffic volumes are largely due to the additional traffic associated with the Virginia Mason Medical Center MIMP, Seattle University MIMP, and Yesler Terrace projects. Along E Cherry Street peak hour traffic volumes are expected to increase by approximately 100 vehicles during the weekday AM peak hour period, representing an increases of 13 percent west of the Swedish campus and 16 percent east of the Swedish campus. Along E Jefferson Street, weekday AM peak hour traffic volumes are forecast to increase by approximately 50 trips. This represents an increase of approximately 11 percent west of the Swedish campus and 14 percent east of the Swedish campus.

During the 2023 weekday PM peak hour, similar to the AM peak hour results, the largest percentage and absolute volume increases are forecast along James Street west of Broadway. Weekday PM peak hour traffic volumes are forecasted to increase by approximately 45 percent along James Street west of Broadway. As noted in the discussion of the AM peak hour forecasts, growth associated with the Virginia Mason Medical Center MIMP, Seattle University MIMP, and Yesler Terrace, all contribute to the growth anticipated along this corridor. Weekday PM peak hour increases in traffic along Broadway and 12th Avenue are generally consistent with the increases forecasted for the AM peak hour. In the immediate vicinity of the Swedish campus, increases in traffic along E Cherry Street are forecast to be on the order of 190 vehicles, representing a 23 percent increase west of the campus and 30 percent increase east of the campus. Along E Jefferson Street in the vicinity of the campus, traffic volumes are forecast to increase by 50 vehicles during the peak hour, representing an increase of 10 percent west of the campus and 13 percent east of the campus.

The traffic forecasts for the 2040 conditions show a lower growth rate between 2023 and 2040 then identified between the existing to 2023 conditions. This is because the majority of the forecasted growth in traffic for the 2023 conditions is associated with pipeline projects, which results in a higher annual growth rate. The only new pipeline projects in 2040 are the phases of the Virginia Mason Medical Center MIMP that would be completed beyond 2023.

Figure 11 provides the 2040 forecast volumes for the weekday AM and PM peak hours volumes. The figure provides the forecast volume as well as the growth relative to the existing traffic volumes.



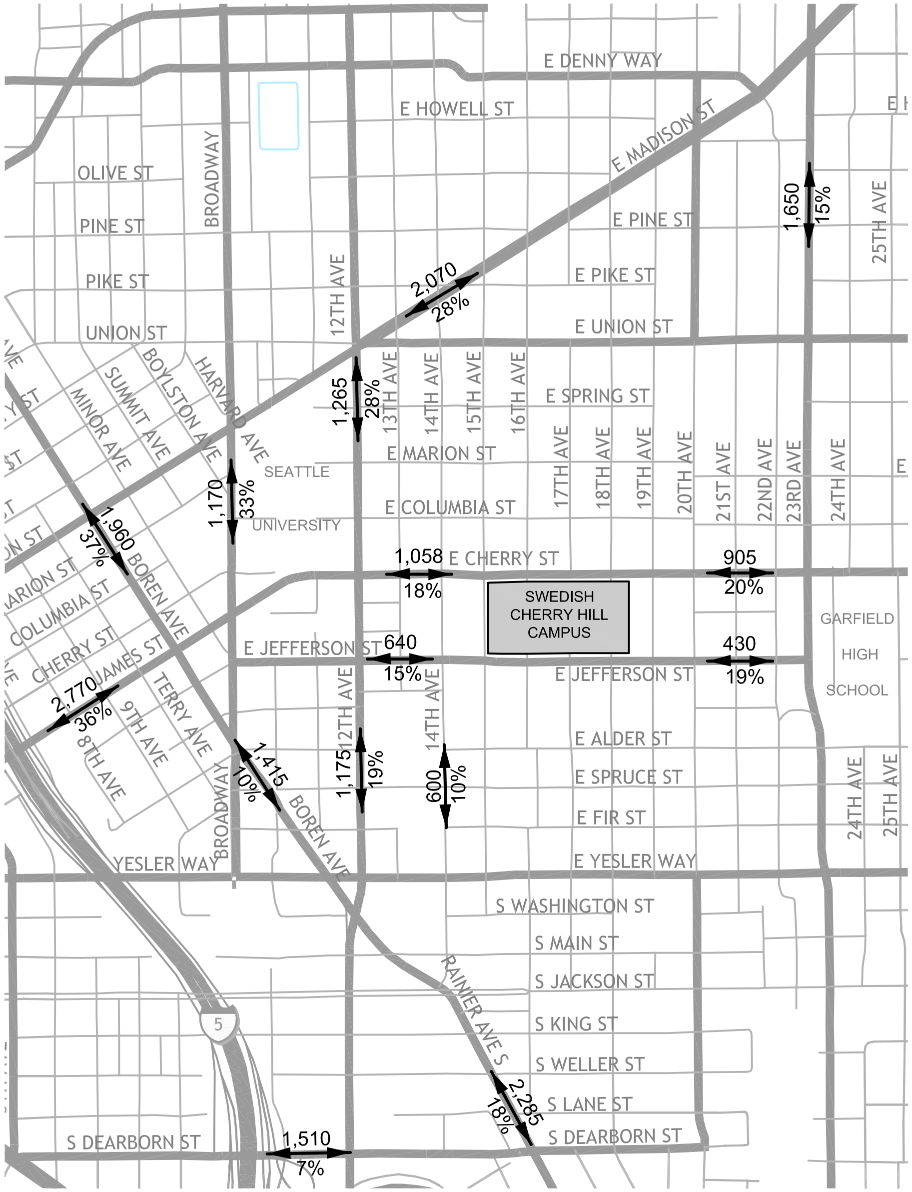
No-Build (2023) Weekday Peak Hours Two-Way Link Volumes

FIGURE **10**

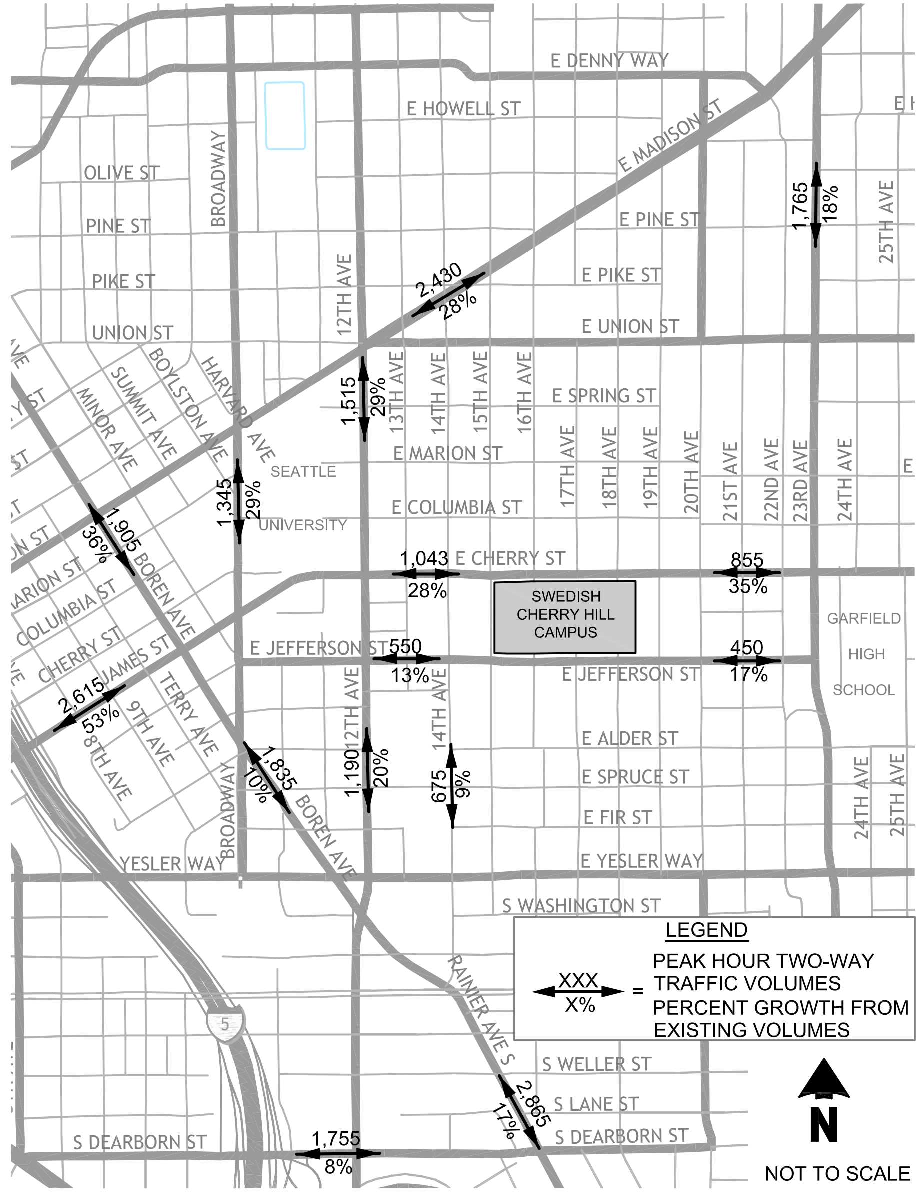
Swedish Cherry Hill MIMP-Preliminary DEIS

\\srv-dfs-wa\MM_Projects\Projects\11\11244.00 Swedish Providence Cherry Hill Campus\Graphics\Swedish_Graphic01 <10-No-Build (2023) Two-Way Link> adamc 11/04/13 16:15

WEEKDAY AM PEAK HOUR



WEEKDAY PM PEAK HOUR



No-Build (2040) Weekday Peak Hour Two-Way Link Volumes

FIGURE **11**

Swedish Cherry Hill MIMP-Preliminary DEIS

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By 2040, during the weekday AM peak hour, increases in the study area volumes are expected to increase by an additional 9 to 12 percent above the growth previously identified for the 2023 forecasts. Within the immediate vicinity of the campus, traffic volumes along E Cherry Street are forecast to increase by an additional 100 to 120 vehicles above the 2023 forecast levels. Along E Jefferson Street, the increase in traffic, relative to the 2023 forecasts, are nominal at less than 25 vehicles. Based on information provided for area-wide pipeline projects, E Cherry Street is forecasted to continue carrying the majority of the east/west traffic through the area.

Similar to the discussion regarding the AM peak hour analysis, the majority of the forecasted growth during the weekday PM peak hour was shown to occur between existing and the 2040 horizon year. Background growth and continued development of the Virginia Mason MIMP result in increased traffic along the James Street and Broadway corridors. In the vicinity of the Swedish campus, traffic volumes along E Cherry Street are forecast to increase by an additional 30 to 40 vehicles during the weekday PM peak hour as compared to 2023. Along E Jefferson Street, relative to 2023 conditions, traffic volumes are forecast to increase by an additional 15 to 20 vph.

4.6 Traffic Operations

The following describes the future intersection and corridor operations within the study area. Intersection levels of service and corridor performance levels are summarized for the 2023 and 2040 conditions. Operations account for the planned improvements described in section 4.1, including operations of the streetcar and the 23rd Avenue corridor transit improvements.

4.6.1 Intersection Operations

Intersection LOS was calculated at the study intersections using the same methodology outlined previously in the Affected Environment section. **Figure 12** provides a comparison between Existing and No Build weekday AM and PM peak hour LOS for the study area. Specific No Build 2023 and 2040 weekday peak hour LOS for each study intersection are displayed on **Figures 13 through 16** with detailed LOS calculations provided in **Attachment C-3**.

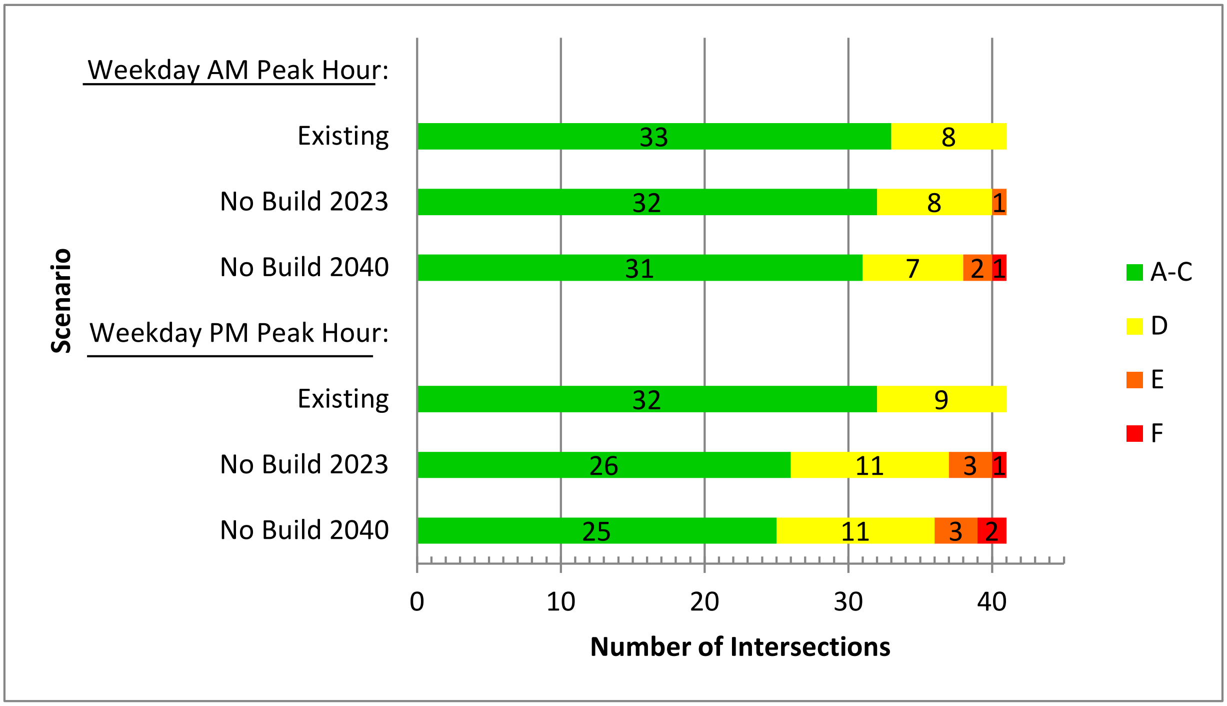
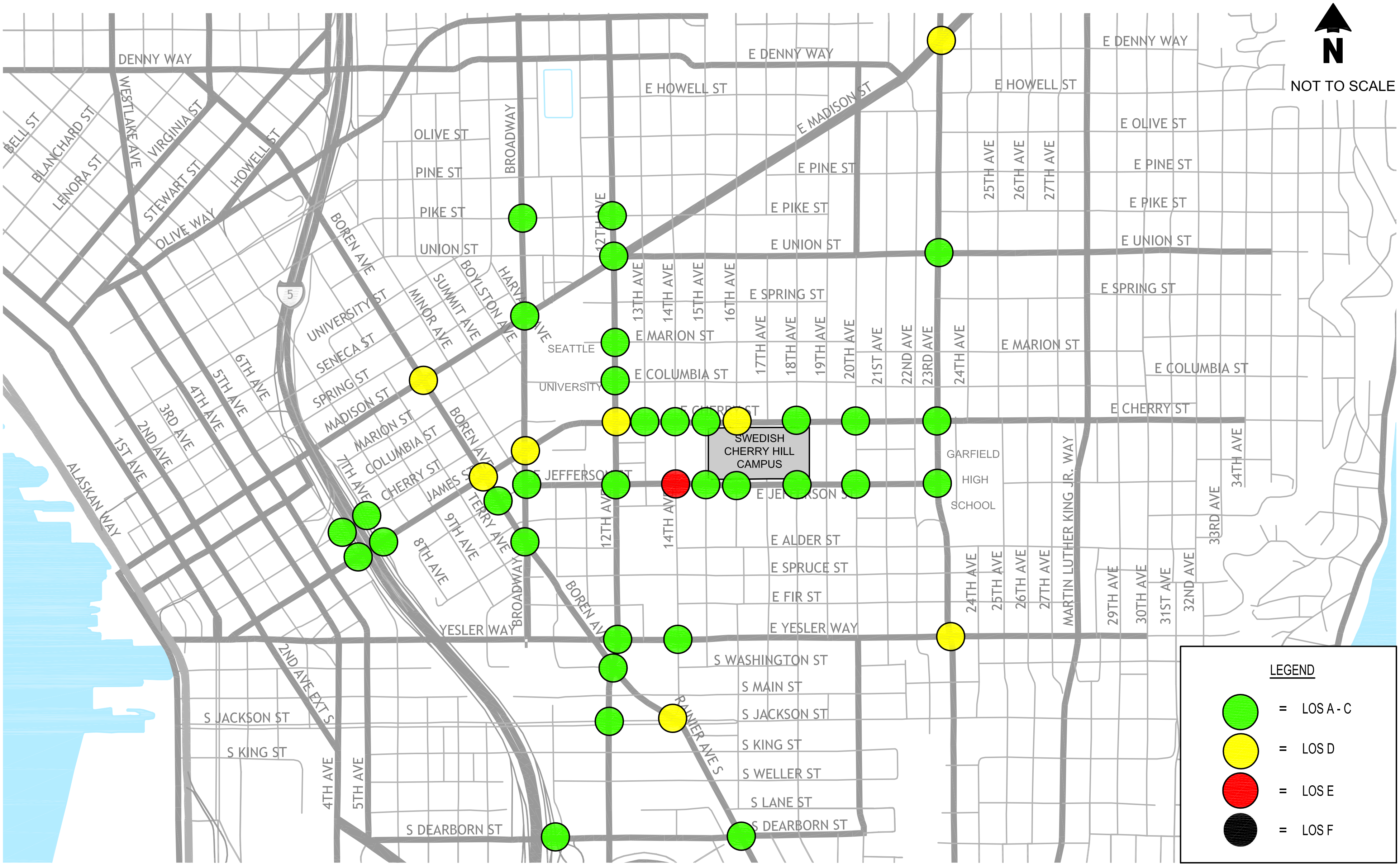


Figure 12 Existing and No Build Weekday Peak Hour Intersection Level of Service Comparison



No-Build (2023) Weekday AM Peak Hour Levels of Service Summary

FIGURE
13

Swedish Cherry Hill MIMP-Preliminary DEIS

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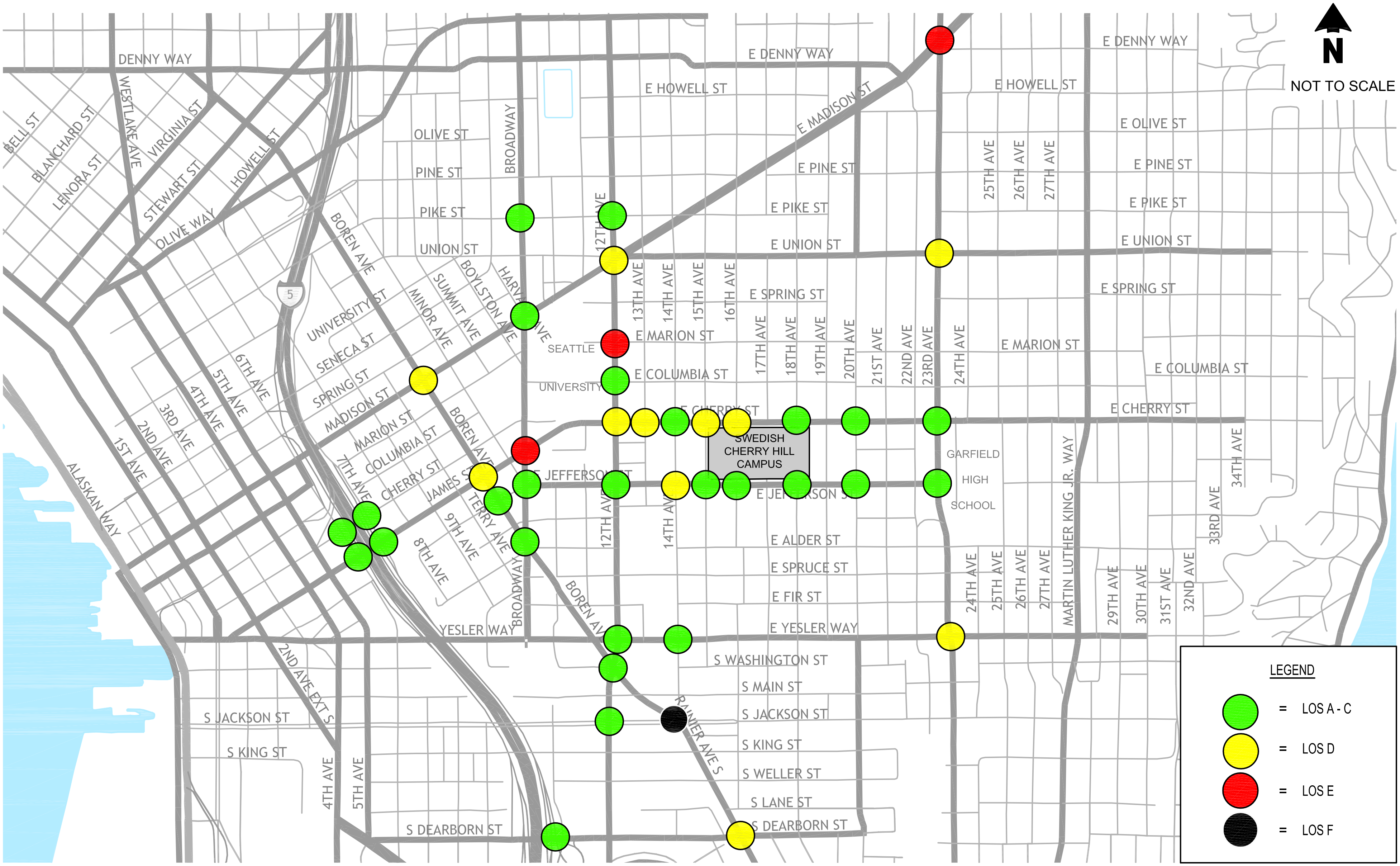
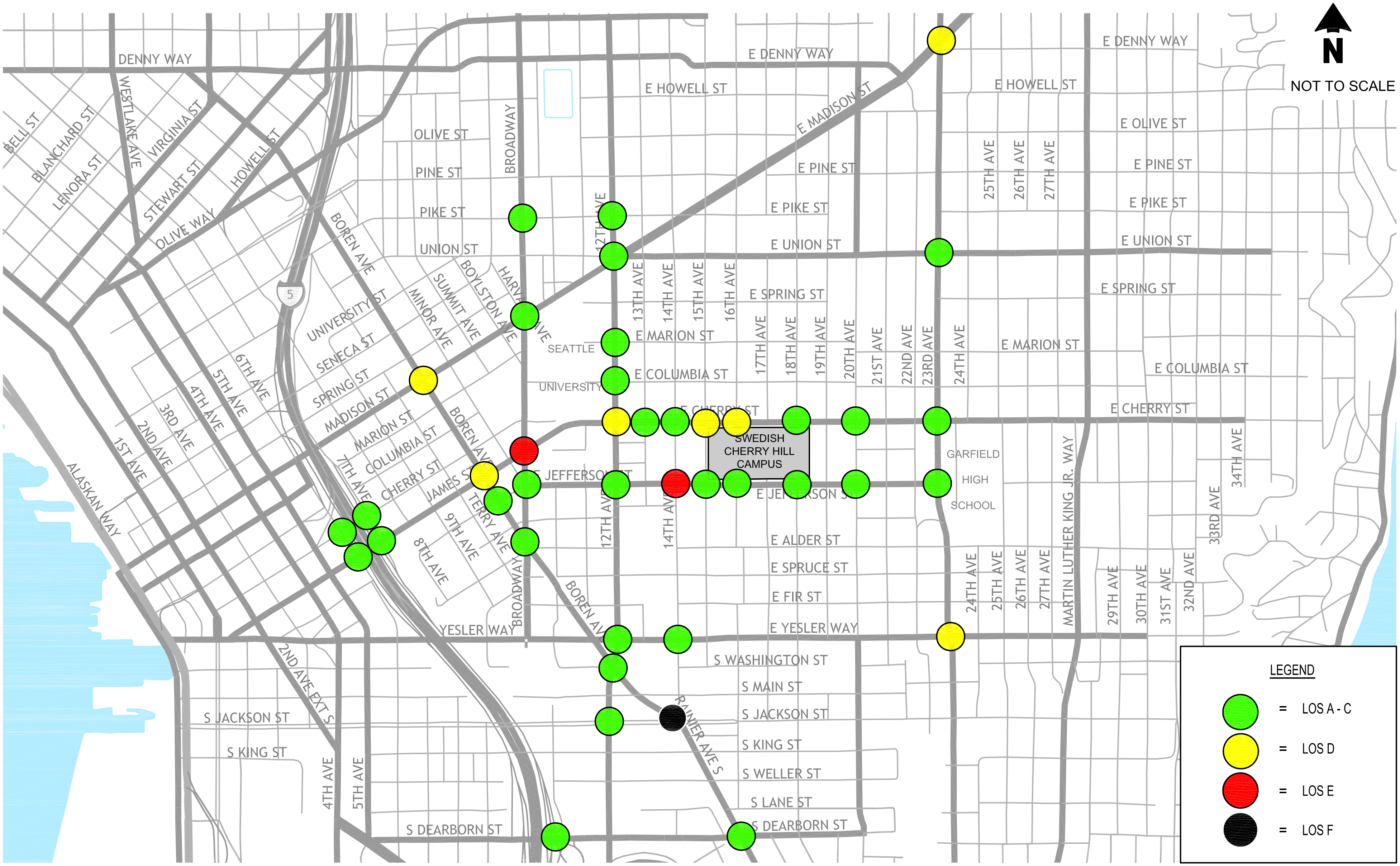


No-Build (2023) Weekday PM Peak Hour Levels of Service Summary

FIGURE **14**

Swedish Cherry Hill MIMP-Preliminary DEIS

\\srv-dfs-wa\MM_Projects\Projects\11\11244.00 Swedish Providence Cherry Hill Campus\Graphics\Swedish_Graphic01 <14-LOS PM (2023) NO BUILD> adamc 11/04/13 16:15

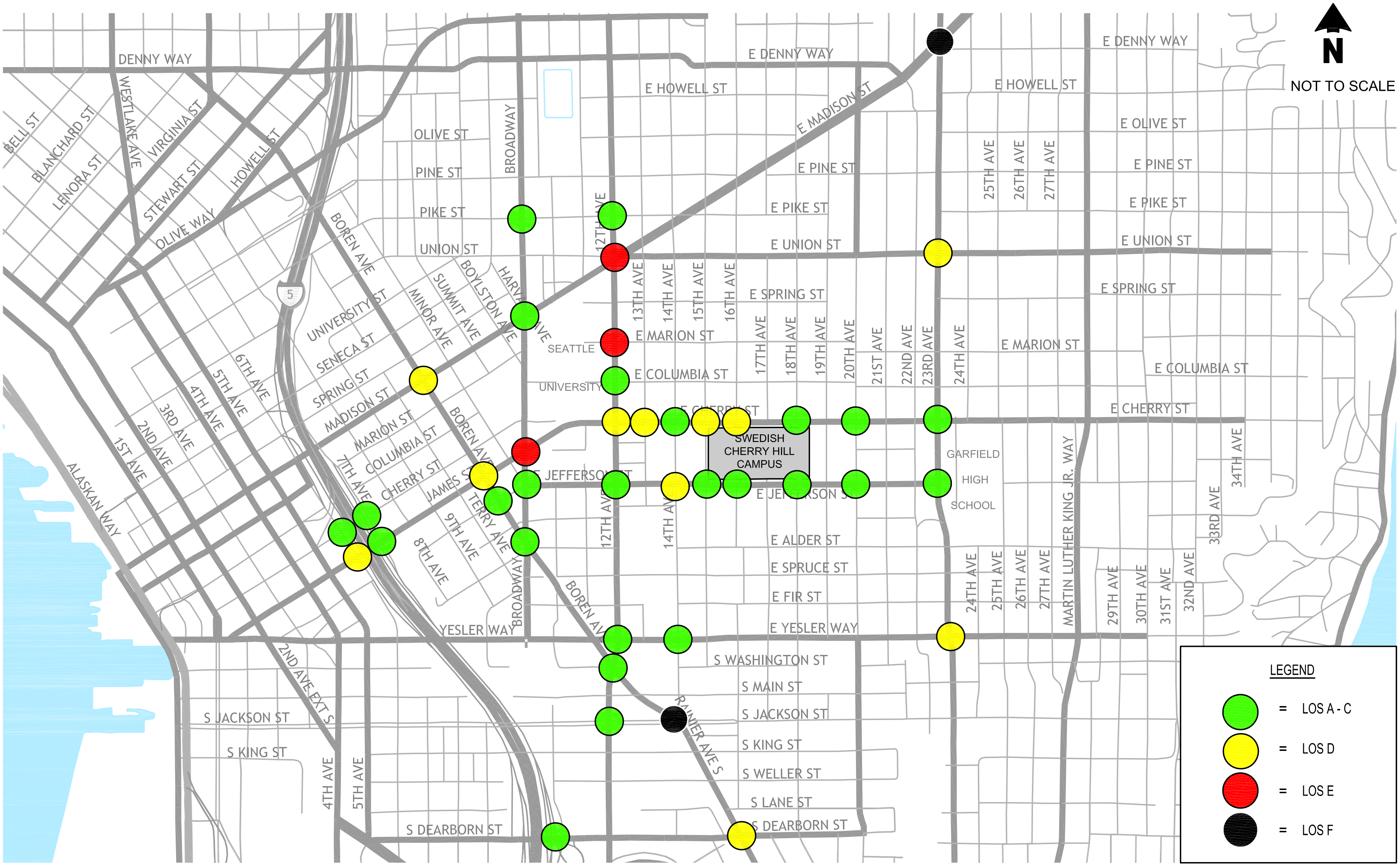


No-Build (2040) Weekday AM Peak Hour Levels of Service Summary

FIGURE
15

Swedish Cherry Hill MIMP-Preliminary DEIS

\\SRV-DFS-WA\mm_projects\Projects\11\11244.00 Swedish Providence Cherry Hill Campus\Graphics\Swedish_Graphic01 <15-LOS AM (2040) NO BUILD> stefanieh 11/05/13 09:25



No-Build (2040) Weekday PM Peak Hour Levels of Service Summary

FIGURE 16

Swedish Cherry Hill MIMP-Preliminary DEIS

\\srv-dfs-wa\MM_Projects\Projects\11\11244.00 Swedish Providence Cherry Hill Campus\Graphics\Swedish_Graphic01 <16-LOS PM (2040) NO BUILD> adamc 11/04/13 16:15

As illustrated on **Figure 12**, under the No Build conditions, there would be a continued decline in intersection level of service. By 2023, a total of five intersections would drop from LOS D or better to LOS E or worse, compared to Existing Conditions where no study intersections are calculated at that level. By 2040, continued growth in background traffic volumes would result in six intersections operating at a LOS E level, one of which is the 14th Avenue/E Jefferson Street which is projected to operate at this level during the weekday AM peak hour. The following discussion provides additional detail regarding those locations forecast to operate at LOS E or worse during either the AM or PM peak hours.

As shown in **Figure 13 and 14**, the results of the analysis indicate that the following study intersections would operate at LOS E or worse under No Build 2023 conditions during either the weekday AM or PM peak hours:

- **23rd Avenue / Madison Street –** Operations at this intersection would degrade from LOS C under existing conditions to LOS E under No Build 2023 conditions during the weekday PM peak hour. This is a signalized intersection. The LOS E operations during the weekday PM peak hour is related to the reduced capacity due to the 23rd Avenue Transit Corridor improvements. This improvement would reduce the general vehicular traffic capacity from four lanes (i.e., two travel lanes in each direction) to three lanes (i.e., one travel lane in each direction and a two-way left turn center lane) to provide a dedicated transit only lane in each direction.
- **12th Avenue / E Marion Street –** Operations at this intersection would degrade from LOS D under existing conditions to LOS E under No Build 2023 conditions during the weekday PM peak hour. The LOS E operations are a result of anticipated increases in traffic volumes at this two-way stop controlled intersection.
- **Broadway / James Street –** Operations at this intersection would degrade from LOS C under existing conditions to LOS E under No Build 2023 conditions during the weekday PM peak hour. The signalized intersection served by the streetcar would operate at LOS E due to increase in traffic volumes.
- **14th Avenue / E Jefferson Street –** Operations at this intersection would degrade from LOS D under existing conditions to LOS E under No Build 2023 conditions during the weekday AM peak hour. The LOS E operations at this location are related to anticipated increases in traffic volumes during the weekday AM peak hour and the all-way stop control at the intersection.
- **14th Avenue / S Jackson Street –** Operations at this intersection would degrade from LOS D under existing conditions to LOS F under No Build 2023 conditions during the weekday PM peak hour. The LOS F operations at this signalized intersection during the weekday PM peak are related to the five leg configuration at this location and the need for exclusive streetcar and pedestrian phases across Boren Avenue. These exclusive phases reduce the amount of green time available for vehicular traffic resulting in higher delays. Most intersections with streetcar service allow the streetcar to travel with traffic, which minimizes the impacts of the streetcar on intersection operations. The No Build conditions were modeled based on future timing provided by SDOT, which incorporate timing changes as a result of the streetcar.

As shown in **Figure 15 and 16**, under 2040 No Build conditions, one additional intersection, 12th Avenue/Madison Street, would degrade to LOS E. The locations operating at LOS E or worse include:

- **12th Avenue / Madison Street –** Operations at this intersection would degrade from LOS D under existing conditions to LOS E under No Build 2040 conditions during the weekday PM peak hour. This is a signalized intersection. The LOS E operations during the weekday PM peak hour are related to the anticipated increases in the westbound left-turn volume at this location.
- **23rd Avenue / Madison Street –** Operations at this intersection would degrade from LOS E under No Build 2023 conditions to LOS F under the No Build 2040 conditions during the PM peak hour. This is a signalized intersection. The LOS F operations are due to anticipated increases in traffic volumes at this location.
- **12th Avenue / E Marion Street –** This intersection would continue to operate at LOS E for both the 2023 and 2040 No Build conditions during the weekday PM peak hour. The LOS E is a result of anticipated increases in traffic volumes at this two-way stop controlled intersection.
- **Broadway / James Street –** Operations at this intersection would degrade from LOS D during the weekday AM peak hour and operate at LOS E under the No Build 2040 conditions during both the weekday AM and PM peak hours. The LOS E operations at this location are related to increased traffic volumes during the AM peak hour at this signalized intersection served by the streetcar.
- **14th Avenue / E Jefferson Street –** This intersection would operate at LOS E under the No Build 2040 conditions during the weekday AM peak hour. The LOS E operations at this location is related to anticipated increases in traffic volumes during the weekday AM peak hour and the all-way stop control at the intersection.
- **14th Avenue / S Jackson Street –** Operations at this intersection would further degrade to LOS F under No Build 2040 conditions during both the AM and PM peak hour. This is a signalized intersection. The LOS F operations at this location for both the weekday AM and PM peak hours are related to the anticipated increases in volumes as well as the operations of the streetcar through this intersection. As discussed previously, this is a five-legged intersection and exclusive streetcar and pedestrian phases would be provided resulting in increased vehicular delay.

All other study intersections would operate at LOS D or better under both the No Build 2023 and 2040 conditions during both the weekday AM and PM peak hours.

Neighborhood Assessment

As a result of the increases in traffic associated with background growth and pipeline traffic, delays for the minor street approaches in the immediate vicinity of the campus are expected to increase accordingly. Intersections along E Cherry and E Jefferson Streets are forecast to operate at LOS C or better during the weekday AM peak hour under both No Build 2023 and 2040 conditions except for the unsignalized intersection of 14th Avenue/E Jefferson Street. As described above this intersection would operate at LOS E due to the anticipated increases in traffic volumes along both 14th Avenue and E Jefferson Street. During the weekday PM peak hour under both No Build 2023 and 2040 conditions, intersections along E Cherry and E Jefferson Streets operate at LOS D or better. The improved operations (i.e., LOS D during the weekday PM peak hour as compared to LOS E during the weekday AM peak hour) at the 14th Avenue/E Jefferson Street intersection is related to weekday PM peak hour traffic volumes being lower than weekday AM peak hour volumes as described in the traffic volume discussion.

4.6.2 Corridor Operations

Consistent with the Affected Environment evaluation, the travel speeds and travel times along E Cherry Street/James Street from I-5 to 18th Avenue S were evaluated using Synchro. The calibration factor identified in Table 2 in the Affected Environment section was added to the No Build projections. The adjustment or calibration factor accounts for operational impacts from vehicle queuing, mid-block pedestrian crossing, on-street parking maneuvers, etc. not accounted for in Synchro. The factored travel times using the adjustment factor multiplied by the calculated travel times and average speeds using Synchro are found below in **Table 6**.The values presented in **Table 6** are rounded due to the nature of the forecast methodology and the long term horizon years identified for this analysis.

As shown in the table, in general, given that capacity along the corridors are already constrained and congested, only small differences in travel times or average speeds would occur between existing and No Build conditions. Travel speed would increase by one minute and speeds would decrease by one mph along E Cherry Street in the westbound direction during the weekday AM peak hour with No Build 2023 and 2040 growth. Average speed would also be reduced by one mph along James Street in the westbound direction during both the AM and PM peak hours and along E Cherry Street in the eastbound direction during the AM peak hour.

Table 6
No Build Weekday Peak Hours James Street/E Cherry Street Travel Time Analysis

		Existing		2023		2040	
Segment	**Direction**	**Travel Time (minutes)[1]**	**Average Speed (mph)**	**Travel Time (minutes)[1]**	**Average Speed (mph)**	**Travel Time (minutes)**	**Average Speed (mph)**
AM Peak Hour							
James Street (6th Ave to Broadway)	EB	4	7	4	7	4	7
	WB	4	9	4	8	4	8
E Cherry Street (Broadway to 18th Ave)	EB	5	10	6	9	6	9
	WB	3	12	3	12	3	11
PM Peak Hour							
James Street (6th Ave to Broadway)	EB	4	7	4	7	4	7
	WB	6	6	7	5	7	5
E Cherry Street (Broadway to 18th Ave)	EB	2	14	3	14	3	14
	WB	3	13	3	11	3	11

Source: Transpo Group, 2013.
1. Rounded to the nearest minute

4.7 Traffic Safety

In general, as traffic volumes increase, the potential for traffic safety issues increases proportionately. As described in Section 4.5, growth in background traffic is forecast on both E Cherry Street and E Jefferson Street. On E Cherry Street, in the vicinity of the campus, 2040 weekday PM peak hour traffic volumes are forecast to increase by 28 to 35 percent depending on the roadway segment. Similarly, along E Jefferson Street, by 2040 traffic volumes are forecast to increase by 13 to 17 percent during the weekday PM peak hour. While there is not a direct relationship between anticipated future accidents and traffic volumes, absent a specific hazard, it is reasonable to expect that the number of accidents could increase in some relation to the increase in traffic volumes. As described in section 4.6 delays for vehicles entering E Cherry Street or E Jefferson Street from unsignalized approaches is forecast to increase. Depending on specific circumstances, this can result in driver impatience, which could result in more aggressive driving maneuvers.

These same traffic conditions can impact pedestrian and bicycle safety, especially as it relates to crossing arterials at unsignalized intersections. The unsignalized intersection of 16th Avenue/E Cherry Street has been the subject of previous conversations with SDOT regarding the need for pedestrian and vehicle improvements. This is primarily related to the sight distance limitations at this intersections for vehicles turning from 16th Avenue onto E Cherry Street. With increases in traffic projected along E Cherry Street existing conflicts between vehicles and pedestrians trying to cross or access E Cherry Street would increase. Similar characteristics would exist at other unsignalized intersections along the E Cherry Street and to a less degree the E Jefferson Street corridor, simply by the nature of the lower traffic volumes along the E Jefferson Street corridor.

4.8 Parking

As noted previously, under the No Build scenario the existing population and patient levels of the hospital and related clinics were assumed to remain at the same levels as they are today. Based on that, it was assumed that No Build parking supply and demand associated with Swedish Cherry Hill Medical campus would remain at current levels. As with vehicular traffic demand, this assumption provides a conservatively low baseline against which to compare impacts of the action alternatives insofar as it assumes no noticeable growth in staff, patient, or visitor demands unrelated to construction of new projects identified in the proposed MIMP.

As identified in the Affected Environment section, the existing utilization of the 16th Avenue parking garage is at approximately 50%. On-street utilization in the neighborhoods surrounding the campus are nearing capacity through a combination of neighborhood and campus related demands. If parking demands were to increase beyond the existing conditions, the parking analyses show that there is additional capacity in the existing parking garages to accommodate additional demand.

5 Impacts of Alternatives 5 and 6 (Build with Vacation of 16th Avenue)

This section documents the impacts associated with the development of either Alternative 5 or 6. Transportation Elements discussed previously in the Affected Environment and No Build discussions are also presented in this section.

The impact analysis of the build alternatives assumes continuation of the existing TMP and current mode-split performance for the "unmitigated" condition. The impact of improved effectiveness of the TMP resulting in lower SOV rates and implementation of the enhanced TMP is reflected in the analysis of the "mitigated" conditions.

The MIMP boundaries include a half-block west of 16th Avenue and a half-block east of 18th Avenue between E Cherry and E Jefferson Streets as well as the Spencer Technology site on northwest corner of 16th Avenue and E Cherry Street. Alternatives 5 and 6 would result in approximately 3.1 million square-feet with 385-beds within the hospital. In addition, for Alternative 5 and Alternative 6, 16th Avenue would be vacated between E Cherry and E Jefferson Streets. While the street vacation would restrict north/south vehicular access through the corridor, pedestrian and bicycle traffic would be able to traverse the corridor.

Increased traffic generation for Alternatives 5 and 6 (the Build Alternatives) is related to the increase in the number of beds and size of the facilities. Land use for Alternatives 5 and 6 is programmatically very similar; therefore, it is expected that employee and patient population and traffic generation would be similar for each. In addition to traffic generation, the Build Alternatives have other transportation characteristics in common. The size of the development, location of parking, proposed parking supply, trip generation, and access and circulation are consistent for Alternatives 5 and 6. The difference between the two alternatives is the location of specific hospital, clinic, research, education, and hotel facilities within the MIMP boundaries.

Both Alternatives 5 and 6 include the development of additional parking. The development of the 18th Avenue building as well as the redevelopment of the areas on the west side of 16th Avenue include parking garages. The amount of parking, approximately 3,300 total stalls, is programmatically the same under either alternative. Given the consistency of the parking supply and location under both alternatives, as well as the similar development program for each, the traffic related impacts of the two alternatives would be similar and thus are presented together in the following sections.

As noted previously, the development assumed in the Master Plan is projected to occur over a period of 25 years. Based on discussions with the applicant, an estimate of development to be completed by the 2023 horizon year was identified. **Table 7** provides a summary of land use assumptions for the short and long term horizon years. As shown in the table, the level of development assumed by the 2023 horizon year results in a total campus development of approximately 1.9 million square-feet. This increase represents a doubling of the existing campus. The build-out of the Master Plan results in 3.1 million square-feet of development or tripling of the campus.

Table 7
Swedish Cherry Hill Land Use Summary[1]

Facilities	No Build / Existing	Alternatives 5 and 6[2]	
		2023	2040
Hospital	366,000 sf (196 beds)	366,000 sf (196 beds)	1,350,000 sf (385 beds)
Clinic	448,000 sf	938,000 sf	1,000,000 sf
Research	33,000 sf	238,000 sf	300,000 sf
Education	33,000 sf	86,900 sf	100,000 sf
Hotel	12,500 sf	12,500 sf	80,000 sf
Long-Term Care	43,000 sf	220,000 sf	220,000 sf
Other Support Facilities	50,000 sf	50,000 sf	50,000 sf
Total	**985,500 sf**	**1,911,400 sf**	**3,100,00 sf**

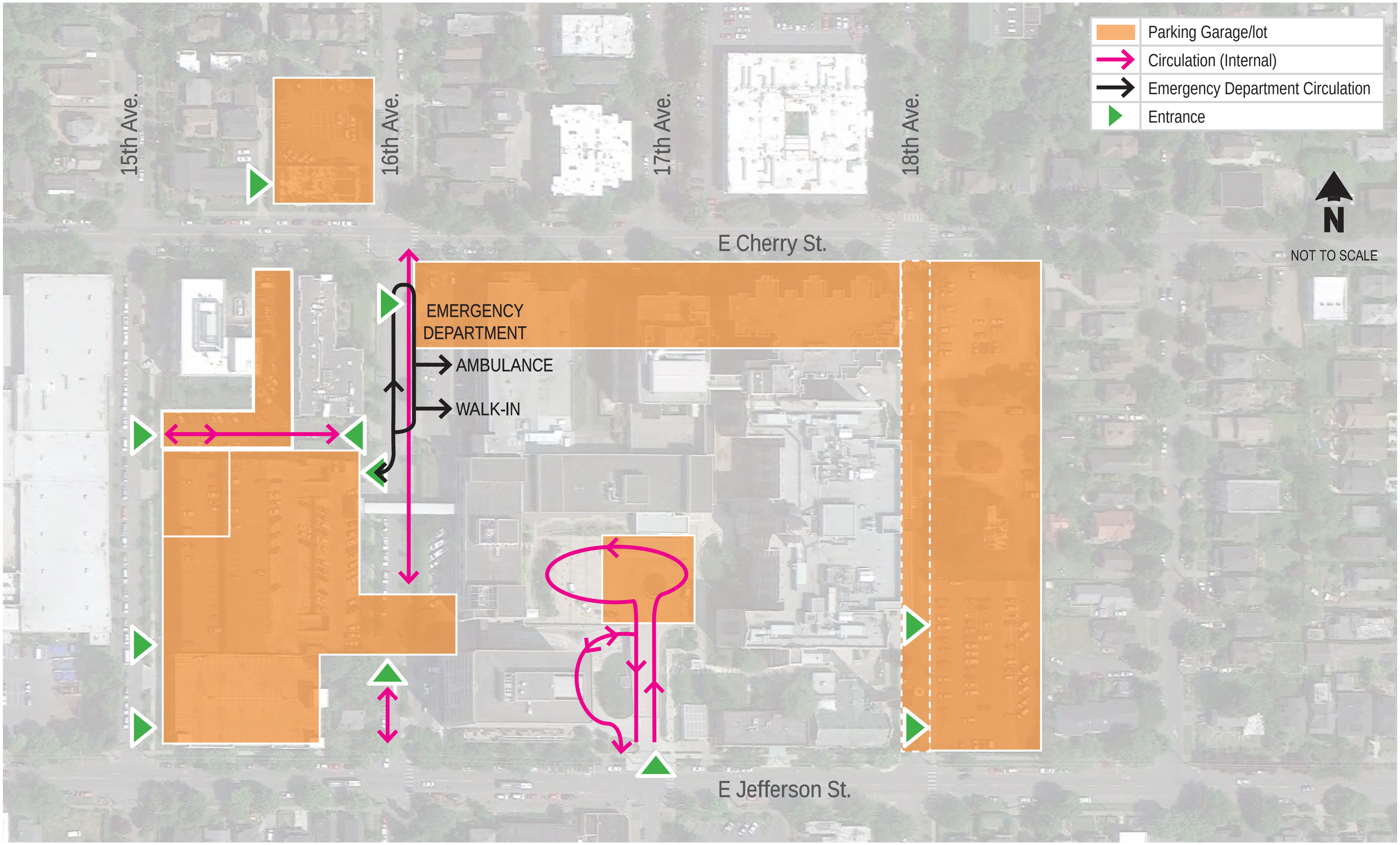
sf = square-feet
1.All building areas rounded for summary purposes
2.Alternative 7 land use is the same as Alternatives 5 and 6.

5.1 Street System

The street system for Alternatives 5 and 6 would be the same as those described under Alternative 1 with the exception of the vacation of 16th Avenue. Section 5.2 describes campus access and circulation and provides an understanding of how the proposed vacation of 16th Avenue would impact the street system in the vicinity of the site.

5.2 Campus Access and Circulation

Figure 17 highlights the proposed parking lots and garages and the campus access and circulation proposed under the current MIMP. As shown in **Figure 17**, access to the Swedish Cherry Hill parking garages and surface lots would continue to be along 15th Avenue, 16th Avenue, and 18th Avenue between E Cherry Street and E Jefferson Street. While the overall circulation and access patterns associated with the campus would generally stay the same, the amount of parking on 18th Avenue would increase and represent a higher proportion of overall parking supply. As such, a higher percentage of traffic is anticipated to utilize 18th Avenue in the future. The only change in access to parking from existing conditions would be the new Spencer Technology garage (northwest corner of 16th Avenue and E Cherry Street), which would be accessed along the alley between 16th Avenue and 15th Avenue. The existing Spencer Technology surface lot would be accessed via 16th Avenue.



Alternatives 5 and 6 Access and Circulation Routes

Swedish Cherry Hill MIMP – Preliminary DEIS

FIGURE **17**

transpoGROUP

Q:\Projects\11\11244.00 Swedish Providence Cherry Hill Campus\Graphics\Figures\11244 Fig 17 Swedish 16th access and circ routes.pdf

The vacation of 16th Avenue would restrict north/south vehicular access through the corridor; however, pedestrian and bicycle traffic would be able to traverse the corridor and there would be access to parking. Further details on the future parking layout are discussed below in the parking section.

As noted in the Affected Environment section, there are several different hospital related services and users that utilize 16th Avenue to access the campus. The uses that currently utilize 16th Avenue for access include the emergency department and service and deliveries for the hospital. These uses would continue to be accessed via 16th Avenue; however ambulance and public walk-in access would be separated. In addition to the service access from 16th Avenue, there would be service docks along 15th Avenue midway between E Cherry and E Jefferson Streets and along 18th Avenue south of E Cherry Street.

5.3 Pedestrian and Bicycle Transportation

Pedestrian and bicycle facilities within the study area would be consistent with those described for the No Build condition. In the immediate vicinity of Swedish, changes to pedestrian and bicycle transportation facilities are anticipated to be minimal even with the vacation of 16th Avenue. As described previously, 16th Avenue would remain open to pedestrian and bicycle circulation and the vacation would only impact north/south vehicular travel. On-site pedestrian circulation would be similar to today except with the vacation better linkage would be provided between the main campus and uses across 16th Avenue. The existing parking structure is connected to the campus via surface connections and a skybridge.

The number of pedestrians on-site as well as to and from transit facilities and parking is anticipated to increase given that the proposed expansion would serve a greater population. If as a result of the expansion, Swedish Cherry Hill employees and patients continue to park on-street then pedestrian levels within the neighborhood would increase. There sidewalks and adequate connections to and from the surrounding on-street parking and transit stops to accommodate any increases in pedestrian demand.

5.4 Transit/Shuttle Services

Consistent with the No Build Alternative, the analysis of traffic volume and operations impacts assumed no change (increase) in the proportional level of use of transit as part of Alternatives 5 and 6. Changes in public transit service would be implemented by the service providers and are not part of the Build Alternatives. However, it is likely that over time as these modes become more accessible and vehicular congestion in the area increases, transit use would increase. In addition, as described in the Street System section, there are number of transit improvements within the study area including the First Hill Streetcar, the Link Light Rail, 23rd Avenue UVTN corridor, and the electronic trolleybus fleet replacement that will impact overall transit ridership.

As described in the Affected Environment, Swedish Cherry Hill operates an inter-campus shuttle service that serves Swedish First Hill Campus, Cherry Hill Campus, and the Metropolitan Park offices. This service was assumed to continue in the future. The analysis does not assume any increases in this service; however, as staff and patient populations increase it is likely that the shuttle service frequency and/or service area would change to accommodate the increased demand.

5.5 Forecast Traffic Volumes

The following provides a summary of the methodology used to forecast the future traffic volumes, inclusive of the proposed campus expansion. This includes a review of Swedish's trip generation, mode share, trip assignment, and trip distribution.

Forecast volumes with the development of the MIMP were developed by adding expansion related traffic to the No Build (Alternative 1) traffic volumes outlined previously. The existing traffic accessing the Swedish campus was re-routed based on the future location and distribution of the parking supply.

5.5.1 MIMP Trip Generation Estimates

The method for forecasting new trips for the Build Alternatives is consistent with approach used for other Hospital MIMPs in the City of Seattle. The following provides a detailed description of the methodology and key assumptions.

Trip generation for use in transportation impact analyses are typically estimated based on either building area or employees. Based on previous experiences with similar projects in the City of Seattle, forecasted total on-site persons (employees, patients, and visitors) provides the basis for estimating trip generation. While the Institute of Transportation Engineers' *Trip Generation Manual* contains information on hospital uses, a more robust trip generation model developed based on population totals and local model split data is recommended. Weekday daily, AM peak hour, and PM peak hour trip generation associated with the Build Alternatives were estimated based on existing Swedish Cherry Hill trip generation characteristics and expected increases in Swedish's population with the Build Alternatives. The process of determining trip generation included first creating an existing trip generation model and then using that model plus the forecasted growth in Swedish's population to determine future trip generation.

The existing trip generation process takes the Swedish Cherry Hill average weekday population applies travel model split data to determine the number of people that driving, using transit, biking, walking, and using other modes to and from the campus. The result of applying mode splits to the population gives the number of person trips by mode for the day. Daily vehicle trips are determined by applying average vehicle occupancy (AVO) to the SOV, carpool, and vanpool person trips. Peak hour vehicle trips are determine by multiplying daily vehicle trips by the percent that would occur during the weekday AM and PM peak hours. Consideration was also given to the potential for people making multiple trips in one day; there is likely only a small amount of the population making multiple trips because staff lunch breaks are typically 30-minutes, there are limited restaurant and retail opportunities nearby, and the parking garages do not allow in/out privileges. To account for persons making multiple trips, the SOV trips were increased by five percent. For future trip generation, population is increased based on the proposed MIMP proportional increase in beds and building square-footage.

The following describes assumptions used in development of the trip generation model.

Existing Trip Model

There are three primary population groups on the Swedish Cherry Hill campus: Sabey, Swedish Medical Center, and Swedish Medical Group. Herein reference to Swedish or Swedish Cherry Hill is inclusive of all three population groups.

A trip generation model was created based on existing population (i.e., employees and patients), mode splits, and percent of daily trips occurring during the peak hours. As discussed above, daily Swedish Cherry Hill campus population is determine for the three population groups. Within these three population groups, Swedish was further subdivided based on the uses on the campus: hospital, clinics or medical office, research, education, hotel, long-term care, and other. Mode splits and AVO are applied to the population and daily vehicle trips are determined. The percent of vehicle trips occurring during the peak hours is applied to the daily trips to determine peak hour vehicle trips. **Figure 18** below illustrates the existing condition trip generation process.

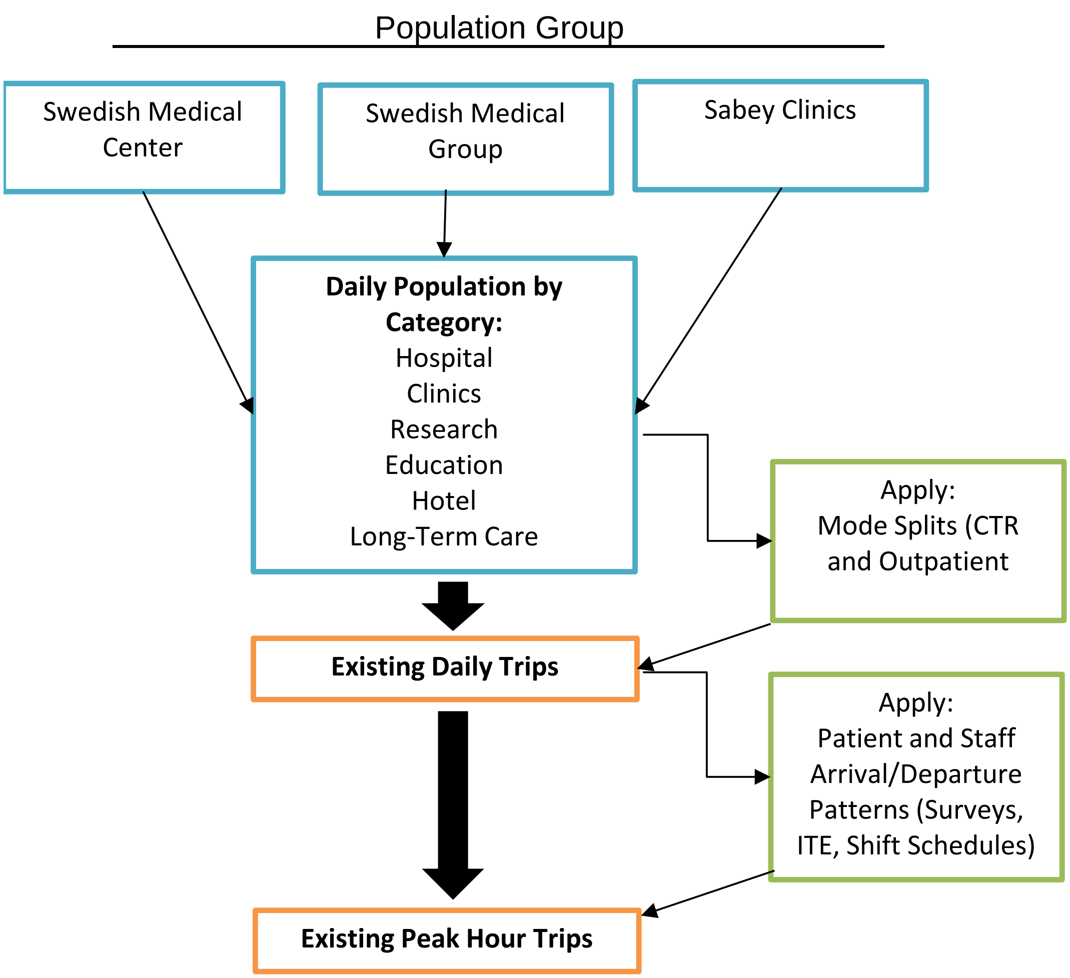


Figure 18 Existing Trip Generation Process

Key assumptions for the existing trip generation model include:

- **Population:** Trip generation was developed based on population groups (patients, doctors, staff). The numbers of existing employees and patients were based on data provided by Swedish. The long-term care facility is within the hospital boundaries but not operated by Swedish; therefore, for the purposes of this analysis, the ITE *Trip Generation Manual*, 9th Edition Nursing Home (#620) land use was to estimate population based on square-footage.
- **Travel Modes:** The mode share for each population group were based on a number of different sources. The source of this information for each population group is noted below.
    - **Other Staff / General Employees**: Average mode splits for all employees from the LabCorp, Swedish Medical Center, and Sabey most recent Commute Trip Reduction (CTR) survey
    - **Clinic Outpatient / Visitors**: Field surveys conducted at the clinics within the Jefferson and James Towers
    - **Inpatients / Class Attendees / Hotel Staff / Long-Term Care Staff / Patients**: No data is available. It was assumed that 95 percent of the trips were drive alone
    - **Hospital Outpatient / Emergency Department Visits**: No data is available. It was assumed that all trips were driving
    - **Doctors**: Based on coordination with Swedish transportation services, it was assumed that 90 percent of the doctors drive to campus
- **Percent Daily Traffic Occurring During Peak Hours:** For each population group, it was determined what percent of daily traffic would occur on the Swedish Cherry Hill campus during the peak hours. This was based on inbound and outbound garage flows, shift times, facility operations, clinic patient surveys, and ITE *Trip Generation*, 9th Edition for medical office (#710), nursing home (#620), and hotel (#310) land uses.

Attachment C-4 provides the detailed trip generation model for existing conditions.

Unmitigated Future Trip Generation

Under the Build Alternatives, the campus population is projected to (employees and patients) nearly triple. To determine the future unmitigated trip generation, the existing population was increased based on the anticipated increase in beds for the hospital portions of the MIMP and increase in square-footage for the other portions of the project. The term mitigated refers to any changes in mode splits that occur through additional Transportation Management Plan (TMP) measures. The trip generation described here is considered unmitigated since assumptions in mode split and vehicle occupancy are assumed to be the same as existing conditions. Swedish has been decreasing its share of single-occupancy vehicles (SOV) over the last few years; however, as a conservative estimate of unmitigated future trip generation, this study assumes the mode split would remain the same as existing. In addition, the percent of trips occurring during the peak hours is assumed to be the same.

Figure 19 below illustrates the process used to estimate the future increase in trip generation for the Swedish Cherry Hill MIMP.

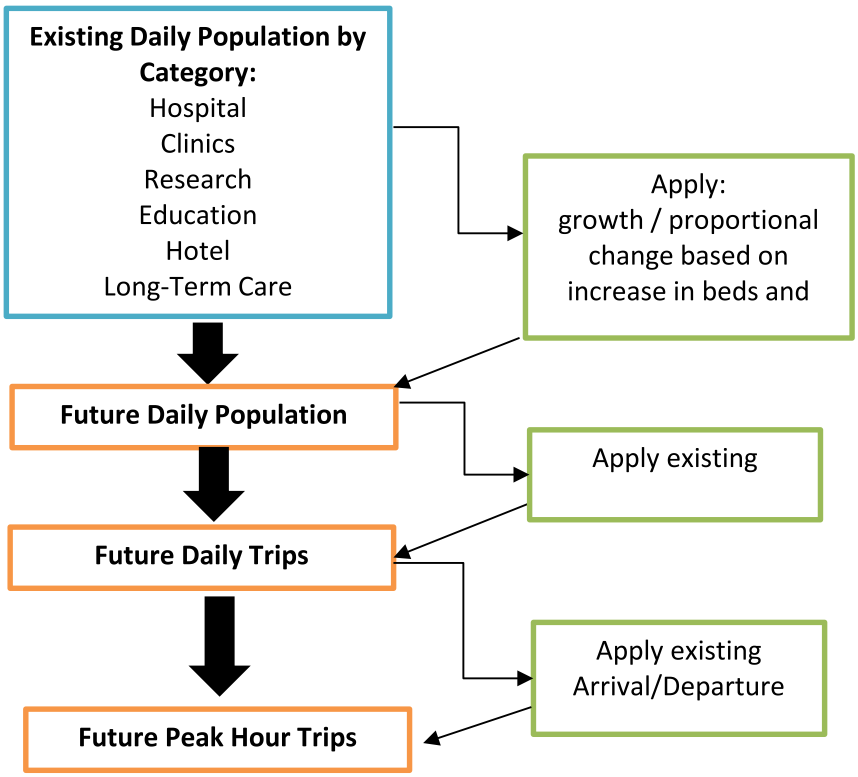


Figure 19 Future Trip Generation Process

Table 8 summarizes the trip generation for the existing and future conditions. **Attachment C-4** provides the detailed trip generation model for future conditions. As shown in the table, based on the model, the Swedish Cherry Hill campus generates 6,163 daily trips with 416 occurring during the AM peak hour and 589 occurring during the PM peak hour. The short-term or Phase 1 development would increase trips by 4,697 net new daily trips with 311 new trips occurring during the AM peak hour and 347 new trips occurring during the PM peak hour. In addition, the build-out of Alternative 5 and 6 would increase trips by 8,322 net new daily trips with 550 new trips occurring during the AM peak hour and 742 new trips occurring during the PM peak hour.

Table 8
Summary of Swedish Cherry Hill MIMP Trip Generation (unmitigated)

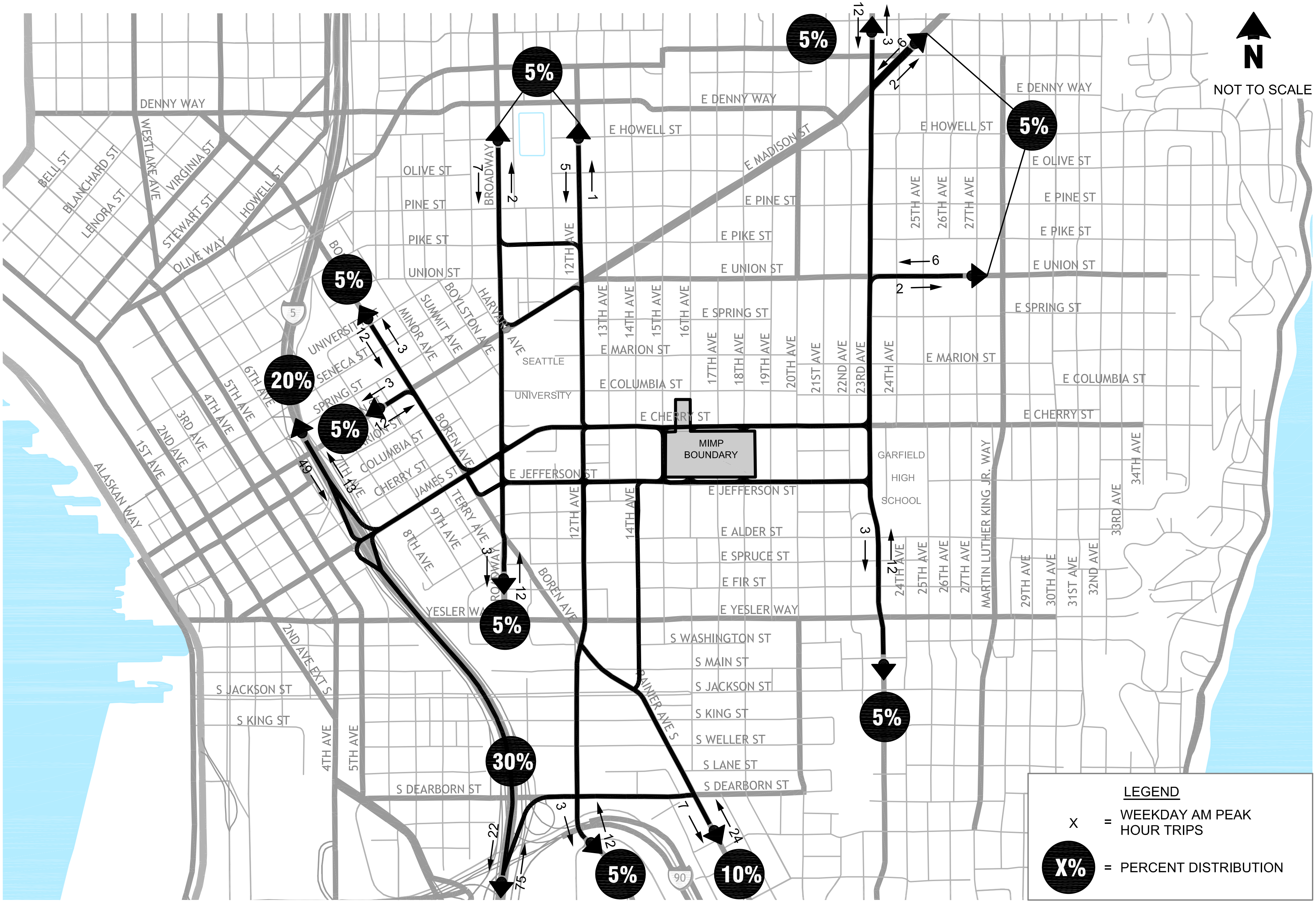
Alternative	Daily Trips	Weekday AM Peak Hour Trips			Weekday PM Peak Hour Trips		
		Inbound	**Outbound**	**Total**	**Inbound**	**Outbound**	**Total**
Existing / No Build	6,163	250	166	416	105	484	589
Short-term (2023) – Alternatives 5 & 6 with Vacation of 16th Avenue							
Net New Trips	*4,697*	*244*	*67*	*311*	*123*	*224*	*347*
Total Trips	**10,860**	**494**	**233**	**727**	**228**	**708**	**936**
Build-out (2040) – Alternatives 5 & 6 with Vacation of 16th Avenue							
Net New Trips	*8,322*	*357*	*193*	*550*	*169*	*573*	*742*
Total Trips	**14,485**	**607**	**359**	**966**	**274**	**1057**	**1,331**

5.5.2 Trip Distribution and Assignment

The Swedish Cherry Hill Campus trip distribution patterns assumed in this study are based on travel patterns identified through the most recent Commute Trip Reduction (CTR) surveys. **Figures 20 through 23** illustrate the weekday AM and PM peak hour trip distribution and assignment for the 2023 and 2040 horizon years. The trip distribution patterns developed for the project generally reflect the following:

- 20 percent I-5 north
- 30 percent I- 5 south
- 25 percent north via Madison Street, Broadway, 12th Avenue, and 23rd Avenue
- 25 percent south via Broadway, 12th Avenue, Rainier Avenue, and 23rd Avenue

The same trip distribution patterns were utilized for the 2023 and 2040 analysis.



Alternatives 5 and 6 (2023) Weekday AM Peak Hour Trip Distribution and Assignment

FIGURE **20**

Swedish Cherry Hill MIMP-Preliminary DEIS

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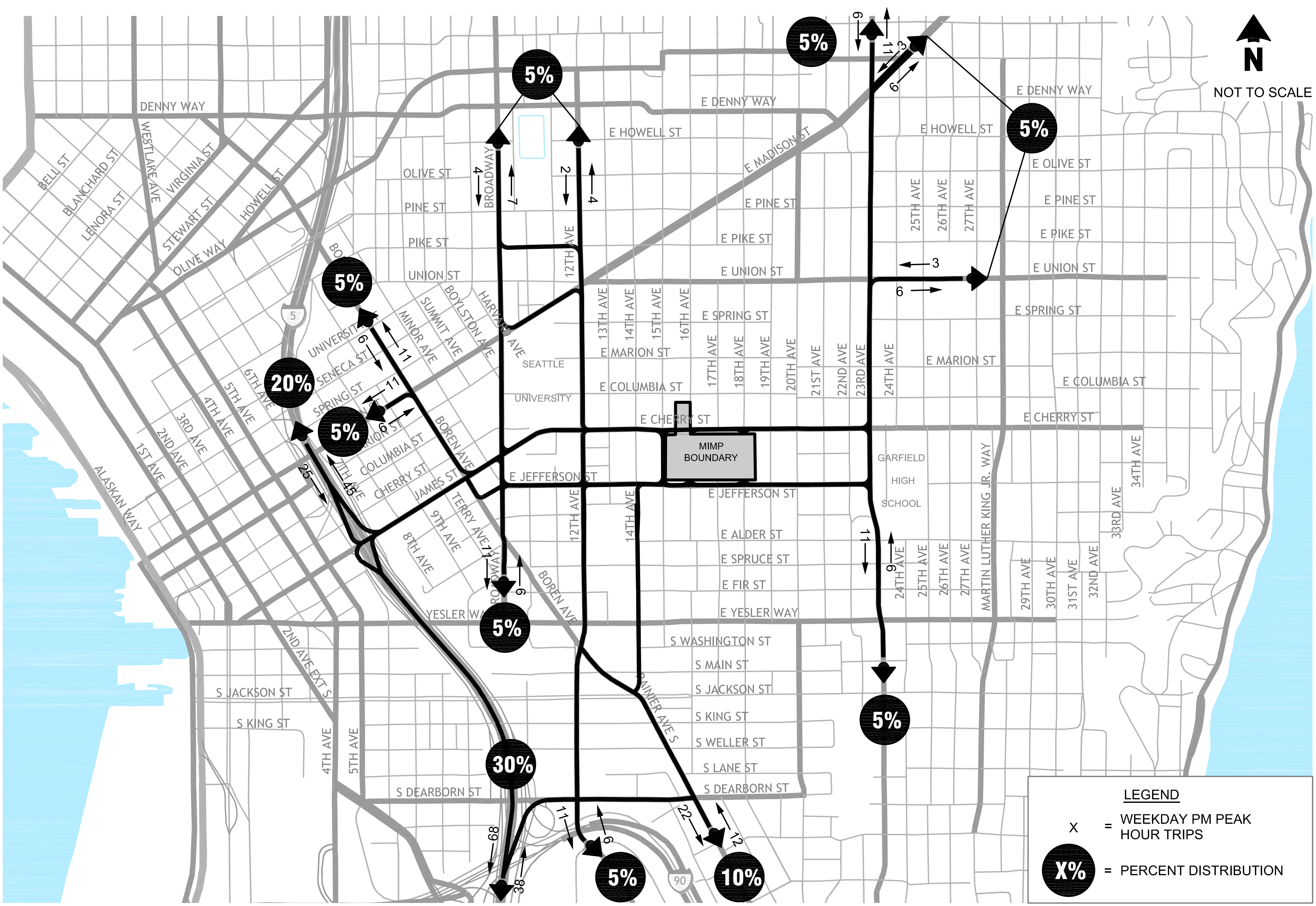

Alternatives 5 and 6 (2023) Weekday PM Peak Hour Trip Distribution and Assignment

FIGURE **21**

Swedish Cherry Hill MIMP-Preliminary DEIS

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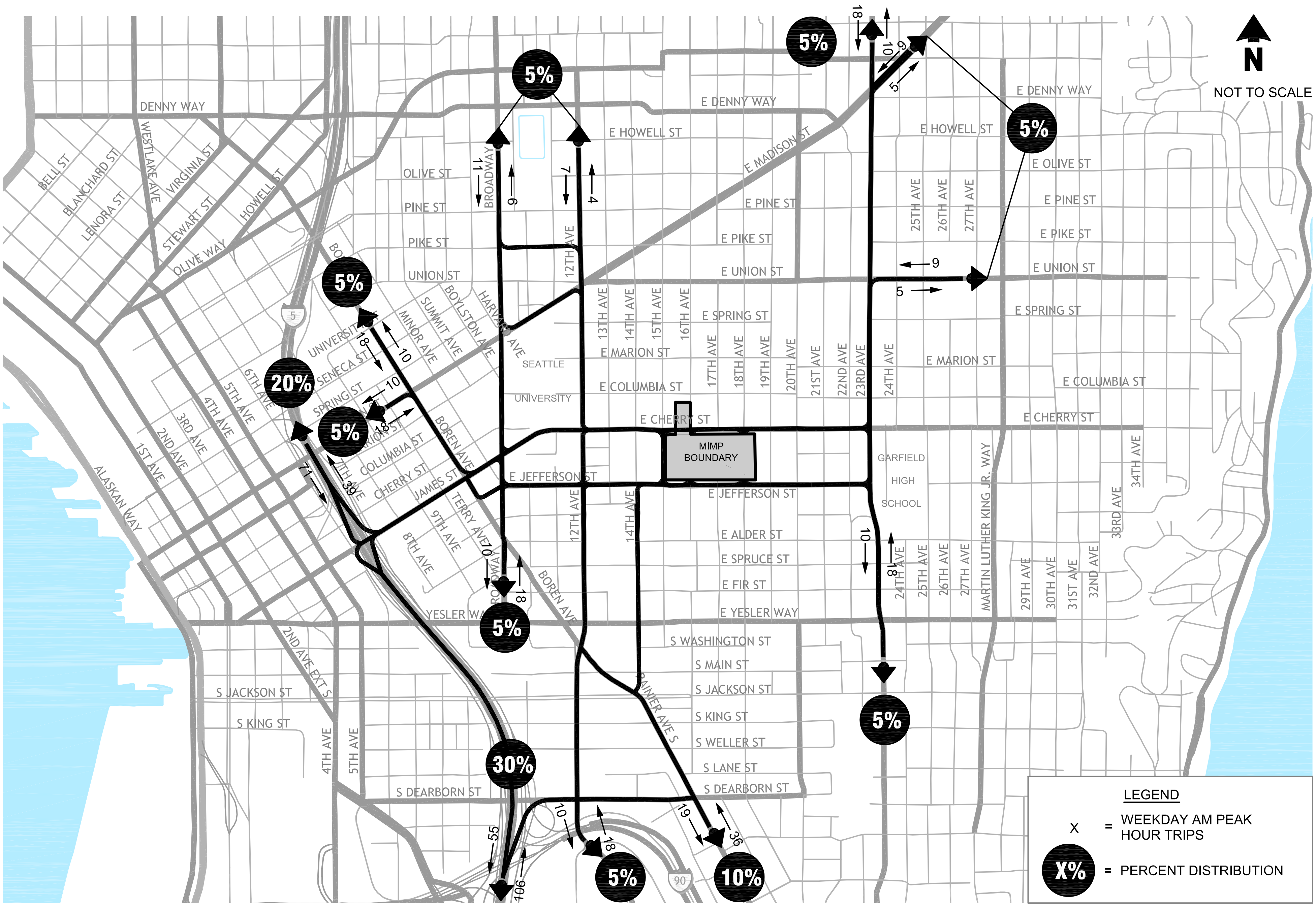

Alternatives 5 and 6 (2040) Weekday AM Peak Hour Trip Distribution and Assignment

FIGURE 22

Swedish Cherry Hill MIMP-Preliminary DEIS

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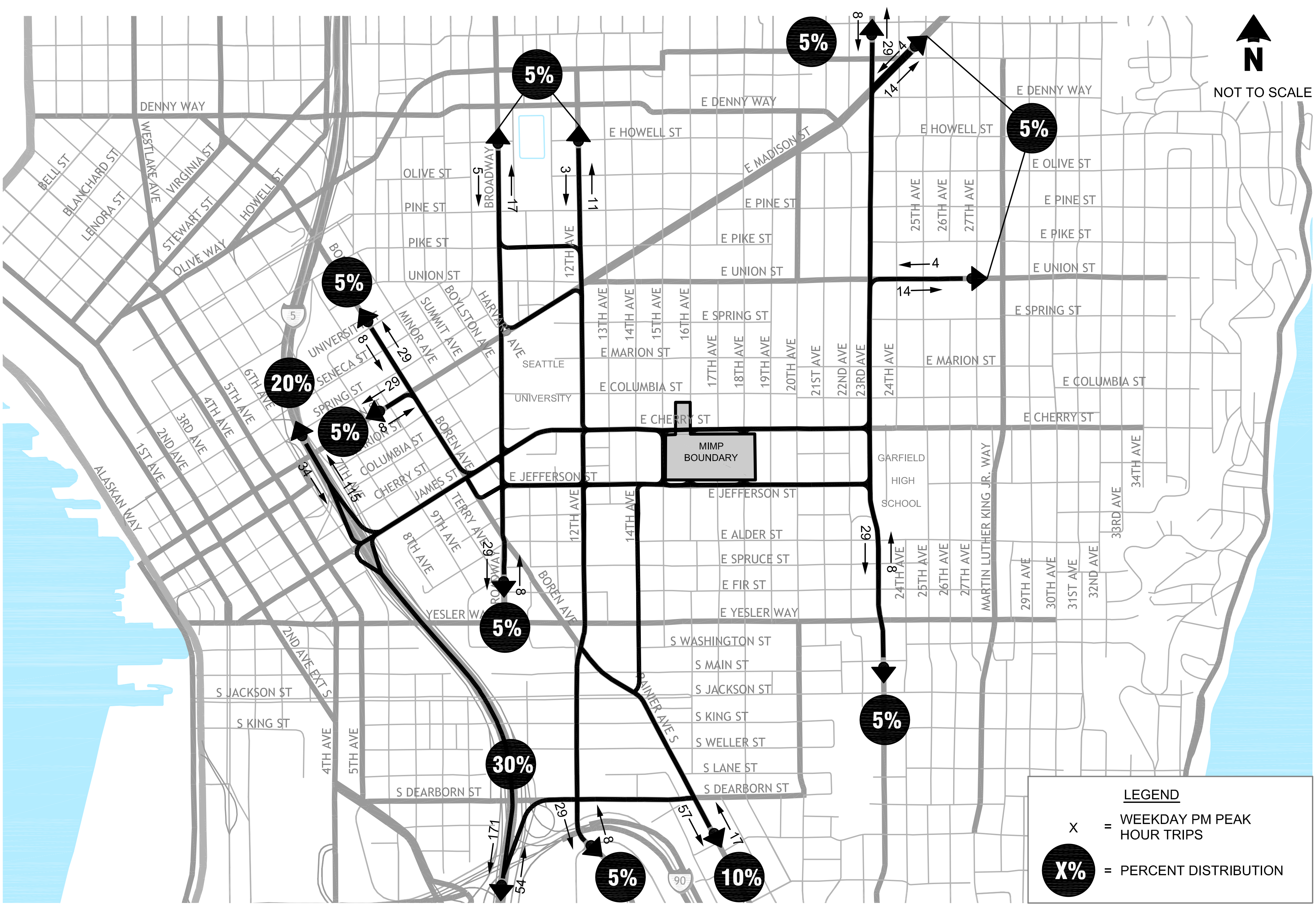

Alternatives 5 and 6 (2040) Weekday PM Peak Hour Trip Distribution and Assignment

FIGURE 23

Swedish Cherry Hill MIMP-Preliminary DEIS

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5.5.3 Alternatives 5 and 6 Forecast Traffic Volumes

Forecast traffic volumes for Alternatives 5 and 6 reflect the vacation of 16th Avenue for north/south vehicular traffic. Vehicular access to the 16th Avenue garage would still be provided from the north and south portions of 16th Avenue. The proposed vacation of 16th Avenue would eliminate the ability for vehicles to travel north/south along 16th Avenue between E Cherry Street and E Jefferson Street. To estimate the shift in traffic, an origin/destination (OD) study of vehicles along 16th Avenue was conducted by Transpo staff. The OD study was conducted during the weekday AM and PM peak hours and traffic counts were collected to determine the number of vehicles using 16th Avenue for north/south through circulation compared to those using this roadway for local access. This survey showed that the volume of traffic along 16th Avenue not related to one of the several campus driveways was between 30 and 50 vph depending on the peak hour. Compared to overall traffic volume of 130 to 170 vph, this accounts for 70 to 80 percent of the traffic along 16th Avenue being local and the remaining 20 to 30 percent being through traffic that was reassigned. This reassigned traffic was shifted to parallel routes and the adjustments reflected in the forecast traffic volumes for Alternatives 5 and 6.

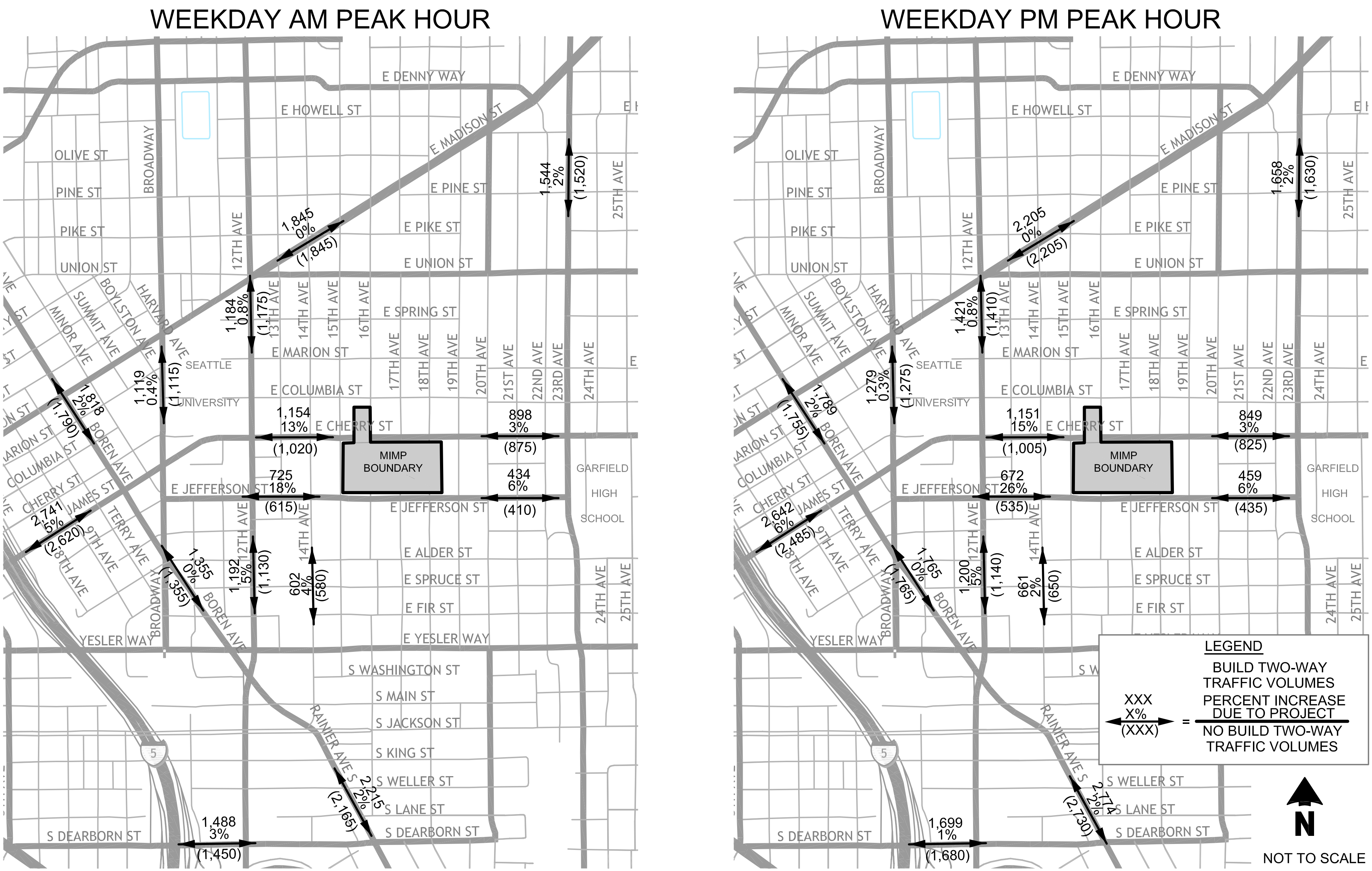
Figures 24 through 25 summarize the 2023 and 2040 weekday AM and PM peak hour traffic forecasts for Alternatives 5 and 6. The intersection turning movement summaries are included in **Attachment C-1**.

As shown on **Figure 24**, for the 2023 horizon year, increases in the weekday AM peak hour traffic volumes would be upwards of 135 vph, depending on the roadway segment. Due to the existing grid network and the overall distribution patterns of the traffic, the traffic volume increases associated with the expansion are distributed over multiple streets. Minimal increases in traffic volumes are expected furthest from the site, whereas the streets closest to the site have the greatest volume increases. During the weekday 2023 AM peak hour, traffic volumes at the outer edges of the study area, both north and south of the project site, are forecast to increase by less than 0.5 to up to 5 percent. Near the campus where project related traffic is concentrated, increases on the order of 3 to 18 percent are anticipated. Specifically, the largest volume increase is along James Street/E Cherry Street between I-5 and 23rd Avenue. Traffic volumes along James Street/E Cherry Street increase by 3 to 13 percent with volumes ranging between approximately 900 and 2,740 vph with the proposed expansion, as compared to 875 to 2,620 vph under No Build conditions. The second largest volume increase occurs along E Jefferson Street between Broadway and 23rd Avenue with Alternatives 5 and 6 ranging between 435 and 725 vph compared to 410 to 615 under No Build conditions; this represents an approximately 6 to 18 percent increase in traffic volumes along E Jefferson Street.

Increases in traffic volumes during the 2023 weekday PM peak hour conditions are slightly higher than identified for the weekday AM peak hour period. During the weekday 2023 PM peak hour, traffic volumes at the outer edges of the study area, both north and south of the project site, would increase by less than 0.5 to 6 percent with development of Alternative 5 and 6. Near the campus where project related traffic is concentrated, increases on the order of 3 to 26 percent are anticipated. Specifically, the largest increase in traffic on any roadway segment is on the order of 160 vph. **Figure 24** summarizes the forecasts 2023 weekday PM peak hour link volumes. The largest volume increase within the study area resulting from the proposed expansion is anticipated along the Cherry Street/James Street corridor, west of Broadway, with volumes as high as 2,645 vph near the I-5 interchange compared to 2,485 vph under the No Build conditions. This represents a six percent increase in traffic volume along James Street. The greatest percentage increase in traffic volumes between No Build and Alternatives 5 and 6 during the weekday PM peak hour occurs along E Jefferson Street near 12th Avenue where Alternatives 5 and 6 would increase weekday PM peak hour traffic by 26 percent with 670 vph anticipated as compared to 535 in the No Build. The second highest percentage increase is forecast along E Cherry Street, adjacent to the campus, with dual direction traffic volumes ranging between 850 to 1,150 vph depending on the individual block with a 3 to 15 percent increase.

As shown in **Figure 25**, during the Weekday 2040 AM peak hour, traffic volumes at the outer edges of the study area, both north and south of the project site, are forecast to increase less than 0.5 to 8 percent. Near the campus where project related traffic is concentrated, increases on the order of 5 to 32 percent are anticipated. Specifically, forecast increases along E Cherry Street and E Jefferson Street range from 40 to 230 vehicles depending on the roadway segment. The largest volume increase is along E Cherry Street between I-5 and 23rd Avenue. Traffic volumes along E Cherry Street range between 945 and 2,990 vph with the proposed expansion, as compared to 905 to 2,770 vph under No Build condition. The second largest volume increase between No Build 2040 and Alternatives 5 and 6 is anticipated along E Jefferson Street. Traffic volumes along E Jefferson Street between Broadway and 23rd Avenue range from 435 to 725 vph compared to 410 to 615 vph under No Build condition.

As shown in **Figure 25,** during the weekday 2040 PM peak hour, traffic volumes at the outer edges of the study area, both north and south of the project site, are forecast to increase by less than 0.5 to 13 percent. Near the campus where project related traffic is concentrated, increases on the order of 6 to 55 percent are anticipated. Specifically, increases of up to 345 vehicles are anticipated along James Street west of Broadway. Forecast volumes with the proposed expansion are anticipated to be as high as 2,960 vph near the I-5 interchange compared to 2,615 vph under the No Build condition. The greatest percentage increase of volumes from No Build to Alternatives 5 and 6 during the weekday PM peak hour would be along E Jefferson Street at 12 Avenue with a 55 percent increase in traffic volumes. The second highest volume increase would be along E Cherry Street, adjacent to the campus, with dual direction traffic volumes ranging between 910 to 1,360 vph depending on the individual block, a 6 to 30 percent increase from the No Build conditions with volumes ranging between 855 and 1,045 vph.



Alternatives 5 and 6 (2023) Weekday Peak Hours Two-Way Link Volumes

FIGURE
24

Swedish Cherry Hill MIMP-Preliminary DEIS

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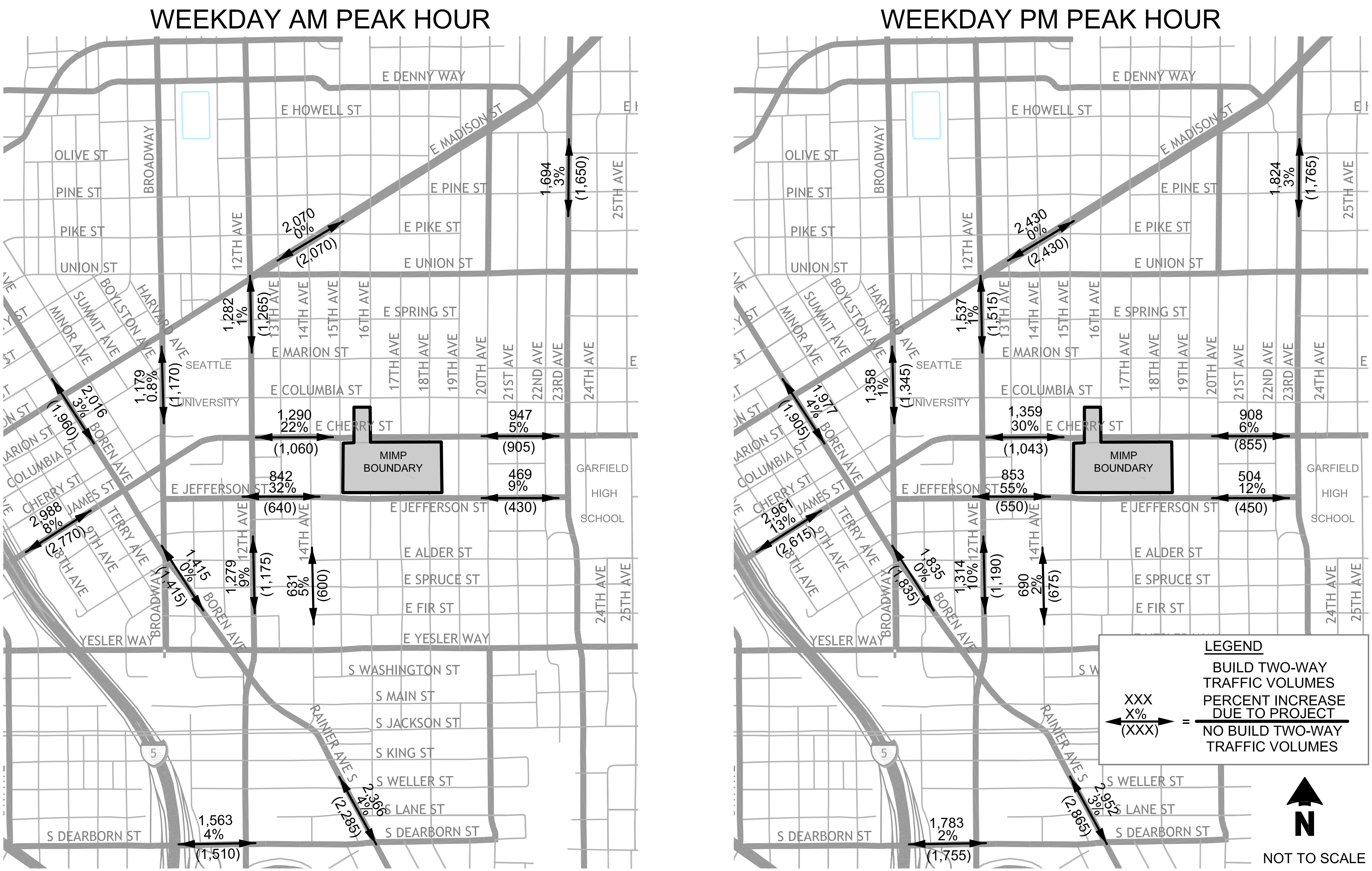

Alternatives 5 and 6 (2040) Weekday Peak Hours Two-Way Link Volumes

FIGURE 25

Swedish Cherry Hill MIMP-Preliminary DEIS

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5.6 Traffic Operations

The following describes the future intersection and corridor operations, consistent with previous sections. The results of the intersection LOS and corridor performance analysis are summarized for the weekday AM and PM peak hours for 2023 and 2040 horizon years.

5.6.1 Intersection Operations

Impacts of Alternatives 5 and 6, compared to Alternative 1 No Build, are considered potentially significant by the City if the:

- Signalized intersection level of service degrades from an LOS D to LOS E or worse
- Signalized intersection level of service degrades from an LOS E to LOS F
- Signalized intersection delay increases by more than five seconds at an intersection already operating at LOS E or worse without project traffic

Impacts at unsignalized intersections are evaluated on a case-by-case basis with consideration of number of traffic volumes being served, location of the intersection, collision history, and overall intersection operations.

Intersection LOS was calculated at the study intersections using the same method outlined in previous sections. **Figure 26** provides a comparison between No Build and Alternatives 5 and 6 weekday AM and PM peak hour LOS for the study area. Specific Alternative 5 and 6 2023 and 2040 weekday peak hour LOS for each study intersection are displayed on **Figures 27 through 30** with detailed LOS calculations provided in **Attachment C-3**.

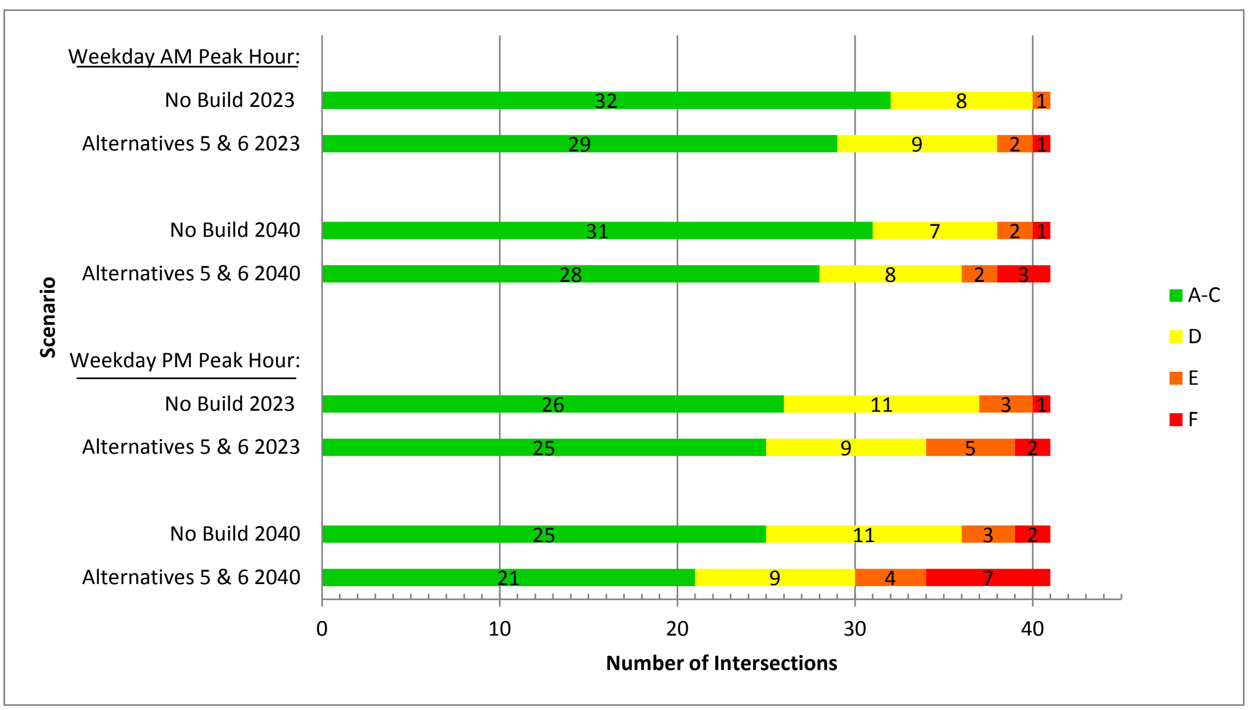


Figure 26 No Build and Alternative 5 and 6 Weekday Peak Hour Intersection Level of Service Comparison

As shown on **Figure 26**, during the weekday AM peak hour, Alternatives 5 and 6 would result in two additional intersections operating at LOS E or F in 2023. During the weekday PM peak hour, the addition of traffic associated with Alternatives 5 and 6 would result in two additional intersections operating at LOS E and one additional intersection operating at LOS F. In 2040, compared to the No Build conditions, Alternatives 5 and 6 would result in two additional intersections operating at LOS F during the weekday AM peak hour and one additional intersection operating at LOS E and five additional intersections operating at LOS F during the weekday PM peak hour.

Figures 27 through 30 and the following discussion provide additional detail regarding the potential impacts of Alternatives 5 and 6 during the weekday AM and PM peak hours. Intersections identified are forecasted to operate at LOS E or F during ether the AM or PM peak hours.

- **23rd Avenue / Madison Street –** This intersection would continue to operate at LOS E during the weekday PM peak hour with the development of Alternatives 5 and 6. As noted in the No Build analyses, transit related projects along the Madison Street corridor are expected to reduce overall intersection capacity. The change in delay as a result of Alternatives 5 and 6 is anticipated to be less than one second; therefore, the impact would not be considered potentially significant.
- **12th Avenue / E Marion Street –** This unsignalized intersection would continue to operate at LOS E during the weekday PM peak hour under Alternatives 5 and 6 conditions. The increase in delay as a result of Alternatives 5 and 6 is anticipated to be approximately one second and traffic volumes on the side-street stop controlled E Marion Street are relatively low. This would not be considered a potentially significant impact.
- **Broadway / James Street –** During the weekday AM peak hour, operations at this signalized intersection would degrade from LOS D under No Build 2023 conditions to LOS E with development of Alternatives 5 and 6. During the weekday PM peak hour, LOS E operations would continue for both No Build and Alternatives 5 and 6 conditions. Alternatives 5 and 6 would results in an approximately four percent increase in overall traffic volumes at the Broadway/James Street intersection.
- **15th Avenue / E Cherry Street –** Operations at this unsignalized intersection would degrade from LOS D under No Build 2023 conditions to LOS E on the northbound approach under Alternatives 5 and 6 2023 conditions during the weekday PM peak hour. Traffic volumes on the northbound approach are relatively low with a total weekday PM peak hour volume of approximately 80 vph and the proposed expansion is anticipated to result in an approximately 16 percent increase in overall traffic volumes at this location. The traffic forecasts represents a worse case impact at this location as traffic shifts related to the vacation were re-assigned to 15th and 18th Avenues and did not account for a potential shift to the traffic signal at the 14th Avenue/E Cherry Street intersection. It is anticipated that as delays increase along 15th and 18th Avenues, some traffic may shift to the intersection of 14th Avenue/E Cherry Street, where the intersection operates at LOS C during both the AM and PM peak hours. Thus, the LOS degradation may be somewhat less than described.
- **16th Avenue / E Cherry Street –** During the weekday AM and PM peak hours, the level of service for the northbound approach would degrade from LOS D under No Build 2023

conditions to LOS E with development of Alternatives 5 and 6. The LOS E operations are associated with the increased traffic volumes on the northbound approach combined with the additional east/west traffic on E Cherry Street. Traffic volumes on the northbound approach are relatively low with a total weekday AM and PM peak hours volume of approximately 40 to 80 vph, respectively. The expansion is anticipated to result in an approximately 8 to 12 percent increase in overall traffic volumes at the intersection for the weekday AM and PM peak hours, respectively.

- **14th Avenue / E Jefferson Street** – Under No Build conditions, this intersection is forecast to operate at LOS E during the AM peak hour and LOS D during the weekday PM peak hour. With the development of Alternatives 5 and 6, this intersection would degrade to LOS F. This intersection is currently controlled by an all-way stop. Under 2023 build conditions, traffic volumes are expected to increase by 10 – 12 percent during the weekday AM and PM peak hours, respectively.
- **14th Avenue / S Jackson Street –** This signalized intersection is projected to operate at LOS F during the weekday PM peak hour under No Build and Build conditions. As discussed previously, poor operations are related to signal operations as a result of the streetcar. The proposed expansion would increase traffic at this intersection by approximately one percent resulting in an increase in intersection delay of approximately six seconds.

By 2040 with the development of Alternatives 5 and 6, the intersections operating at LOS E or worse include:

- **12th Avenue / Madison Street –** This intersection would continue operating at LOS E during the weekday PM peak hour under build conditions. The proposed expansion is anticipated to increase intersection delay by less than one second as compared to the No Build 2040 conditions reflecting an increase in traffic volumes of less than one percent during the weekday PM peak hour.
- **23rd Avenue / Madison Street –** This intersection would continue to operate at LOS F during the weekday PM peak hour. The proposed expansion is anticipated to increase intersection delay by approximately two second as compared to the No Build 2040 conditions reflecting an increase in traffic volumes of approximately two percent during the weekday PM peak hour.
- **12th Avenue / E Marion Street –** This intersection would degrade from LOS E under No Build conditions to LOS F with the development of Alternatives 5 and 6 during the weekday PM peak hour. The proposed expansion is anticipated to increase intersection delay by approximately three seconds as compared to the No Build 2040 conditions reflecting an increase in traffic volumes of less than one percent during the weekday PM peak hour.
- **Boren Avenue / James Street –** Intersection levels of service would degrade from LOS D under No Build 2040 conditions to LOS E during the weekday PM peak hour with the development of Alternatives 5 and 6. The Build Alternatives would increase traffic at these intersections by approximately 12 percent during the weekday PM peak hour in 2040.
- **Broadway / James Street –** Operations at this signalized intersection would continue to operate at LOS E under Alternatives 5 and 6 conditions during both the weekday AM and PM peak hours. The Build Alternatives would increase traffic at these intersections by

approximately 7 and 10 percent during the weekday AM and PM peak hours in 2040, respectively.

- **12th Avenue / E Cherry Street –** Intersection levels of service would degrade from LOS D under No Build 2040 conditions to LOS E during the weekday PM peak hour with the development of Alternatives 5 and 6. The Build Alternatives would increase traffic at these intersections by approximately 14 percent during the weekday PM peak hour in 2040.
- **13th Avenue / E Cherry Street –** Operations at this unsignalized intersection would degrade from LOS D under No Build 2040 conditions to LOS F under Alternatives 5 and 6 2040 conditions during the weekday PM peak hour. The LOS F operations are related to the increases in traffic volumes along Cherry Street as a result of the project. Northbound and southbound traffic volumes range between 70 and 95 vph during the weekday PM peak hour under 2040 conditions. Alternatives 5 and 6 would result in an increase in overall traffic volumes of approximately 26 percent at the 13th Avenue/E Cherry Street intersection in 2040 during the weekday PM peak hour.
- **15th Avenue / E Cherry Street –** Operations at this unsignalized intersection would degrade from LOS D under No Build 2040 conditions to LOS F under Alternatives 5 and 6 2040 conditions during the weekday PM peak hour. During the weekday AM peak hour, operations would degrade from LOS D under the No Build 2040 conditions to LOS E under Alternatives 5 and 6 2040 conditions. The LOS E and F operations are related to the increases in traffic volumes along Cherry Street as a result of the project. Northbound and southbound traffic volumes range between 25 and 100 vph during the weekday PM peak hour under 2040 conditions and Alternatives 5 and 6 would result in an approximately 31 percent increase in traffic volumes at this intersection. Similarly, during the weekday AM peak hour, the northbound and southbound traffic volumes range between 25 and 70 vph under 2040 conditions and Alternatives 5 and 6 would result in an approximately 22 percent increase in traffic volumes at this intersection. The traffic forecasts represents a worse case impact at this location as traffic shifts related to the vacation were re-assigned to 15th and 18th Avenues and did not account for a potential shift to the traffic signal at the 14th Avenue/E Cherry Street intersection. It is anticipated that as delays increase along 15th and 18th Avenues, some traffic may shift to the intersection of 14th Avenue/E Cherry Street, where the intersection operates at LOS C during both the AM and PM peak hours. Thus, the LOS degradation may be somewhat less than described.
- **16th Avenue / E Cherry Street –** Operations at this unsignalized intersection would degrade from LOS D under No Build 2040 conditions to LOS F under Alternatives 5 and 6 2040 conditions during both the weekday AM and PM peak hours. The LOS F operations are related to the increases in traffic volumes along Cherry Street with approximately 50 to 150 northbound left-turns during the AM and PM peak hours. During the weekday AM and PM peak hours in 2040, overall traffic volumes would increase by approximately 15 to 25 percent, respectively, at 16th Avenue/E Cherry Street with the development of Alternatives 5 and 6.
- **14th Avenue / E Jefferson Street –** Under No Build conditions, this intersection is forecast to operate at LOS E during the AM peak hour and LOS D during the weekday PM peak hour. With the development of Alternatives 5 and 6 this intersection degrades to LOS F. This intersection is currently controlled by an all-way stop. Under 2040 build conditions, traffic

volumes are expected to increase by 18 – 25 percent during the AM and PM peak hours, respectively.

- **14th Avenue / S Jackson Street –** This signalized intersection is projected to operate at LOS F during the weekday AM and PM peak hours under No Build and Build conditions. As discussed previously, poor operations are related to signal operations as a result of the streetcar. The project would result in an increase in intersection delay of approximately nine seconds and a less than three percent increase in overall intersection traffic volumes.

All other study intersections would operate at LOS D or better with Alternatives 5 and 5 under 2023 and 2040 conditions during both the weekday AM and PM peak hours.

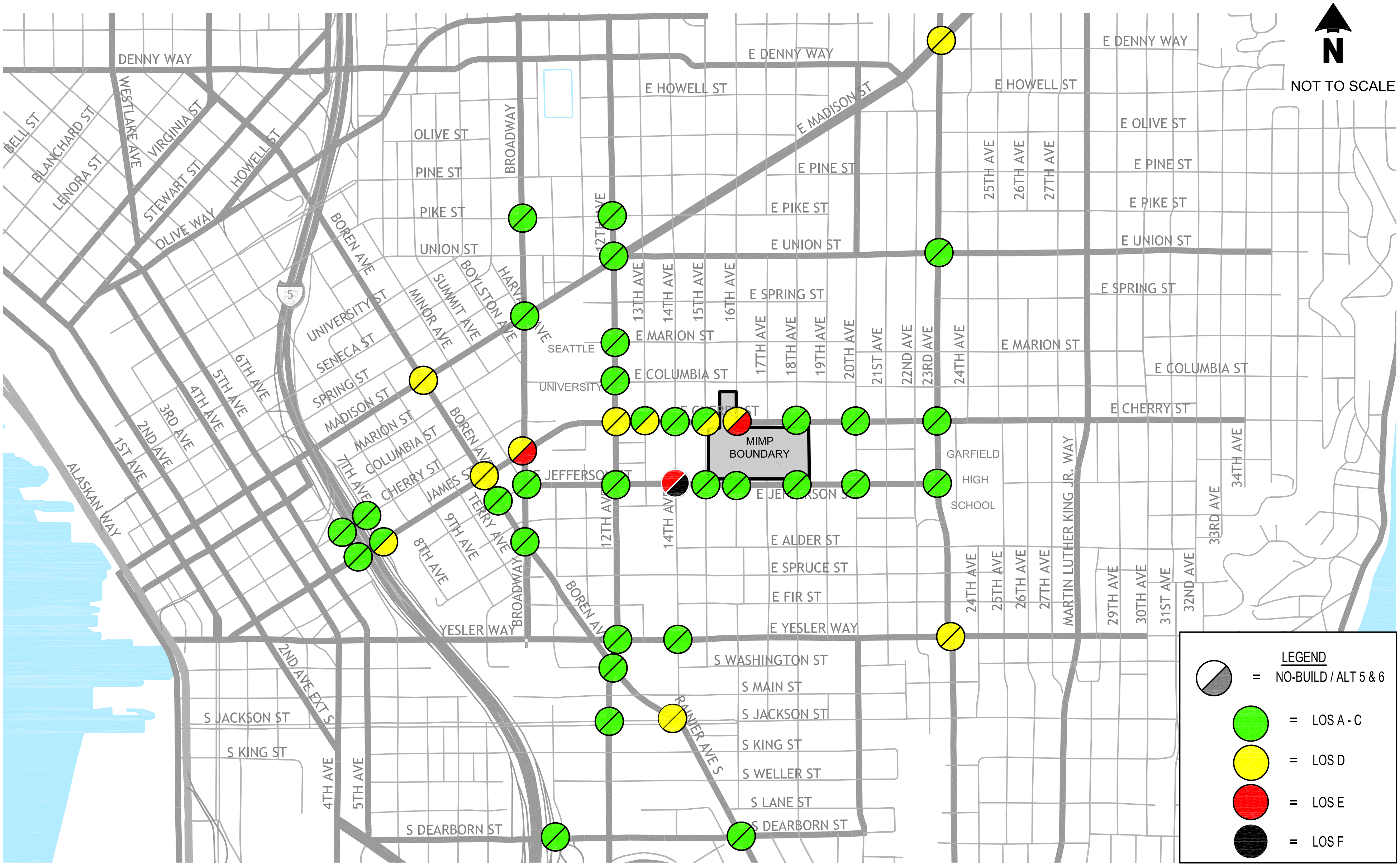
Neighborhood Assessment

During the weekday AM peak hour, within the immediate vicinity of the campus, intersections along E Cherry and E Jefferson Streets are expected to operate at LOS D or better under 2023 conditions except for two unsignalized intersections, 14th Avenue/E Jefferson Street and 16th Avenue/E Cherry Street. As described above, the 14th Avenue/E Jefferson intersection would operate at LOS F due to the anticipated increases in traffic volumes along both 14th Avenue and E Jefferson Street. The 16th Avenue/E Cherry Street intersection operates at LOS E due to anticipated growth in volumes at the intersection. By 2040, during the weekday AM peak hour, the 15th Avenue/E Cherry Street intersection would also degrade to LOS E. These operations are related to the anticipated shift in traffic volumes due to the proposed 16th Avenue vacation as well as overall increases in traffic volumes along E Cherry Street.

During the weekday PM peak hour, under 2023 conditions, intersections along E Cherry and E Jefferson Streets operate at LOS D or better, with the exception of three intersections, 15th Avenue/ E Cherry Street, 16th Avenue/E Cherry Street, and 14th Avenue/E Jefferson Street. As described above, these three intersections are stop controlled, 15th and 16th Avenue along E Cherry Street being two-way stop controlled and 14th Avenue / E Jefferson Street being a four-way stop controlled intersection. The two-way stop controlled intersections operate at LOS E and the four-way stop controlled intersection operates at LOS F due to increased project volumes through these intersections.

Increases in traffic volumes of up to 55 percent along E Cherry and E Jefferson Streets would make it progressively more challenging for side-street traffic to enter the traffic stream. By 2040, during the weekday PM peak hour with the development of Alternatives 5 and 6, intersections along E Cherry and E Jefferson Streets are projected to operate at LOS D or better, with the exception of four intersections, the three intersections previously mentioned as well as 13th Avenue/ E Cherry Street. The three intersections along E Cherry Street are two-way stop controlled and the 14th Street/E Jefferson Street intersection is four-way stop controlled. All four intersections operate at LOS F as a result of increases in traffic volume with the proposed expansion.

Along E Cherry Street traffic signals exist at the 14th Avenue/E Cherry Street and 18th Avenue/E Cherry Street intersections. These traffic signals provide an opportunity to utilize a signal controlled intersection to exit from the neighborhood, if the unsignalized intersection approaches exceed the delay tolerance for a driver. The two existing signalized intersections are projected to operate at LOS C or better during the weekday AM and PM peak hours in 2040.



Alternatives 5 and 6 (2023) Weekday AM Peak Hour Levels of Service Summary

FIGURE 27

Swedish Cherry Hill MIMP-Preliminary DEIS

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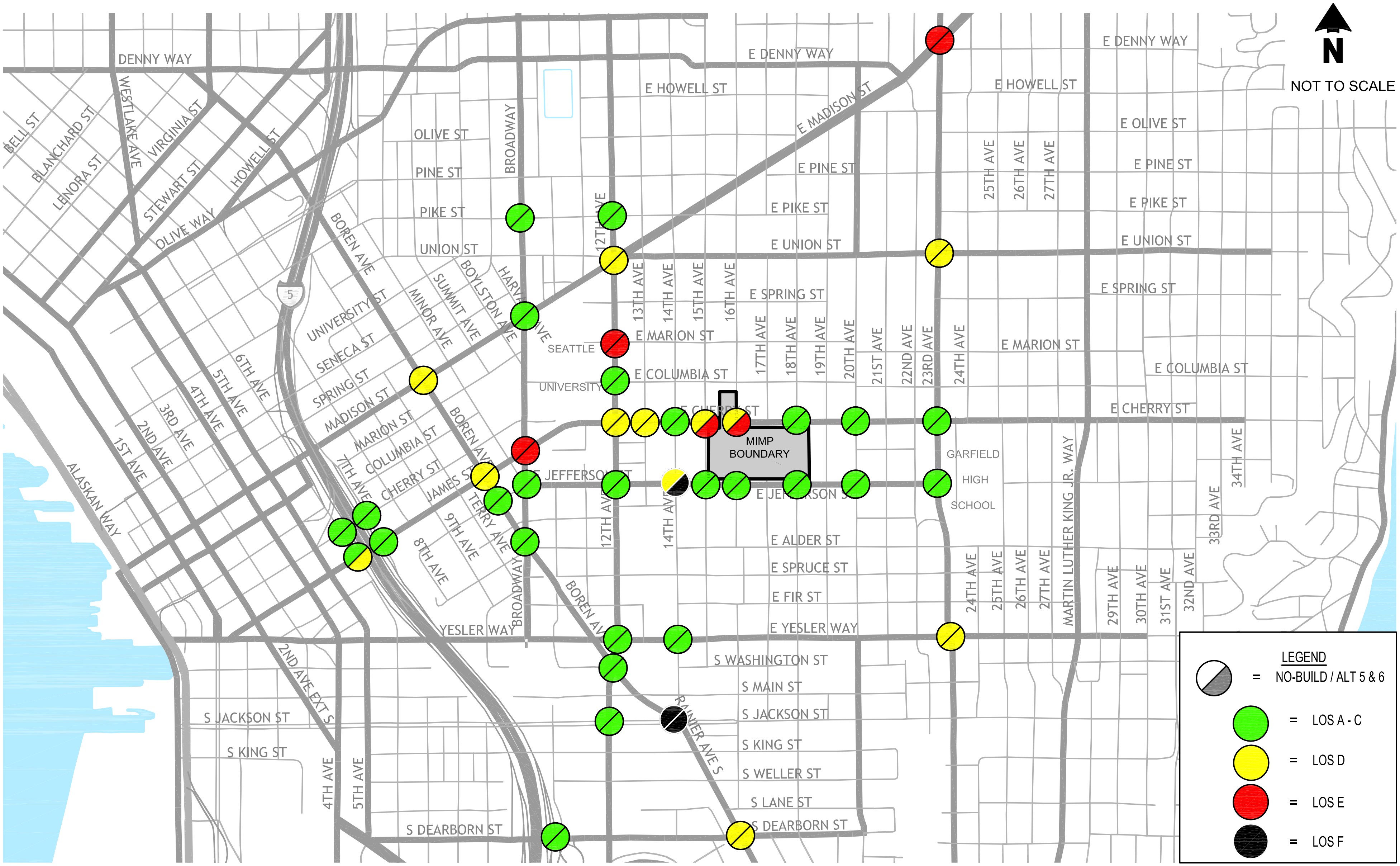

Alternatives 5 and 6 (2023) Weekday PM Peak Hour Levels of Service Summary

FIGURE
28

Swedish Cherry Hill MIMP-Preliminary DEIS

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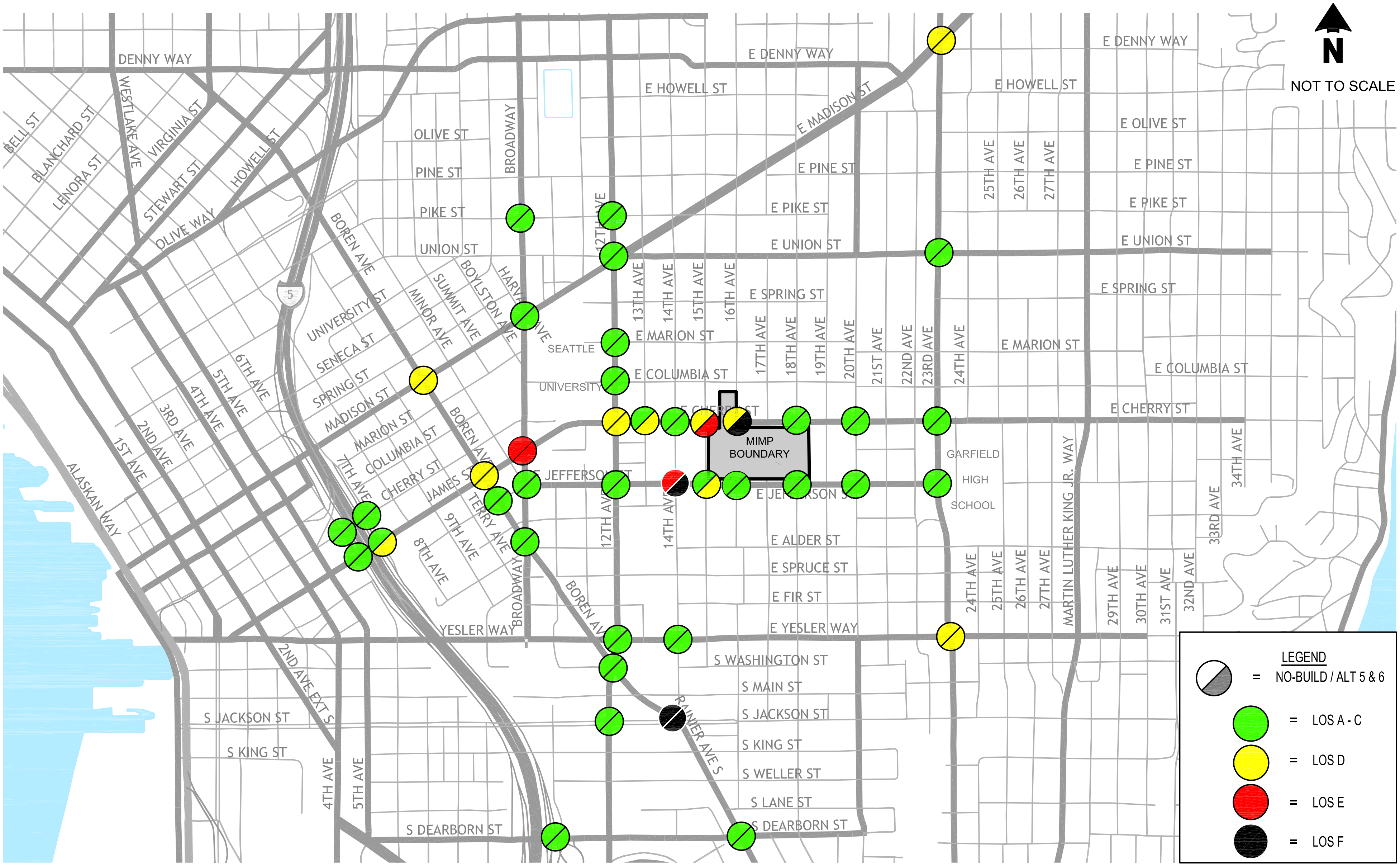

Alternatives 5 and 6 (2040) Weekday AM Peak Hour Levels of Service Summary

FIGURE **29**

Swedish Cherry Hill MIMP-Preliminary DEIS

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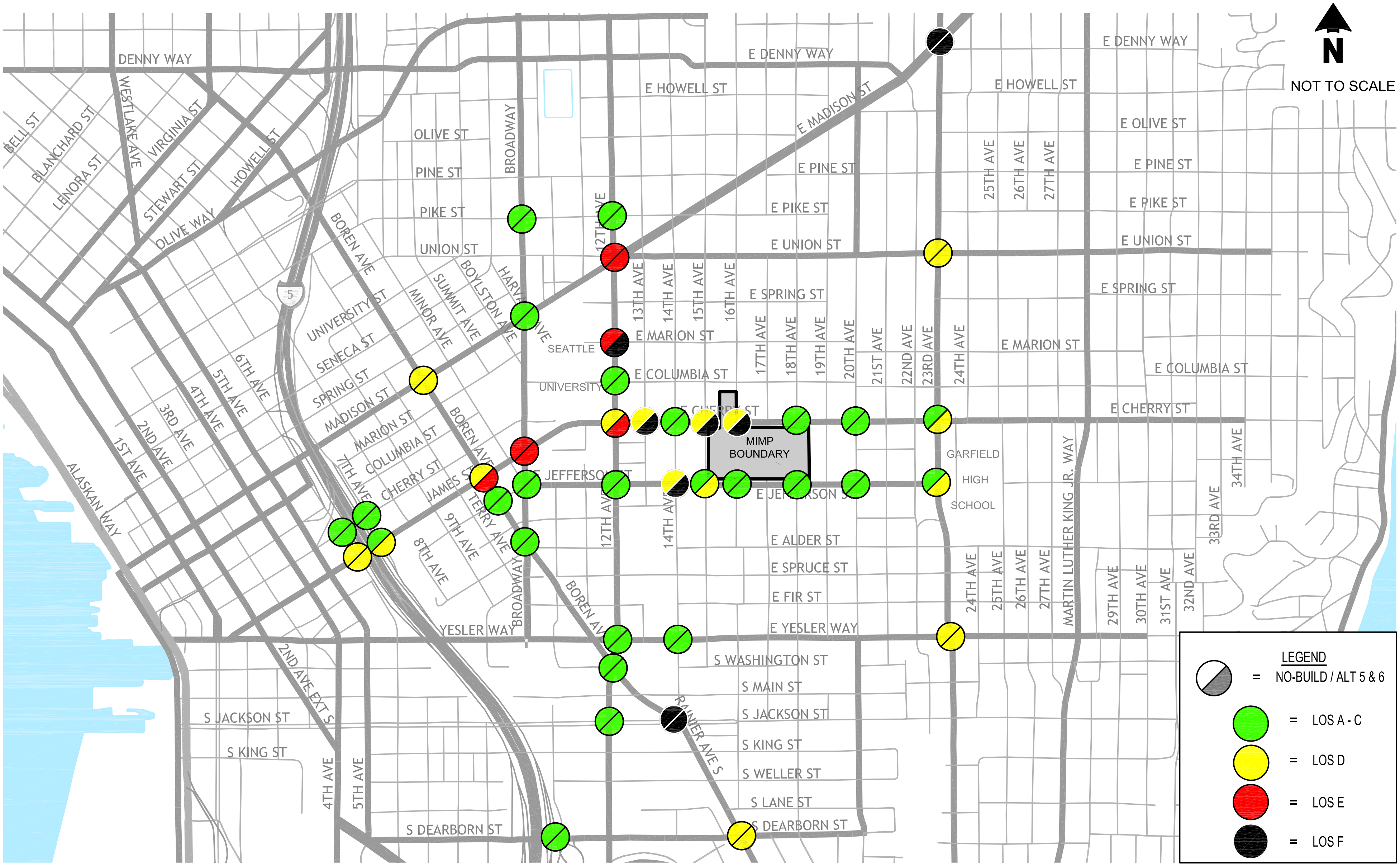

Alternatives 5 and 6 (2040) Weekday PM Peak Hour Levels of Service Summary

FIGURE
30

Swedish Cherry Hill MIMP-Preliminary DEIS

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5.6.2 Corridor Operations

Consistent with the Affected Environment and No Build evaluations, the travel speeds and travel times along E Cherry Street/James Street from I-5 to 23rd Avenue were evaluated using Synchro. A comparison of travel times along the James Street and E Cherry Street corridors under No Build and Alternatives 5 and 6 conditions is provided in **Table 9**. Travel time calibration factors discussed in previous sections were applied to the Alternatives 5 and 6 projections

As shown in **Table 9**, with development of Alternatives 5 and 6, corridor operations would degrade slightly in 2023 with average speed decreasing by one mph along both James Street in the westbound direction during the AM peak hour and E Cherry Street in the eastbound direction during the PM peak hour. As discussed in the review of No Build conditions, given the existing capacity constraints along the corridor changes travel times and speeds are small. Similar conditions would exist during the 2040 conditions, with travel times and average speeds, showing generally small increases as a result of Alternatives 5 and 6 compared to No Build conditions. The exception is along James Street in the westbound direction during the weekday PM peak hour where travel time would increase by approximately four minutes between No Build and Alternatives 5 and 6 conditions in 2040.

Table 9
Weekday Peak Hour Comparison of No Build and Alternatives 5 and 6 ravel Times

		2023 Horizon Year				2040 Horizon Year			
		Travel Time (minutes)[1]		Average Speed (mph)		Travel Time (minutes)		Average Speed (mph)	
Segment	**Direction**	**No Build**	**Alt 5 & 6**	**No Build**	**Alt 5 & 6**	**No Build**	**Alt 5 & 6**	**No Build**	**Alt 5 & 6**
AM Peak Hour									
James Street (6th Ave to Broadway)	EB	4	4	7	7	4	4	7	7
	WB	4	4	8	7	4	4	8	7
E Cherry Street (Broadway to 23rd Ave)	EB	6	6	9	9	6	6	9	9
	WB	3	3	12	11	3	3	11	11
PM Peak Hour									
James Street (6th Ave to Broadway)	EB	4	4	7	7	4	4	7	7
	WB	7	7	5	5	7	11	5	3
E Cherry Street (Broadway to 23rd Ave)	EB	3	2	14	15	3	3	14	14
	WB	3	3	11	11	3	4	11	9

Source: Transpo Group, 2013.
1. Rounded to the nearest minute.

5.7 Traffic Safety

Based on the three-year accident history reviewed in Section 3.7, the study area has not experienced an unusually high level of accidents to date except at the James Street/6th Street intersection. In general, as traffic volumes increase, the potential for traffic safety issues increases proportionately. As described in Section 5.5.3, Alternatives 5 and 6 would increase traffic along both E Cherry Street and E Jefferson Street. On E Cherry Street, in the vicinity of the campus, 2040 weekday PM peak hour traffic volumes are forecast to increase by 15 to 31 percent depending on the roadway segment. Similarly, along E Jefferson Street, by 2040 traffic volumes are forecast to increase by 25 to 47 percent during the weekday PM peak hour. However, it would likely become progressively more challenging for side-street traffic at unsignalized intersections to enter the traffic stream. Indicators of this are found in the Traffic Operations described above.

Increased traffic along the E Cherry Street and E Jefferson Street corridor increases the potential for conflicts between pedestrians and vehicles. Along E Cherry Street several signalized crossing are provided at key intersections. Additional signalized crossings could be considered in the future to provide additional vehicular capacity and pedestrian safety enhancements at key neighborhood connection points. Projects to address intersection capacity and pedestrian/vehicle safety are discussed in the mitigation section of this report.

With the improvements related to the First Hill Streetcar, including additional signalized crossings and bicycle lanes, the safety of pedestrian and bicyclist would likely improve along that alignment.

5.8 Parking

Figure 31 illustrates the proposed expansion off-street parking supply. Alternatives 5 and 6 would provide approximately 3,300 parking spaces by 2040 more than doubling the off-street parking supply. The initial phases of development would include construction of the 18th and 16th parking garages, which constitute the majority of the proposed Swedish Cherry Hill parking. By 2023 with the initial 16th and 18th parking garages, there would be approximately 2,840 parking spaces.

Future peak parking demand for the proposed project was developed consistent with the trip generation method. As described in the existing conditions, the peak parking demand for the study area occurs between 10:00 a.m. and 1:00 p.m. with the Swedish Cherry Hill campus peaking at 10:00 a.m. Future peak parking demands were projected by increasing existing parking demand based on the anticipated increase in beds for the hospital portions of the MIMP and increase in square-footage for the other portions of the project. This results in an unmitigated parking demand consistent with the trip generation assumptions. Swedish has been decreasing its share of single-occupancy vehicles (SOV) over the last few years; however, as a conservative estimate of unmitigated future parking demand, this study assumes the mode split would remain the same as existing.

Table 10 summarizes the No Build and Alternatives 5 and 6 parking demand. As shown in the table, by 2023 with the proposed expansion parking demand would increase by approximately 60 percent, for a total peak parking demand of 2,179 vehicles. The Alternative 5 and 6 parking demand could be fully accommodated on-site with the proposed 2,839 parking spaces. By 2040, peak parking demand would be more than twice what currently occurs with a total of 3,142 vehicles. The proposed 3,304 parking spaces would fully accommodate the anticipated parking demand with completion of Alternatives 5 and 6. These parking demand estimates are preliminary and may be refined for the Draft EIS based on additional parking demand data and Swedish parking characteristics.

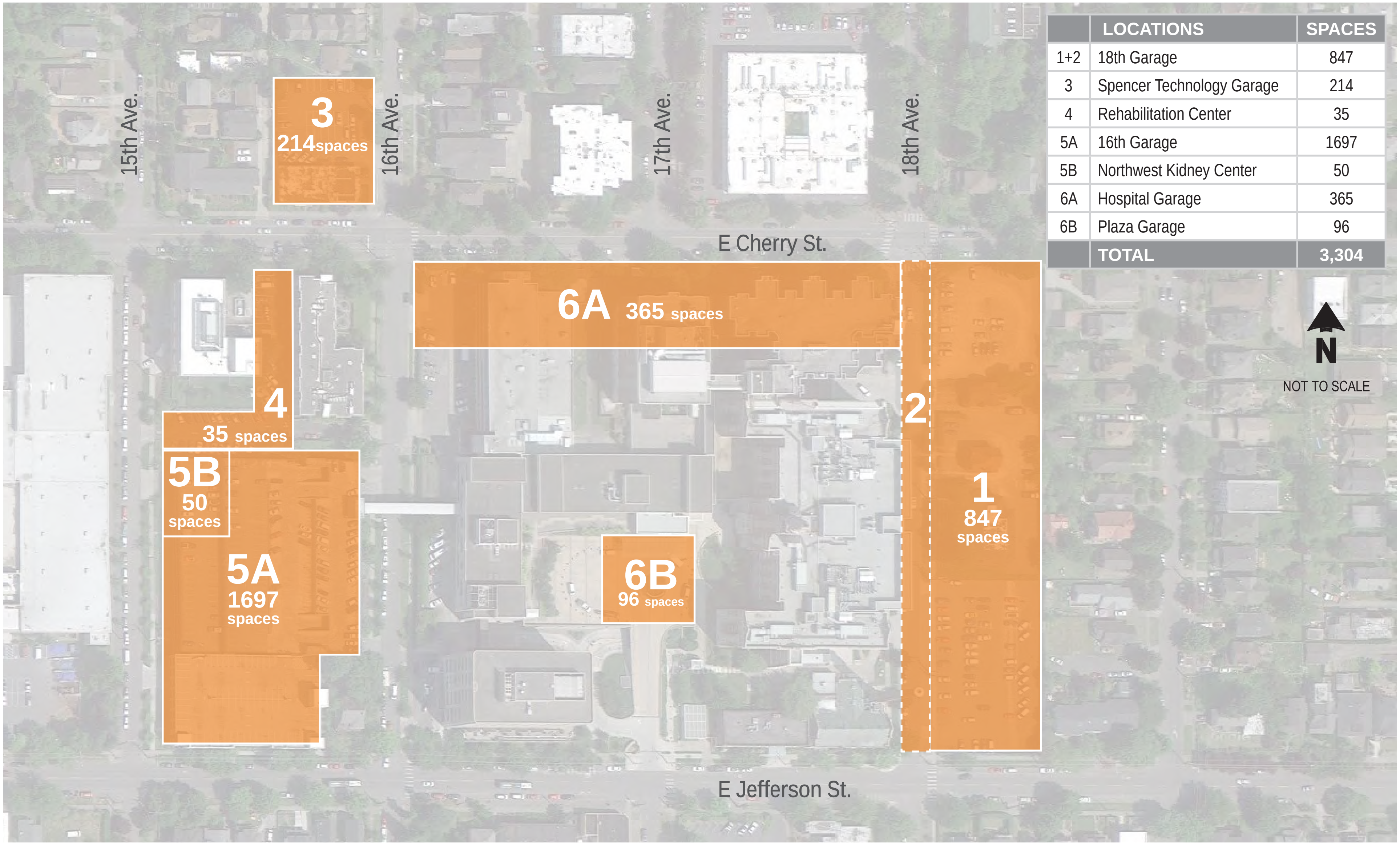
Table 10
Preliminary Swedish Cherry Hill Estimated Parking Demand[1]

Facilities	No Build / Existing	Alternatives 5 and 6	
		2023	**2040**
Hospital	728	690	1,427
Clinic	507	983	1,131
Research	27	199	251
Education	39	103	118
Hotel	2	2	13
Long-Term Care	33	169	169
Other Support Facilities	33	33	33
Total Parking Demand	**1,369**	**2,179**	**3,142**
Off-Street Parking Supply	**1,547**	**2,839**	**3,304**
Surplus Parking	***178***	***444***	***158***

sf = square-feet
1. The parking demand by facility is estimated based on mode splits and is not reflective of actual parking classification counts. These numbers are preliminary and may be refined with publication of the Draft EIS

Table 10 highlights that current parking supply levels, if efficiently utilized, would be adequate to accommodate current demands. By 2023, if all parking and other Swedish development occurs consistent with Alternatives 5 and 6, the proposed supply would adequately accommodate demand. By 2040, the supply and demand balance would be similar to current conditions. If all the anticipated demand parks on-site, surplus parking of 5 to 15 percent would occur. This level of surplus parking ensures vehicles circulating parking areas can locate a space, and accounts for peak surges and vehicles leaving parking spaces

Existing parking surveys documented some vehicles associated with Swedish using on-street parking in the surrounding neighborhood. It is expected, without further action to discourage it, this activity would continue in the future, with or without MIMP approval. Given the current level of on-street parking use, the rate of occurrence may decrease as available on-street parking becomes increasingly scarce. This parking analysis documents that the level of proposed parking is consistent with the intent to provide adequate on-site parking. Further TMP measures and/or cooperation with the City of Seattle parking enforcement may be required to help ensure the constructed on-site parking is used as intended.



	LOCATIONS	SPACES
1+2	18th Garage	847
3	Spencer Technology Garage	214
4	Rehabilitation Center	35
5A	16th Garage	1697
5B	Northwest Kidney Center	50
6A	Hospital Garage	365
6B	Plaza Garage	96
	TOTAL	3,304

Alternative 5 and 6 Swedish Parking Facilities

FIGURE

31

Swedish Cherry Hill MIMP – Preliminary DEIS

transpoGROUP

Q:\Projects\11\11244.00 Swedish Providence Cherry Hill Campus\Graphics\Figures\11244 Fig 31 build parking facilities.pdf

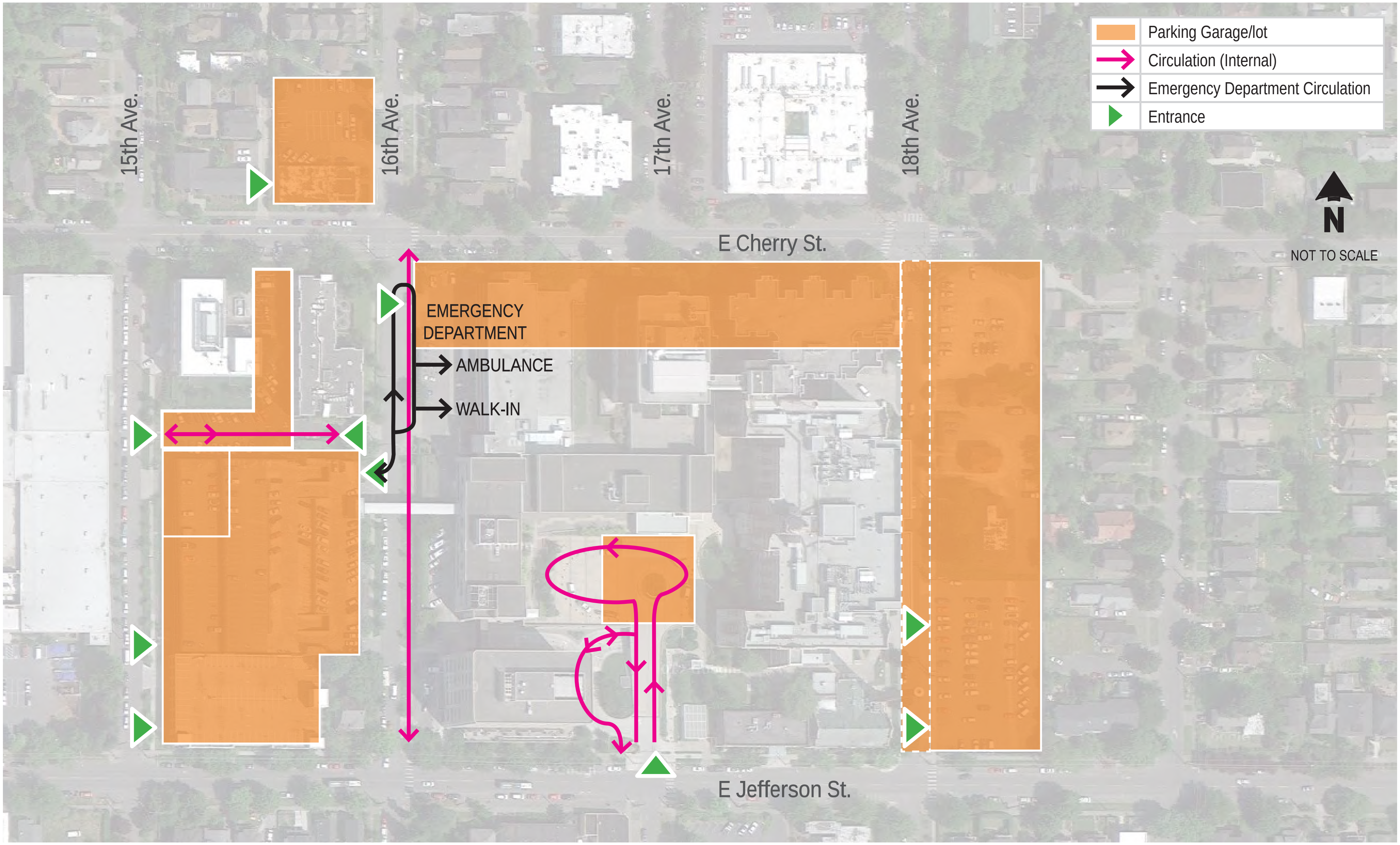
6 Impacts of Alternative 7 Build No Vacation of 16th Avenue

This section documents the impacts associated with the development of Alternative 7. The traffic and parking characteristics of Alternative 7 are generally consistent with Alternatives 5 and 6. The only difference between Alternative 7 and Alternatives 5 and 6 is that with Alternative 7 16th Avenue would not be vacated. This would allow for continued north/south vehicular access along 16th Avenue consistent with existing conditions.

Not vacating 16th Avenue would result in slightly different travel patterns and impacts in the immediate vicinity of Swedish Cherry Hill. Outside the immediate vicinity of the campus transportation impacts of Alternative 7 would be consistent with Alternatives 5 and 6. As such, the following focuses on only those areas where the impacts of Alternative 7 would be different from disclosed for Alternatives 5 and 6. This includes campus access and circulation, traffic volumes, and intersection operations.

6.1 Campus Access and Circulation

Figure 32 highlights the proposed parking lots and garages and the campus access and circulation for Alternative 7. As shown in **Figure 32**, consistent with Alternative 5 and 6, access to the Swedish Cherry Hill parking garages and surface lots would continue to be along 15th Avenue, 16th Avenue, and 18th Avenue between E Cherry Street and E Jefferson Street with Alternative 7. Access to the emergency department and for deliveries would also be consistent with Alternatives 5 and 6 and Alternative 7. The only change in access with Alternative 7 would be 16 Avenue would allow north/south vehicular travel.



Alternative 7 Access and Circulation Routes

Swedish Cherry Hill MIMP – Preliminary DEIS

FIGURE
32

Q:\Projects\11\11244.00 Swedish Providence Cherry Hill Campus\Graphics\Figures\11244 Fig 18 Swedish 16th access and circ routes.pdf

6.2 Traffic Volumes

Figures 33 and 34 summarize the Alternative 7 weekday AM and PM peak hour link volumes for 2023 and 2040 within the vicinity of Swedish. For comparison purposes, the Alternative 5 and 6 traffic volumes are shown to provide an understanding of how vacating 16th Avenue changes travel patterns. As described previously, outside the immediate vicinity of the campus, traffic volumes are anticipated to be the same with or without the 16th Avenue vacation. The weekday AM and PM peak hour link volumes on the major roadways surrounding the campus for 2023 and 2040 can be found on **Figures 24 – 25** above. The intersection turning movement summaries are included in **Attachment C-1**.

As shown in the figures, the vacation of 16th Avenue results in an increase in traffic volumes along 15th and 18th Avenues since north/south vehicle circulation would shift to these parallel corridors. The shift in traffic volumes due to the vacation is relative low with approximately 30 to 50 vph shifted to parallel routes. This volume was determined through field surveys conducted by Transpo Group staff as described previously. With the shift between the adjacent parallel routes the impacts to the intersection operations would be minimal.

6.3 Traffic Operations

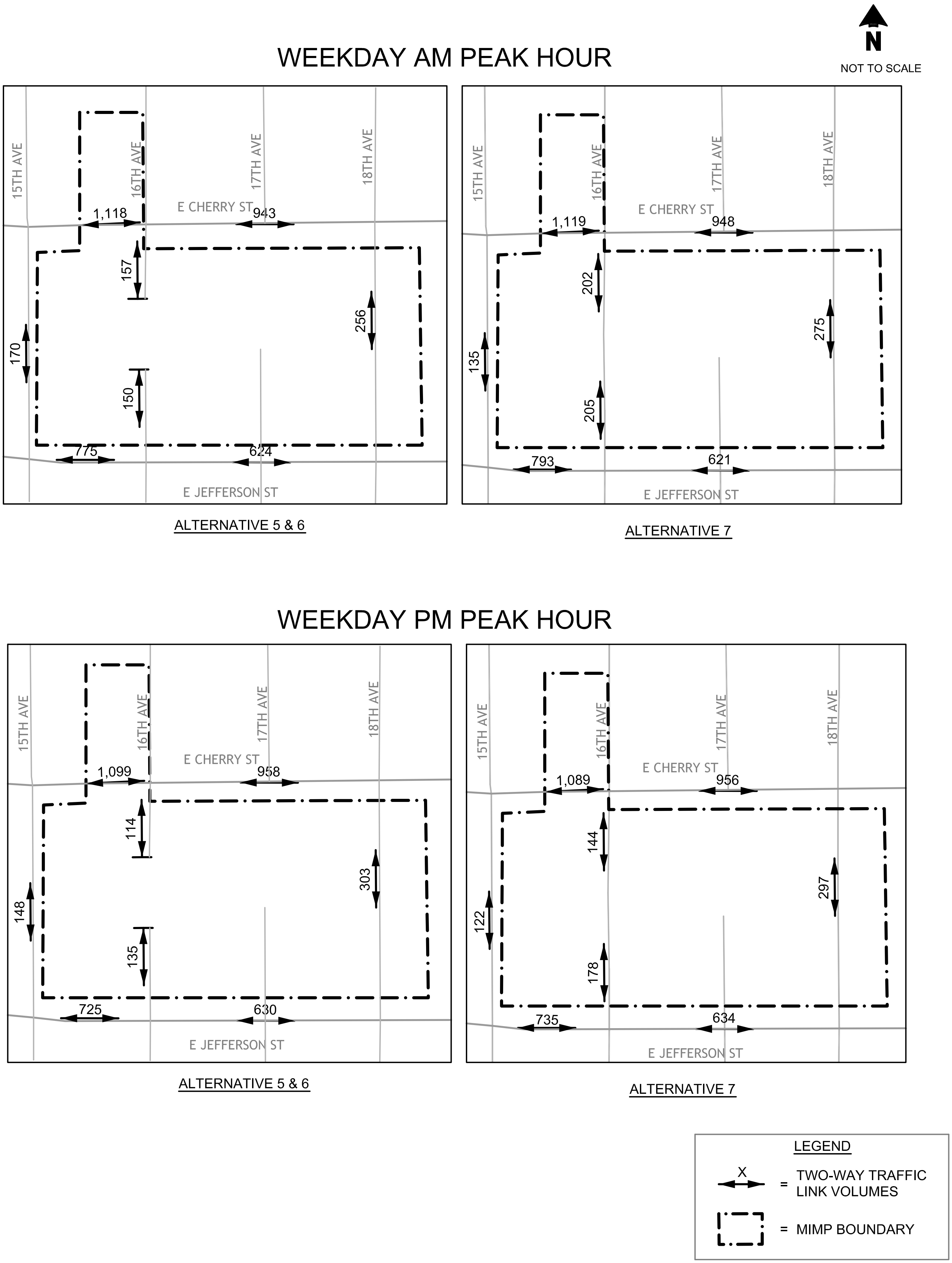
The following describes the intersection operations in the immediate vicinity of Swedish Cherry Hill for Alternative 7. Given the minimal change in traffic volumes between Alternatives 7 and Alternatives 5 and 6 corridor operations would be similar.

6.3.1 Intersection Operations

Impacts of Alternative 7 were determined by comparing operations to Alternatives 5 and 6 at the intersections within the immediate vicinity of Swedish including 15th Avenue to 18th Avenue along E Cherry Street and E Jefferson Street. All other study intersections for Alternative 7 have the same LOS as shown in **Figures 27 through 30** above for Alternatives 5 and 6.

Intersection LOS was calculated at the six study intersections using the same methodology outlined in previous sections. **Figure 35** summarizes the Alternative 7 peak hour levels of services for 2023 and 2040 compared to Alternatives 5 and 6. A detailed summary showing intersection LOS, delay, and volume to capacity ratios is provided in **Attachment C-3**.

As shown in **Figure 35**, in the immediate vicinity of the Swedish Cherry Hill campus, intersection operations are anticipated to be the same between Alternative 7 and Alternatives 5 and 6 conditions for both the 2023 and 2040 conditions during the weekday AM and PM peak hours. Although LOS would be consistent between the Build Alternatives, there would be some changes in intersection delay. Delays for the 15th Avenue/E Cherry Street northbound approach would increase with development of Alternative 7 given the slightly higher volume of traffic along E Cherry Street at this intersection without the vacation.



Build Alternatives (2023) Weekday Peak Hour Two-Way Link Volume Comparison

FIGURE 33

Swedish Cherry Hill MIMP

transpoGROUP

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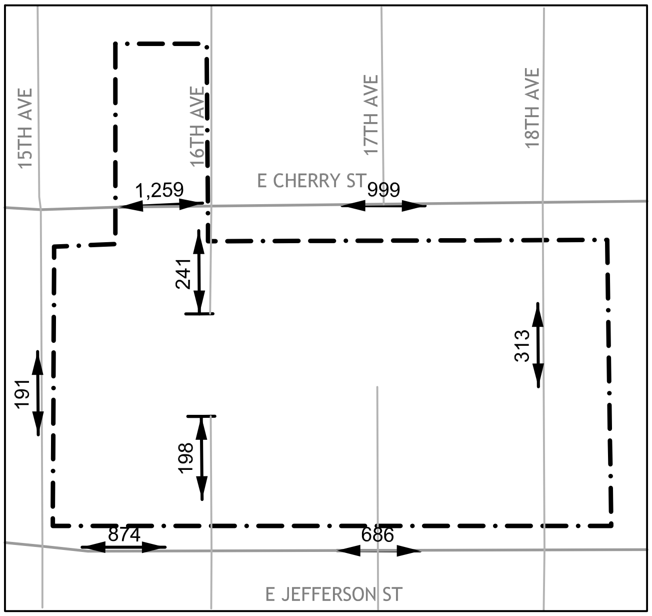
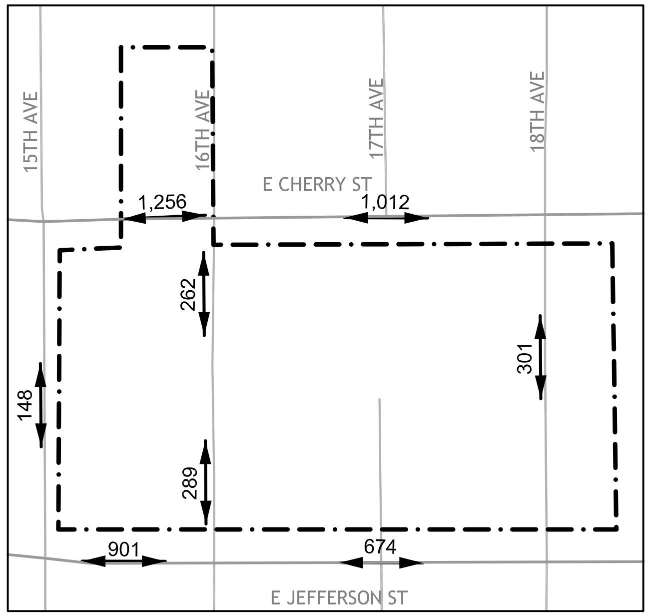
NOT TO SCALE

WEEKDAY AM PEAK HOUR

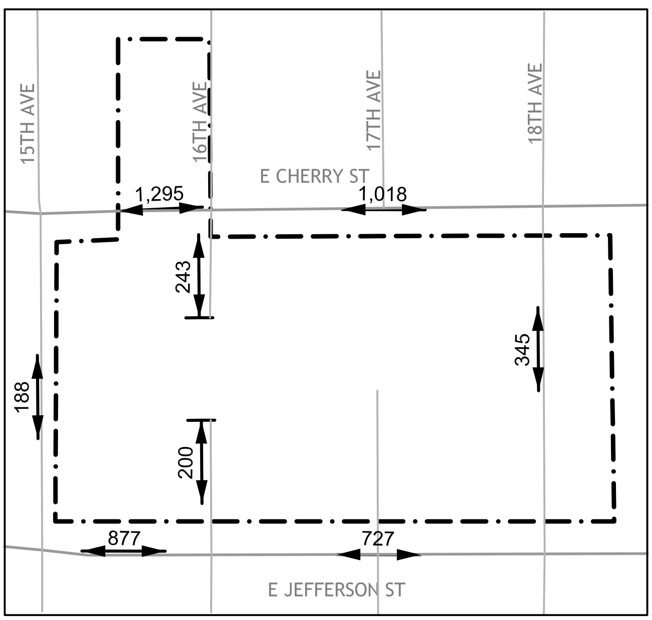


ALTERNATIVE 5 & 6

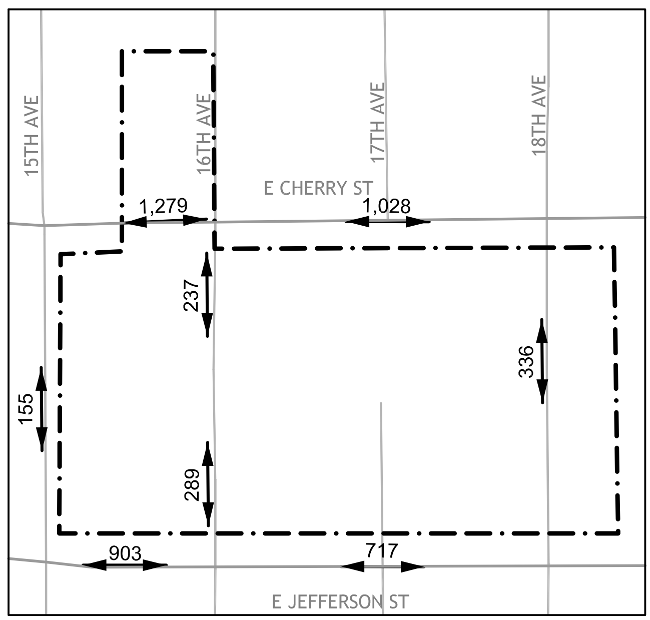


ALTERNATIVE 7

WEEKDAY PM PEAK HOUR



ALTERNATIVE 5 & 6



ALTERNATIVE 7

LEGEND

X = TWO-WAY TRAFFIC LINK VOLUMES

= MIMP BOUNDARY

Build Alternatives (2040) Weekday Peak Hour Two-Way Link Volume Comparison

FIGURE 34

Swedish Cherry Hill MIMP

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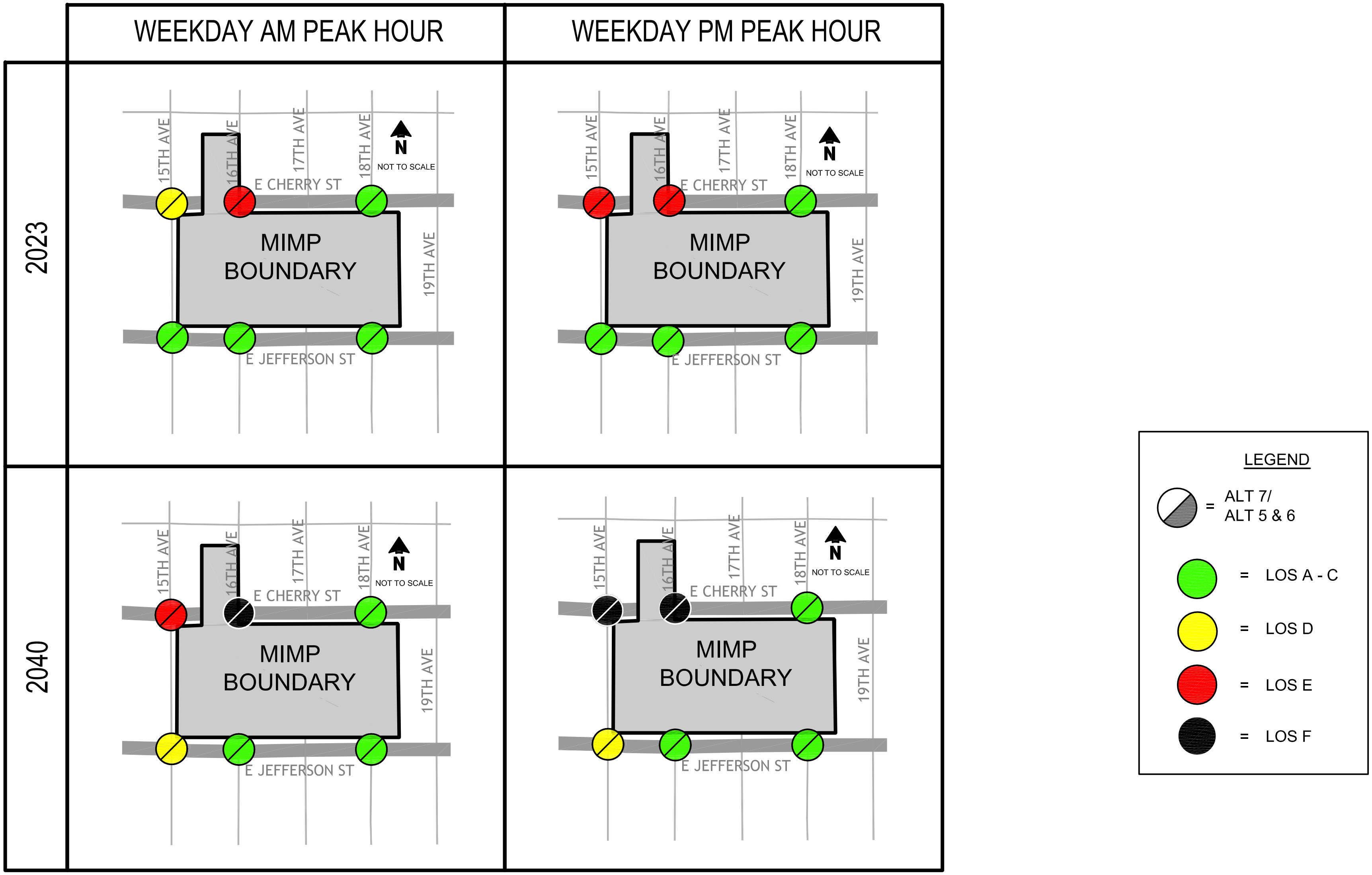

Build Alternatives Peak Hour Intersection Levels of Service Comparison

Swedish Cherry Hill MIMP-Preliminary DEIS

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FIGURE
35

7 Construction Impacts

Section to be completed for DEIS.

8 Mitigation

Mitigation measures required to support the proposed MIMP are not defined in this publication of the preliminary DEIS. Mitigation measures will be further defined and outlined based on coordination with the DPD, SDOT, and the applicant. A preliminary list of mitigation measures will be included in the publication of the DEIS.

The results of the preliminary DEIS indicate that several unsignalized intersections in the immediate vicinity of the hospital are expected to experience an increase in minor street delay as a result of the buildout of the proposed MIMP. The increases in traffic along E Cherry Street and E Jefferson Street will impact vehicle, pedestrian, and bicycle accessibility into the neighborhoods from arterials such as E Cherry Street and E Jefferson Street. For that reason the potential for the installation of a traffic signal will be considered at two possible locations. These locations include:

- 16th Avenue/E Cherry Street
- 14th Avenue/E Jefferson Street

The intersection of 14th Avenue/E Jefferson Street is currently controlled by an all-way stop. Future improvements at this intersection could include the installation of a traffic signal. The impacts at intersections not in the immediate vicinity of the campus will continue to be reviewed by DPD and SDOT staff through the preliminary DEIS review process. No specific mitigation measures have been identified at these off-site intersections to date, pending further agency review.

Based on a review of the current Transportation Management Plan and the Commute Trip Reduction (CTR) surveys it is evident that additional measures are likely to be required by the City to be taken to further encourage the use of active modes of transportation. The current SOV % is approximately 58 percent for the campus. The existing goal is 50 percent for the Cherry Hill campus. The applicant will be working closely with DPD and SDOT's TMP coordinators to identify specific elements to be included in the enhanced TMP.

The existing parking analysis conducted for the campus showed that the current hospital demand that is utilizing on-street parking on streets surrounding the campus could likely be accommodated in the existing campus designated supply. While the current pricing of the parking garages are consistent with the objectives of the current TMP in terms of promoting non-SOV travel, it is also likely resulting in the intrusion of campus related parking into the neighborhood. On-going review of the parking rates and its impact on neighborhood intrusion is something that will be considered further in the development of an enhanced TMP.

9 Secondary and Cumulative Impacts

Secondary and cumulative impacts on area roadways are included in the analysis of direct impacts. In addition, there is a potential for cumulative impacts due to the combined affects of traffic being generated by build-out of the project and construction. This potential impact could be mitigated by scheduling construction activities such that arrival and departure of construction traffic occurs outside the peak hours.

10 Significant Unavoidable Adverse Impacts

Significant unavailable adverse impacts of the proposed MIMP will be defined in the publication of the DEIS. DPD and SDOT are reviewing the preliminary DEIS and will refine this upon completion of their review.

Attachments C-1 through C-5 are available upon request.