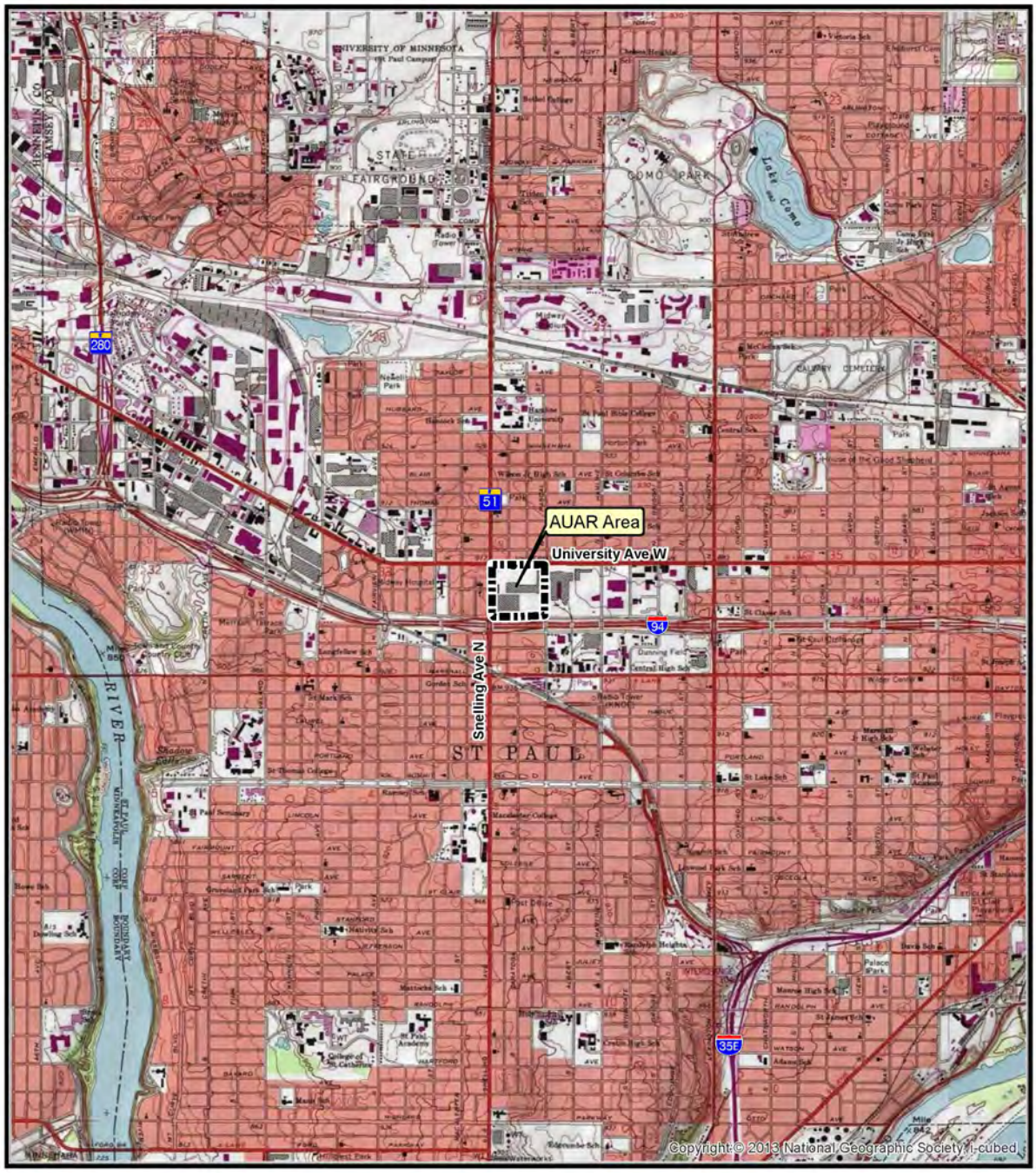
Appendix A

Figures

Figure 5-1 USGS Location Map



USGS Map

AUAR Area

N

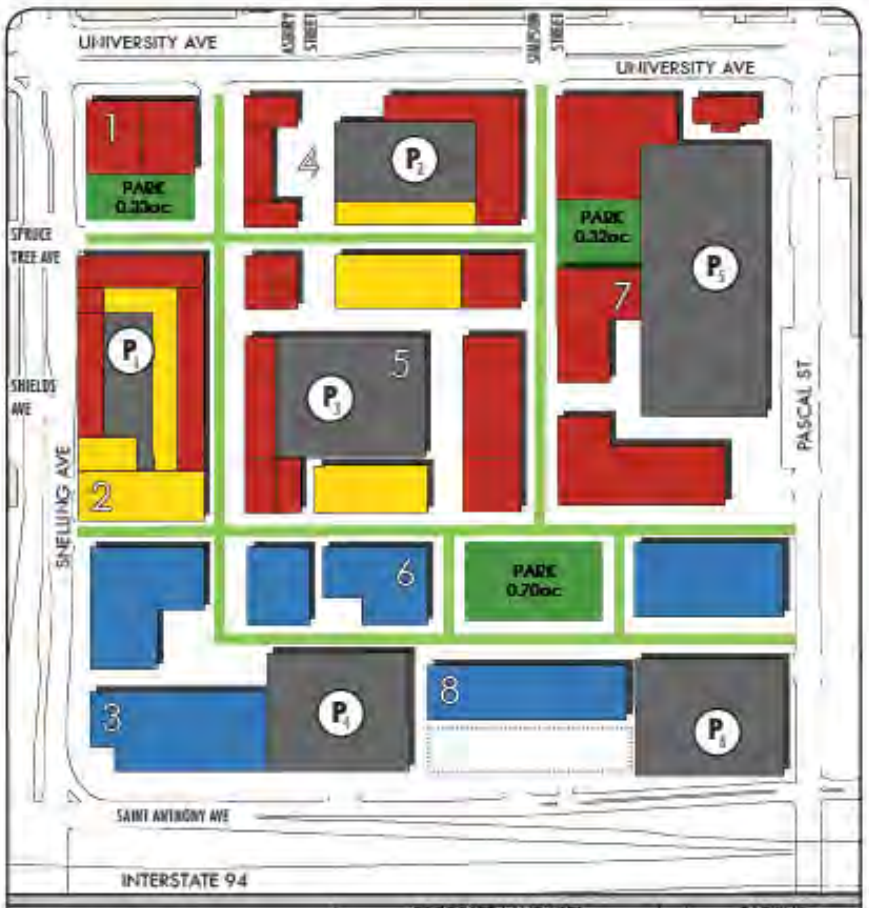
0 3,000 6,000 Feet

Stantec

V:\1938\active\193803449\GIS\Projects\AUAR\USGS Location.mxd

Figure 5-2 AUAR Area Boundary

Figure 6-1 Scenario 1 Site Plan and Program



		PROPOSED LAND USES			PARKING	
Block #	Building Type	Retail (SF)	Resid. (SF)	Office/Instit.(SF)	Spaces	Type
1	Mixed-Use Comm. - 2 story	23,800	-	23,800		
2	Mixed-Use Res. - 3 story	42,783	85,567	-	120	Structure
	Mixed-Use Comm. - 3 story	36,716		73,433		
3	Office/ Inst - 3 story	-	-	142,000		
	Office/ Inst - 10 story	-	-	305,925		
4	Mixed-Use Comm. - 2 story	15,250	-	15,250		
	Mixed-Use Comm. - 3 story	24,790	-	49,560	213	Structure
	Mixed-Use Res. - 3 story	10,195	20,385	-		
5	Mixed-Use Comm. - 2 story	8,380	-	8,380		
	Mixed-Use Comm. - 2 story	20,530	-	20,530		
	Mixed-Use Comm. - 4 story	30,690	-	92,070	320	Structure
	Mixed-Use Res. - 4 story	29,900	92,860	-		
	Mixed-Use Res. - 4 story	15,950	47,850	-		
6	Office/ Inst - 2 story	-	-	29,000	530	Surface
	Office/ Inst - 3 story	-	-	63,645	420	Structure
	Office/ Inst - 3 story	-	-	98,100	395	Surface
7	Mixed-Use Comm. - 3 story	31,900	-	63,800	850	Structure
	Mixed-Use Comm. - 3 story	23,030	-	46,060		
	Mixed-Use Comm. - 3 story	34,580	-	69,160		
	Mixed-Use Comm. - 1 story	6,800	-	-		
8	Office/ Inst - 3 story	-	-	99,570	440	Structure
	Totals	355,294	246,662	1,200,283	3,288	
	Grand Total	1,802,239		Parking Ratio	1.82	
	FAR	1.20				

SCENARIO 1: Comprehensive Plan Buildout

Saint Paul, Minnesota

Stantec

Figure 6-2 Scenario 2 Site Plan

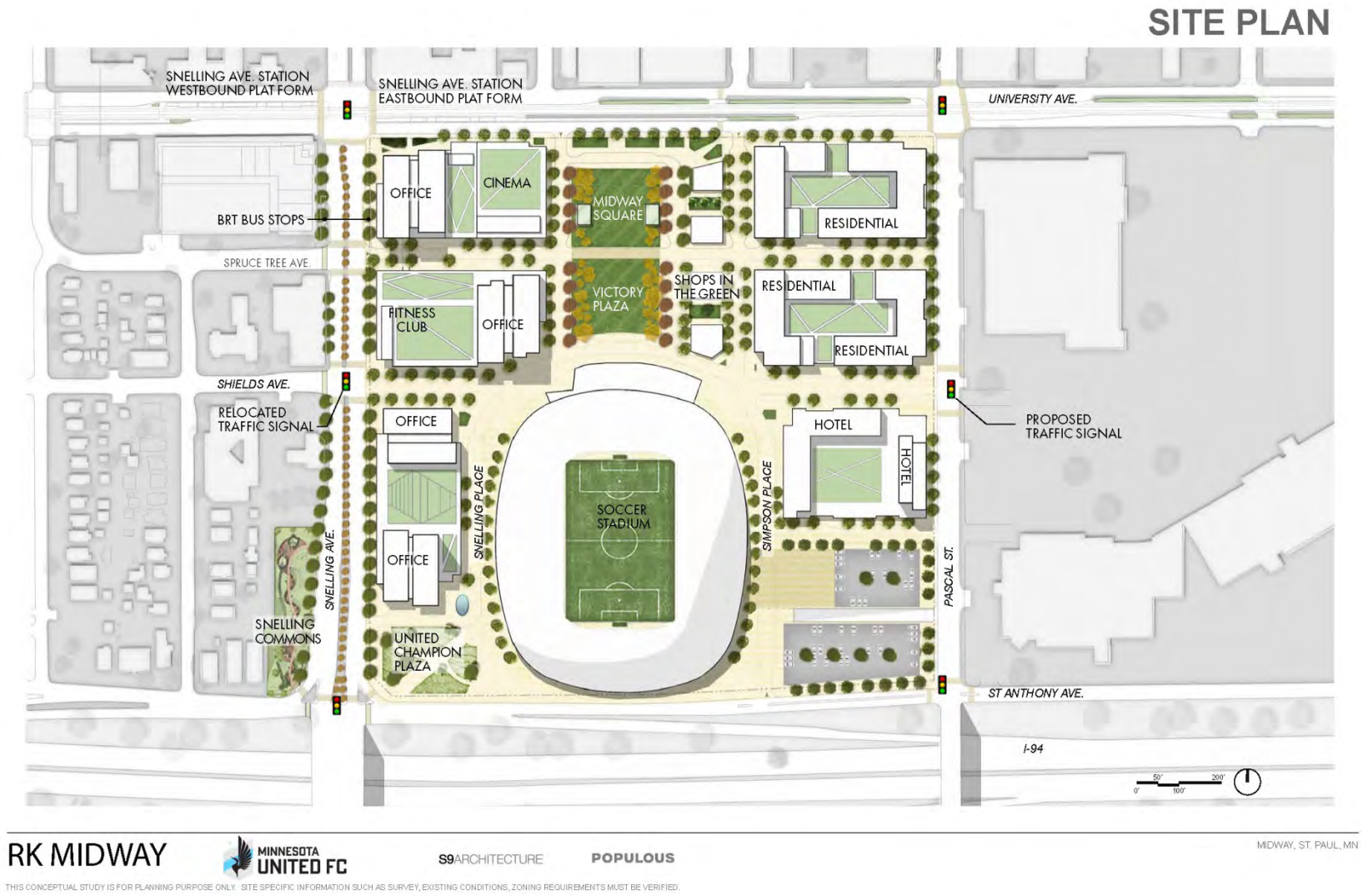


Figure 6-3 Scenario 2 Program

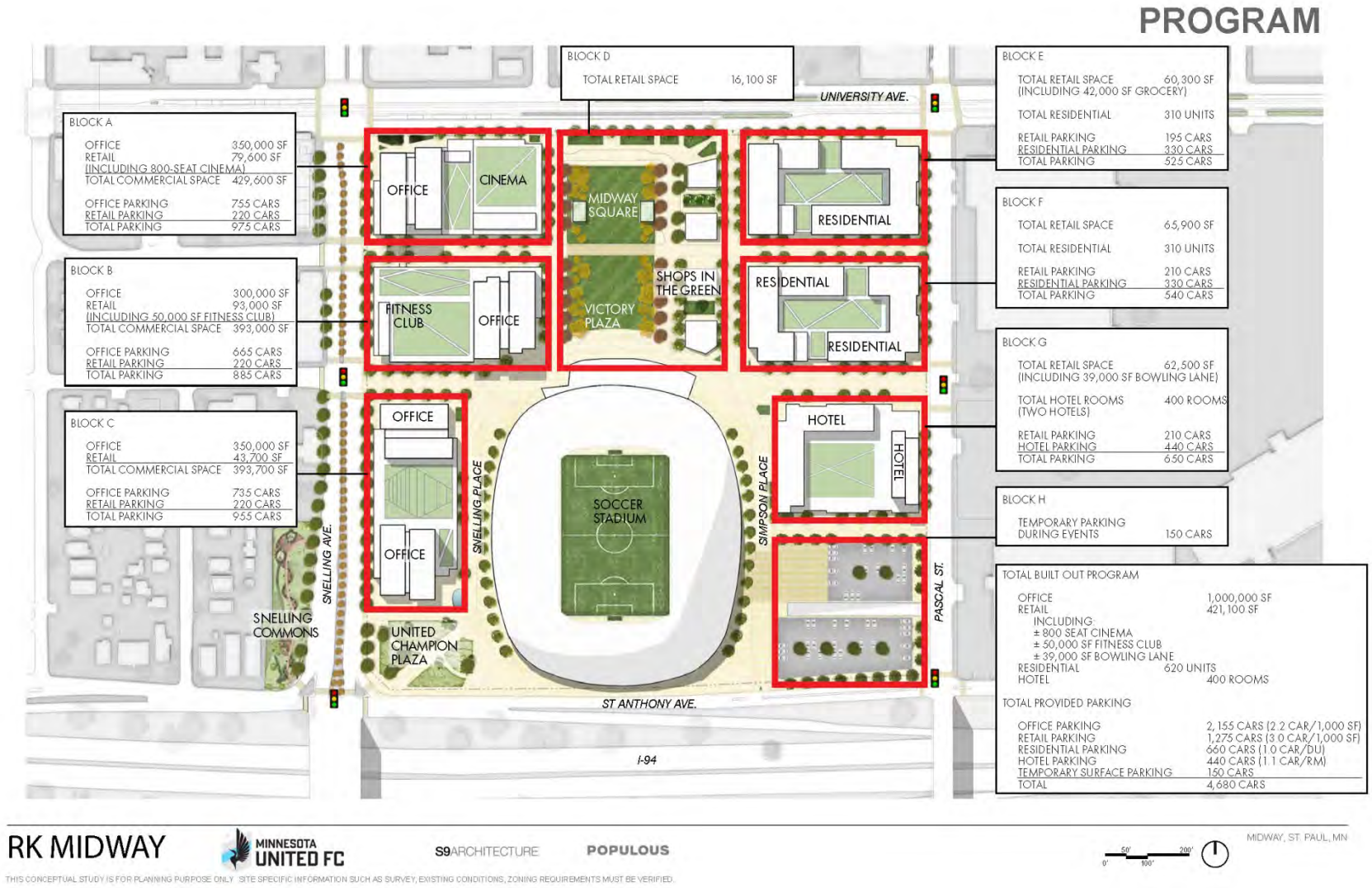


Figure 6-4 Scenario 2 Program with Building Heights

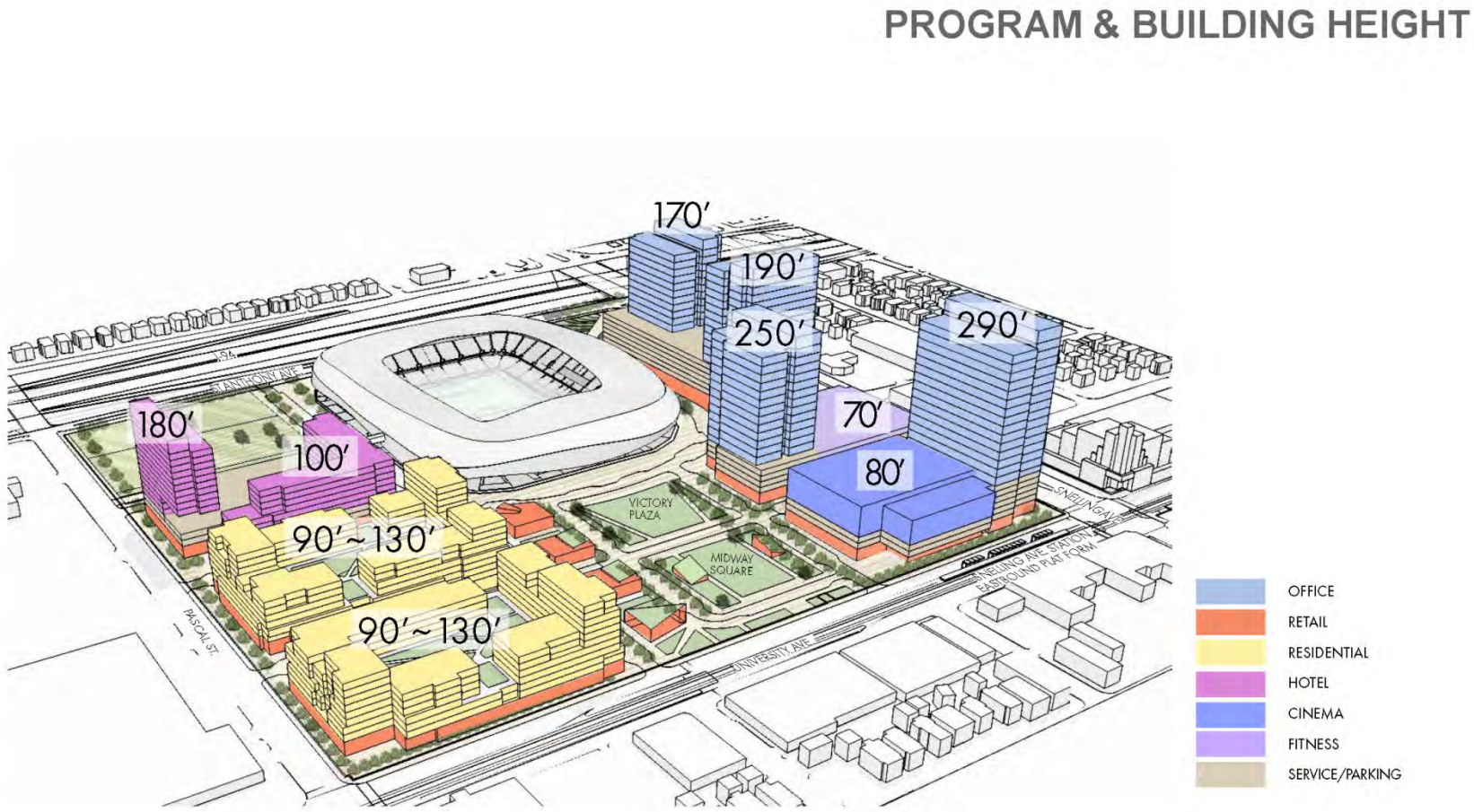


Figure 7-1 Existing Land Cover

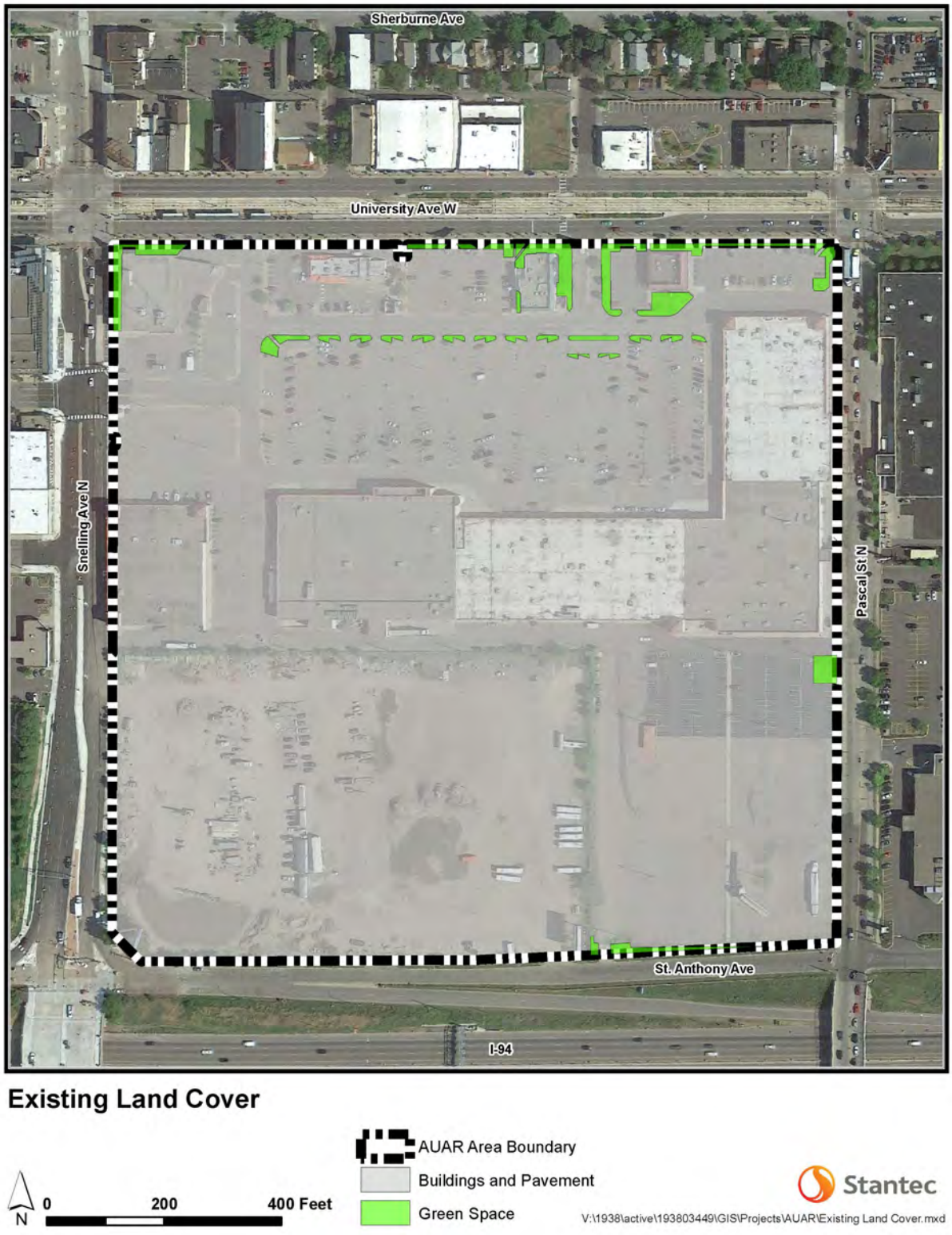


Figure 7-2 Scenario 1 Post-Construction Land Cover

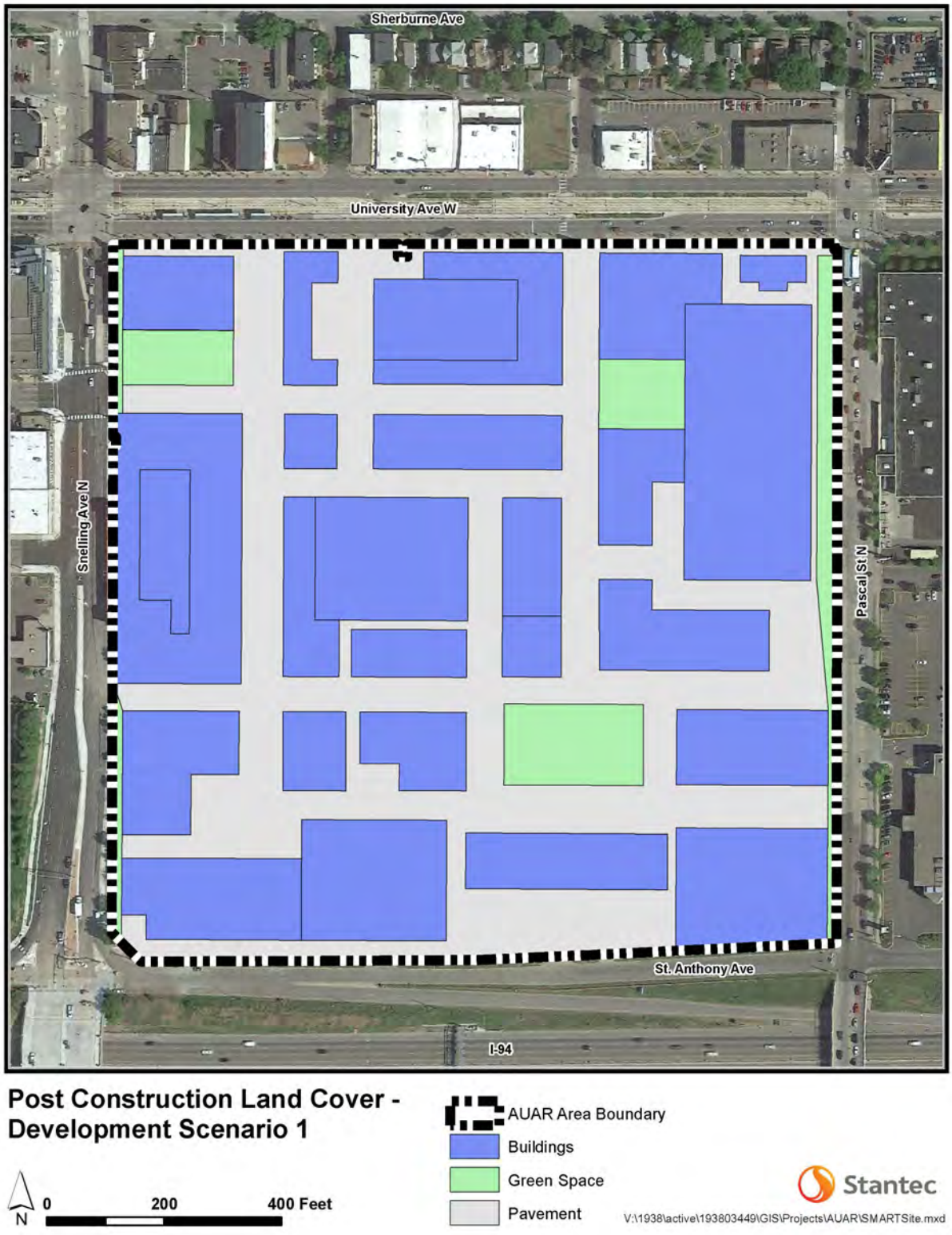


Figure 7-3 Scenario 2 Post-Construction Land Cover

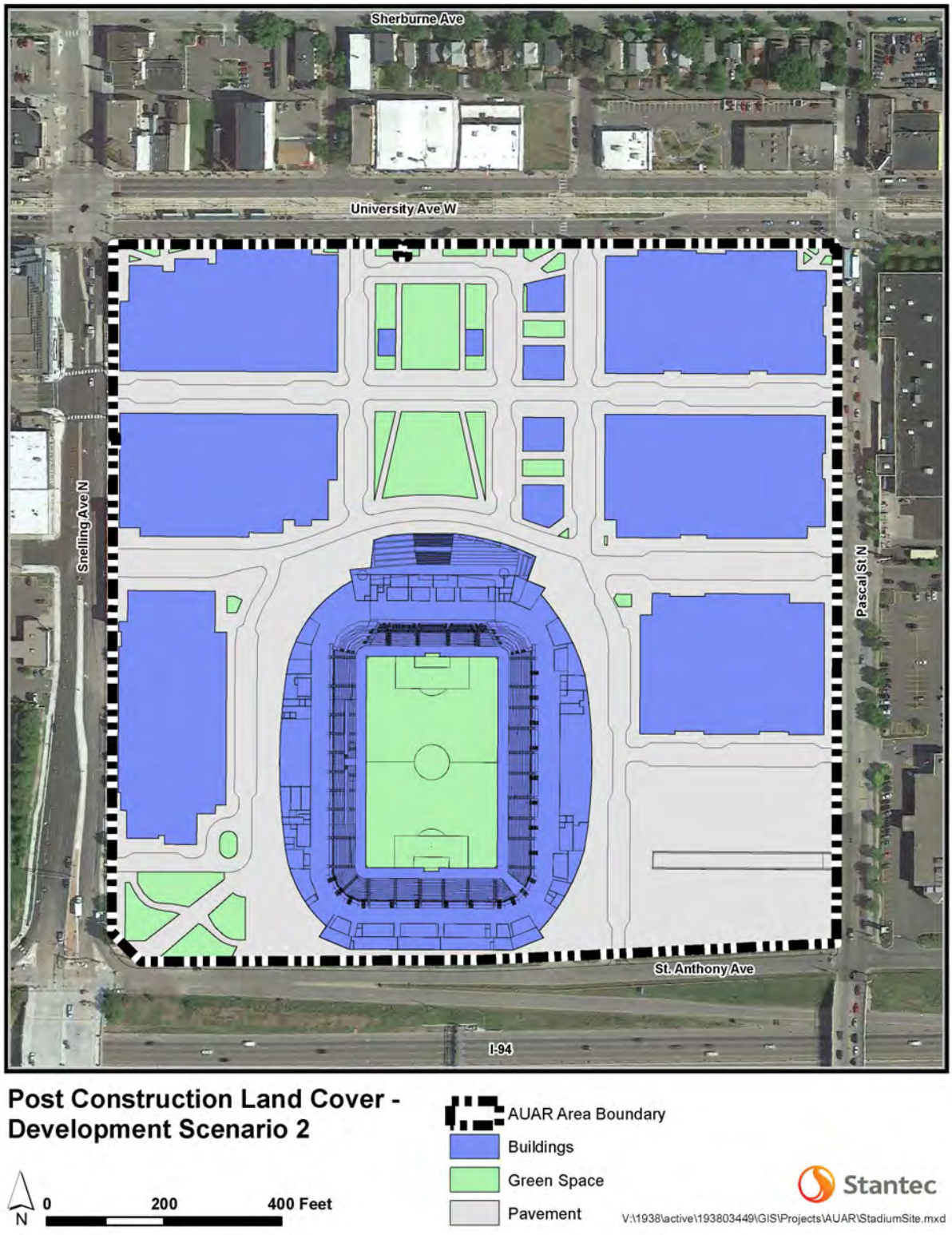


Figure 9-1 Existing Land Use

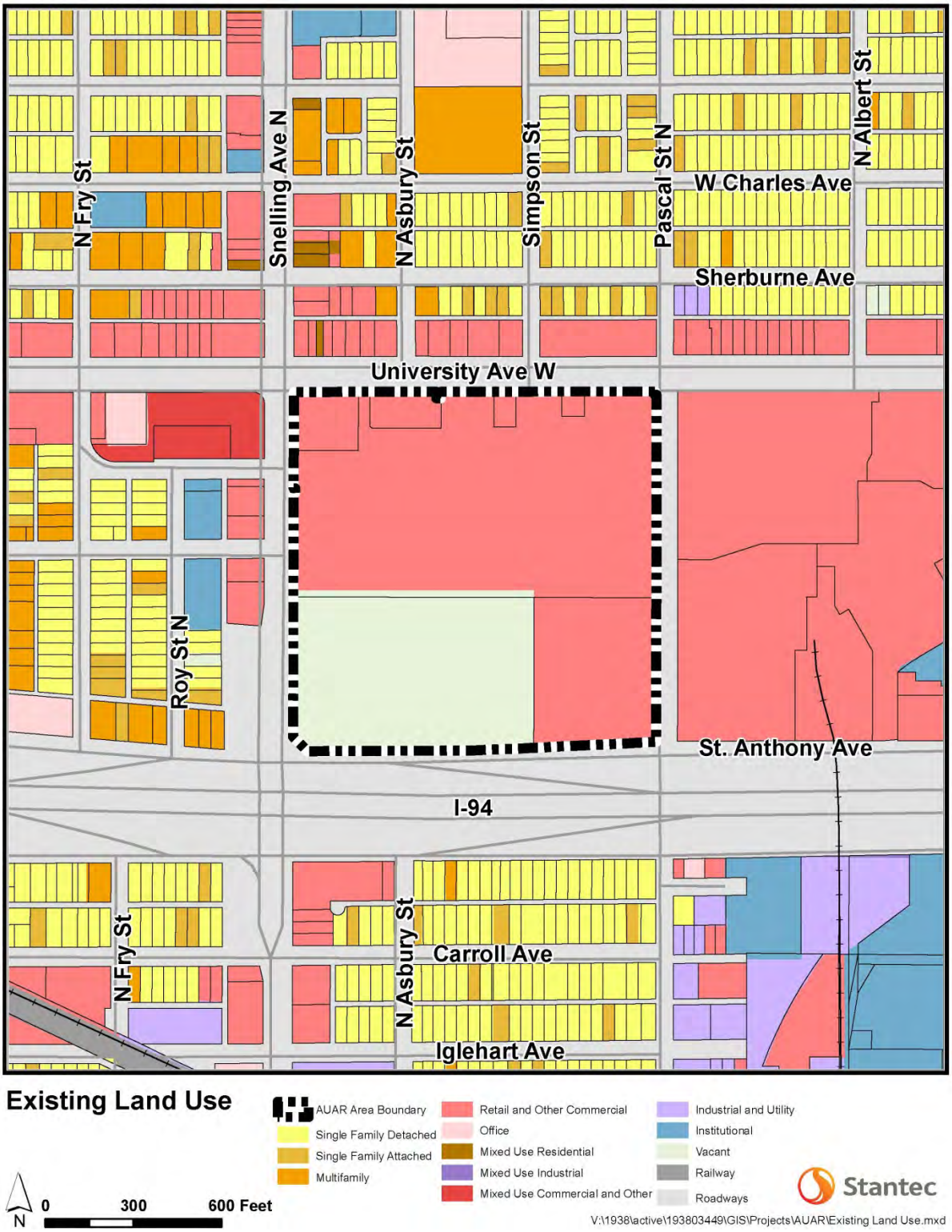


Figure 9-2 Future Land Use

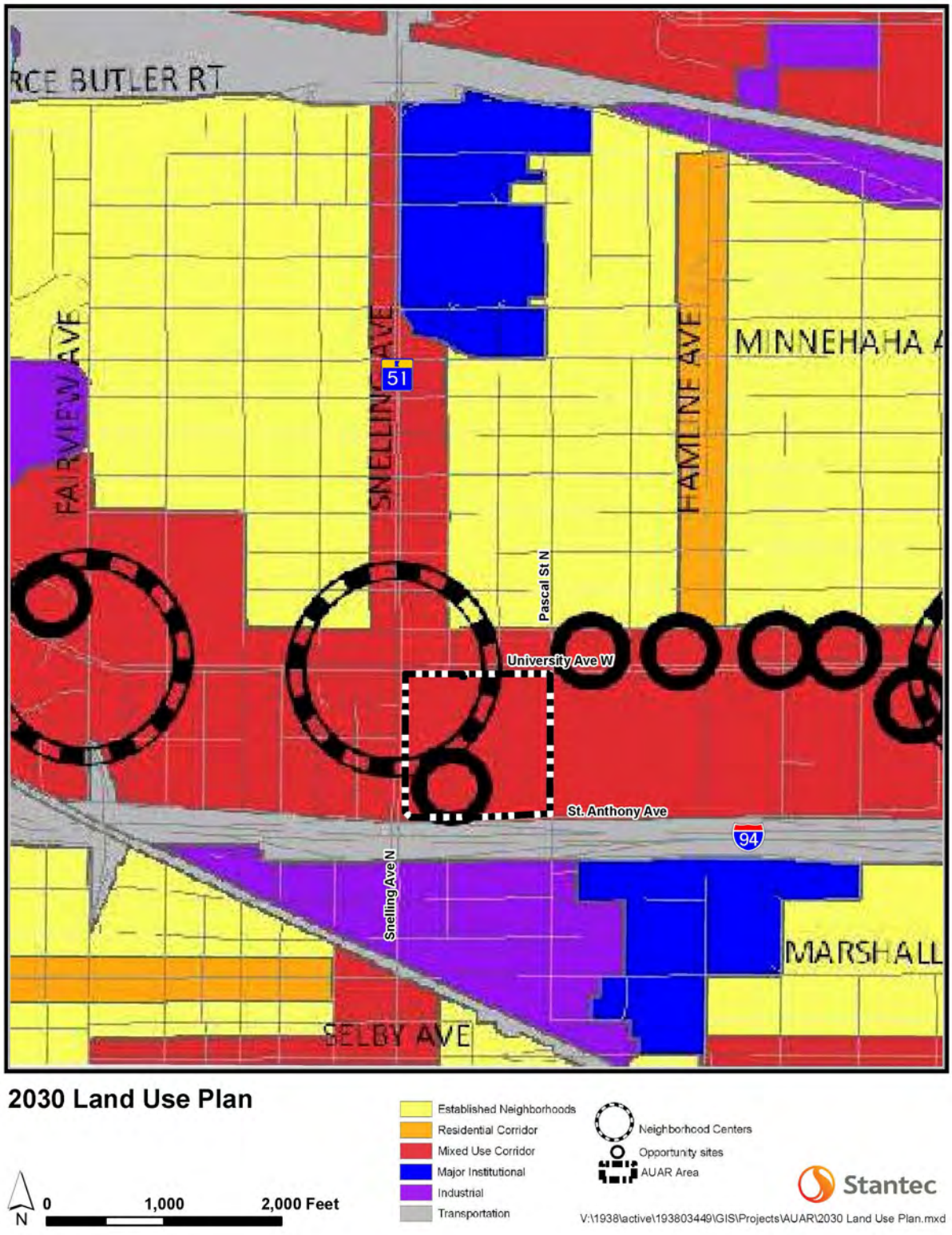


Figure 9-3 Existing Zoning

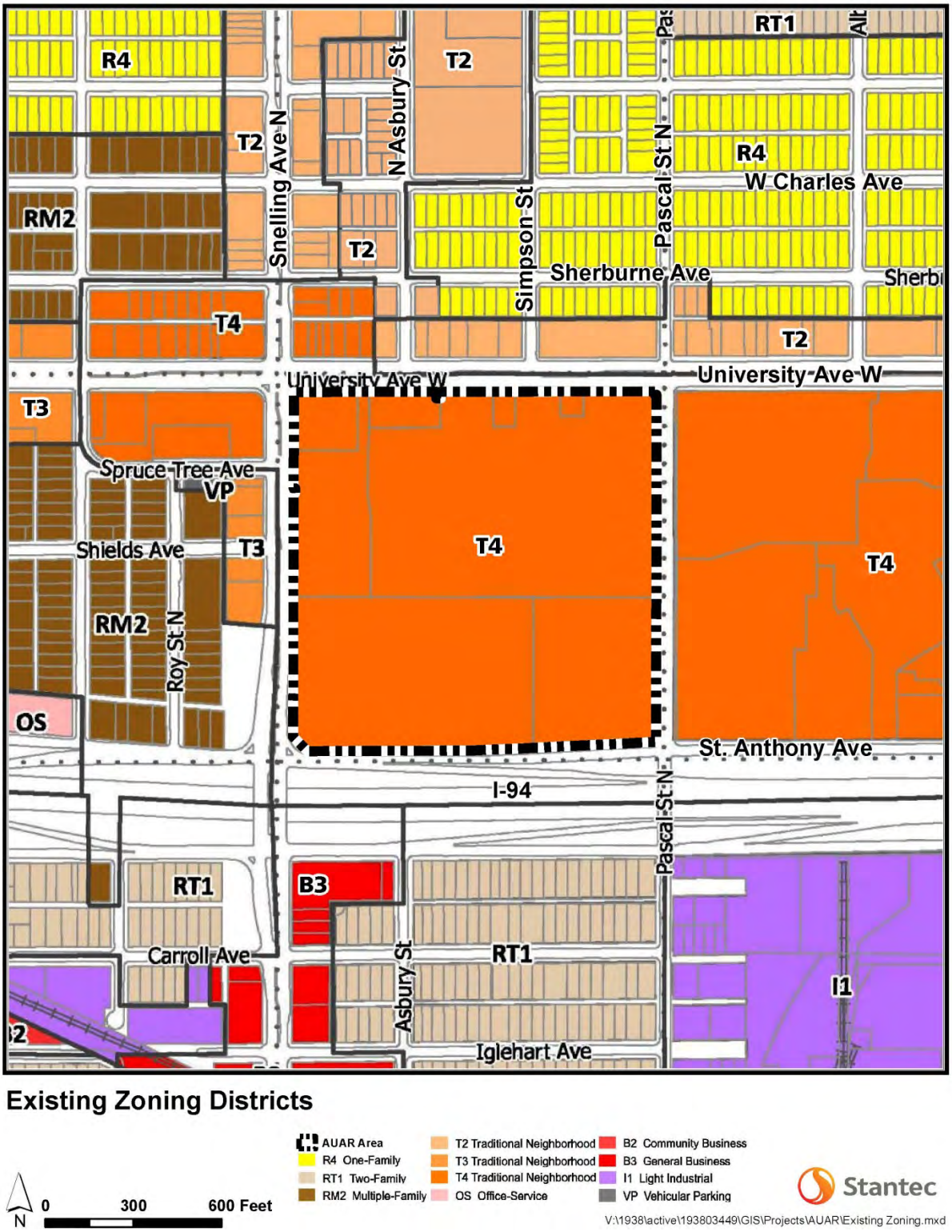


Figure 10-1 Soils and Topography

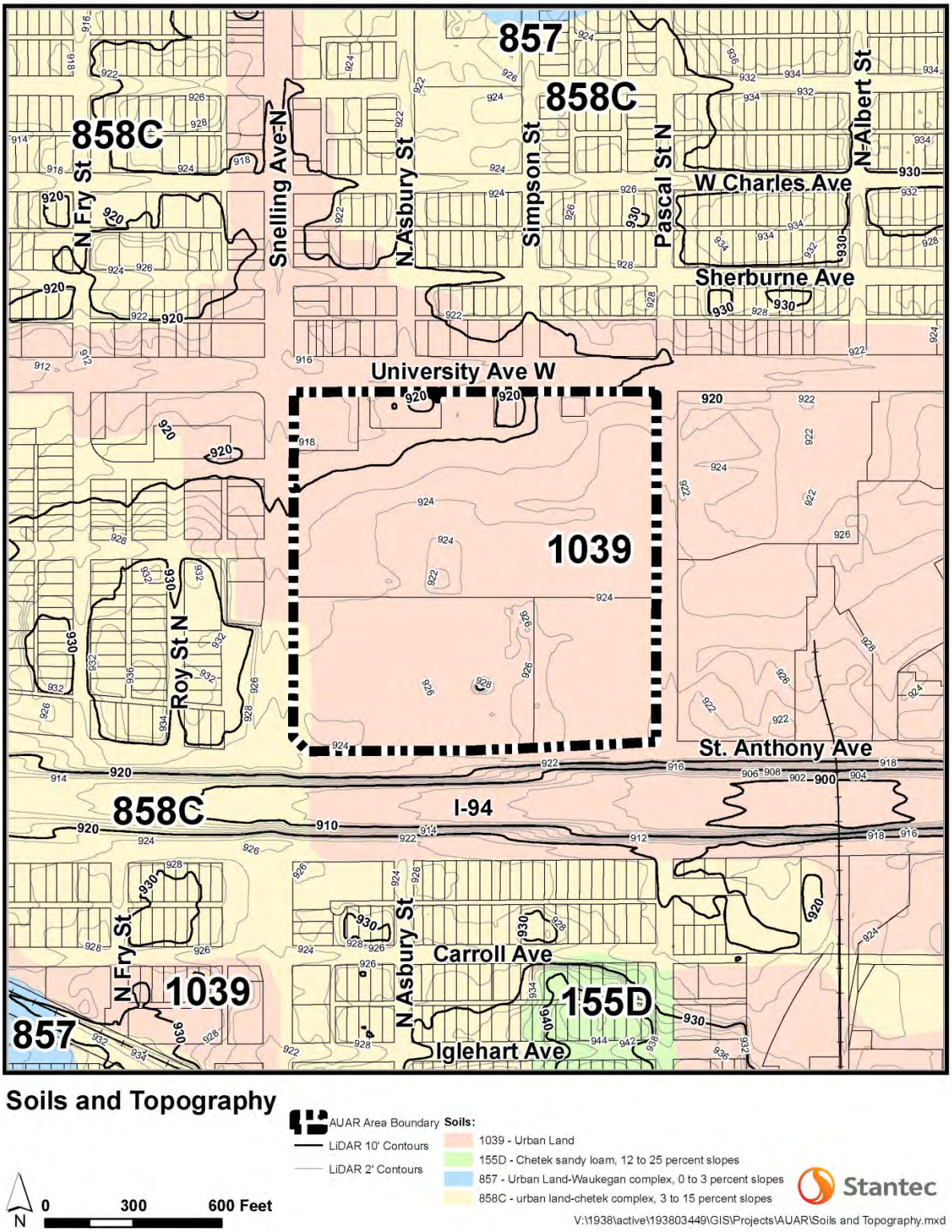


Figure 11-1 Wells within the AUAR Area

Figure 15-1 Scenario 2 Stadium Lighting Direction

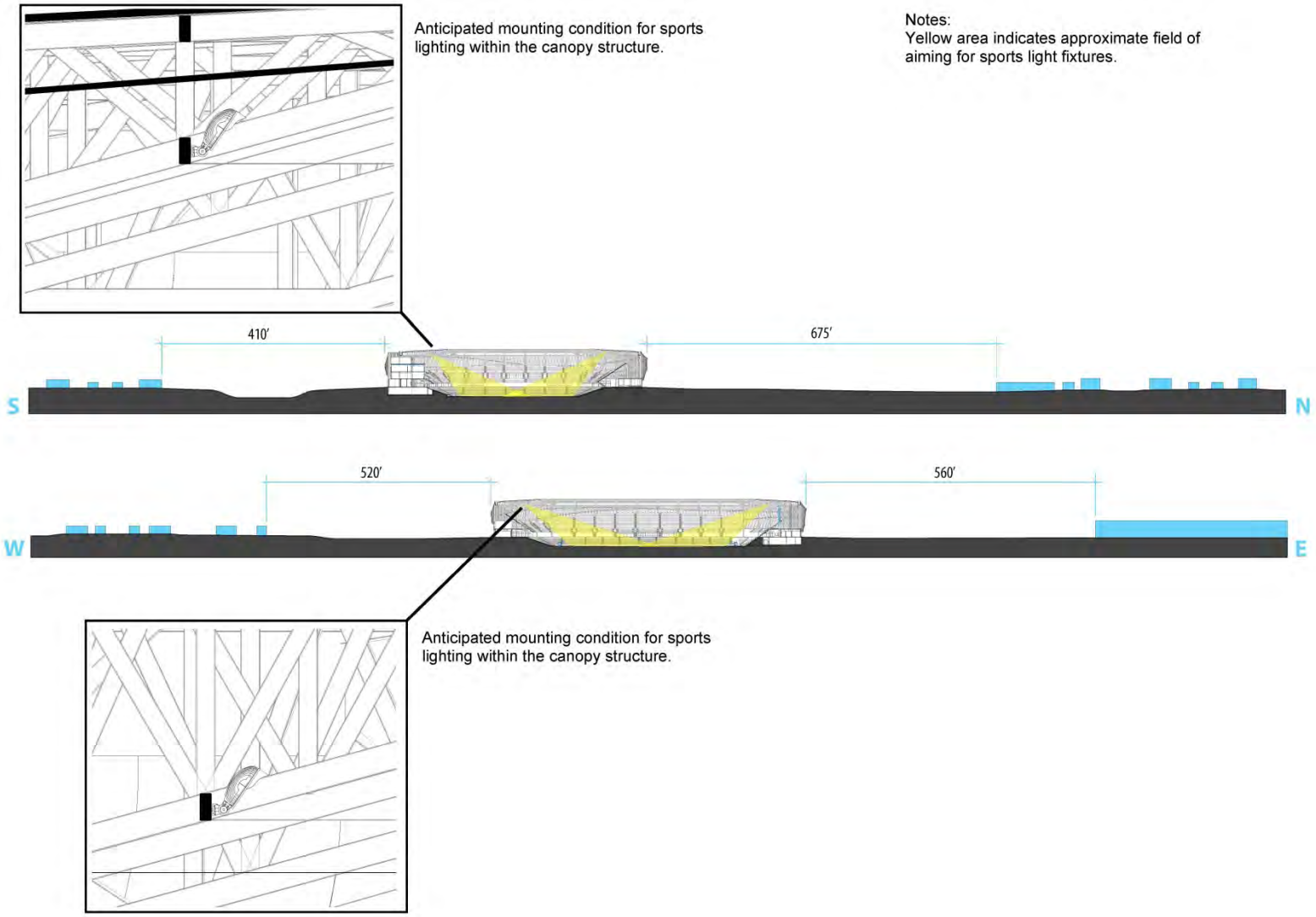


Figure 17-1 Stadium Noise

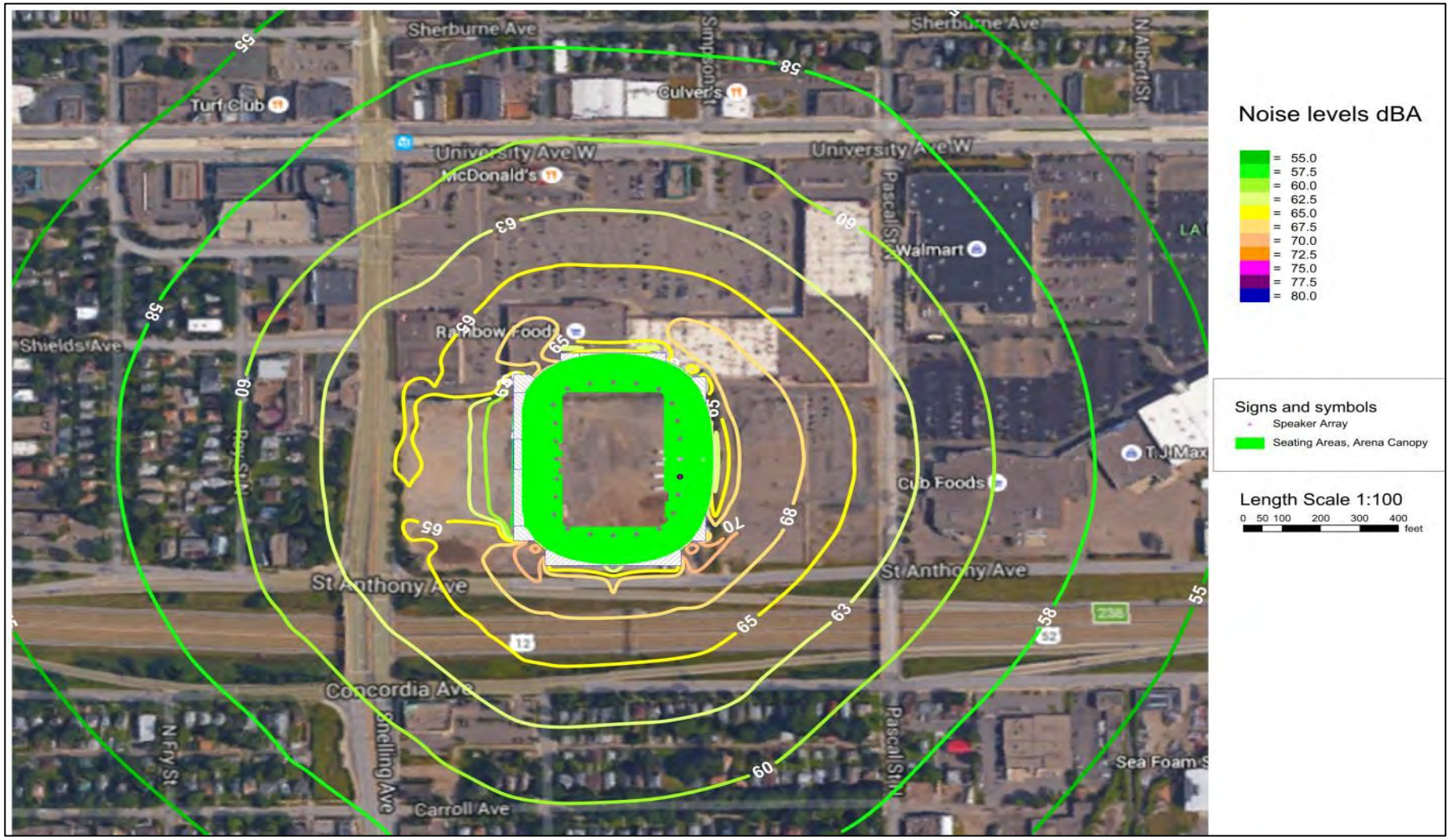


Figure 17-2 Stadium Sound System Noise Contours

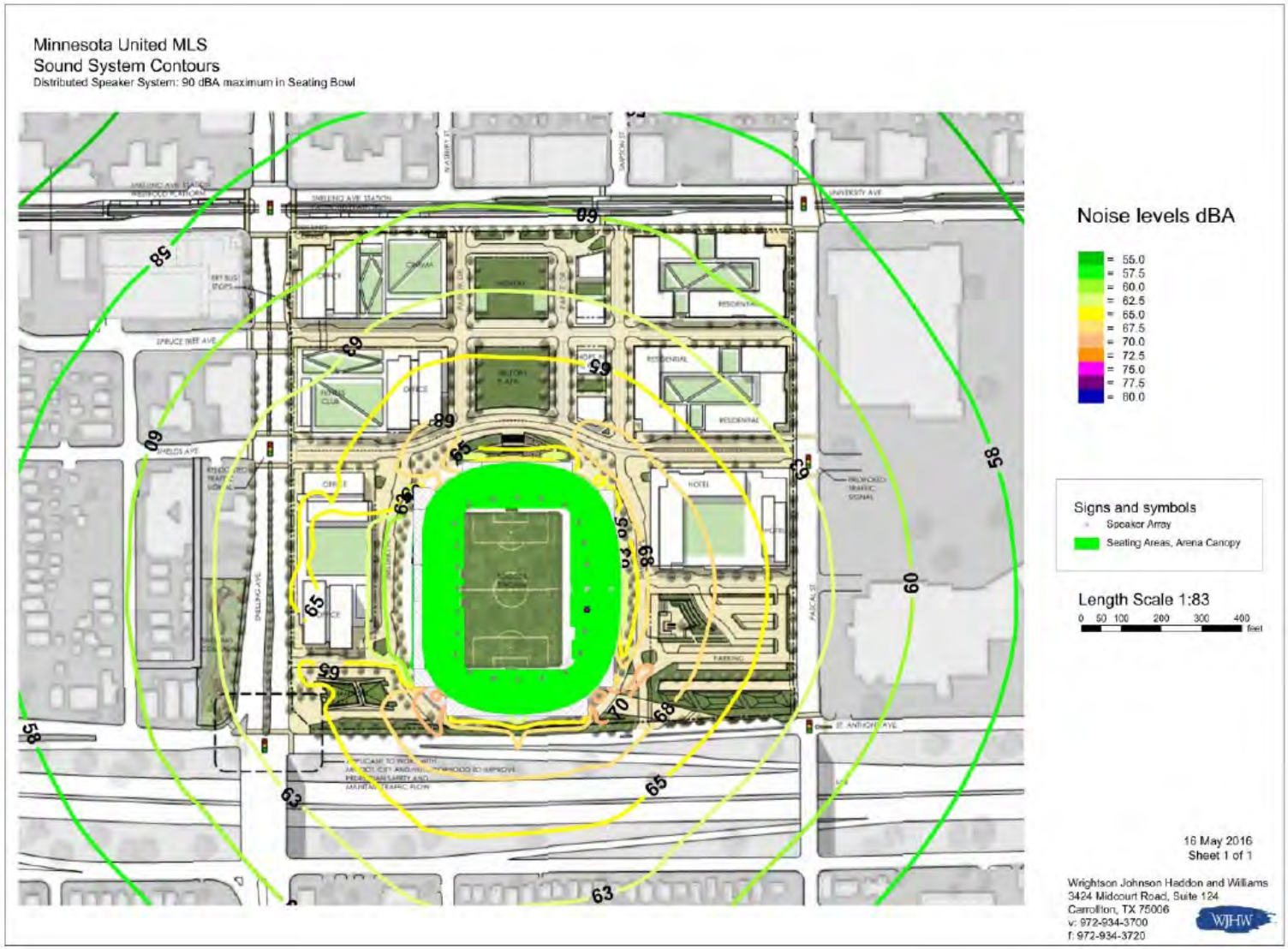


Figure 17-3 Traffic Noise

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SRF Consulting Group, Inc.

RK Midway Master Plan - Traffic Noise Analysis

Snelling Midway Stadium Environmental Review

City of St. Paul

0169154
April 2016

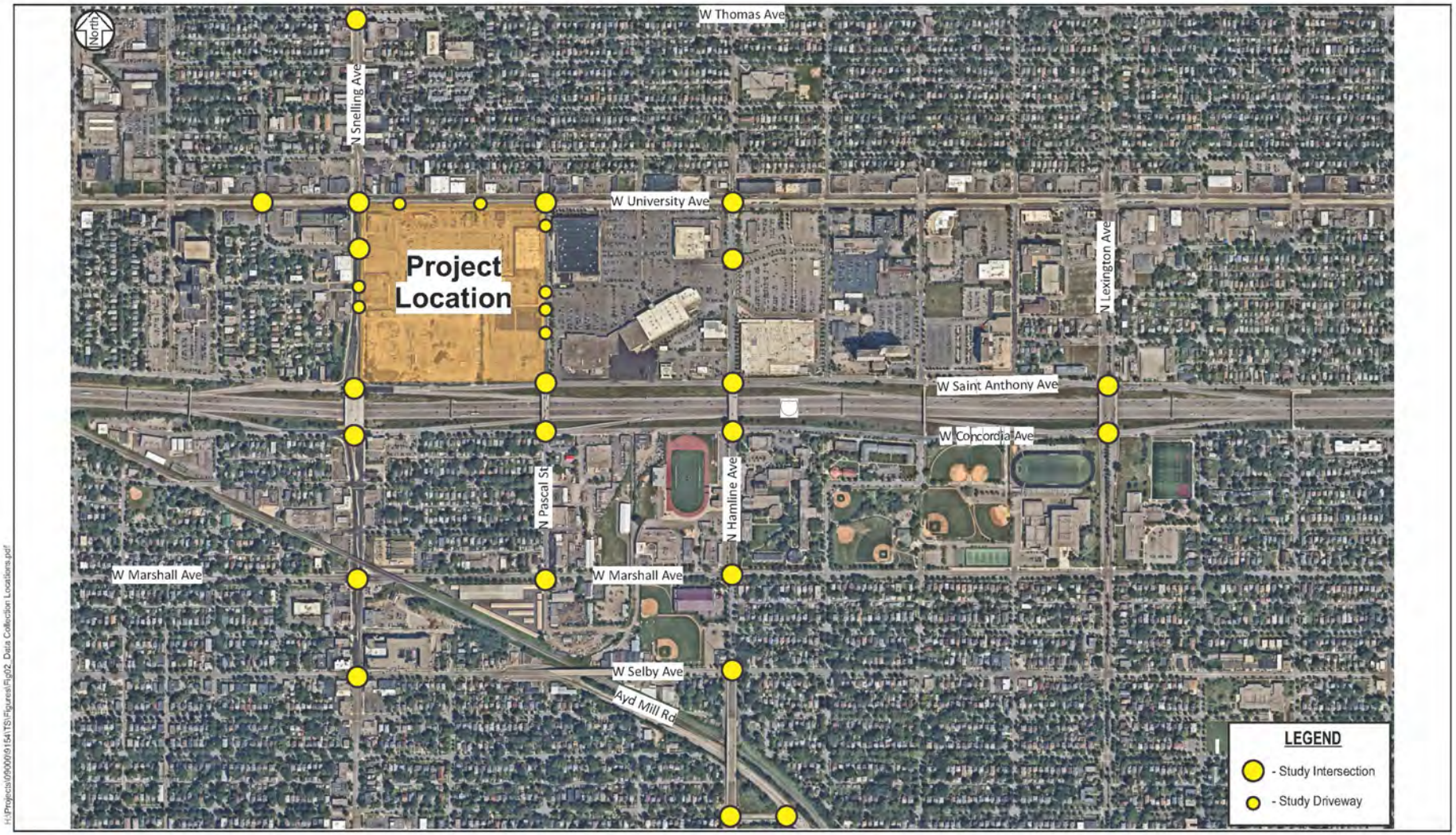
SRF Consulting Group, Inc.

Project Location

Snelling Midway Stadium AUAR
City of St. Paul

0169154
April 2016

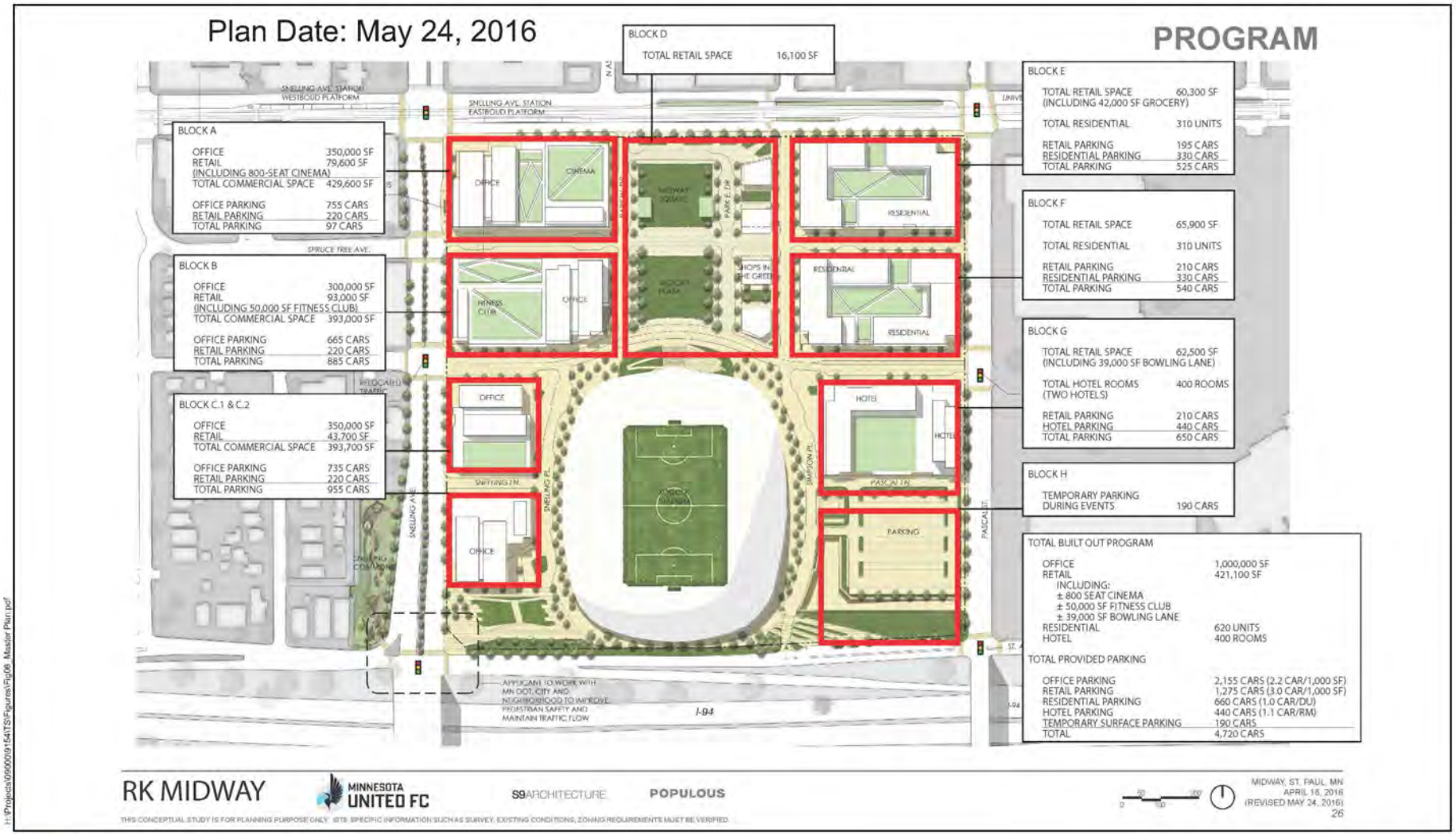
Figure 18-1



SRF Consulting Group, Inc.
0169154
April 2016

Data Collection Locations
Snelling Midway Stadium AUAR
City of St. Paul

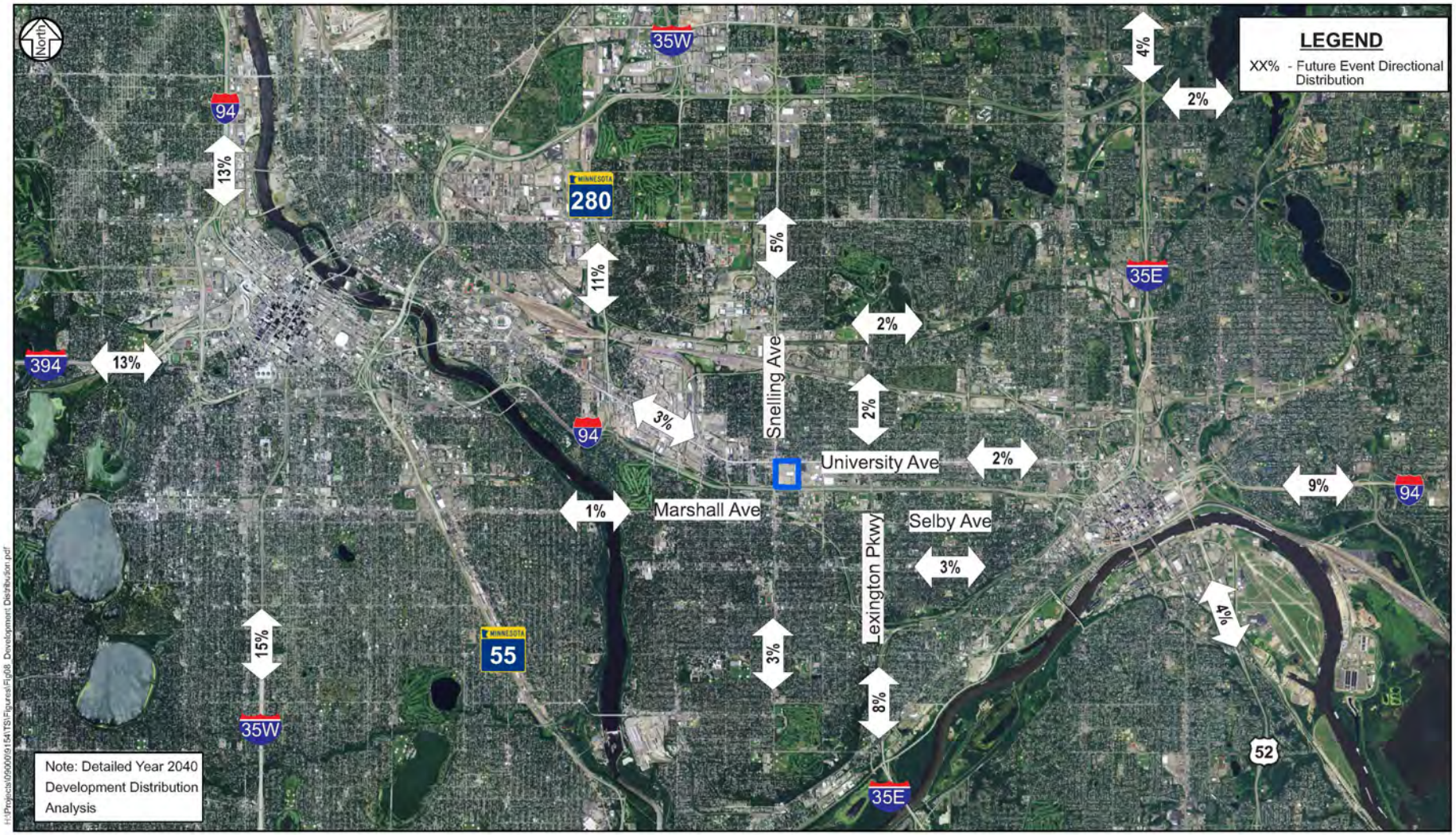
Figure 18-2



SRF Consulting Group, Inc.
0169154
April 2016

RK Midway Master Plan
Snelling Midway Stadium AUAR
City of St. Paul

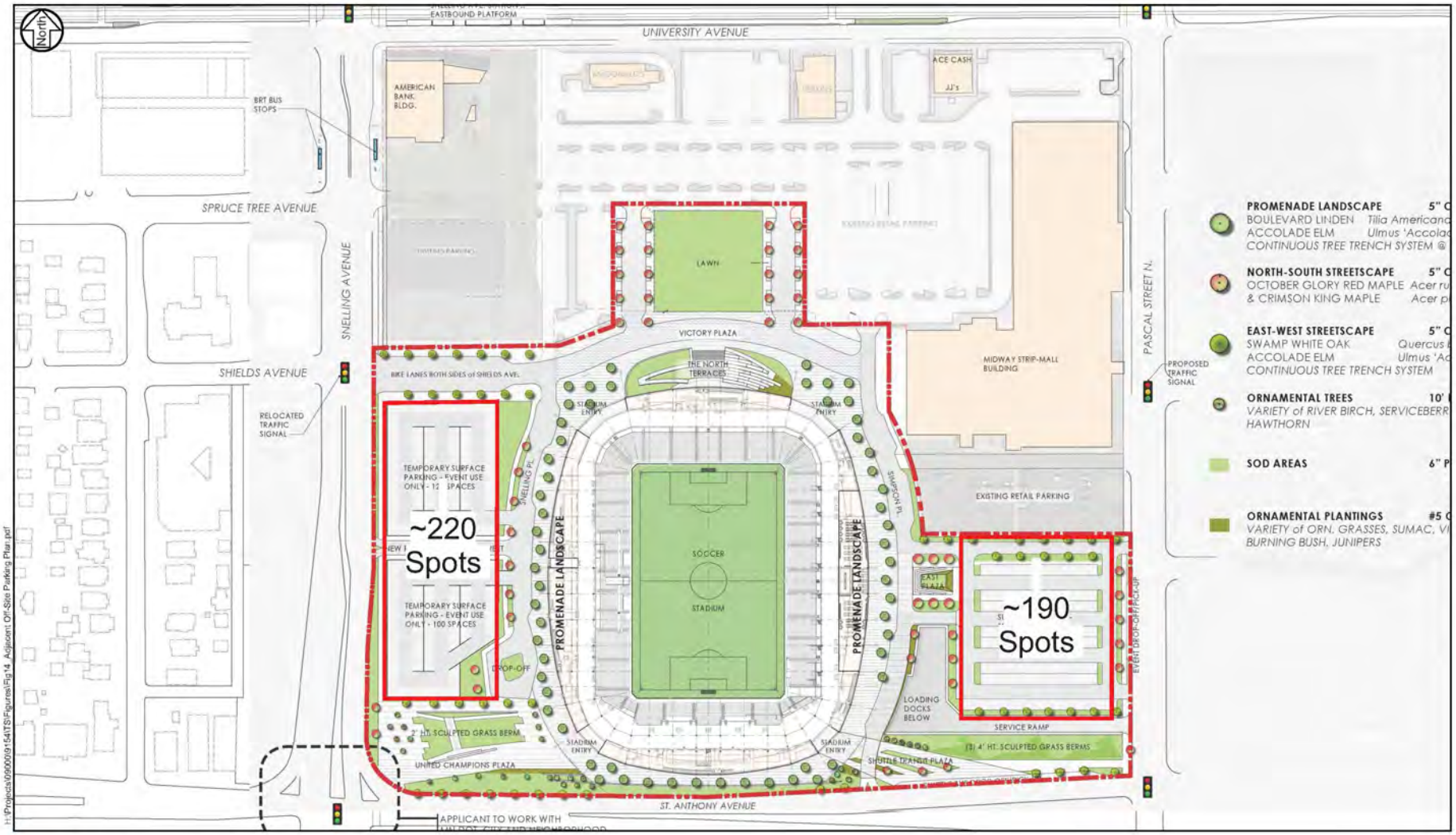
Figure 18-3



Development Distribution
Snelling Midway Stadium AUAR
City of St. Paul

SRF Consulting Group, Inc.
0169154
April 2016

Figure 18-4



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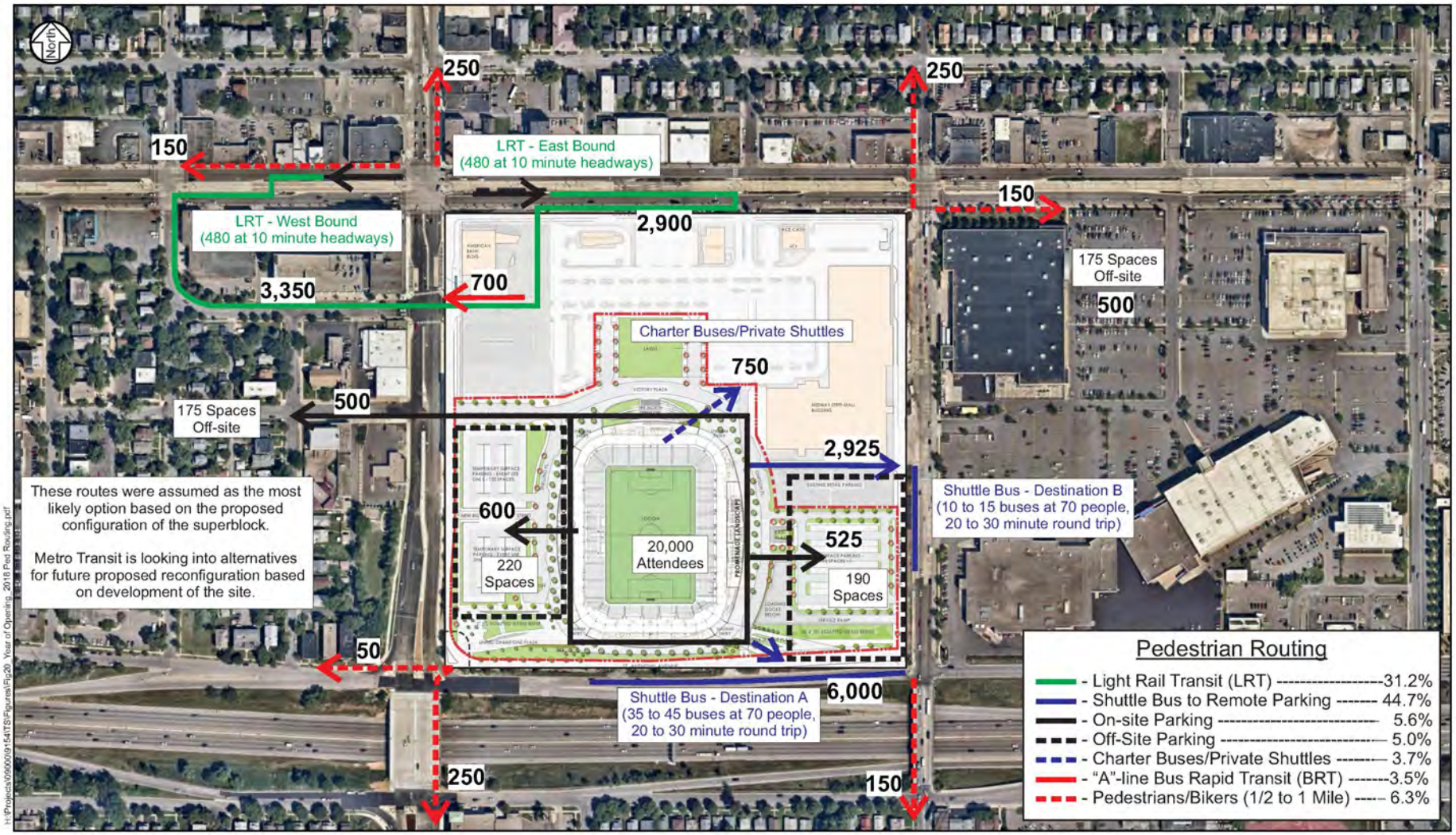
SRF Consulting Group, Inc.
0169154
April 2016

Year of Opening On-Site Parking
Snelling Midway Stadium AUAR
City of St. Paul

Figure 18-5

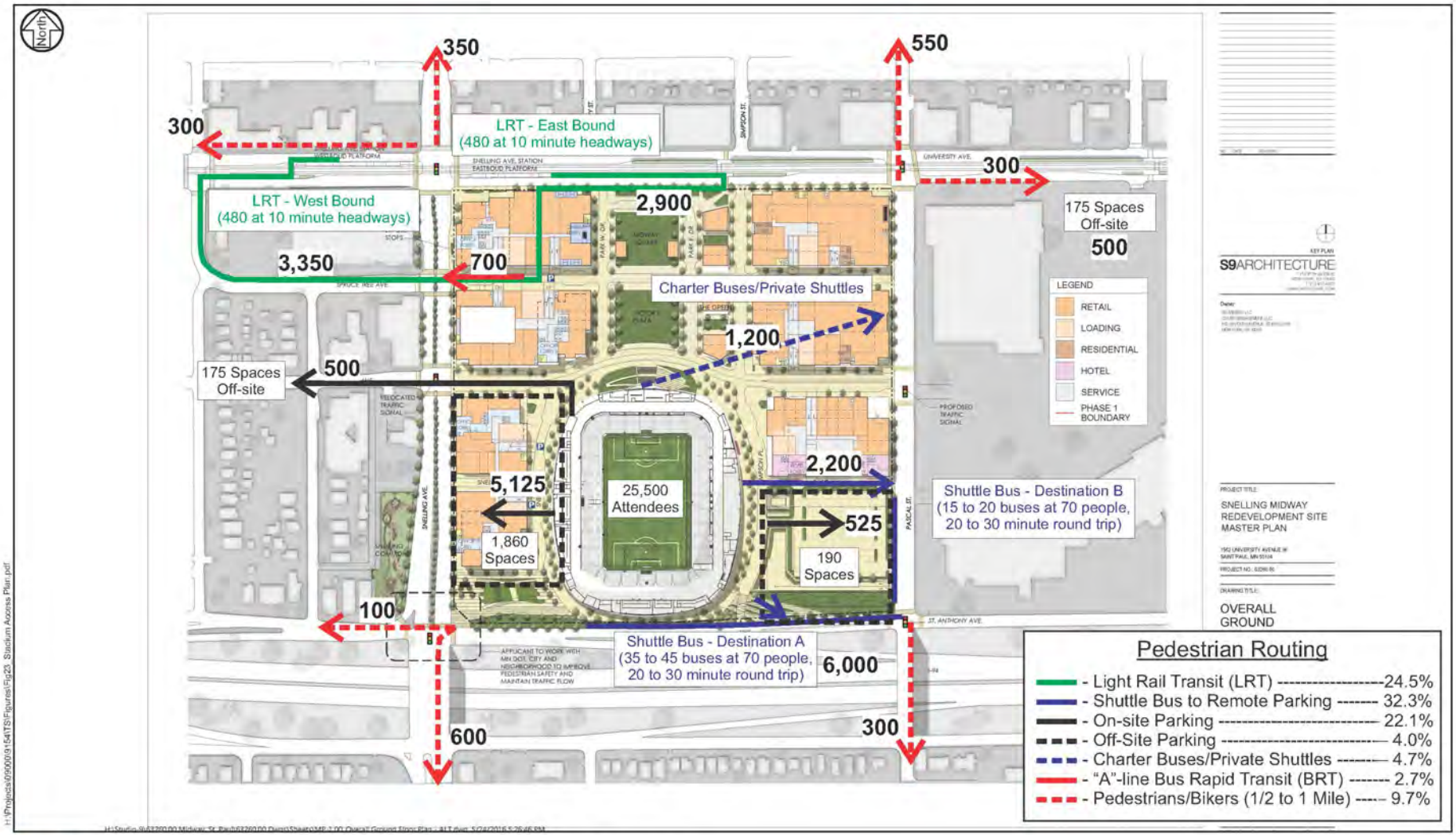


SRF Consulting Group, Inc.
0169154
April 2016

Year of Opening 2018 Event - Potential Pedestrian Routing of Capacity Event (Mode Selection - Potential Plan)

Snelling Midway Stadium AUAR
City of St. Paul

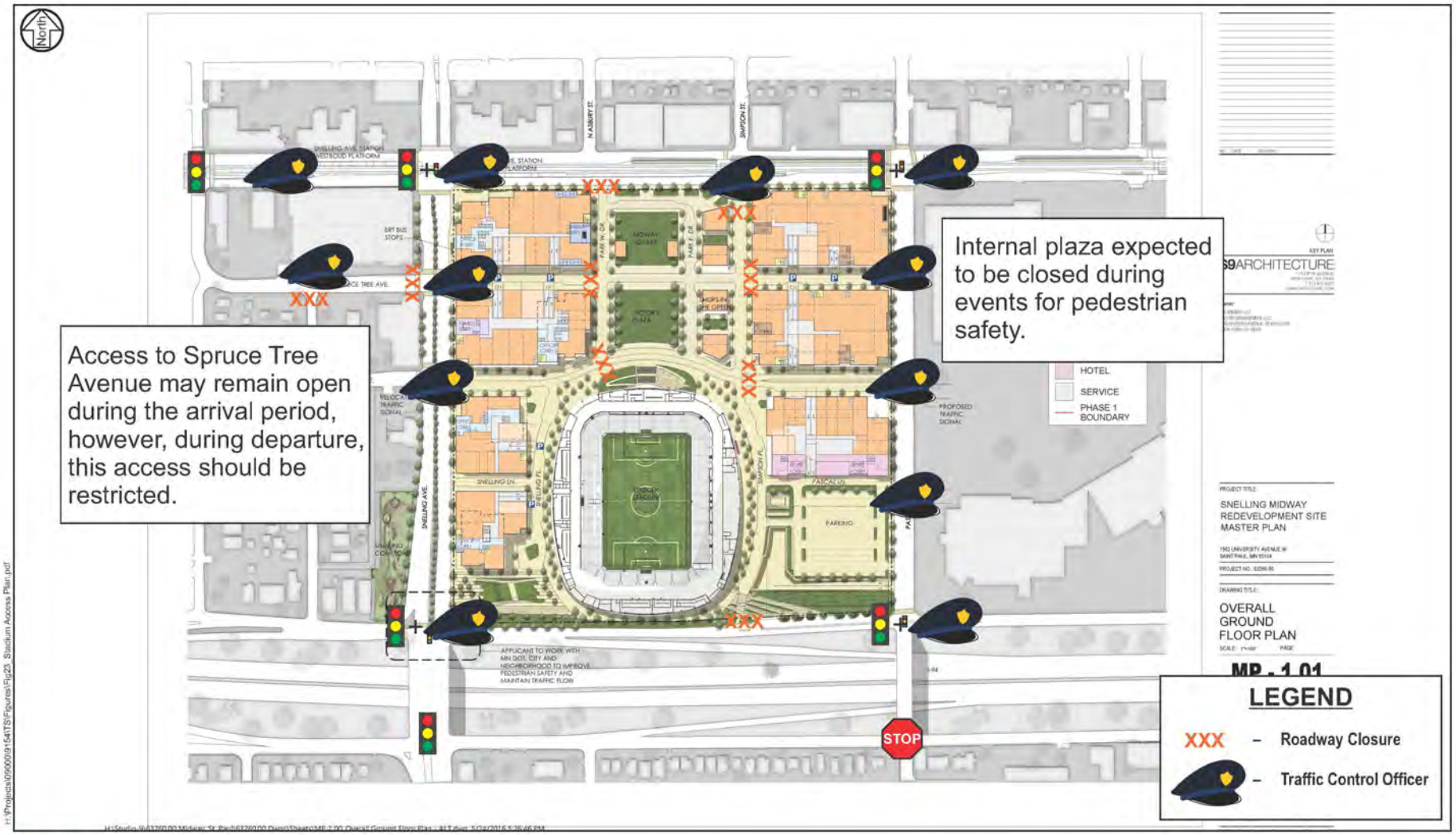
Figure 18-6



SRF Consulting Group, Inc.
0169154
April 2016

Year 2035 Event - Pedestrian Routing Capacity Event (Mode Selection - Potential Plan)
Snelling Midway Stadium AUAR
City of St. Paul

Figure 18-8



SRF Consulting Group, Inc.
0169154
April 2016

Year 2035 Event Traffic Control
Snelling Midway Stadium AUAR
City of St. Paul

Figure 18-7

Appendix B

Cultural Resources Analysis

Cultural Resource Analysis, Alternative Urban Areawide Review (AUAR) for the Proposed Minnesota United Midway Project, City of St. Paul, Ramsey County, Minnesota. MNSHPO # 2016-1711

Prepared for Stantec Consulting Services, Inc.

15 May, 2016

John G. Hodgson
Principal Investigator
Phase One Archaeological Services Inc.
5618 Hempstead Road
Madison, Wisconsin, 53711

Abstract

The following report describes the results of a cultural resources field and literature research study conducted to partially fulfill the requirements of an AUAR study for the proposed multi-use development of a 34.5-acre parcel located north of I-94 in the Township of Rose, in the City of Saint Paul, Ramsey County, Minnesota.

The proposed project will involve the demolition of the Midway Center Shopping Mall and several other structures for the proposed construction of an 18,000 seat stadium with expansion and standing room capacity to accommodate a maximum of 25,500 visitors in the AUAR area. The remainder of the site will be redeveloped in a phased manner to accommodate a mixed-use development including retail and service commercial, hospitality, residential, office, potentially institutional uses and public and private open space.

Based on the results of the investigation, the current project design will not have direct adverse effects on any currently listed NRHP listed properties located within the 34.5-acre direct APE.

While no structures are listed or currently identified as eligible for the NRHP are located within the 34.5-acre parcel, the principle investigator recommends that the MNSHPO be contacted and consulted regarding the potential eligibility of the former Midwest National Bank Building (RA-SPC-2991) for the NRHP. Despite changes to the original building exterior and interior design, this structure retains element of its original integrity that are characteristic of the modernist architectural style. RA-SPC-2991 warrants further evaluation to determine if the building is eligible for inclusion in the NRHP.

Depending on the final design plan, the principal investigator recommends consultation with SHPO regarding further study of the potential for adverse effect on structures that will require further evaluation to determine the potential that they are eligible for inclusion in the NRHP: The Central Baptist Church (RA-SPC-3224), the Bethlehem Lutheran Church (RA-SPC-3225), and the former Aston Building (RA-SPC-3910).

In addition to these three structures, one building (RA-SPC-3912), the former Quality Park Investment Building (now Midway Books) has been determined as eligible for the NRHP and nomination is in process through MNSHPO. MNSHPO should also be consulted regarding the potential for adverse effect on the structure once the construction design for the development of the project area is finalized.

Table of Contents

Figures

Introduction:

The following report describes the results of a cultural resources field and literature research study conducted to partially fulfill the requirements of an AUAR study for the proposed multi-use development of a 34.5-acre parcel located north of I-94 in the Township of Rose, in the City of Saint Paul, Ramsey County, Minnesota (Figures One and Two).

The study was initiated by Stantec Consulting in April 2016 following requirements for AUAR evaluations as outlined in Minnesota Administrative Rules 4410.3610. The study was conducted in order to determine if the proposed Minnesota United MLS Stadium and Mixed Use Urban Village project would potentially cause significant environmental impacts to occur to cultural resources located within the Area of Potential Effect (APE).

The investigation was conducted from April 25 through May 22, 2016 by a team of two individuals, John G. Hodgson (Principal Investigator [P.I.]) and Miriam L. Hernandez (Asst. to P.I.).

All aspects of the reported investigation were conducted in accordance with methodological guidelines of the *State Historical Preservation Office Manual for Archaeological Projects in Minnesota* (Anfinson 2001), the *Guidelines for History/Architecture Projects in Minnesota* (SHPO 2009), and the *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* (National Park Service [NPS]1983).

The investigation methods outlined in the above publications are endorsed by the Minnesota State Historical Preservation Office (MNSHPO) and provide the standard for conducting legislative compliance-related archaeological/cultural resource research in Minnesota.

During the investigation, databases, historical documents and other resources maintained at the Minnesota History Center and other locations were consulted for available information on previously identified cultural resources located in the APE. Cultural resources investigated during the study included archaeological sites and historical/architectural (e.g. standing structures) resources reported to be located within the immediate areas of planned construction and within a one-mile radius of the 34.5-acre parcel.

Prior to the field visit to the project location, representatives of the Minnesota State Historical Society (MSHS), the MNSHPO were consulted regarding study methods and techniques to be used during the investigation.

Database literature research was conducted at the Minnesota History Center (MHC) by Mr. Thomas Cinadr in St. Paul on March 17, 2016.

A detailed review of MNSHPO topographic maps and site/structure files was conducted in the MNSHPO office and the MHC Archives by the P. I. during several visits in May of 2016. In addition to resources at the MSHS Minnesota History Center, additional documents and sources of information were examined on-line and at the Ramsey County Historical Society in St. Paul by the P.I.

Location of Project Area:

The proposed project area is located in the City of St. Paul, Rose Township, Ramsey County, Minnesota. The project area is situated in the NW ¼ of the SW ¼ of Section 34, Township 29 North, Range 23 West (Figures One and Two).

Natural Environment and Soils

At the time of the cultural resources investigation in Spring 2016, the majority of the project area consisted of an open air shopping mall and several free-standing commercial buildings surrounded by paved parking areas. The southern project area consisted of a vacant partially paved lot covered in pavement and compacted non-naturally deposited soils with crushed gravel (Figure Five).

The general project area is located within the Mississippi River Basin. While the project area is now drained with municipal storm water systems, before urbanization, it was drained by small intermittent streams/creeks that eventually flowed into the Mississippi River (Minnesota Department of Natural Resources 2012).

The project area is located in the ecological zone of the St. Croix Outwash Plain & Stagnation Plains (MNDNR System) and Oak Savanna regions of southeastern Minnesota. At the time of Euro-American settlement and the general area consisted primarily of uplands with low rolling hills formally used as pasture and agriculture which now have been replaced by wooded residential/commercial lots and structures.

Natural soils reported for the general area are predominately loams, silt loams, and sandy loams with intermittent small areas of sands. The modern classification for the area by the NRCS is "Urban Land" (1039) (NRCS/USDA 1980). Geomorphological borings made in 2015 indicated that the area of the project also had been filled in to depths of 2-20 feet with non-natural soils and fill materials (information from Stantec representatives).

Project Description

The planned future use for the property will involve multi-use development including the construction of various facilities and commercial office buildings. At the time of writing this report, the final design plan for development was not completed but several tentative designs provide an indication of plans for construction (Figures Six-Eight).

The AUAR analyses two different development scenarios, Scenario one features a mix of residential, commercial and parking areas. Buildings will range from two to ten stories tall.

Scenario two also features mixed residential, retail and office space. The new structures will range from 70 to 290 feet tall. The scenario also features the Minnesota United MLS stadium. The proposed stadium would seat 20,000 and be located in the southern portion of the AUAR area.

Both development scenarios currently propose full redevelopment of the site and demolition of all existing structures located within the 34.5-acre parcel. Development of both scenarios would occur in phases.

Cultural Resources AUAR Investigation

The goal of the archaeological and architectural/historical cultural resources AUAR investigation was to determine whether the project area contains cultural resources that are listed in, or are potentially eligible for listing on the National Register of Historic Places (NRHP) or are significant enough for further investigation in order to determine the potential for eligibility under MN guidelines for documentation of historical resources (SHPO 2009).

The survey for the cultural resources (archaeological, architectural, and historical) investigation identified all known archaeological sites, above-ground buildings, structures, historical features/objects, landscapes, and NRHP districts within the defined direct APE (34.5-acre parcel).

The purpose of the investigation was to determine whether the proposed project area and visual APE contains any cultural resources that are listed in the NRHP or that had been identified as being eligible, or as being potentially eligible for listing on the NRHP.

After cultural resources located within the APE had been identified, a field visit was made to the proposed project area and NRHP criteria were applied to standing structures located within the direct APE (National Park Service 1983):

A. That are associated with events that have made a significant contribution in our past; or.
B. That are associated with the lives of persons significant in our past; or.
C. That embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. That have yielded or may be likely to yield information important to prehistory or history.

When the project design plans are finalized, the cultural resources identified in the AUAR to be in the indirect APE can be assessed using the above criteria as well.

Research Design and Methodology

The total area investigated consisted of the AUAR main area which was the 34.5-acre parcel. This area is the “Direct APE” assessed for direct potential for adverse effect such as demolition and physical modification by proposed project plans. In addition to Direct APE, the surrounding area was considered for potential visual or “indirect” effect. The “Indirect APE” was based on

the visual and potential for aesthetic effect for the proposed construction activities on cultural resources surrounding the 34.5-acre parcel planned for development.

Based on the findings of earlier culture resources investigations for the area such as the Central Corridor/Green Line Light Rail Project (LRT) (RCRRA 2006 and 2008) and work for the A-Line Bus route (Nelson et. Al. 2015), as well as documentation obtained from primary and secondary resources, information from previous investigations combined with the field visits to the project area in May, 2016 in most cases provided sufficient information to make decisions about which properties located within the indirect APE remained potentially eligible for listing in the NRHP.

A review of the results of earlier investigations also identified those properties that had been subjected to changes that made them no longer eligible for the NRHP due to lack of significance and/or integrity or had been razed since they had been reported to MNSHPO and require no further investigation.

Literature Investigations:

During the investigation cultural resources databases, modern and historical documents and various files at the MNSHPO, MNHS Archives and the Ramsey County Historical Society were examined to identify archaeological sites, standing structures, and other historic/cultural resources located within the boundaries of the proposed project area.

Sources examined during the investigation included 19th and 20th century plat maps for Ramsey County (Andreas 1874; Hopkins 1916. 1928) and Sanborn Fire Insurance Maps (Sanborn 1926), land use records (Ramsey County Historical Society files), descriptive histories (Castle 1912; Diers and Issacs 2007; Foote 1881) and newspaper/journal clippings etc. available at the Ramsey County Historical Society, the Minnesota Streetcar Museum and on-line.

The project area was a recreational park in the 1870s that was located to the west of a horse race track (Andreas 1874). By 1907, the area had begun to be used by streetcar companies which led to development of the entire parcel as a maintenance facility and yard for the Minneapolis Street Railway Company and the Saint Paul City Railway Company (Figures Fifty-Eight and Fifty-Nine). The streetcar facilities were replaced by the construction of new facilities in the 1940s and 1950s for gasoline powered motorized transit buses leading to the construction of bus barns that were located behind the shopping center in Areas B and C shown in Figure Five. The bus barns and supporting smaller structures on the site that were razed in 2001.

Minnesota Archaeological Inventory Database

No archaeological sites have been previously reported to be located within the immediate area of the proposed project boundaries. One archaeological site; 21-RA-0015 (Merriam Park), an Euro-American structural ruin, is reported for the adjacent section 33, Twp. 29 North and Range 23 West (Figure Sixty). The archaeological site is located outside of the proposed project area and will not be physically disturbed or subjected to other adverse effect by the planned construction activities.

Minnesota Architecture-History Inventory Database

A large number of standing structures and other locations of historical interest are reported and documented by the MNSHPO in their History/Architecture Inventory database to be located within a one-mile radius of the proposed project area (Figures Sixty-One-Seventy-One). The majority of these structures will not be impacted physically or visually by the proposed project activities and many of the buildings are not eligible for evaluation for, or inclusion in the NRHP.

Structures that were reported to be located outside of the direct APE and were selected for further consideration in the AUAR study are highlighted in yellow in Figures Sixty-One through Seventy-One. After field evaluation, the majority of these structures also were determined to either not be eligible (majority documented as not eligible for NRHP in MNSHPO files) or to be situated in areas where the potential for indirect adverse effect does not exist from the proposed project construction plans. Structures highlighted in purple are located in the direct APE and buildings highlighted in green had been razed prior to the reported study.

Project Field visits to the Investigation Area:

Direct APE

Following historical and literature research, a series of field visits were made to the proposed project area in May of 2016.

Archaeology

The entire project area is paved or covered with crushed gravel or fill deposits. While structures were present since the early 20th century and there may be intact subsurface archaeological deposits, at the time of the field investigation, it was not possible to conduct shovel testing.

Architecture/Historical Resources

Visual inspection of the project area revealed that 5 standing structures are present in the direct APE that are considered for demolition as part of the planned project.

Three of the structures located in "Area A" (See Figure Five for numerical designation of structures in project area); Structure 3-McDonalds (Figures Thirty-Eight-Forty), Structure 4-Perkins (Figures Fifteen-Sixteen and Forty-One-Forty-Two), and Structure 6-Multi-vender commercial building (Figures Forty-Three-Thirty-Four) at the project location are recent/modern commercial buildings constructed in the early 1990s and do not meet criteria for inclusion in, or further evaluation to determine eligibility for inclusion in the NHRP and no further investigations were deemed as being required prior to demolition.

Structure 2 (RA-SPC-2993) is recorded in the MNSHPO inventory of Architectural/Historical Resources and while not recorded in the inventory, the Midway Center Shopping Mall (Constructed 1954-1958) both meet the minimum age requirement for listing in the NRHP but due to changes to the exterior and interior facades and treatments of the buildings (concrete

block and faux “stucco” facades constructed since 1991) neither currently represent properties meeting conditions for inclusion in or further evaluation to determine eligibility for inclusion in the NRHP under NPS guidelines for evaluation of historic properties (NPS 1983).

The former Midwest National Bank Building (RA-SPC-2991), constructed circa 1960, is an example of modernist architecture that is located in the northwest corner of the project area at the intersection of Snelling and University Avenue (Figures Twenty-Six-Thirty-Seven). The original building has been modified with sash windows being replaced in the front facade (University Avenue) with glass and aluminum curtain walls at some time before 2005. Despite modification and remodeling, the building may be eligible for the NRHP and it is recommended that the MNSHPO be consulted regarding evaluation of the building for eligibility in the NRHP.

Indirect APE

One short-coming for the information presented in this report and one that limits fulfilling the goals of the AUAR is that the final design plans for construction and development of the Midway property were not prepared at the time of writing. For a number of cultural resources located within the potential indirect APE surrounding the 34.5-acre parcel, an assessment of the potential for adverse effect could not be made at the time of writing this report.

Depending on the final design plan, several standing structures within the immediate area of the proposed project area are of potential concern if the 5-10 story residential buildings are constructed as presented in Figures Seven and Nine. The structures recommended for further evaluation for a potential adverse effect and eligibility for the NRHP are outlined in the following section of the report.

Study Results and Recommendations:

Based on the results of the investigation, the current project design will not have direct adverse effects on any currently listed NRHP listed properties located within the 34.5-acre parcel of the main project area. The project area does not contain any currently identified archaeological sites or materials.

The principle investigator recommends that the MNSHPO be contacted and consulted for the potential eligibility of the former Midwest National Bank Building (RA-SPC-2991), despite changes to the original building design and facades etc. this structure displays integrity characteristic of the modernist architectural style and warrants further evaluation to determine if the building is eligible for inclusion in the NRHP.

If not found to be eligible, it is recommended that the building be documented and recorded with professional quality photographs of the exterior and interior of the building etc. prior to demolition.

Depending on the final design plan with special concern to planned structure height, the principal investigator recommends consultation with SHPO regarding further study of the potential for adverse effect on structures that will require further evaluation to determine the potential that

they are eligible for inclusion in the NRHP. Of special interest are the Central Baptist Church (RA-SPC-3224), the Bethlehem Lutheran Church (RA-SPC-3225), the former Aston Building (RA-SPC-3910).

In addition to these three structures, one building (RA-SPC-3912) located on University Avenue and Snelling Avenue, the former Quality Park Investment Building (now Midway Books) has been determined as eligible for the NRHP and nomination is in process through MNSHPO. MNSHPO should also be consulted regarding the potential for adverse effect on this structure.

It is important to note that any modifications to the project design may require additional investigations and a modified survey report. If changes are made to plans, personnel at the MNSHPO should be consulted to ensure that compliance standards have been met prior to any construction at the proposed site location.

In the event any archaeological materials are encountered during the project, it is recommended that all construction activities be brought to a halt and the P.I. or the MNSHPO/OSA should be consulted prior to continuing work.

Pursuant to Federal and Minnesota State laws (Statute 307.08), should grave markers or human skeletal remains be encountered during construction, all activities in the find area are required to cease immediately and the MOSA must be contacted at 612-725-2411 for further instructions.

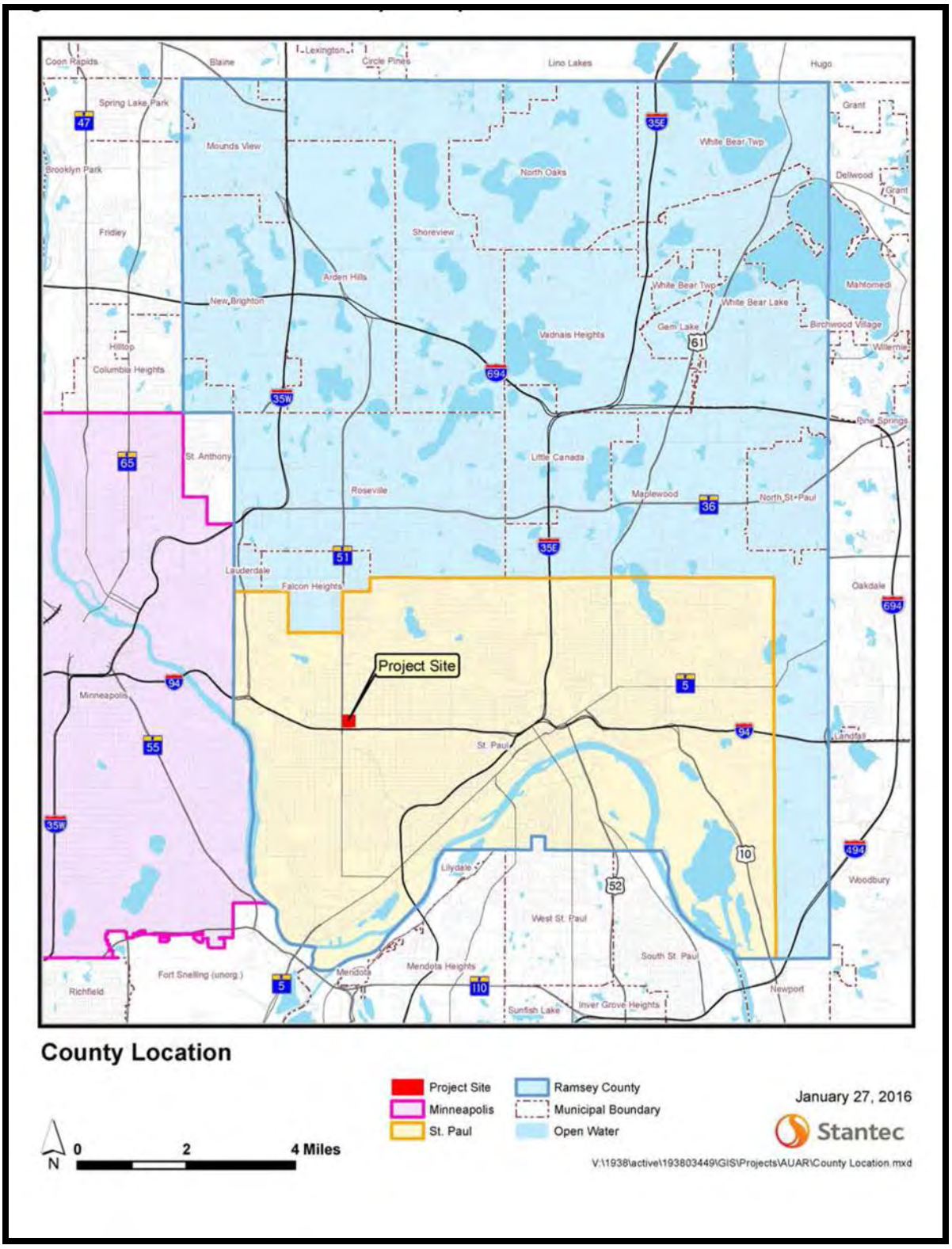


Figure One: Project location plotted in Ramsey County (Courtesy of Stantec).

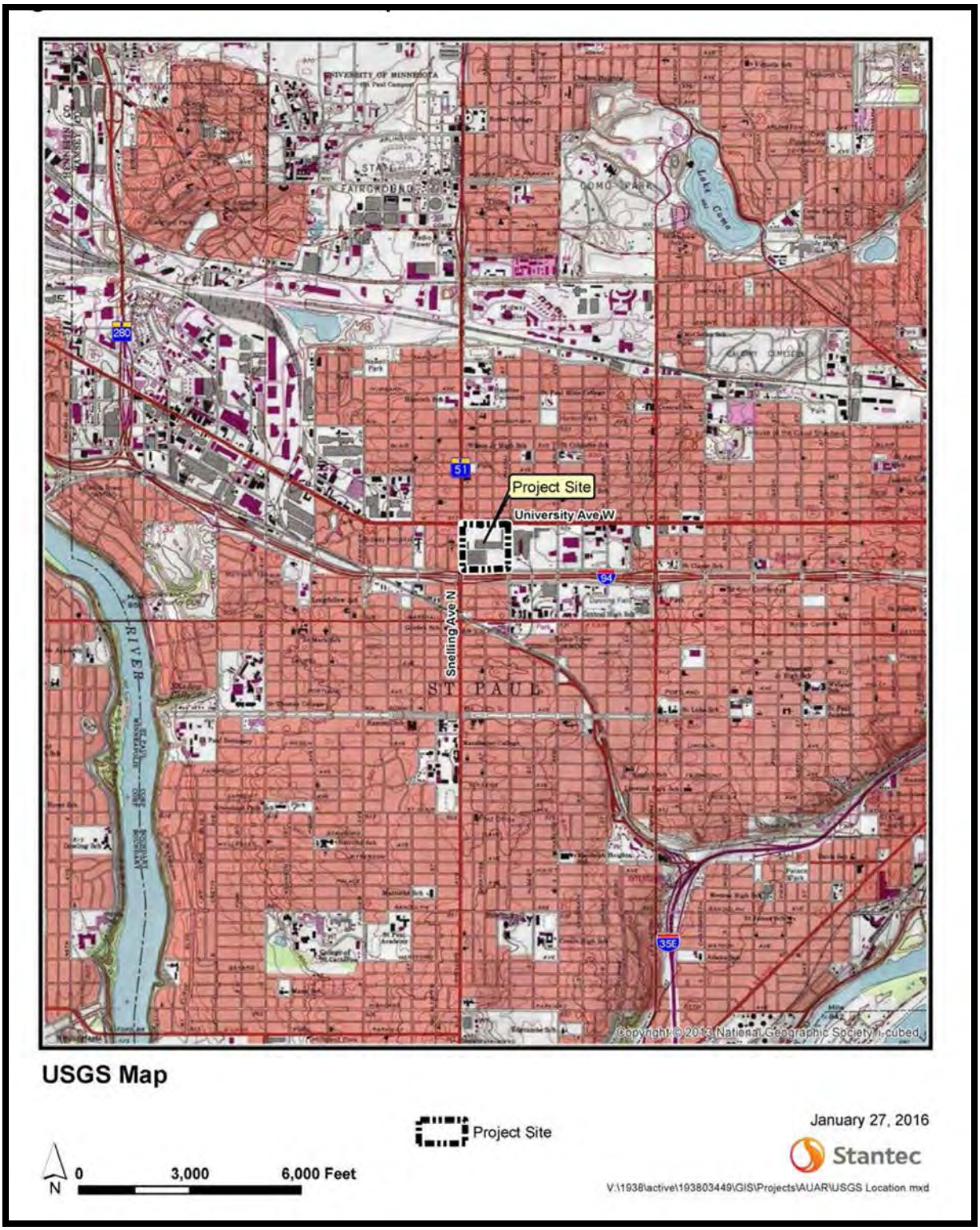


Figure Two: Project location outlined in yellow and plotted 1:24,000 scale topographic map section (USGS 1993).

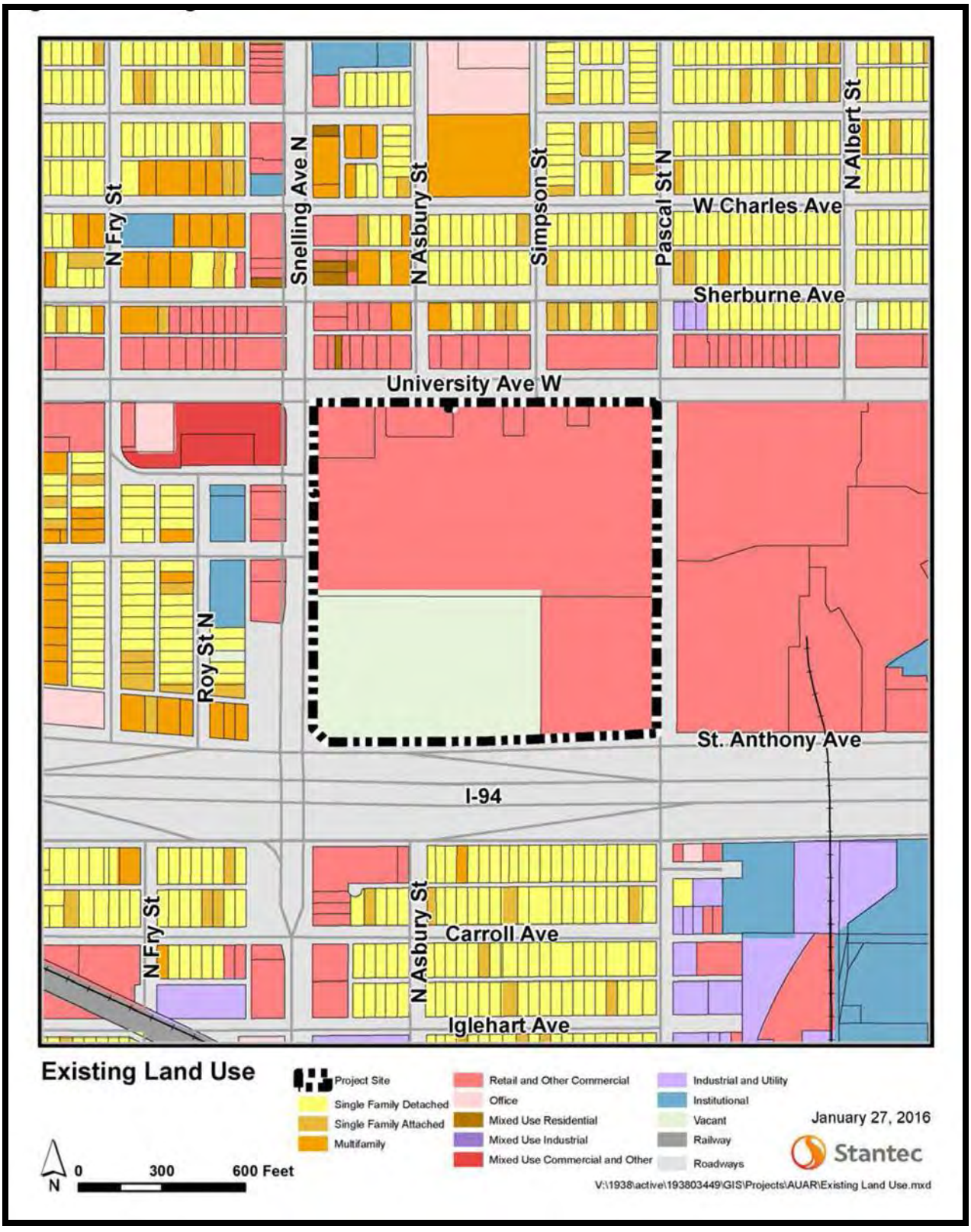


Figure Three: Project location indicating current land use and ground cover plotted on orthographic imagery (Image courtesy of Stantec).

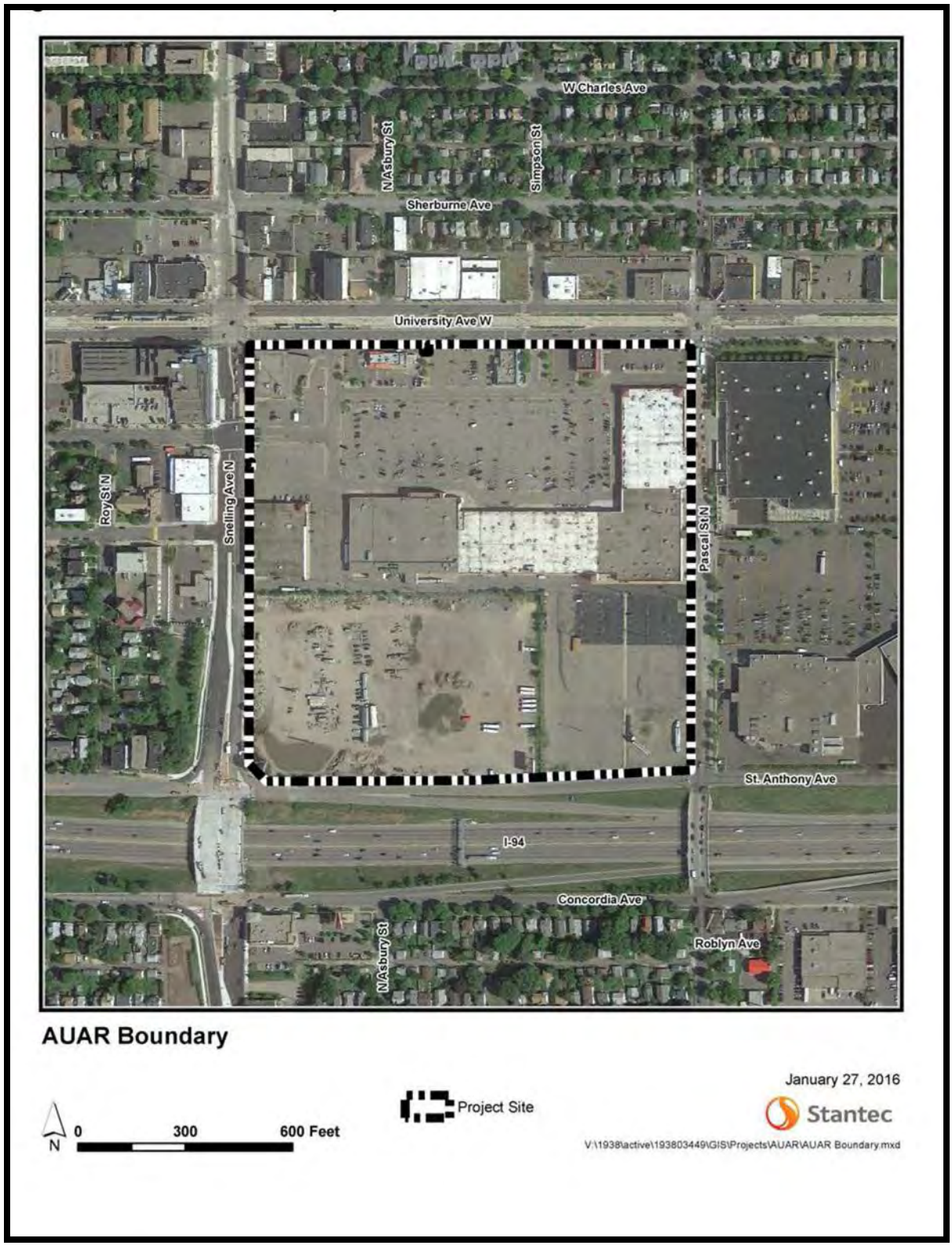


Figure Four: Project location outlined in black and white rectangle plotted on orthographic imagery (Image courtesy of Stantec).

Figure Five: Satellite image from the NRCS soil data website showing the project area with structures and reference points labeled for reference in this report (NRCS).

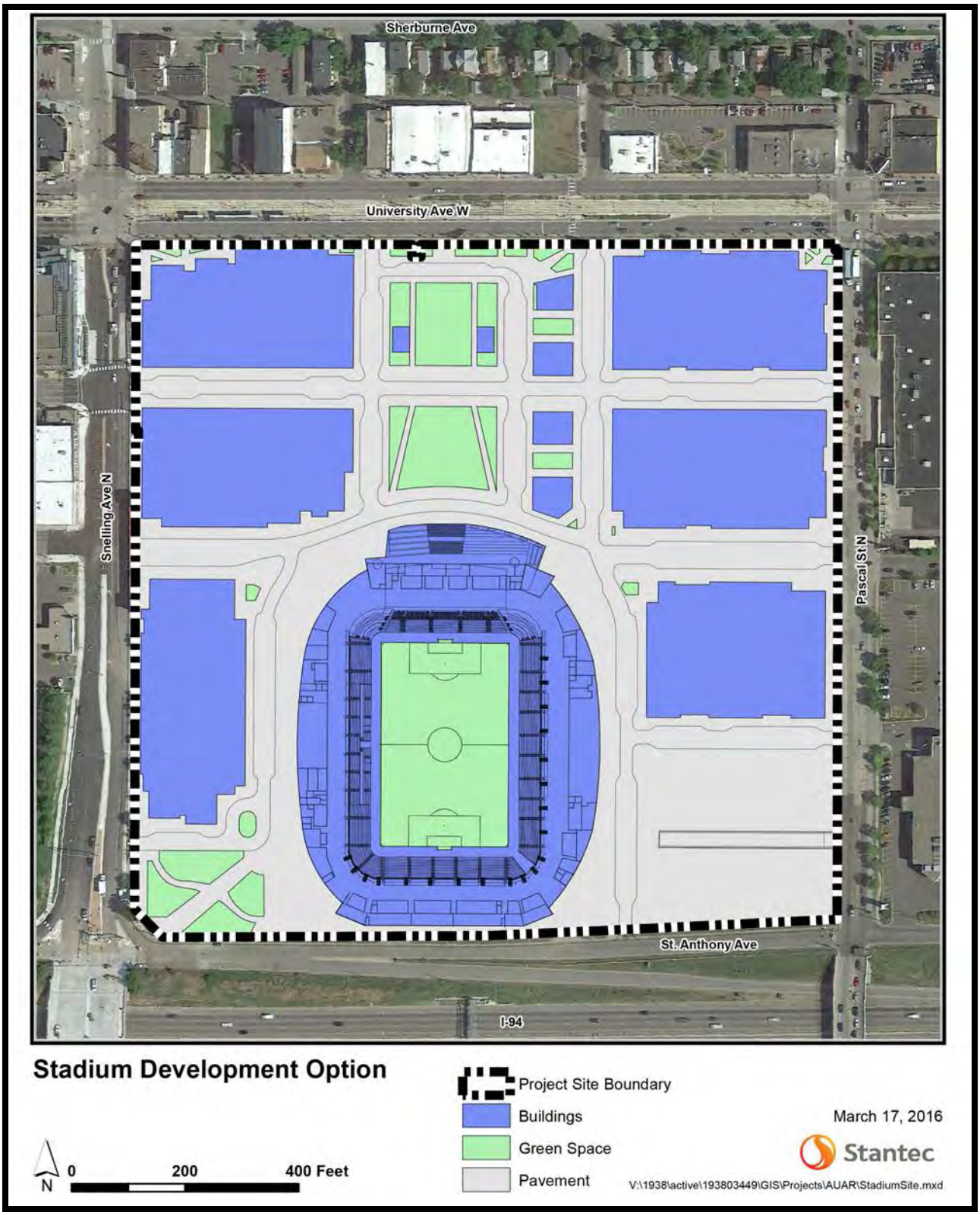


Figure Six: Tentative plans for development within the investigated area (Image courtesy of Stantec).

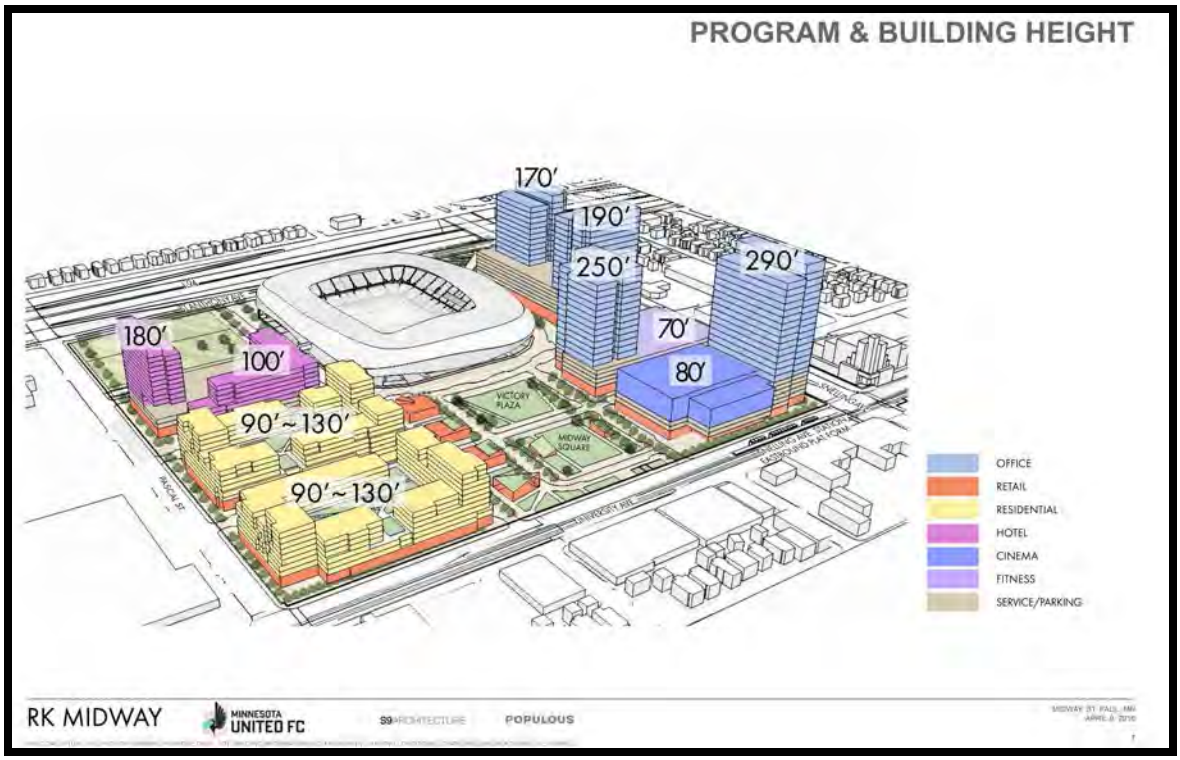


Figure Seven: Tentative plans for property development. View to southwest. (Image courtesy of Stantec).

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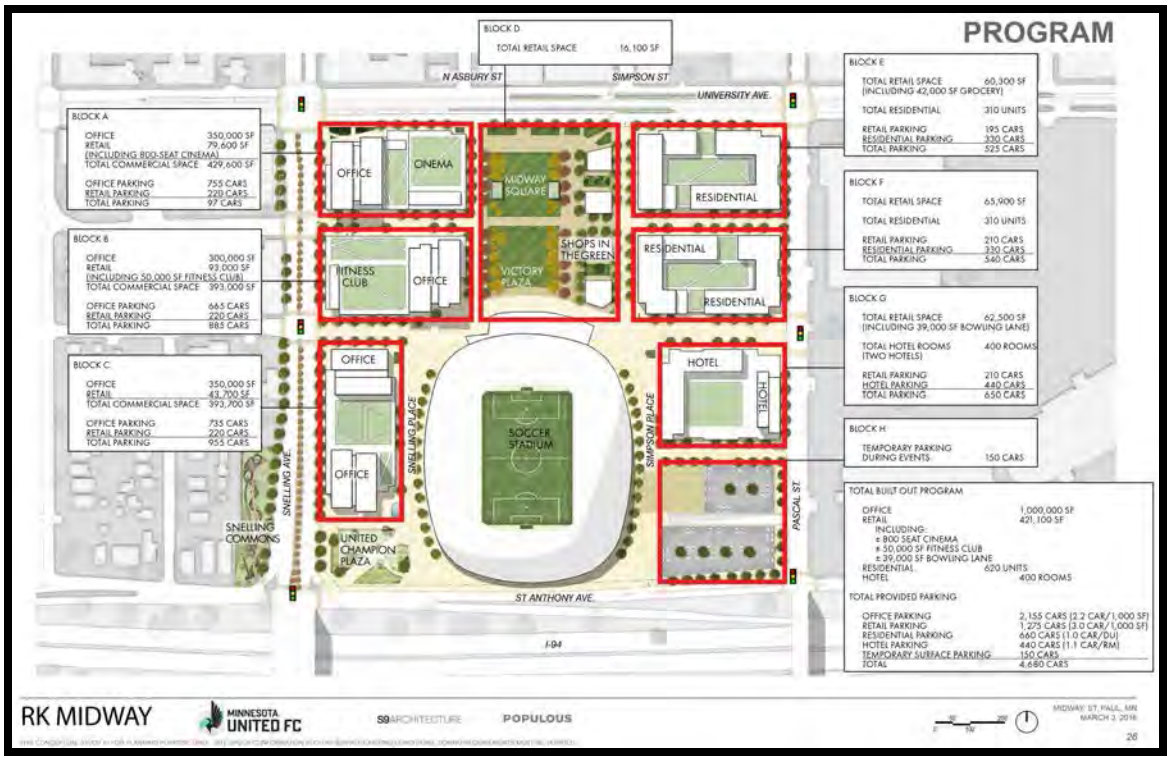

Figure Eight: Detailed tentative plans for development of the investigated area (Image courtesy of Stantec).

Figure Nine: Conceptual image with view to the southwest of the project area after development (Image courtesy of Stantec).

Figure Ten: View to west from 1600 University Avenue (Spruce Tree Centre) of project area and the Midway Center Shopping Mall in 1991 (Library of Congress Image-Public Domain).

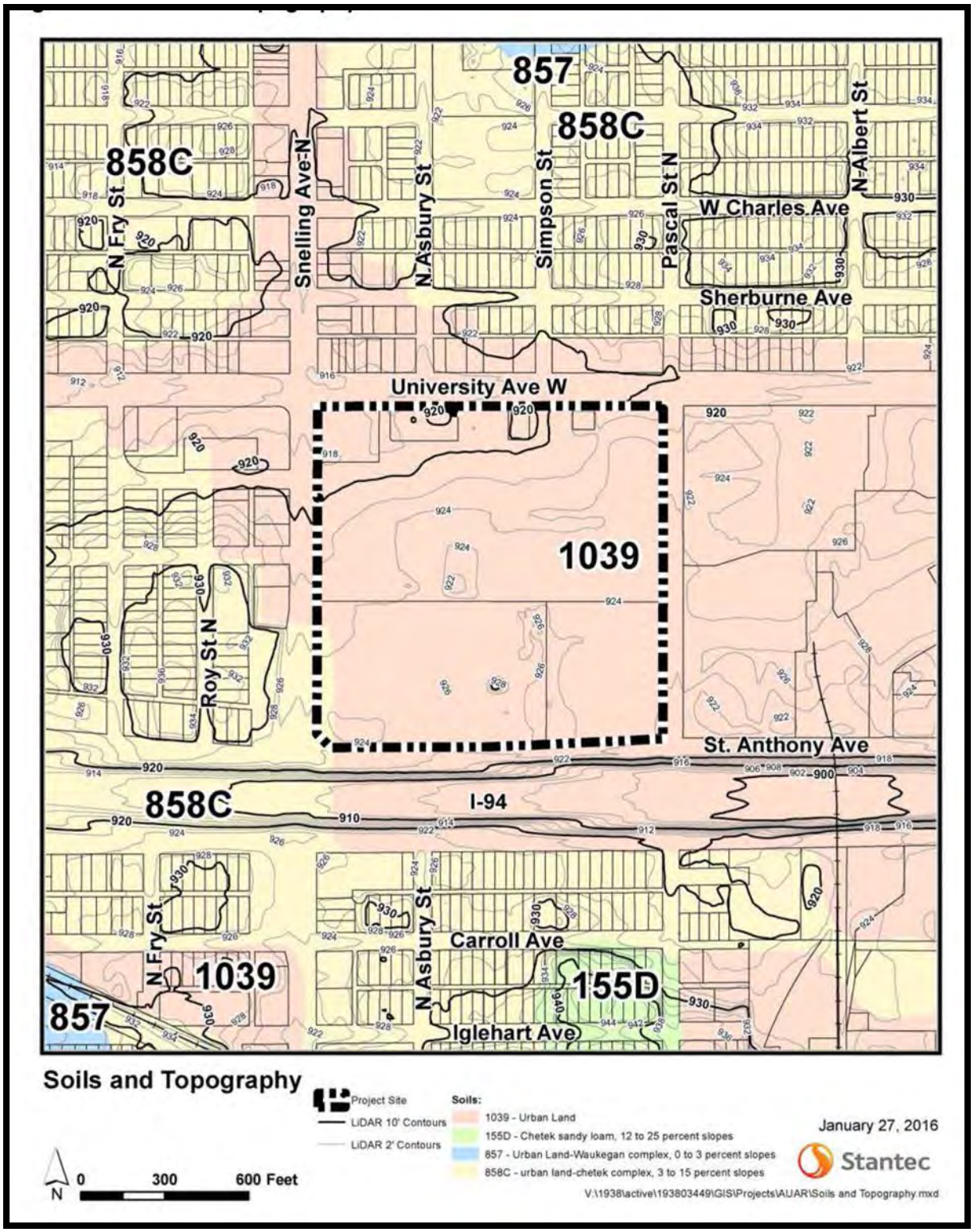

Figure Eleven: Soil information for the proposed Project location (Image courtesy of Stantec).

Figure Twelve: Front (northern) elevation of the Midway Center Shopping Mall (Structure 5 in Figure Five) showing post 1991 façade, paved parking areas and signage. View to south.

Figure Thirteen: Front (northern) elevation of the Midway Center Shopping Mall (structure 5 in Figure Five) showing post-1991 facade and signage. View to southeast.

Figure Fourteen: Main parking area of the Midway Center Shopping Mall (structure 5 in Figure Five) View to southeast.

Figure Fifteen: Main parking area of the Midway Center Shopping Mall (structure 5 in Figure Five) to right and southern portion of Structure 4. View to east.

Figure Sixteen: Front elevation (west) of Structure 4 (Figure Five) View to east.

Figure Seventeen: Main parking area of Structure 4 View to northeast towards University Avenue.

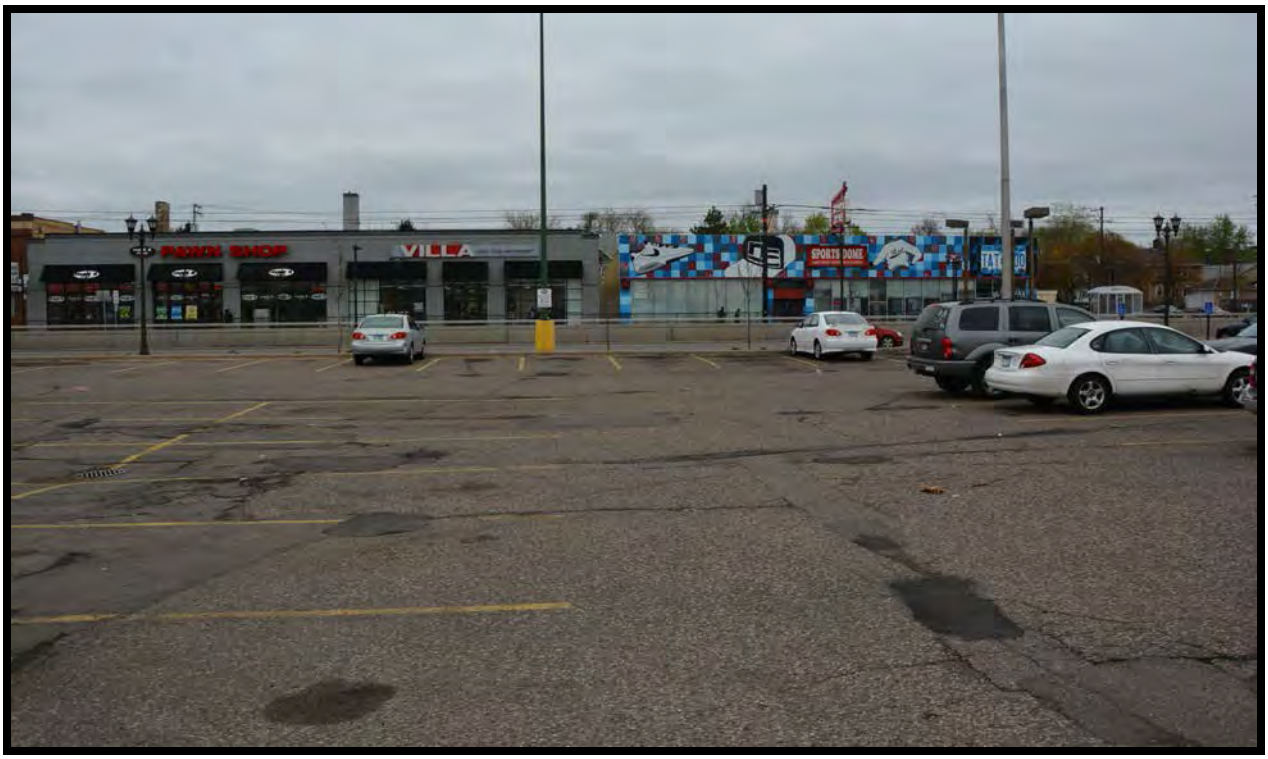

Figure Eighteen: Main parking area of Structure 4 View to north towards University Avenue.

Figure Nineteen: Main parking area of Structure 4 View to northwest towards University Avenue.

Figure Twenty: Overflow parking area of the Midway Center Shopping Mall and southern area of Structure 3.

Figure Twenty-One: Overflow parking area of the Midway Center Shopping Mall and eastern area of Structure 3..

Figure Twenty-Two: Main parking area of the Midway Center Shopping Mall (Structure 5). View to southwest.

Figure Twenty-Three: Main parking area of the Midway Center Shopping Mall (Structure 5 in Figure Five) View to southeast.

Figure Twenty-Four: Front (northern) elevation of Structure 2. View to south/southwest.

Figure Twenty-Five: Overflow parking area of the Midway Center Shopping Mall and western area of Area C in Figure Five. View to northwest of Spruce Tree Centre.

Figure Twenty-Six: Front (North) elevation of the former Midwest National Bank Building (Structure 1) . View to southeast from the intersection of Snelling and University Avenues.

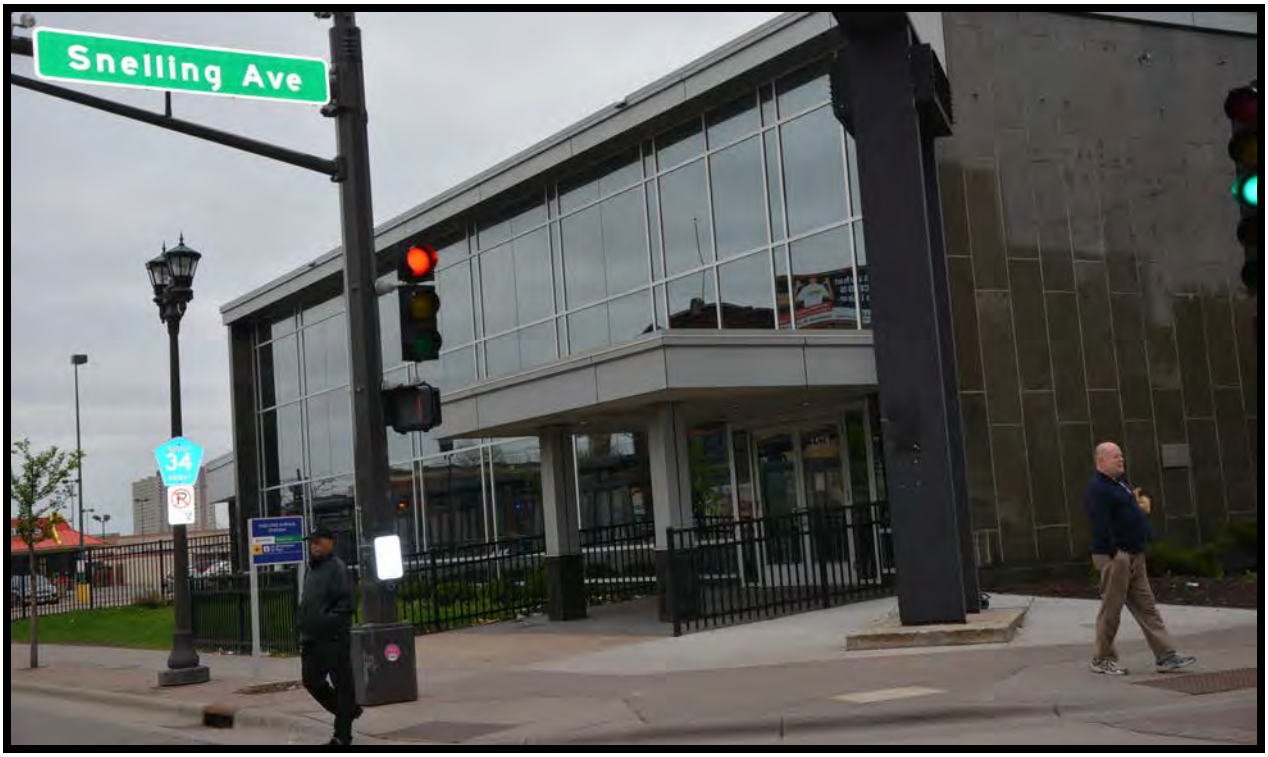

Figure Twenty-Seven: Front (North) elevation of the former Midwest National Bank Building (Structure 1) . View to southeast from the intersection of Snelling and University Avenues.

Figure Twenty-Eight: Detail of front (North) elevation of the former Midwest National Bank Building (Structure 1). View to west/southwest towards the intersection of Snelling and University Avenues.

Figure Twenty-Nine: Front (North) elevation of the former Midwest National Bank Building (Structure 1) . View to south with the intersection of Snelling and University Avenues to the right.

Figure Thirty: Rear (south) elevation of the former Midwest National Bank Building (Structure 1). View to northwest toward the intersection of Snelling and University Avenues.

Figure Thirty-One: Detail of rear (south) elevation of the former Midwest National Bank Building (Structure 1). View to north toward the intersection of Snelling and University Avenues.

Figure Thirty-Two: Eastern elevation of the former Midwest National Bank Building (Structure 1). View to west showing drive-through lanes and parking area.

Figure Thirty-Three: Eastern elevation of the former Midwest National Bank Building (Structure 1). View to west/northwest showing drive-through lanes and parking area.

Figure Thirty-Four: Eastern and northern elevation of the former Midwest National Bank Building (Structure 1). View to southwest from University Avenue.

Figure Thirty-Five: Western elevation of the former Midwest National Bank Building (Structure 1). View to northeast from Snelling Avenue.

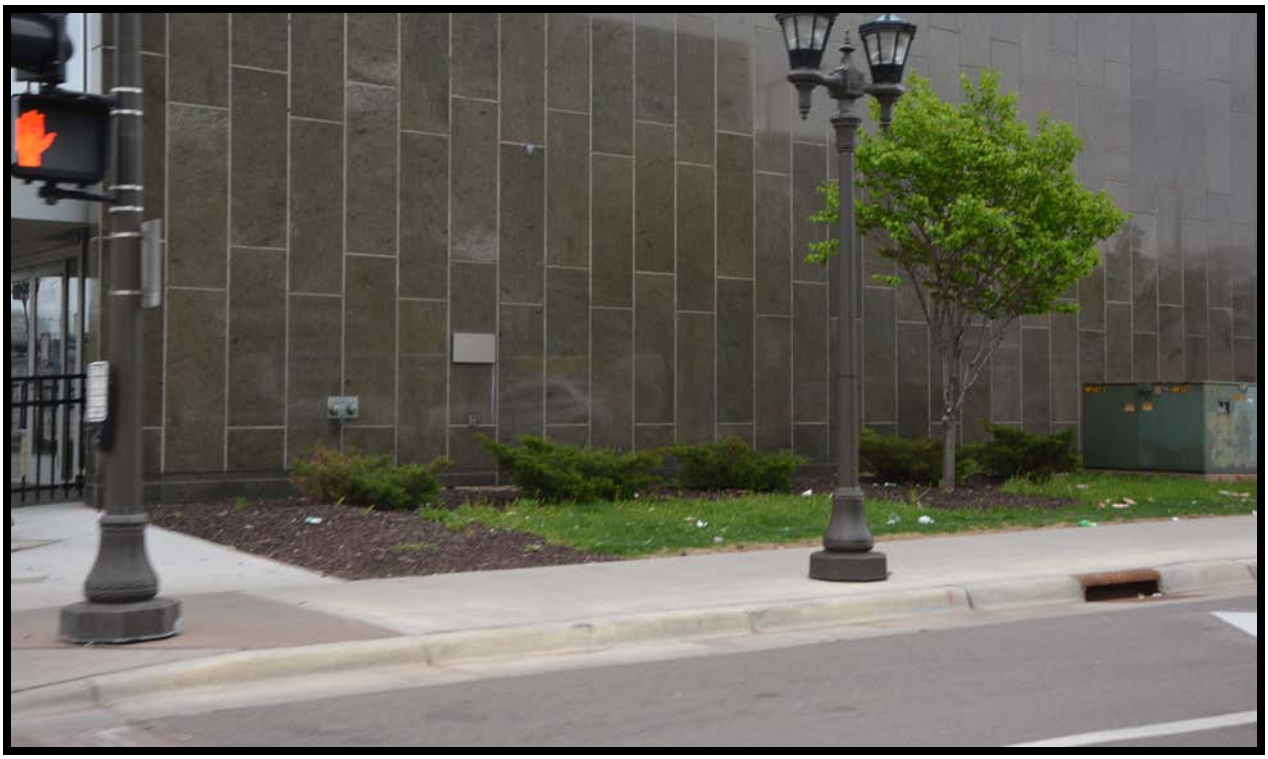

Figure Thirty-Six: Northern area of the western elevation of the former Midwest National Bank Building (Structure 1). View to southeast from Snelling Avenue.

Figure Thirty-Seven: Southern areas of the western elevation of the former Midwest National Bank Building (Structure 1). View to southeast from Snelling Avenue.

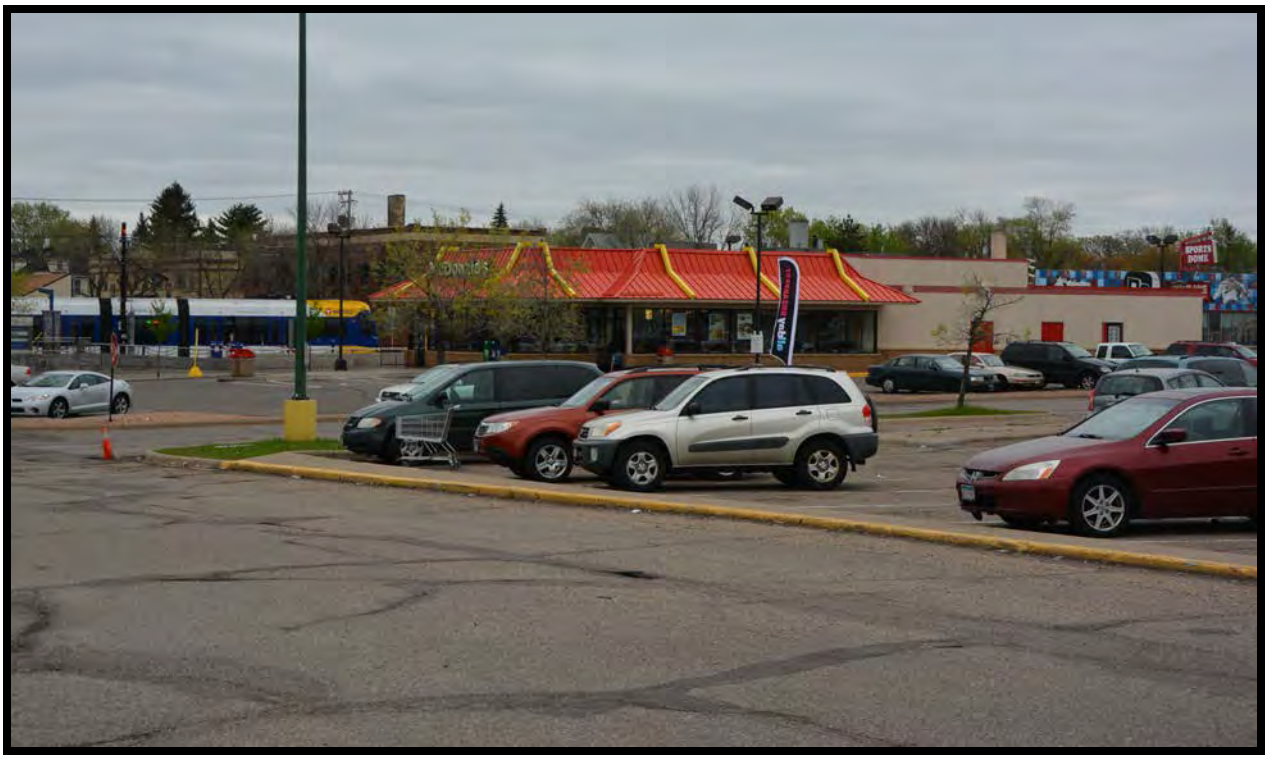

Figure Thirty-Eight: Southern elevation of Structure 3. View to northeast.

Figure Thirty-Nine: Northern and western (front) elevations of Structure 3. View to southeast.

Figure Forty: Western (front) elevation of Structure 3. View to east.

Figure Forty-One: Western (front) elevation of Structure 4. View to east.

Figure Forty-Two: Eastern (rear) elevation of Structure 4. View to west.

Figure Forty-Three: Western elevation of Structure 6. View to east/southeast.

Figure Forty-Four: Eastern elevation of Structure 6. View to west/southwest.

Figure Forty-Five: Front elevation (western) of the eastern wing of Structure 5. View to east/southeast.

Figure Forty-Six: Northern elevation of the eastern wing of Structure 5. View to south.

Figure Forty-Seven: Eastern elevation of the eastern wing of Structure 5. View to north/northwest from Pascal St.

Figure Forty-Eight: Eastern terminus of AUAR area. View to north/northwest from Pascal St.

Figure Forty-Nine: Eastern elevation of the eastern wing of Structure 5. View to southwest on Pascal St.

Figure Fifty: Eastern terminus of AUAR area (eastern edge of "Area B" in Figure Five). View to north/northeast of parking area and Pascal St.

Figure Fifty-One: Southern terminus of AUAR area (southern edge of "Area B" in Figure Five). View to southwest of St. Anthony Avenue from Pascal St.

Figure Fifty-Two: Eastern terminus of AUAR area (eastern edge of "Area B" in Figure Five). View to southwest of parking area from Pascal St.

Figure Fifty-Three: Southern terminus of AUAR area (southern edge of "Area B" in Figure Five). View to west of parking area and Area A in Figure Five.

Figure Fifty-Four: North central area of Area A. View to northwest of parking area (former bus barns).

Figure Fifty-Five: North central area of Area A. View to north of former bus barn location and southern (rear) elevation of Structure 5.

Figure Fifty-Six: North central area of Area A. View to southwest of former bus barn location.

Figure Fifty-Seven: North central area of Area A. View to northeast of the southern (rear) elevation of Structure 5.

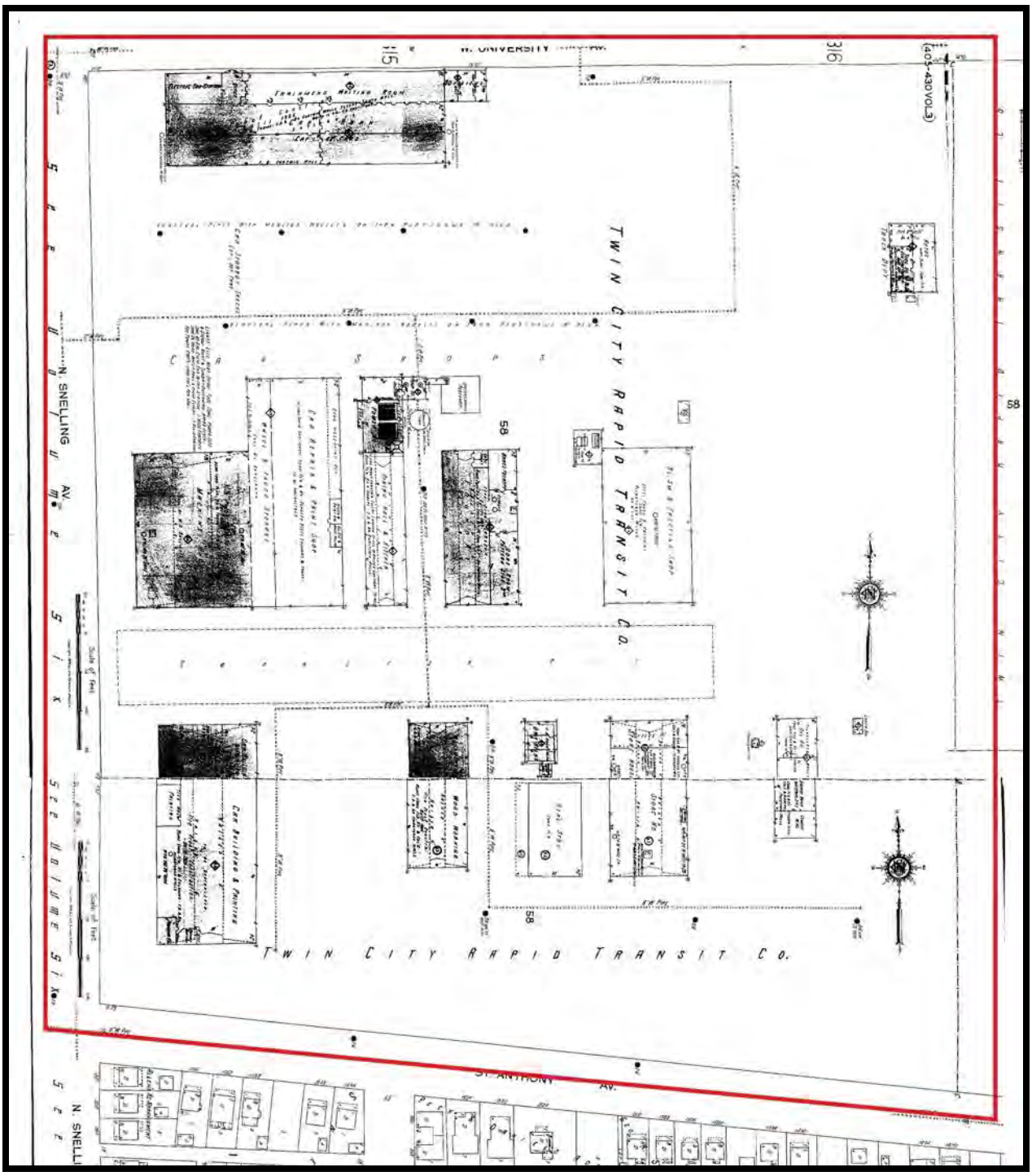

Figure Fifty-Eight: Sanborn map showing AUAR area in 1926 when the area served as the principle yard and facility for the Twin City Rapid Transit Company (Sanborn 1926).

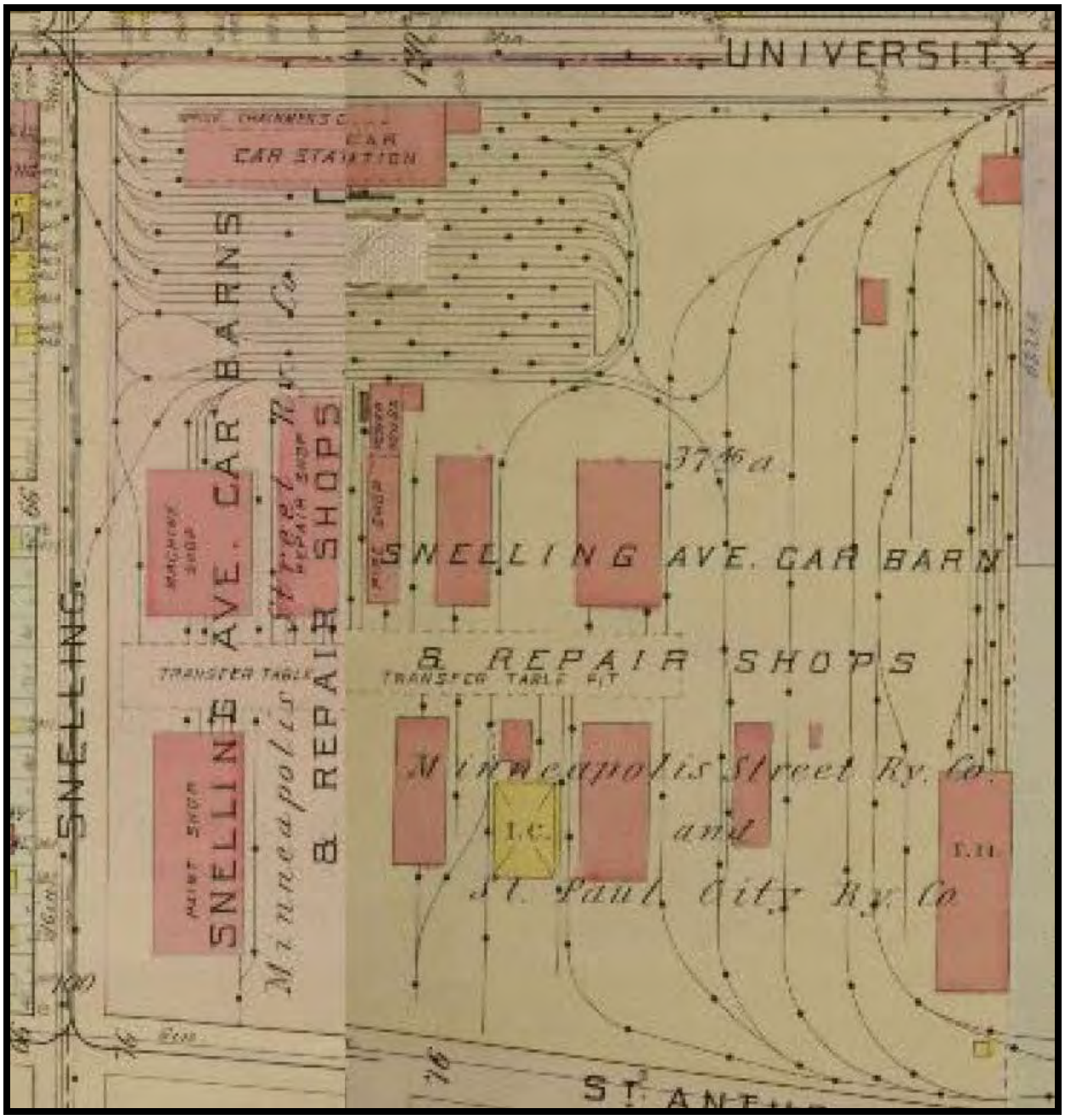

Figure Fifty-Nine: Plat book section showing AUAR area in 1916 when the area served as the principle yard and facility for the Snelling Avenue Streetcar barns and maintenance facilities of the Minneapolis Street Railway Company and the St. Paul City Railway Company (Hopkins 1916).

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Archaeological Site Locations

Site Number	Site Name	Twp.	Range	Sec.	Quarter Sections	Acres	Phase	Site Description	Tradition	Context	Reports	NR	CEF	DOE
County: Ramsey														
21RA0015	Merriam Park	29	23	33	N-NW-SW	2.5	0, 8	AS, SR		Ur-1				

Thursday, March 17, 2016 *Page 1 of 1*

Figure Sixty: Results of the literature search conducted for previously reported archaeological sites located within a one-mile search radius of the AUAR (MNSHPO).

History/Architecture Inventory

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY: Hennepin											
CITY/TOWNSHIP: Minneapolis											
commercial building (Jungle Theater)	2945-2951 Lyndale Ave. S	29	23	34	SW-SW	Minneapolis South	HE-2004-9H		Y		HE-MPC-5116
commercial building (Jungle Theater)		29	23	34	SW-SW	Minneapolis South	HE-2004-8H		Y		HE-MPC-5116
commercial building (Jungle Theater)		29	23	34	SW-SW	Minneapolis South	HE-2006-10H		Y		HE-MPC-5116
COUNTY: Ramsey											
CITY/TOWNSHIP: St. Paul											
Woodrow Wilson Senior High	631 Albert St. N	29	23	34	NENW	Saint Paul West	RA-81-2H				RA-SPC-0044
house	424 Beacon Ave. N	29	23	33	NWSE	Saint Paul West	RA-81-2H				RA-SPC-0315
James R. McCoy House	450 Beacon Ave. N	29	23	33	NWSE	Saint Paul West	RA-81-2H				RA-SPC-0316
St. Columba School	1330 Blair Ave. W	29	23	34	NWNE	Saint Paul West	RA-81-2H				RA-SPC-0353
Thomas Nicholsen House	1447 Blair Ave. W	29	23	34	NENW	Saint Paul West	RA-81-2H				RA-SPC-0354
Alexander W. McCrea House	1661-63 Blair Ave. W	29	23	33	NENE	Saint Paul West	RA-81-2H				RA-SPC-0355
Lena Howard House	1672 Blair Ave. W	29	23	33	NENE	Saint Paul West	RA-81-2H				RA-SPC-0356
house	1754 Blair Ave. W	29	23	33	NWNE	Saint Paul West	RA-81-2H				RA-SPC-0357
house	1780 Blair Ave. W	29	23	33	NWNE	Saint Paul West	RA-81-2H				RA-SPC-0358
house	1829 Carroll Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-0480
J.J. McDonald House	1857 Carroll Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-0481
house	1875 Carroll Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-0482
Alvah B. Bell House	1888 Carroll Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-0483
house	1902 Carroll Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-0484

Figure Sixty-One: Page one for results of a literature search for previously reported History/Architectural Inventory cultural resources located within a one-mile search radius of the AUAR (MNSHPO).

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY: Ramsey											
CITY/TOWNSHIP: St. Paul											
Mark & Mary Fay House	1921 Carroll Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-0485
George J. Pilkington House	1940-1942 Carroll Ave. W	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-0486
house	1984 Carroll Ave. W	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-0487
house	1996 Carroll Ave.	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-0488
Annie Martin House	2018 Carroll Ave. W	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-0489
house	2052 Carroll Ave. W	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-0490
J.C. Fleischer House	1119 Charles Ave. W	29	23	34	SENE	Saint Paul West	RA-81-2H				RA-SPC-0585
Northern Pacific Beneficial Association Hospital	1515 Charles Ave. W	29	23	34	SWNW	Saint Paul West	RA-81-2H				RA-SPC-0586
house	1230 Concordia Ave. W	29	23	34	SWSE	Saint Paul West	RA-81-2H				RA-SPC-0792
house	1492 Concordia Ave. W	29	23	34	SWSW	Saint Paul West	RA-81-2H				RA-SPC-0793
house	382 & 394 Dewey St. N	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1070
William & Mattie Hillman House	396 Dewey St. N	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1071
Reverand Leander Lane House	403 Dewey St. N	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1072
house	428 Dewey St. N	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1073
house	432 Dewey St. N	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1074
house	436 Dewey St. n	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1075
John W. Shugard House	442 Dewey St. N	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1076
house	399 Dewey St. N	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1081
house	1217 Edmund Ave. W	29	23	34	SWNE	Saint Paul West	RA-81-2H				RA-SPC-1155
Claus & Minnie Schuldt House	1259 Edmund Ave. W	29	23	34	SWNE	Saint Paul West	RA-81-2H				RA-SPC-1156
house	1401 Edmund Ave. W	29	23	34	SENW	Saint Paul West	RA-81-2H				RA-SPC-1157
commercial building	451 Fairview Ave. N	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1250
house	612 Fairview Ave. N	29	23	33	NENW	Saint Paul West	RA-81-2H				RA-SPC-1251

Figure Sixty-Two: Page two for results of the literature search conducted for previously reported History/Architectural Inventory cultural resources located within a one-mile search radius of the AUAR (MNSHPO).

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY: Ramsey											
CITY/TOWNSHIP: St. Paul											
J.W. Wallace House	634 Fairview Ave. N	29	23	33	NENW	Saint Paul West	RA-81-2H				RA-SPC-1252
house	680 Fairview Ave. N	29	23	33	NENW	Saint Paul West	RA-81-2H				RA-SPC-1253
M.B. Watson House	1842 Feronia Ave. W	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1276
house	1896 Feronia Ave. W	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1277
Henry W. Carter House	1910-1912 Feronia Ave. W	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1278
house	1917 Feronia Ave. W	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1279
house	1920 Feronia Ave. W	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1280
hotel	1921-1923 Feronia St. W	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1281
house	1928 Feronia Ave. W	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-1282
Crosby Block	1956 Feronia Ave. W	29	23	33	NWSW	Saint Paul West	RA-81-2H				RA-SPC-1283
house	665 Fry St. N	29	23	33	NENE	Saint Paul West	RA-81-2H				RA-SPC-1416
St. Paul Water Department Store House	289 Hamline Ave. N	29	23	34	SESW	Saint Paul West	RA-81-2H				RA-SPC-1690
First Swedish Methodist Episcopal Church	540 Hamline Ave. N	29	23	34	SENW	Saint Paul West	RA-81-2H				RA-SPC-1691
house	435 Hersehel St.	29	23	33	NWSE	Saint Paul West	RA-81-2H				RA-SPC-1745
The Herschel	467-469 Herschel St. N	29	23	33	NWSE	Saint Paul West	RA-81-2H				RA-SPC-1746
house	1467 Iglehart Ave. W	29	23	34	SWSW	Saint Paul West	RA-81-2H				RA-SPC-1888
apartment	1752 Iglehart Ave. W	29	23	33	SWSE	Saint Paul West	RA-81-2H				RA-SPC-1889
Osmer C.Sheldon House	1797 Iglehart Ave. W	29	23	33	SWSE	Saint Paul West	RA-81-2H				RA-SPC-1890
house	1842 Iglehart Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-1891
house	1844 Iglehart Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-1892
Olivet Congregational Church	1850 Iglehart Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-1893
house	1873 Iglehart Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-1894
Triune Masonic Lodge	1898 Iglehart Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H	Y			RA-SPC-1895

Figure Sixty-Three: Page three for results of a literature search conducted for previously reported History/Architectural Inventory cultural resources located within a one-mile search radius of the AUAR (MNSHPO).

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY: Ramsey											
CITY/TOWNSHIP: St. Paul											
house	1905 Iglehart Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-1896
house	1911 Iglehart Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-1897
Edward Drew House	1914 Iglehart Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-1898
Collett House	1919 Iglehart Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-1899
house	1923 Iglehart Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-1900
James H. Helson	1924 Iglehart Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-1901
Frank L. Austin House	1935 Iglehart Ave. W	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-1902
Oscar P. Shepardson House	1954 Iglehart Ave. W	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-1903
house	1972 Iglehart Ave. W	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-1904
First Presbyterian Church	1982 Iglehart Ave. W	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-1905
Martin Ludolph House	2002 Iglehart Ave. W	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-1906
house	2024 Iglehart Ave. W	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-1907
commercial building (Lloyd's	720 Snelling Ave N	29	23	34	NW-NW	St. Paul West					RA-SPC-2987
commercial building (Fusion Salon/Aikido of Minnesota)	712 Snelling Ave. N	29	23	34	NW-NW	St. Paul West					RA-SPC-2988
Auto Repair Shop (Valvoline)	699 Snelling Ave N	29	23	33	NE-NE	St. Paul West					RA-SPC-2989
Midway National Bank (American Bank)	1579 University Ave W	29	23	34	NW-SW	St. Paul West					RA-SPC-2990
commercial building	455-457 Snelling Ave N	29	23	33	NE-SE	St. Paul West					RA-SPC-2991
St. Paul Industrial Post Office Substation (Furniture Barn)	451-453 Snelling Ave N	29	23	33	NE-SE	St. Paul West					RA-SPC-2992
Midway Shopping Center West Building (Big Top Liquor/Vacant)	1460 University Ave W	29	23	34	NW-SW	St. Paul West					RA-SPC-2993
railroad bridge	railroad bridge over Prior Ave.	29	23	33			RA-81-2H				RA-SPC-3017
residence	286 Prior Ave. N.	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-3018
Olivett Congregational Church	330 Prior Ave. N.	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-3019

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Figure Sixty-Four: Page four for results of a literature search conducted for previously reported History/Architectural Inventory cultural resources located within a one-mile search radius of the AUAR (MNSHPO).

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY: Ramsey											
CITY/TOWNSHIP: St. Paul											
commercial building	348 Prior Ave. N.	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-3020
commercial building	366 Prior Ave. N.	29	23	33	NWSW	Saint Paul West	RA-81-2H				RA-SPC-3021
Union Park Police Substation	478 Prior Ave. N.	29	23	33	NWSW	Saint Paul West	RA-81-2H				RA-SPC-3022
double residence	1834-1836 Roblyn Ave. W.	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-3202
residence	1854 Roblyn Ave. W.	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-3203
residence	1868 Roblyn Ave. W.	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-3204
DeLaskie Danforth House	1908 Roblyn Ave. W.	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-3205
Charles H. Baldwin House	1912 Roblyn Ave. W.	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-3206
residence	1926 Roblyn Ave. W.	29	23	33	SESW	Saint Paul West	RA-81-2H				RA-SPC-3207
residence	1936-1938 Roblyn Ave. W.	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-3208
Central Baptist Church	420 Roy St. N.	29	23	33	NESE	Saint Paul West	RA-81-2H				RA-SPC-3224
Bethlehem Lutheran Church	436 Roy St. N.	29	23	33	NESE	Saint Paul West	RA-81-2H				RA-SPC-3225
residence	1153 Sherburne Ave. W.	29	23	34	SENE	Saint Paul West	RA-81-2H				RA-SPC-3343
residence	1157 Sherburne Ave. W.	29	23	34	SENE	Saint Paul West	RA-81-2H				RA-SPC-3344
duplex	1453-1455 Sherburne Ave. W.	29	23	34	SWNW	Saint Paul West	RA-81-2H				RA-SPC-3345
residence	1645 Sherburne Ave. W.	29	23	33	SENE	Saint Paul West	RA-81-2H				RA-SPC-3346
Christensen House	1673 Sherburne Ave. W.	29	23	33	SENE	Saint Paul West	RA-81-2H				RA-SPC-3347
commercial building	304 Snelling Ave. N.	29	23	33	SESE	Saint Paul West	RA-81-2H				RA-SPC-3420
commercial building	308 Snelling Ave. N.	29	23	33	SESE	Saint Paul West	RA-81-2H				RA-SPC-3421
Minneapolis & St. Paul Railroad Snelling Ave. Paint Shop	400 Snelling Ave. N.	29	23	33	NESE	Saint Paul West	RA-81-2H				RA-SPC-3422
commercial building	512 Snelling Ave. N.	29	23	33	SENE	Saint Paul West	RA-81-2H				RA-SPC-3423
Kimball Hotel	545 Snelling Ave. N.	29	23	33	SENE	Saint Paul West	RA-81-2H		Y		RA-SPC-3424
McCarthy House	633 Snelling Ave. N.	29	23	33	NENE	Saint Paul West	RA-81-2H				RA-SPC-3425

Figure Sixty-Five: Page five for results of a literature search conducted for previously reported History/Architectural Inventory cultural resources located within a one-mile search radius of the AUAR (MNSHPO).

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY: Ramsey											
CITY/TOWNSHIP: St. Paul											
service station	666 Snelling Ave. N.	29	23	33	NENE	Saint Paul West	RA-81-2H				RA-SPC-3426
commercial building	689 Snelling Ave. N.	29	23	33	NENE	Saint Paul West	RA-81-2H				RA-SPC-3427
William & Ada Chamberlin House	1827-1829 St. Anthony Ave. W.	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-3460
residence	1893 St. Anthony Ave. W.	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-3461
residence	1917 St. Anthony Ave. W.	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-3462
residence	1933 St. Anthony Ave. W.	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-3463
Concordia College administration building	ca. 275 Syndicate St. N.	29	23	34	SWSE	Saint Paul West	RA-81-2H				RA-SPC-3811
Concordia College Gymnasium	1265 Carroll Ave. W.	29	23	34	SWSE	Saint Paul West	RA-81-2H				RA-SPC-3812
Concordia College East Dormitory	269 Syndicate St. N.	29	23	34	SWSE	Saint Paul West	RA-81-2H				RA-SPC-3813
duplex	1254 Thomas Ave. W.	29	23	34	NWNE	Saint Paul West	RA-81-2H				RA-SPC-3836
residence	1263 Thomas Ave. W.	29	23	34	NWNE	Saint Paul West	RA-81-2H				RA-SPC-3837
butcher shop	1336 Thomas Ave. W.	29	23	34	NENW	Saint Paul West	RA-81-2H				RA-SPC-3838
Hamline Grocery Company	1340-1342 1/2 Thomas Ave. W.	29	23	34	NENW	Saint Paul West	RA-81-2H				RA-SPC-3839
residence	1402 Thomas Ave. W.	29	23	34	NENW	Saint Paul West	RA-81-2H				RA-SPC-3840
residence	1431 Thomas Ave. W.	29	23	34	NENW	Saint Paul West	RA-81-2H				RA-SPC-3841
commercial building	1584 Thomas Ave. W. (547-549 Snelling Ave. N.)	29	23	33	SENE	Saint Paul West	RA-81-2H				RA-SPC-3842
Prom Ballroom (razed)	1192 University Ave. W.	29	23	34	NESE	Saint Paul West	RA-81-2H				RA-SPC-3901
Central Supply Company	1210 University Ave. W.	29	23	34	NESE	Saint Paul West	RA-81-2H				RA-SPC-3902
St. Paul Casket Company	1222 University Ave. W.	29	23	34	SE-NE-SE	Saint Paul West	XX-2003-3H		Y		RA-SPC-3903
St. Paul Casket Company		29	23	34	SE-NE-SE	Saint Paul West	RA-81-2H		Y		RA-SPC-3903
Midway Chevrolet	1389-1399 University Ave. W.	29	23	34	SENW	Saint Paul West	RA-81-2H				RA-SPC-3904
Montgomery Ward & Co. (razed)	1400 University Ave. W.	29	23	34	NESW	Saint Paul West	RA-81-2H				RA-SPC-3905
Tip Top Tavern	1415 University Ave. W.	29	23	34	SENW	Saint Paul West	XX-2008-4H				RA-SPC-3906

Figure Sixty-Six: Page six for results of a literature search conducted for previously reported History/Architectural Inventory cultural resources located within a one-mile search radius of the AUAR (MNSHPO).

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY: Ramsey											
CITY/TOWNSHIP: St. Paul											
Tip Top Tavern	1415 University Ave. W.	29	23	34	SENW	Saint Paul West	RA-81-2H				RA-SPC-3906
Tip Top Tavern		29	23	34	SENW	Saint Paul West	RA-2008-3H				RA-SPC-3906
Mowrey Building	1435 University Ave. W.	29	23	34	SENW	Saint Paul West	RA-81-2H				RA-SPC-3907
commercial building	1437-1439 University Ave. W.	29	23	34	SENW	Saint Paul West	RA-81-2H				RA-SPC-3908
Westerlin Campbell Company	1457-1459 University Ave. W.	29	23	34	SWNW	Saint Paul West	RA-81-2H				RA-SPC-3909
department store	1547-1551 University Ave. W.	29	23	34	SWNW	Saint Paul West	RA-81-2H				RA-SPC-3910
commercial building	1569 University Ave. W.	29	23	34	SWNW	Saint Paul West	RA-81-2H				RA-SPC-3911
Quality Park Investment Company	1577-1579 University Ave. W.	29	23	33	SENE	Saint Paul West	RA-81-2H		Y		RA-SPC-3912
Quality Park Investment Company		29	23	33	SENE	Saint Paul West	XX-2008-4H		Y		RA-SPC-3912
Quality Park Investment Company		29	23	33	SENE	Saint Paul West	RA-2008-3H		Y		RA-SPC-3912
commercial building	1580-1602 University Ave. W.	29	23	33	NESE	Saint Paul West	RA-81-2H				RA-SPC-3913
Midwest Federal (razed)	1581 University Ave. W	29	23	33	SENE	Saint Paul West	RA-81-2H				RA-SPC-3914
commercial building	1601 University Ave. W.	29	23	33	SENE	Saint Paul West	RA-81-2H				RA-SPC-3915
commercial building	1625-1631 University Ave. W.	29	23	33	SENE	Saint Paul West	RA-81-2H				RA-SPC-3916
store	1639 University Ave. W.	29	23	33	SENE	Saint Paul West	RA-81-2H				RA-SPC-3917
Midway Hospital	1700 University Ave. W.	29	23	33	NWSE	Saint Paul West	RA-81-2H				RA-SPC-3918
commercial building	1720-1724 University Ave. W.	29	23	33	NWSE	Saint Paul West	RA-81-2H				RA-SPC-3919
commercial building	1728 University Ave. W.	29	23	33	NWSE	Saint Paul West	RA-81-2H				RA-SPC-3920
residence	1744 University Ave. W.	29	23	33	NWSE	Saint Paul West	RA-81-2H				RA-SPC-3921
Brown, Blodgett and Sperry Co.	1745 University Ave. W.	29	23	33	SWNE	Saint Paul West	RA-81-2H				RA-SPC-3922
Griggs, Cooper and Company Sanitary Food Manufacturing Building	1821 University Ave. W.	29	23	33	SE-NW	Saint Paul West	RA-81-2H		Y		RA-SPC-3923
Griggs, Cooper and Company Sanitary Food Manufacturing Building		29	23	33	SE-NW	Saint Paul West	XX-2003-3H		Y		RA-SPC-3923
Northwest Sanitary Supply	1845 University Ave. W.	29	23	33	SENW	Saint Paul West	RA-81-2H				RA-SPC-3924

Figure Sixty-Seven: Page seven for results of a literature search conducted for previously reported History/Architectural Inventory cultural resources located within a one-mile search radius of the AUAR (MNSHPO).

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY: Ramsey											
CITY/TOWNSHIP: St. Paul											
commercial building	1865 University Ave. W.	29	23	33	SENW	Saint Paul West	RA-81-2H				RA-SPC-3925
double residence	1879 University Ave. W.	29	23	33	SENW	Saint Paul West	RA-81-2H				RA-SPC-3926
Iris Park Place/Krank Building	1885 University Ave. W.	29	23	33	SENW	Saint Paul West	RA-81-2H	Y			RA-SPC-3927
Minnesota Transfer Railway	2021 University Ave. W.	29	23	33	SWNW	Saint Paul West	RA-81-2H				RA-SPC-3928
residence	1339 Van Buren Ave. W.	29	23	34	NENW	Saint Paul West	RA-81-2H				RA-SPC-3958
residence	1518 Van Buren Ave. W.	29	23	34	NWNW	Saint Paul West	RA-81-2H				RA-SPC-3959
residence	1595 Van Buren Ave. W.	29	23	33	NENE	Saint Paul West	RA-81-2H				RA-SPC-3960
John J. Dewey House	1684 Van Buren Ave. W.	29	23	33	NENE	Saint Paul West	RA-81-2H				RA-SPC-3961
Ellen Gillette House	1730 Van Buren Ave. W.	29	23	33	NWNE	Saint Paul West	RA-81-2H				RA-SPC-3962
residence	1777 Van Buren Ave. W.	29	23	33	NWNE	Saint Paul West	RA-81-2H				RA-SPC-3963
house	1170 Lafond Ave. W	29	23	34	NENE	Saint Paul West	RA-81-2H				RA-SPC-4106
Peter Olesen House	1300-1302 Lafond Ave. W	29	23	34	NWNE	Saint Paul West	RA-81-2H				RA-SPC-4110
Church of St. Columba	1305 Lafond Ave. W	29	23	34	NW-NE	Saint Paul West	RA-81-2H		Y		RA-SPC-4111
Hamline Playground Building	1564 Lafond Ave. W	29	23	34	NWNW	Saint Paul West	RA-81-2H		Y		RA-SPC-4112
Swedish Lutheran Church	1697 Lafond Ave. W	29	23	33	NWNE	Saint Paul West	RA-81-2H				RA-SPC-4113
Nels Peterson House	1772 Lafond Ave. W	29	23	33	NWNE	Saint Paul West	RA-81-2H				RA-SPC-4114
Central High School	275 Lexington Pkwy. N	29	23	34	SESE	Saint Paul West	RA-81-2H				RA-SPC-4252
shops	462-476 Lexington Pwky. N	29	23	34	NESE	Saint Paul West	RA-81-2H				RA-SPC-4253
Martin M. McNulty House	516 Lexington Pkwy. N	29	23	34	SENE	Saint Paul West	RA-81-2H				RA-SPC-4254
Martin M. McNulty House		29	23	34	SENE	Saint Paul West	XX-2003-3H				RA-SPC-4254
house	523 Lexington Pkwy. N	29	23	34	SENE	Saint Paul West	RA-81-2H				RA-SPC-4255
George H. Carsley House	451 Lynnhurst Ave. E	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-4342
Frank Holstrom House	444 Lynnhurst Ave. W	29	23	33	NESW	Saint Paul West	RA-81-2H				RA-SPC-4343
house	1130 Marshall Ave. W	29	23	34	SESE	Saint Paul West	RA-81-2H				RA-SPC-4468

Figure Sixty-Eight: Page eight for results of a literature search conducted for previously reported History/Architectural Inventory cultural resources located within a one-mile search radius of the AUAR (MNSHPO).

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY: Ramsey											
CITY/TOWNSHIP: St. Paul											
Calvary Lutheran Church for the Deaf	1162 Marshall Ave. W	29	23	34	SESE	Saint Paul West	RA-81-2H				RA-SPC-4469
house	1190 Marshall Ave. W	29	23	34	SESE	Saint Paul West	RA-81-2H				RA-SPC-4470
Robert C. Lippen House	1260 Marshall Ave. W	29	23	34	SWSE	Saint Paul West	RA-81-2H				RA-SPC-4471
O'Connor's Filling Station	1344 Marshall Ave. W	29	23	34	SESW	Saint Paul West	RA-81-2H				RA-SPC-4472
Tracy Oil Co.	1345 Marshall Ave. W	29	23	34	SESW	Saint Paul West	RA-81-2H				RA-SPC-4473
Highway Safety Appliance Company	1381 Marshall Ave. W	29	23	34	SESW	Saint Paul West	RA-81-2H				RA-SPC-4474
Midway Lime and Cement Company	1400-1410 Marshall Ave. W	29	23	34	SESW	Saint Paul West	RA-81-2H				RA-SPC-4475
house	1656 Marshall Ave. W	29	23	33	SESE	Saint Paul West	RA-81-2H				RA-SPC-4477
house	1657 Marshall Ave. W	29	23	33	SESE	Saint Paul West	RA-81-2H				RA-SPC-4478
Frank E. Aldrich House	1703 Marshall Ave. W	29	23	33	SWSE	Saint Paul West	RA-81-2H				RA-SPC-4479
Benjamin J. Joslin House	1711 Marshall Ave. W	29	23	33	SWSE	Saint Paul West	RA-81-2H				RA-SPC-4480
Emil Slawik House	1730 Marshall Ave. W	29	23	33	SWSE	Saint Paul West	RA-81-2H				RA-SPC-4481
Malvern H. Manuel House	1731 Marshall Ave. W	29	23	33	SWSE	Saint Paul West	RA-81-2H				RA-SPC-4482
R. Atchison House	1735 Marshall Ave. W	29	23	33	SWSE	Saint Paul West	RA-81-2H				RA-SPC-4483
Elam D. Parker House	2016 Merriam Ln. W	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-4561
house	1630 Minnehaha Ave. W	29	23	33	NENE	Saint Paul West	RA-81-2H				RA-SPC-4630
double house	1636-1638 Minnehaha Ave. W	29	23	33	NENE	Saint Paul West	RA-81-2H				RA-SPC-4631
house	1645 Minnehaha Ave. W	29	23	33	NENE	Saint Paul West	RA-81-2H				RA-SPC-4632
Samuel Boyer House	315 Moore St. N	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-4680
Longfellow School	318 Moore St. N	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-4681
apartment	374 Wheeler St. N.	29	23	33	NWSE	Saint Paul West	RA-81-2H				RA-SPC-5057
Currier House	403 Wheeler St. N.	29	23	33	NWSE	Saint Paul West	RA-81-2H				RA-SPC-5058
Griggs-Cooper Company	541 Wheeler St. N.	29	23	33	SWNE	Saint Paul West	RA-81-2H				RA-SPC-5059
Annette Farwell House	309 Wilder St. N.	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-5075

Figure Sixty-Nine: Page nine for results of a literature search conducted for previously reported History/Architectural Inventory cultural resources located within a one-mile search radius of the AUAR (MNSHPO).

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY: Ramsey											
CITY/TOWNSHIP: St. Paul											
residence	371 Wilder St. N.	29	23	33	NWSW	Saint Paul West	RA-81-2H				RA-SPC-5076
residence	319 Wilder St. N.	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-5077
residence	339 Wilder St. N.	29	23	33	SWSW	Saint Paul West	RA-81-2H				RA-SPC-5078
apartment	400 Pierce St. N	29	23	33	NESE	Saint Paul West	RA-81-2H				RA-SPC-5560
Iris Park Place	1885 University Ave. W	29	23	33							RA-SPC-5903
62839	I 94 Service Rd	29	23	33	NW-SE	St. Paul West					RA-SPC-5951
62847	I 94	29	23	33	SW-SE	St. Paul West					RA-SPC-5952
Luckie, Jefferson, House	1191 Sherburne Ave.	29	23	34	SE-SW-NE	St. Paul West					RA-SPC-6001
Whitaker Buick	1221-1225 University Ave.	29	23	34							RA-SPC-6101
Porky's Drive-In Restaurant (moved)	1884 University Ave.	29	23	33	NW-SE-NW	St. Paul West	XX-2003-3H				RA-SPC-6102
apartments	517-519 Asbury St.	29	23	34	SW-SW-NW	St. Paul West	XX-2003-3H				RA-SPC-6106
apartments	1635 Sherburne Ave.	29	23	33							RA-SPC-6107
Church of St. Columba School	1327 Lafond Ave. W	29	23	34	NW-NE	Saint Paul West	RA-81-2H		Y		RA-SPC-6204
Minnesota Transfer Railway Company Mainline		29	23	33					Y		RA-SPC-6309
Minnesota Transfer Railway Co. Railroad Company Railroad Bridge	over University Ave.	29	23	33	SW-NW	St. Paul West	XX-2003-3H		Y		RA-SPC-6310
Minneapolis-St. Paul Interurban Streetcar Line (St. Paul Segment)		29	23	33							RA-SPC-7001
Minneapolis-St. Paul Interurban Streetcar Line (St. Paul Segment)		29	23	34							RA-SPC-7001
Bridge No. 92258	carries Soo Line RR tracks over Prior Ave	29	23	33		Saint Paul West					RA-SPC-7111
Bridge 62845	Prior Ave. 1.1 mi SE of Jct. TH 280	29	23	33	NW-SW	St. Paul West					RA-SPC-8068
Bridge 9377	Snelling Ave. ar Jct. TH 94 & 51	29	23	34	SW-SW	St. Paul West					RA-SPC-8078
Bridge 9379	Pascal St. .3 mi E of Jct. TH 51	29	23	34	SW-SW	St. Paul West					RA-SPC-8079
Bridge 9381	Hamline Ave. .5 mi E of Jct TH 51	29	23	34	SW-SE	St. Paul West					RA-SPC-8080

Figure Seventy: Page ten for results of a literature search conducted for previously reported History/Architectural Inventory cultural resources located within a one-mile search radius of the AUAR (MNSHPO).

PROPERTY NAME	ADDRESS	Twp	Range	Sec	Quarters	USGS	Report	NRHP	CEF	DOE	Inventory Number
COUNTY: Ramsey											
CITY/TOWNSHIP: St. Paul											
Bridge 9457	Cleveland Ave. .8 mi SE of Jct. TH 280	29	23	33	NE-SE	St. Paul West					RA-SPC-8085
Bridge No. 62846	.4 mile west of Jct. T.H. 51	29	23	33	NW-SE	Saint Paul West			Y		RA-SPC-8212
Bridge 62849	Pedestrian at Aldine - I 94 .2 miles W of Jct. TH 51	29	23	33	SW-SE	St. Paul West					RA-SPC-8213

Figure Seventy-One: Page eleven for results of a literature search conducted for previously reported History/Architectural Inventory cultural resources located within a one-mile search radius of the AUAR (MNSHPO).

Appendix C

Air Quality Analysis

SRF Consulting Group, Inc. | Engineers Planners Designers

Draft Memorandum

SRF No. 0169154

To: Josh Williams, Senior Planner
City of St. Paul

From: Paul Morris, PE, Senior Associate
Krista Anderson, Engineer

Date: May 24, 2016

Subject: Snelling Midway Air Quality Analysis Technical Memorandum

Introduction

This memorandum documents the traffic-related air quality evaluation completed for the proposed Snelling Midway AUAR area. This assessment was completed to evaluate the impacts of additional traffic generated by the proposed development on regional air quality levels and to identify whether this project would cause or contribute to a new localized exceedance of carbon monoxide (CO) ambient air quality standards. The analysis also evaluated the mobile source air toxic (MSAT) impacts of the project and potential air quality impacts during construction of the project. The scope and methods of these analyses were developed in collaboration with the City of Saint Paul, Minnesota Pollution Control Agency (MPCA), and the Minnesota Department of Transportation (MnDOT).

Motorized vehicles affect air quality by emitting airborne pollutants. Changes in traffic volumes, travel patterns, and roadway locations affect air quality by changing the number of vehicles and the congestion levels in a given area. The air quality impacts for this project were analyzed by addressing criteria pollutants, a group of six common air pollutants regulated by the U.S. Environmental Protection Agency (EPA). In addition to the criteria air pollutants, the EPA also regulates air toxics. These include seven compounds with significant contributions from mobile sources. A qualitative evaluation of Mobile Source Air Toxics (MSATs) has been performed for this project.

Criteria Pollutants

The air quality impacts from this project are analyzed by addressing criteria pollutants, as a group of common air pollutants regulated by the EPA on the basis of criteria (information on health and/or environmental effects of pollution). The criteria pollutants identified by the EPA are ozone, particulate matter, carbon monoxide, nitrogen dioxide, lead, and sulfur dioxide. Potential impacts resulting from these pollutants are assessed by comparing projected concentrations to the National Ambient Air Quality Standards (NAAQS).

Air quality is evaluated based on impacts to humans in the impacted environment. Humans experience air quality impacts by breathing unsafe concentrations of airborne pollutants. Exposure to air pollutants emitted from motor vehicles can occur in homes, businesses, and recreation facilities located adjacent to affected roadway segments or on pedestrian and bicycle facilities along project area roadways.

Ozone

Ground-level ozone is a primary constituent of smog and is a pollution problem throughout many areas of the United States. Exposures to ozone can make people more susceptible to respiratory infection, result in lung inflammation, and aggravate preexisting respiratory diseases such as asthma. Ozone is not emitted directly from vehicles but is formed as volatile organic compounds (VOCs) and nitrogen oxides (NO_x) react in the presence of sunlight. Transportation sources emit NO_x and VOCs and can therefore affect ozone concentrations. However, due to the phenomenon of atmospheric formation of ozone from chemical precursors, concentrations are not expected to be elevated near a particular roadway.

The State of Minnesota is currently classified by the EPA as an "ozone attainment area," which means that Minnesota has been identified as a geographic area that meets the national health-based standards for ozone levels. Because of these factors, a quantitative ozone analysis was not conducted for this project.

Particulate Matter

Particulate matter (PM) is the term for particles and liquid droplets suspended in the air. Particles come in a wide variety of sizes and have been historically assessed based on size, typically measured by the diameter of the particle in micrometers. $PM_{2.5}$, or fine particulate matter, refers to particles that are 2.5 micrometers or less in diameter. PM_{10} refers to particulate matter that is 10 micrometers or less in diameter.

Motor vehicles (i.e., cars, trucks, and buses) emit direct PM from their tailpipes, as well as from normal brake and tire wear. Vehicle dust from paved and unpaved roads may be re-entrained, or re-suspended, in the atmosphere. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as sulfur dioxide, nitrogen oxides, and VOCs. $PM_{2.5}$ can penetrate the human respiratory system's natural defenses and damage the respiratory tract when inhaled. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including:

- Premature death in people with heart or lung disease
- Nonfatal heart attacks
- Irregular heartbeat
- Aggravated asthma
- Decreased lung function
- Increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing
  Source: http://www.epa.gov/air/particlepollution/health.html

On December 14, 2012, the EPA issued a final rule revising the annual health NAAQS for fine particles ($PM_{2.5}$). The EPA revised the annual $PM_{2.5}$ standard by lowering the level to 12.0 micrograms per cubic meter ($\mu g/m^3$), from the previous annual standard of 15.0 $\mu g/m^3$. The EPA has retained the 24-hour $PM_{2.5}$ standard at a level of 35 $\mu g/m^3$ (http://www.epa.gov/pm/actions.html). The agency also retained the existing standards for coarse particle pollution (PM_{10}). The NAAQS 24-hour standard for PM_{10} is 150 $\mu g/m^3$, which is not to be exceeded more than once per year on average over three years.

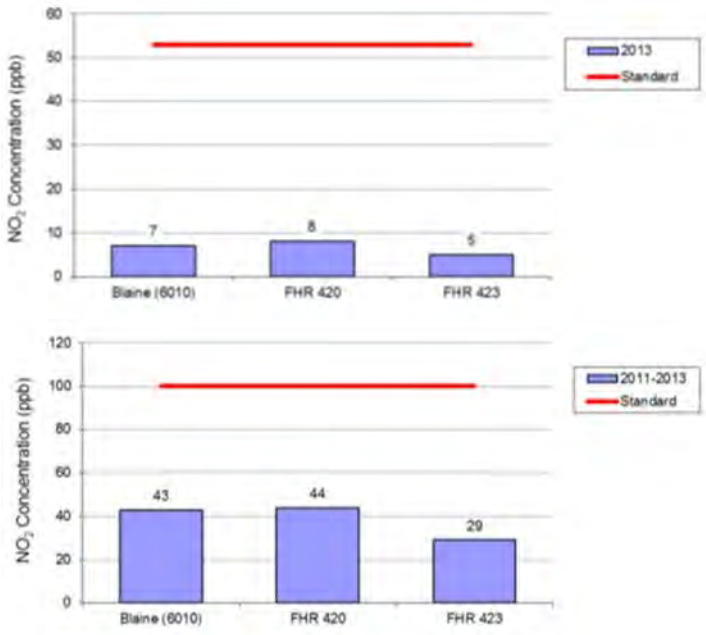
The Clean Air Act conformity requirements include the assessment of localized air quality impacts of transportation projects that are located within PM nonattainment and maintenance areas and deemed to be projects of air quality concern. This project is located in an unclassifiable/attainment area for PM, meaning that the project area has been identified as a geographic area that meets the national health-based standards for PM levels. Therefore, the project is exempt from detailed analysis and no quantitative evaluation of PM impacts was conducted for this project.

Nitrogen Dioxide (Nitrogen Oxides)

Nitrogen Dioxide (NO_2) is one compound in a group of highly reactive gases called Nitrogen oxides, or NO_x, which contain nitrogen and oxygen in varying amounts. Nitrogen oxides form when fuel is burned in a combustion process, primarily including motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels.

Minnesota currently meets federal nitrogen dioxide standards, as shown in related figures from the *2015 Annual Air Monitoring Network Plan* (September 2014), which are shown in Figure 1. This document shows that for three monitoring sites in the Twin Cities Metropolitan Area, annual one-hour concentrations are substantially below the NAAQS limits of 53 parts per billion (ppb) and 100 ppb, respectively. Additionally, comparing these diagrams with similar diagrams from previous years, shows a steadily decreasing trend, which is in conformance with EPA's Tier 2 regulatory announcement.

Figure 1: Annual Average and 1-Hour NO_2 Concentrations Compared to the NAAQS



The EPA's Tier 2 regulatory standards announced in December 1999 "will significantly reduce emissions of nitrogen oxides from vehicles by about 74 percent by 2030" (EPA420-F-99-051, http://www.epa.gov/tier2/documents/f99051.pdf).

Within the project area, it is unlikely that NO_2 standards will be approached or exceeded based on the relatively low ambient concentrations of NO_2 in Minnesota and on the long-term trend toward reductions of NO_x emissions. Thus, a specific analysis of NO_2 was not conducted for this project.

Sulfur Dioxide

Sulfur dioxide (SO_2) and other sulfur oxide gases (SO_x) are formed when fuel containing sulfur, such as coal, oil, and diesel fuel, is burned. Sulfur dioxide is a heavy, pungent, colorless gas. Elevated levels can impair breathing, lead to other respiratory symptoms, and (at very high levels) aggravate heart disease. People with asthma are at most risk when SO_2 levels increase. Once emitted into the atmosphere, SO_2 can be further oxidized to sulfuric acid, which is a component of acid rain.

MPCAs *2015 Annual Air Monitoring Network Plan for Minnesota* (September 2014) shows that eight sites were monitored for SO_2 in the Twin Cities Metropolitan Area during the period of 2011 to 2013. The NAAQS limit for SO_2 is met if the three-year average of the annual 99th percentile daily maximum one-hour SO_2 is less than 75 ppb. The maximum of the monitoring sites was found to be 14 ppb, which is well below the 75 ppb threshold.

MPCA also states that about 70 percent of SO_2 released into the air comes from electric power generation (*Air Quality in Minnesota: 2013 Report to the Legislature*, January 2013). Therefore, a much smaller proportion is attributable to on-road mobile sources. The MPCA has concluded that long-term trends in both ambient air concentrations and total SO_2 emissions in Minnesota indicate steady improvement.

Emissions of sulfur oxides from transportation sources are a small component of overall emissions and continue to decline due to the desulphurization of fuels. Additionally, the project area is classified by the EPA as a sulfur dioxide attainment area, which means that the project area has been identified as a geographic area that meets the national health-based standards for sulfur dioxide levels. Therefore, a quantitative analysis for sulfur dioxide was not conducted for this project.

Lead

Due to the phase out of leaded gasoline, lead is no longer a pollutant associated with vehicular emissions, and no analysis is warranted.

Carbon Monoxide

Carbon Monoxide (CO) is a traffic-related pollutant that has been a concern in the Twin Cities Metropolitan area. In 1999, the EPA redesignated all of Hennepin, Ramsey, Anoka, and portions of Carver, Scott, Dakota, Washington, and Wright counties as a maintenance area for CO. This means the area was previously classified as a nonattainment area, but was found to be in attainment. Due to successful compliance as a maintenance area since 1999, the Twin Cities region was designated a limited maintenance area in 2010, further reducing the evaluation required for CO. Maintenance areas are required to undertake actions to demonstrate continuing compliance with CO standards. Since the AUAR area is located in Ramsey County, evaluation of CO for assessment of air quality impacts is required for approval in environmental documents.

Regional Conformity

The 1990 Clean Air Act Amendments (CAAA) require that the State Implementation Plans (SIPs) must demonstrate how states with nonattainment and maintenance areas will meet federal air quality standards. The EPA issued final rules on transportation conformity (40 CFR 93, Subpart A), which describe the methods required to demonstrate SIP compliance for transportation projects. It requires that regionally significant transportation projects must be a part of a conforming Long Range Transportation Policy Plan (LRTPP) and four-year Transportation Improvement Program (TIP). The proposed project is not a regionally significant transportation improvement and therefore conformity requirements do not apply. In concordance, no regional emissions modeling was completed as part of the evaluation of the current project.

Intersection CO Analysis

CO is also subject to detailed intersection-level evaluation to assess whether any localized impacts from increased traffic congestion may be expected to occur. Vehicles queued at congested intersections emit CO, which may contribute to elevated CO concentrations near the roadways where pedestrians may be present. The analysis completed for the AUAR area included three scenarios representing different conditions expected to occur. The scenarios include:

- 2018 Stadium Build Scenario – this condition reflects traffic patterns and volumes that would be expected to occur prior to an evening event at the proposed stadium. Increased traffic congestion would be expected as a result of additional event traffic along with normal p.m. peak period traffic. This scenario assumes year 2018 volumes and vehicle emission rates.

- 2035 Comprehensive Plan Full Buildout Scenario – this condition reflects traffic patterns and volumes that would be expected to occur once all of the proposed development in the AUAR area has been completed, including residential and commercial land uses. Increased traffic would be expected from the additional land uses proposed. This scenario assumes year 2035 traffic volumes, but uses year 2022 vehicle emission rates to represent a worst-case scenario should market conditions allow development to occur faster than anticipated.

- Construction Scenario – this condition reflects increased traffic congestion along roadways adjacent to the AUAR area that may occur due to temporary lane closures resulting from construction equipment. This scenario assumes existing traffic volumes and vehicle emission rates.

Air quality modeling was performed using current versions of EPA CO emission (MOVES2014) and dispersion modeling (CAL3QHC) software. All methods and procedures used in the air quality analyses are generally accepted by the EPA and MPCA as approved for industry-standard analytical methods. The modeling assumptions used in this analysis include the following:

Table 1: Modeling Assumptions

Category	Assumption
Speed Class	Arterial, posted speed limits
Traffic Mix	MOVES data for Ramsey County
Traffic Age Distribution	MPCA Data
Wind Speed	1 meter/second
Temperature	Meteorology information at county level
Wind Direction	36 directions at 10 degree increments
Surface Roughness	180 centimeters
Atmospheric Stability Class	D
8-Hour Persistence Factor	0.7
Fuel Program	Conventional Gasoline East
Fuel Reid Vapor Pressure	9.0 pounds/square inch
Oxygenated Fuels	Ethanol with 2.7 percent oxygen content

The CO emissions factors were produced by the MOVES2014 emission model at varying speeds for year 2018 and year 2022 conditions (see Appendix A).

Background CO concentrations are needed for air quality analysis purposes to represent conditions without the influence of nearby vehicles. The background concentrations are added to intersection-scale modeled results to yield predicted CO levels.

Background CO concentrations for the analysis documented in this study were obtained from MPCA for the monitoring station at Site 861 (near the intersection of University Avenue and Lexington Avenue) in Saint Paul. The maximum one-hour and eight-hour concentrations for the worst-case (winter) condition are shown in Table 2. Background concentrations were also adjusted for future year 2018 and year 2022 conditions to account for regional growth. The annual background growth rate was assumed to be 0.5 percent per year. To represent worst-case conditions, no background reduction was used to account for future emissions-control improvements. This likely overestimates the ambient background CO concentrations.

Table 2: Background Carbon Monoxide Concentrations

Site #861, Saint Paul, Minnesota	1-Hour	8-Hour
2013 Background CO Concentration (ppm)	2.4	1.1
Background Growth Factor – 2013 to 2018	1.28	1.28
Adjusted Background CO Concentration – 2018 (ppm)	3.1	1.4
Background Growth Factor – 2013 to 2022	1.41	1.41
Adjusted Background CO Concentration – 2022 (ppm)	3.4	1.55

The following intersections, and surrounding areas, were included in the evaluation of air quality impacts for carbon monoxide:

- Snelling Avenue & Concordia Avenue
- Snelling Avenue & St. Anthony Avenue
- Snelling Avenue & University Avenue
- Lexington Avenue & University Avenue

Analysis is required at the Snelling Avenue & University Avenue and Lexington Avenue & University Avenue intersections since these are included in the list of ten intersections in the Twin Cities as identified by MnDOT (http://dotapp7.dot.state.mn.us/edms/download?docId=644986). The Snelling Avenue & Concordia Avenue and Snelling Avenue & St. Anthony Avenue intersections were modeled due to their proximity to the project area and potential for traffic congestion.

Carbon monoxide concentrations near the intersections were estimated using forecast traffic volumes, proposed intersection geometrics, optimized signal timing, emission levels from MOVES2014, and dispersion modeling using the EPA model CAL3QHC. Schematics and peak-hour turning movements for each intersection model are provided in Appendix B.

The intersection CO modeling results are shown in Table 3 through Table 5. These results are the worst-case results from the CAL3QHC dispersion model. The results show the location of the highest expected concentration, the value of the highest one-hour and eight-hour concentrations, and the wind angle that produced these concentrations. The CO results provided represent background CO concentrations plus modeled intersection CO concentrations. The worst case was identified at the intersection of Snelling Avenue and Concordia Avenue, under the Year 2018 construction scenario.

Table 3: Year 2018 Stadium Build Scenario Carbon Monoxide Modeling Results (Shown in Parts per Million (ppm))

Highest CO Receptor Location	1-Hour Average Concentration	8-Hour Average Concentration	Wind Direction
I-94 Interchange Area			
NE Quadrant of Snelling Avenue and Concordia Avenue	5.2	2.5	200°
Snelling Avenue & University Avenue Station Area			
NE Quadrant of Intersection	5.0	2.4	180°
Stadium Site			
Shields Avenue East of Snelling Avenue	4.8	2.2	190°
Lexington Avenue & University Avenue Station Area			
NE Quadrant of Intersection	5.1	2.5	350°

Table 4: Year 2035 Comprehensive Plan Full Buildout Scenario Carbon Monoxide Modeling Results (Shown in Parts per Million (ppm))

Highest CO Receptor Location	1-Hour Average Concentration	8-Hour Average Concentration	Wind Direction
I-94 Interchange Area			
NE Quadrant of Snelling Avenue and Concordia Avenue	5.2	2.5	200°
Snelling Avenue & University Avenue Station Area			
SE Quadrant of Intersection	5.2	2.5	190°
Stadium Site			
Several Receptors Along Pedestrian Plaza	4.8	2.2	190°
Lexington Avenue & University Avenue Station Area			
University Avenue Median (West of Lexington Avenue)	5.1	2.5	170°

Table 5: Year 2018 Construction Scenario Carbon Monoxide Modeling Results (Shown in Parts per Million (ppm))

Highest CO Receptor Location	1-Hour Average Concentration	8-Hour Average Concentration	Wind Direction
I-94 Interchange Area			
NE Quadrant of Snelling Avenue and Concordia Avenue	5.3	2.6	200°
Snelling Avenue & University Avenue Station Area			
SE Quadrant of Intersection	5.1	2.5	190°
Stadium Site			
Shields Avenue East of Snelling Avenue	4.8	2.2	220°
Lexington Avenue & University Avenue Station Area			
University Avenue Median (West of Lexington Avenue)	5.1	2.5	170°

The highest predicted concentrations are expected to occur in the I-94 interchange area at the Snelling Avenue & Concordia Avenue intersection, with the one-hour and eight-hour concentrations of 5.3 and 2.6 ppm, respectively. Based on these results, concentrations of CO in the project area would be substantially below the federal one-hour standard of 35 ppm, the Minnesota one-hour standard of 30 ppm, and the federal eight-hour standard of 9 ppm. These CO modeling results show that the Snelling Midway project is not expected to cause CO concentrations exceeding state or federal standards.

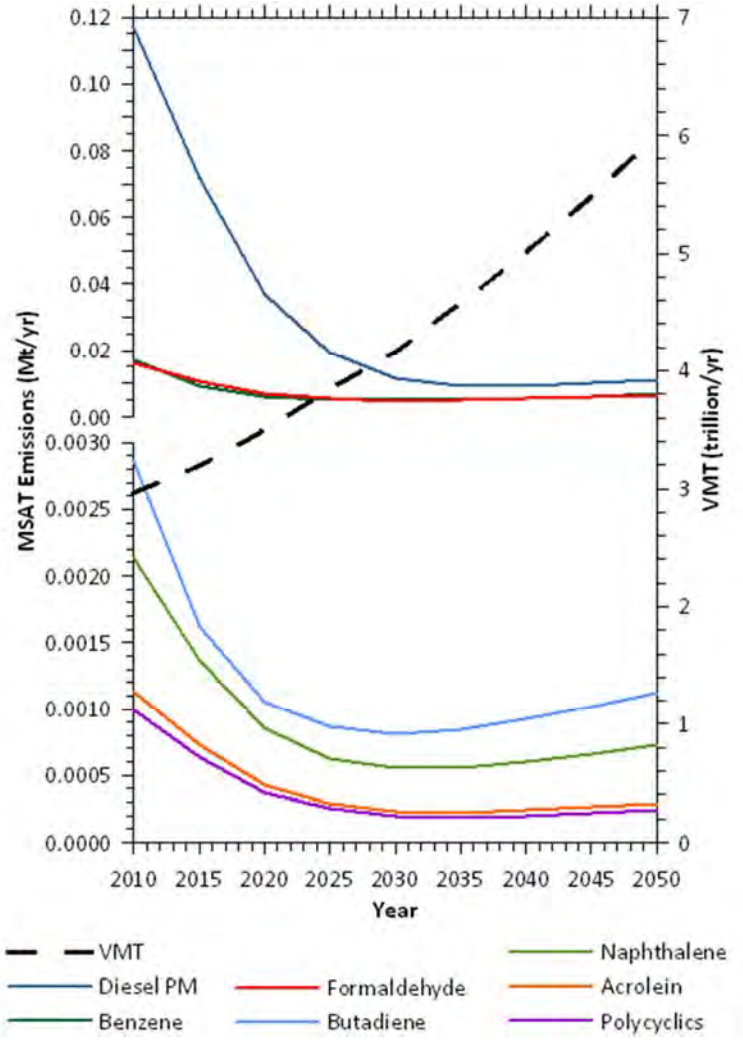
Mobile Source Air Toxics

Controlling air toxic emissions became a national priority with the passage of the CAAA of 1990, whereby Congress mandated that the EPA regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (http://www.epa.gov/iris/).

In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (http://www.epa.gov/ttn/atw/nata1999/). These are Acrolein, Benzene, 1,3-Butidiene, Diesel Particulate Matter plus diesel exhaust organic gases (Diesel PM), Formaldehyde, Naphthalene, and Polycyclic Organic Matter (POM). The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines.

Based on an FHWA analysis using EPA's MOVES2010b model, as shown in Figure 2, even if vehicle-miles travelled (VMT) increases by 102 percent, as assumed from 2010 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSAT is projected for the same time period. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth), that MSAT emissions in the project area are likely to be lower in the future in nearly all cases. On a regional basis, EPA's vehicle and fuel regulations will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

Figure 2: National MSAT Emission Trends 2010-2050 for Vehicles Operating On Roadways Using EPA's MOVES2010b Model



Notes:

(1) Trends for specific locations may be different, depending on locally derived information on vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

Source: EPA MOVES2010b model runs conducted during May - June 2012 by FHWA. http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/nmsatetrends.cfm

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how potential public health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA.

Information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of development actions. The FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with transportation projects. However, available technical tools do not enable us to predict the project-specific health impacts of MSAT emissions. The FHWA will continue to monitor the developing research in this field.

The methodologies for forecasting health impacts include emissions modeling, dispersion modeling, exposure modeling, and then final determination of health impacts – with each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevent a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSATs, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (http://pubs.healtheffects.org/view.php?id=282). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA (http://www.epa.gov/risk/basicinformation.htm#g) and the HEI (http://pubs.healtheffects.org/getfile.php?u=395) have not established a basis for quantitative risk assessment of diesel PM in ambient settings.

There is also a lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required to 1) provide an ample margin of safety to protect public health, or, 2) prevent an adverse environmental effect.

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between scenarios is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

Qualitative MSAT Analysis

For each scenario in this AUAR, the amount of MSATs emitted would be proportional to the amount of VMT, assuming that other variables (such as travel not associated with the proposed development) are the same for each alternative. The VMT estimated for the comprehensive plan full buildout scenario is higher than that for the No Build condition, because of the additional activity associated with the proposed development. This increase in VMT associated with the Comprehensive Plan Full Buildout scenario would lead to higher MSAT emissions in the vicinity of the AUAR area. The higher emissions could be offset somewhat by a decrease in regional traffic due to increased use of transit. The extent to which these emissions decreases will offset VMT-related emissions increases is not known.

Regardless of which scenario is chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by over 80 percent from 2010 to 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the EPA-projected reductions are so significant (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future as well.

The additional activity contemplated as part of the project scenarios could have the effect of increasing emissions in the vicinity of nearby homes and businesses; therefore, under the Comprehensive Plan Full Buildout scenario there may be localized areas where ambient concentrations of MSATs would be higher than under the No Build conditions. However, as discussed above, the magnitude and the duration of these potential differences cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific health impacts. Even though there may be differences among the scenarios, on a region-wide basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will cause substantial reductions over time that in almost all cases the MSAT levels in the future will be significantly lower than today.

In sum, the Stadium Build and Comprehensive Plan Full Buildout scenarios are expected to be associated with higher levels of MSAT emissions in the study area, relative to the No Build condition, along with some benefit from mode shifts to transit. There also could be slightly higher differences in MSAT levels in a few localized areas where activity occurs closer to homes, and businesses. Under all scenarios, MSAT levels are likely to decrease over time due to nationally mandated cleaner vehicles and fuels.

Avoidance, Minimization, and/or Mitigation Measures

The analysis presented in this document demonstrates there will be no anticipated exceedances of air pollutant concentrations resulting from the proposed project; therefore, no mitigation measures are necessary. The State of Minnesota does not require permits for traffic-related emissions for projects of this type.

This analysis also demonstrates that no exceedances are anticipated under the construction phase. However, a series of Best Management Practices (BMPs) would be implemented during construction to control dust. This may include the following preventive and mitigative measures:

- Minimization of land disturbance during site preparation
- Use of watering trucks to minimize dust
- Covering of trucks while hauling soil/debris off-site or transferring materials
- Stabilization of dirt piles if they are not removed immediately
- Use of dust suppressants on unpaved areas
- Minimization of unnecessary vehicle and machinery idling
- Revegetation of any disturbed land post-construction

APPENDIX A

CO Emissions Factors

Table A-1: Carbon Monoxide Emissions Factors from MOVES2014

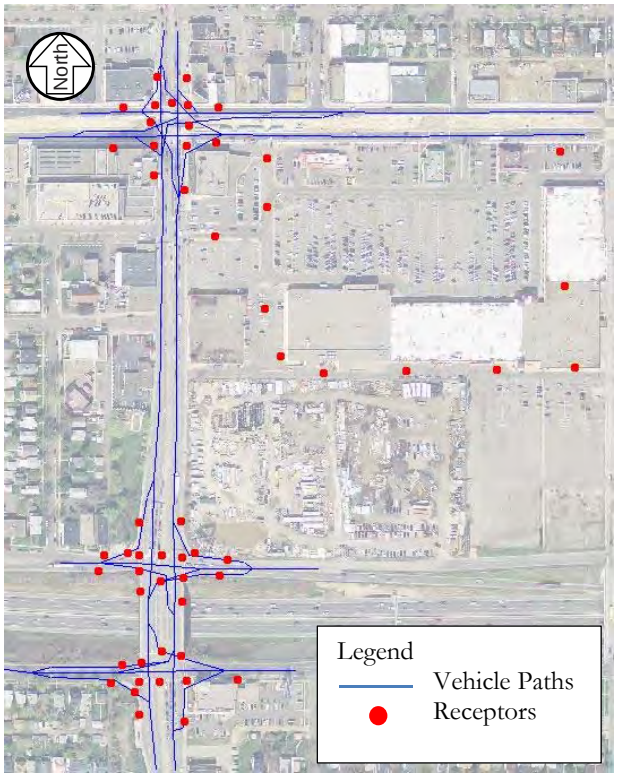
Speed	Emissions (g/veh-mi)	
	Year 2018	Year 2022
Idle*	10.8	5.0
2	15.7	11.8
5	10.1	7.8
10	7.3	5.7
15	6.4	5.1
20	5.7	4.5
25	4.8	3.7
30	4.5	3.6
35	4.2	3.3
40	3.8	3.1
45	3.6	2.9
50	3.5	2.8
55	3.6	2.9
60	3.7	3.0
65	3.9	3.2
70	4.5	3.7
75	5.9	4.9

* unit: g/veh-hour

APPENDIX B

CAL3QHC Schematics and Traffic Inputs

CAL3QHC Schematic for I-94 Interchange and Snelling Avenue & University Avenue Station Areas



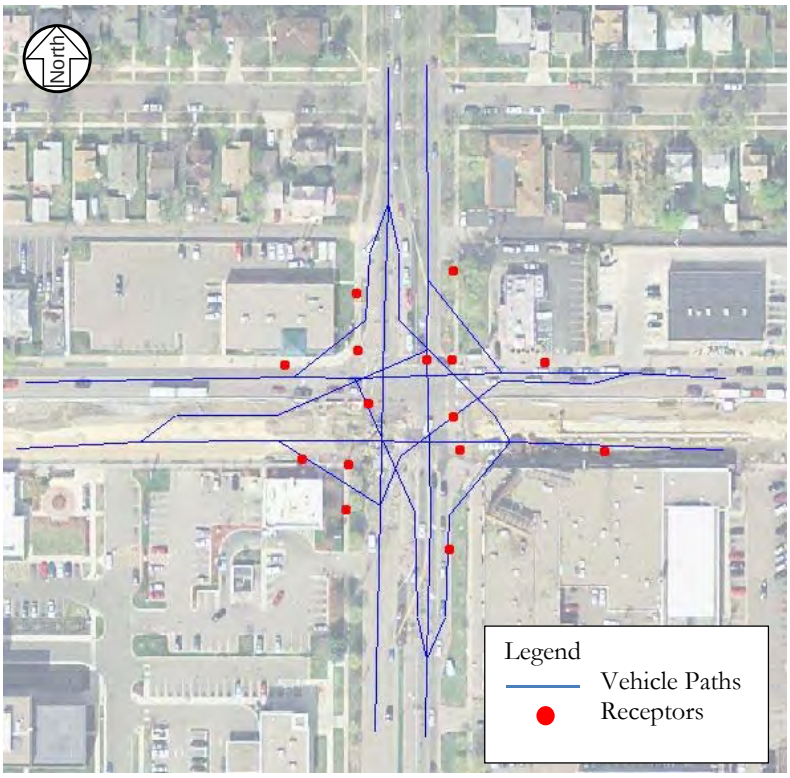
Year 2018 Stadium Build Scenario Peak Hour Turning Movements

Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	EBR
Snelling Avenue & Concordia Avenue	-	940	258	316	776	-	661	759	722	-	-	-
Snelling Avenue & St. Anthony Avenue	482	1,119	-	-	843	265	-	-	-	248	356	358
Snelling Avenue & University Avenue	94	564	76	182	747	31	86	276	118	146	191	101

Year 2035 Comprehensive Plan Full Buildout Scenario Peak Hour Turning Movements

Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	EBR
Snelling Avenue & Concordia Avenue	-	1,208	212	678	1,210	-	476	478	770	-	-	-
Snelling Avenue & St. Anthony Avenue	510	1,174	-	-	1,600	620	-	-	-	288	392	419
Snelling Avenue & University Avenue	205	1,066	121	243	910	107	111	446	136	118	391	83

CAL3QHC Schematic for Lexington Avenue & Snelling Avenue Station Area



Year 2018 Stadium Build Scenario Peak Hour Turning Movements

Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	EBR
Lexington Avenue & University Avenue	85	660	85	35	655	80	115	410	160	115	270	40

Year 2035 Comprehensive Plan Full Buildout Scenario Peak Hour Turning Movements

Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	EBR
Lexington Avenue & University Avenue	135	1,050	95	60	995	105	255	825	160	170	415	35

Appendix D

Stadium Noise Analysis

WJHW

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Designers and Planners for Sound, Video, Multi-Media
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Dallas • San Antonio • Denver

May 16, 2016

Michael Donovan, AIA
Associate Principal
POPULOUS
4800 Main Street | Suite 300
Kansas City, Missouri 64112

Subject: Minnesota United MLS Stadium
Preliminary Community Noise Review

Dear Mike:

This report is provided to present an assessment of potential community noise impact of the new Minnesota United MLS Stadium. The evaluation is based upon the current concept design for the new stadium featuring a distributed loudspeaker configuration with loudspeakers located on the stadium roof canopy. This loudspeaker system was modeled to be representative in performance and loudness capability when compared with other new MLS stadiums with similar sound system configurations. In addition to noise mitigation offered by the sound system design and architectural configuration of the stadium, operational noise mitigation measures may also be recommended, pending review of the project with the City of St. Paul, and Minnesota United.

This review is limited to sound from the stadium sound system and crowd noise. Roadway traffic noise is reviewed elsewhere, and it is premature to review sound levels from any stadium mechanical systems as they have not yet been designed. It is understood, however, that noise from stadium mechanical systems as well as construction activity will be required to be compliant with the applicable regulations.

PROJECT SITE DESCRIPTION

The new stadium is located at the south end of a parcel bounded by I-94 to the south, Snelling Avenue to the west, Pascal Street to the east and University Avenue to the north. The site and surrounding areas are relatively flat, with no large changes in elevation, hills, etc. that can be expected to block sound propagation from the proposed stadium site to the nearest residential areas.

There are long established residential and commercial properties to the west and north of the site. An existing retail development is to the east, with additional residential neighborhoods to the south of the site, across I-94.

The primary use of the stadium is for MLS soccer games, although other sporting events can be expected, along with limited amplified music as a pre-game activity (not concerts) for sports events.

Existing ambient noise levels for the properties in the environs of the site are primarily due to traffic operations on I-94 and the surrounding surface streets, which are busy during the daytime due to the existing commercial developments.

To the north, the nearest homes to the new stadium are approximately 850 ft. from the stadium. To the west, the nearest homes across Snelling Avenue are about 575 ft. (to backyards). To

the south, the homes across I-94 are about 380 ft. away. To the east, there is continuous commercial development from Pascal Street to Lexington Parkway; the residential neighborhoods to the northeast, across University Avenue, are much closer than are those due east of the site. The project site graphic is presented as Figure 1 below.

Figure 1. Project Site Location – Minnesota United MLS Stadium – St. Paul, MN

To the best of our knowledge, there is no significant development planned for the existing land uses surrounding the project site that could change the overall character of the adjacent areas

or alter noise propagation from the proposed stadium to the adjacent residential neighborhoods. As described, there is the potential for additional development on the stadium site to the north of the stadium perimeter.

As is described below, Interstate traffic, surface street traffic, and normal urban/suburban business and residential activity dominate the existing ambient noise environment during the daytime and evening hours when soccer games at the project stadium would typically occur.

CRITERIA FOR EVALUATION OF NOISE IMPACT

There are three common categories for determining community noise impact and response:

- **Audibility** – Many noises are audible in all built-up environments. The most common of these are expected, and do not give rise to substantial complaint activity. When unusual noises, or noises which do not meet the approval of residents, are audible, then annoyance is often registered. Depending upon the duration, loudness, and nature of the noise, community dissatisfaction may be registered. Clearly, noise that is not audible is not annoying. However, lowering noise levels to inaudibility can be difficult, as evidenced by modern, urban life. Despite this, some sounds are more intrusive than others, and are considered annoying by some residents even when the sound level of the offending noise is at or lower than other common sounds (such as traffic), and is well within the regulatory limits.
- **Change from Existing Conditions** – Many communities and states along with some Federal agencies define a noise impact in terms of the change in noise levels caused by an event or proposed new development. However, this does not apply under the City of St. Paul and State of Minnesota noise regulations. Therefore, this criterion is not relevant when determining noise impact.
- **Objective Noise Regulations** – Most communities, such the City of St. Paul (and the State of Minnesota), have noise ordinances and regulations which outline numerically quantified noise level limits. The objective standards generally determine what sound levels are Permissible by law, however these objective standards do not ensure inaudibility, but rather define what is considered "reasonable" for a particular land use or zoning at a particular time of day by that agency.

Noise Regulations

The applicable noise criteria for the project are established by the State of Minnesota Pollution Control Agency and the City of St. Paul Noise Ordinance (Code of Ordinances, Chapter 293). The objective noise level limits are based on the land use of affected properties and the time of day. The level exceeded 50% of the time (L_{50}) and the level exceeded 10% of the time (L_{10}) are the noise level descriptors used in the regulations. The L_{50} value is the sound level exceeded more than 30 minutes of any given hour, and the L_{10} value is the sound level exceeded more than 6 minutes of any given hour.

The State of Minnesota noise level limits include both L_{10} and L_{50} descriptors. All levels are A-weighted (dBA), which is appropriate for community noise. The applicable State standards are presented in Table 2 below.

Table 1. State of Minnesota Noise Level Limits

Noise Area Classification	Daytime (7 am-10 pm)		Nighttime (10 pm-7 am)	
	L_{10} (dBA)	L_{50} (dBA)	L_{10} (dBA)	L_{50} (dBA)
1 (residential)	65	60	55	50
2 (commercial)	70	65	70	65
3 (industrial)	80	75	80	75

The City of St. Paul noise level limits are based on the L_{10} descriptor. All levels are A-weighted (dBA), which is appropriate for community noise. The applicable City standards are presented in Table 2 below.

Table 2. City of St. Paul Noise Level Limits

Noise Receptor	Land Use Classification	Time of Day	Sound Level Limit (Hourly L_{10} dBA)
Class I	I-1, I-2 and I-3 (Industrial districts)	At all times (24 hr.)	80 dBA
Class II	R-1 through R-4, RT-1, RT-2 (single family, duplex and townhome residential) RM-1 through RM-3, P-1 and PD (low density and high rise multifamily)	7:00 am to 10:00 pm (daytime)	65 dBA
		10:00 pm to 7:00 am (nighttime)	55 dBA
Class III	B-1 through B-5, B-2C and OS-1 (business districts)	At all times (24 hr.)	70 dBA

The business (Class III) and residential (Class II) standards are the most relevant standards for the new MLS stadium project, as these are the closest land uses to the stadium site. Note that for residential noise receptors, the allowable limits is 10 dB less for nighttime hours compared to daytime hours due to lower nighttime ambient noise levels and the need for relative quiet (e.g., sleep).

The Minnesota Pollution Control Agency noise rules list both L50 and L10 noise level limits. The L10 values are identical to the City ordinance, the L50 values are 5 dBA lower than the L10 values in each category above.

Construction Noise Level Limits

The City noise level limits relative to construction activity is an Hourly L_{10} of 85 dBA at a distance of 50 ft. from the construction noise source. The sound level limits listed in the table above are applicable to operation of the project facility once constructed.

EXISTING AMBIENT NOISE ENVIRONMENT

As noted above, the ambient noise levels should be considered when both assessing compliance with objective standards and in any estimate of audibility. When ambient noise levels from a sound source are not substantially higher than the background (ambient) noise, it

can be difficult to determine the noise level of the subject source alone, as both the ambient and the noise that is to be measured contribute to the overall measured level. Calculation can remove the influence of background noise within 5 dB of the noise to be measured, provided the background noise levels are constant. However, to be confident that ambient noise will not contaminate a given measurement, it should be at least 10 dB or more below the noise source(s) being measured.

Ambient noise is also a very important factor in determining audibility of a sound. Sounds that are heard in very quiet conditions are likely to be judged as louder and easier to hear than the same sound at the same intensity in a noisier environment. Higher ambient noise levels tend to "mask" the perceptibility of other sounds.

Ambient noise levels were measured by David Braslau Associates on May 10, 2016. The following is a summary of the data included in the attached report. The three locations selected were in the existing residential neighborhoods closest to the stadium site. It can be assumed that the values for the commercial district to the east of the site will be at least a high as the location symmetrically to the west, with an expectation of higher levels due to increased traffic.

Figure 2 – Ambient Noise Level Measurement Locations (yellow dots)

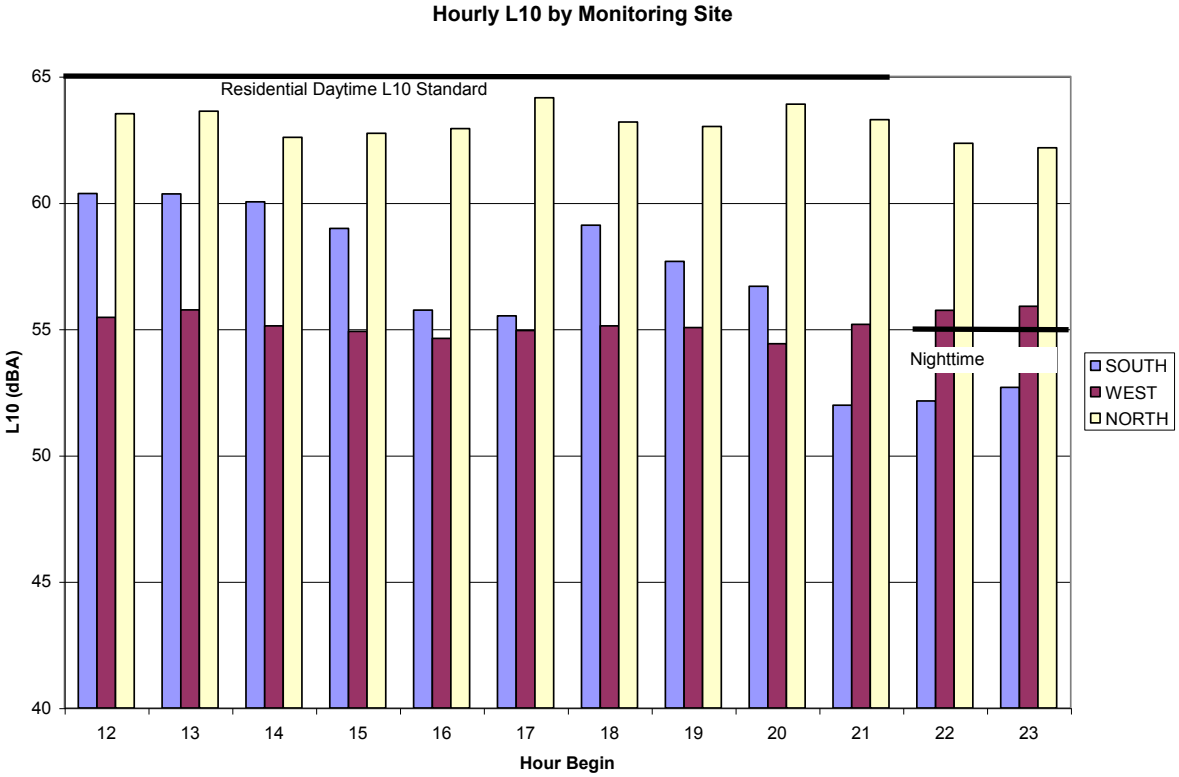


Figure 3. Hourly abmbient noise L10 values starting at 12 noon and extending until midnight

As can be seen, the L10 sound levels in all locations prior to 8 pm exceed the post 10 pm sound level limits and in all three locations are dominated by roadway noise. In all cases, the sound levels are below the pre 10 pm sound level limit. These levels are typical mixed use, urban/close suburban environments.

The measured ambient levels indicate that sound from stadium sporting events can be expected to be audible at homes and properties nearest the site, even if well within the City noise level limits. The factors that impact the degree of audibility are noted below.

ISSUES THAT AFFECT MEASURED AND PERCEIVED COMMUNITY NOISE LEVELS

In addition to the source sound levels and any reduction of sound offered by the stadium structure, the built environment, terrain, and weather conditions can affect measured sound levels and audibility. As regards to weather conditions, at locations within 1,000 ft. of an outdoor noise source, measured sound levels are primarily a function of the unimpeded sound levels associated with the source (e.g., stadium loudspeakers and crowd noise), distance from the source to the measurement location, and the presence of any barriers that can attenuate or otherwise alter sound propagation between the source and receiver. These factors are well understood and relatively easy to model and predict with good accuracy. The residential properties closest to the site are within 1,000 ft., and sound propagation between the stadium and these properties would not be significantly affected by the atmospheric conditions listed below; these conditions are mentioned, however, as they can significantly affect sound propagation at more distant receivers, occasionally producing complaints.

The following atmospheric conditions can affect stadium sound propagation and noise levels at distant receiver locations. These factors are well understood, but can be difficult to predict on a day-to-day or event basis.

- *Wind*

  Wind can have a large impact on sound level propagation (5-10 dB), and therefore perceptibility of amplified sound a great distance (i.e., over 1000 feet) from the site. At locations near the source of the sound, wind has a much smaller effect. The residential neighborhoods in the vicinity of the stadium site are close enough that significant changes in stadium sound levels in these neighborhoods due to wind are not expected.

- *Temperature Inversion*

  Normally, the temperature of air decreases with altitude/elevation. This is one reason why air is cooler in the mountains than at sea level. Under conditions where the air temperature near the ground is lower than that of the air above, a temperature inversion is said to exist. This condition is not unusual, and is often due to rapidly cooling landmass (as in the desert) or infiltration of cooler sea air on-shore in coastal areas. During a temperature inversion condition, effective sound propagation over large distances could be achieved, increasing stadium-related sound levels at more distant noise-sensitive receivers. Again, the proximity of the adjacent residential neighborhoods indicates that temperature inversion conditions would not significantly affect stadium sound levels.

TYPICAL MLS STADIUM PUBLIC ADDRESS AND CROWD NOISE LEVELS

To verify sound levels typical of an MLS game, reference sound level measurements were conducted at a purpose-built, MLS stadium (Sporting KC) with a similar (though not identical) sound system and architectural design. Sound level measurements were made both inside the stadium, within the spectator seating, and outside the stadium at a distances similar to the closest residential property locations near the proposed Minnesota United stadium site in St. Paul. The intent of measurements was to gain an understanding of how the sound system would be used in regards to level, program, and frequency of use during the game, as well as understanding how sound is attenuated in level from inside the stadium to outside. This data was used to inform the modeling of the anticipated sound levels associated with the proposed stadium in St. Paul. Additionally, the reference sound level measurements were used to evaluate crowd-related noise (i.e., cheering and drumming) and how it propagates outward from the stadium.

Noise level measurements were completed using a Norsonic Type 140 sound level meter (Class 1, precision system). The sound level meter was calibrated in the field immediately before the measurement session using a Norsonic Type 1251 Sound Calibrator. The measurement system was laboratory certified to be in proper working condition on December 31, 2015.

Atmospheric conditions during the reference noise level measurement session were typical of the MLS season – sunny, warm (65-70 deg. F), moderate humidity, and calm winds. The weather conditions were conducive to quality results.

Sound levels from the stadium sound system were nearly continuous prior to the game and during halftime. However, sound system use was very limited during game play, and only occurred in response to the most relevant action on the field (i.e., a goal, significant penalty), and was not used for every play as is common for other sports, such as American football. The frequency of use of the sound system is important, as the City noise regulations are percentile based, as noted above.

Crowd noise included cheering throughout the stadium and drumming from the supporters' section. Crowd noise was the primary stadium noise source during the game, and was also a contributing source of noise for the 30 minutes prior to the start of the game. Measured, noise levels are summarized in the table below.

Measured, existing MLS stadium noise levels are summarized in Table 3 below.

Table 3. Comparison Measurements at MLS Stadium (Sporting KC)

L_{10} (dBA)	L_{50} (dBA)	Specific Measurement Notes
Exterior		
70.4	66.9	Only pre-game PA, music, and crowd. PA=67 dBA, music=67-73 dBA, crowd-61-65 dBA, stadium fireworks=80 dBA (short duration)
71.5	66.3	Combination of pre-game and start of game. PA=67 dBA, music=67-73 dBA, and crowd=61-65 dBA.
66.2	62.5	Game play only (no PA or music).
Interior		
85.9	82.1	Upper seating area near concourse. PA=85-87 dBA, music=83-85 dBA.
91.7	87.2	Lower seating area near field. PA=87-90 dBA, music=82-86 dBA, crowd=95-105 dBA (short bursts)

General Notes:

- All exterior noise level measurements were completed at a distance of approximately 393 feet from the building façade. The measurement site was on the short side of the stadium adjacent to the primary fan section that included drums.
- All measurements were 10 minutes in duration. Therefore, the L_{10} measurement is the noise exceeded for 1 minute, and the L_{50} measurement is the noise exceeded for 5 minutes.
- Measurement results are expected to represent worst-case MLS game noise exposure associated with the proposed stadium.

PREDICTED NOISE FROM NEW STADIUM

House Sound/Public Address System

This is the permanently installed sound system for the seating bowl spectator seating that provides announcements, audio associated with the large video displays, and prerecorded audio programming. The calculations of community sound levels from this system are based on the following assumptions:

- The new stadium loudspeaker configuration is a distributed type system with multiple loudspeakers mounted on the roof canopy.
- The elevation of the primary speakers for the new stadium is not more than 90 ft. relative to the field.
- Public Address system sound levels at the new stadium will be no greater than 90 dBA as measured in the fixed seating areas.
- While the architectural configuration of the Sporting KC stadium is different than that proposed for St. Paul, and those differences have been accounted for in the computer model for St. Paul, the propagation (reduction in level) of sound over distance, from the stadium will be similar to that measured.

The primary speakers, with the longest speaker-to-listener distance, face nearly straight down to cover the bottom two thirds of the lower seating bowl. Additional canopy-mounted speakers cover the remainder of the lower bowl and the upper level seating. These ratios change as the seating bowl section varies around the circumference of the stadium.

The speaker configuration would not direct sound outside the stadium. In addition, the canopy roof, stadium seating and concessions buildings would act as barriers to sound escaping the seating bowl. The proposed fabric façade is minimal to provide minimal sound reduction, so was not included in the sound modeling to yield conservative values.

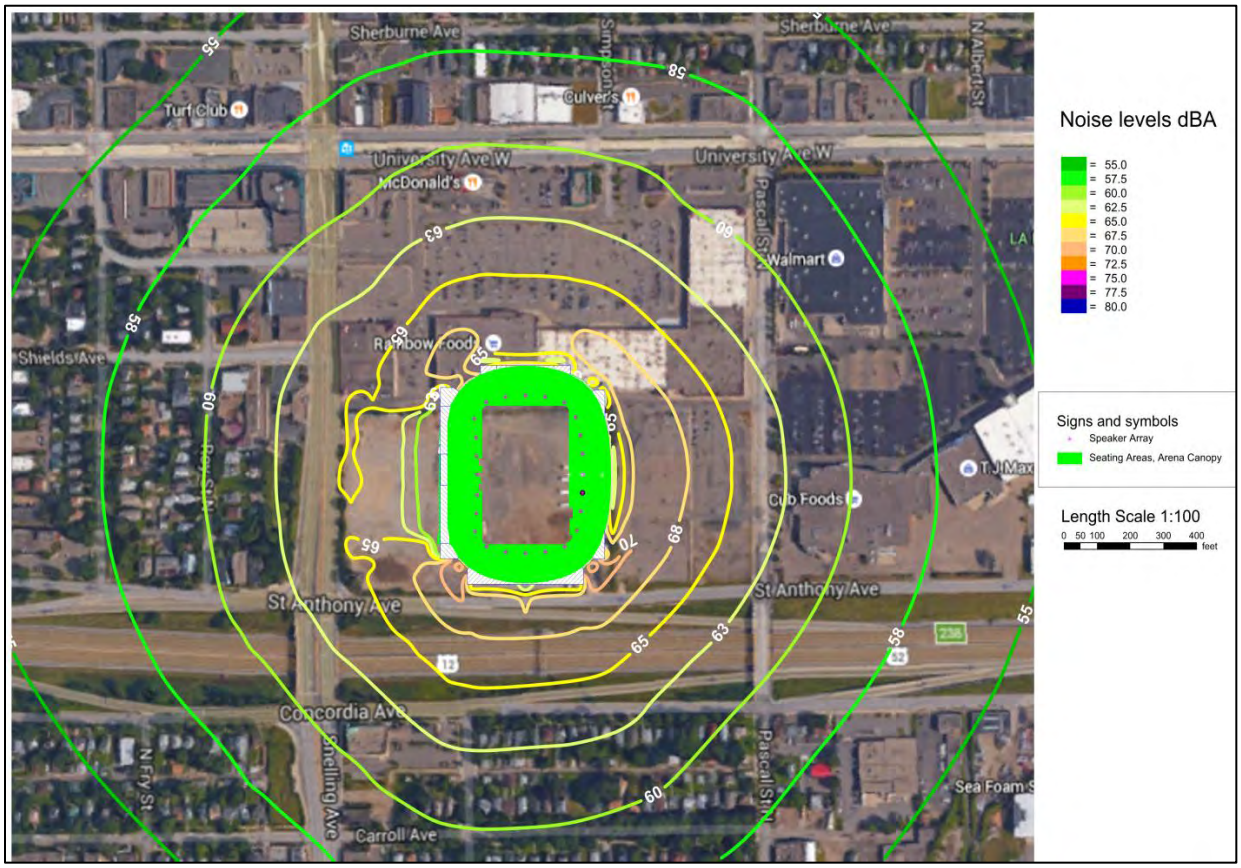


Figure 2. Noise Contours of Distributed Speaker System

Based on the current architectural design, proposed loudspeaker configuration and assumed sound levels in the bowl, sound levels at the nearest residential property are estimated to be a continuous 64 dBA, assuming a direct line of sight from the sensitive receptor to the stadium. Locations that are blocked by other structures, or are more distant from the stadium would experience lower sound levels.

Based on the reference sound level measurements presented in Table 3 above, we anticipate a maximum of 45 minutes of PA system noise during pre-game activities and 30 minutes at halftime, and 15 minutes of crowd noise with little contribution from the PA system, during gameplay. For these noise sources and at these durations, we anticipate an L_{10} and L_{50} of approximately 64 dBA at the closest existing residential uses. This level is in excess of the post 10:00 pm residential City of St. Paul sound level limit. For this reason, scheduled sporting events are recommended to end prior to 10:00 pm or operate with reduced source sound levels during nighttime hours.

The sound system source levels will also have to be carefully controlled during daytime hours to ensure that the applicable noise level limits are met.

Crowd Noise Sound Levels

Crowd noise is significantly different in character than the public address system; it consists of a collection of many, lower power level sources in comparison to the relatively few, higher-powered sound sources of the distributed loudspeaker system. For this reason, crowd-produced sound levels are typically lower than the house sound system outside the stadium. In addition, peak crowd noise levels are of shorter duration than the announcements and other program played through the public address system when also considering the pregame and halftime program. It is unlikely that maximum crowd noise would occur for as much as 6 minutes total in any given hour during an event (i.e., 10% of the hour).

During the measurements performed at the Sporting KC facility, described in Table 3 above, crowd noise levels were measured to be approximately 4 dBA less than the PA system noise outside the stadium. When comparing this data to the proposed St. Paul stadium, and accounting for the increased distance to the nearest residences on the south side of the stadium, we anticipate an L_{10} from crowd noise alone to be approximately 62 dBA. For this reason, crowd noise should not exceed the City noise level limits for daytime events.

Other Amplified Sound Sources

As can be seen in the site plan above (Figure 1), there is a plaza area to the north of the stadium proper. This type of plaza area can be expected to host small, pre-event functions that may feature musical performances or broadcaster pre-game shows, as well as a house public address system for making announcement to patrons in the area. In each case, these amplified sound sources have the potential to exceed the City noise level limits to the west and north of the site. As a practical matter, the sound levels for these sources are considerably lower than for the main stadium spectator seating sound system. This does not mean, however that these sound sources can be ignored. For reasons of compliance, any permanent speakers should be limited in scope or distributed throughout the plaza to minimize community sound levels. Portable sound systems and stages should be set up to direct sound away from residential areas, as well as being limited in loudness to ensure compliance.

Concert Sound Levels

Currently, there are no plans to host concerts at the stadium. Should there be a desire to promote outdoor, amplified music concerts at the venue in the future, further evaluation of sound levels may be needed.

Future Site Development

As noted above, there is the potential for development in addition to the stadium on the project site. Currently there is no approved plan or other projects, however a concept site plan has been provided that provides some insight to what might possibly be constructed.

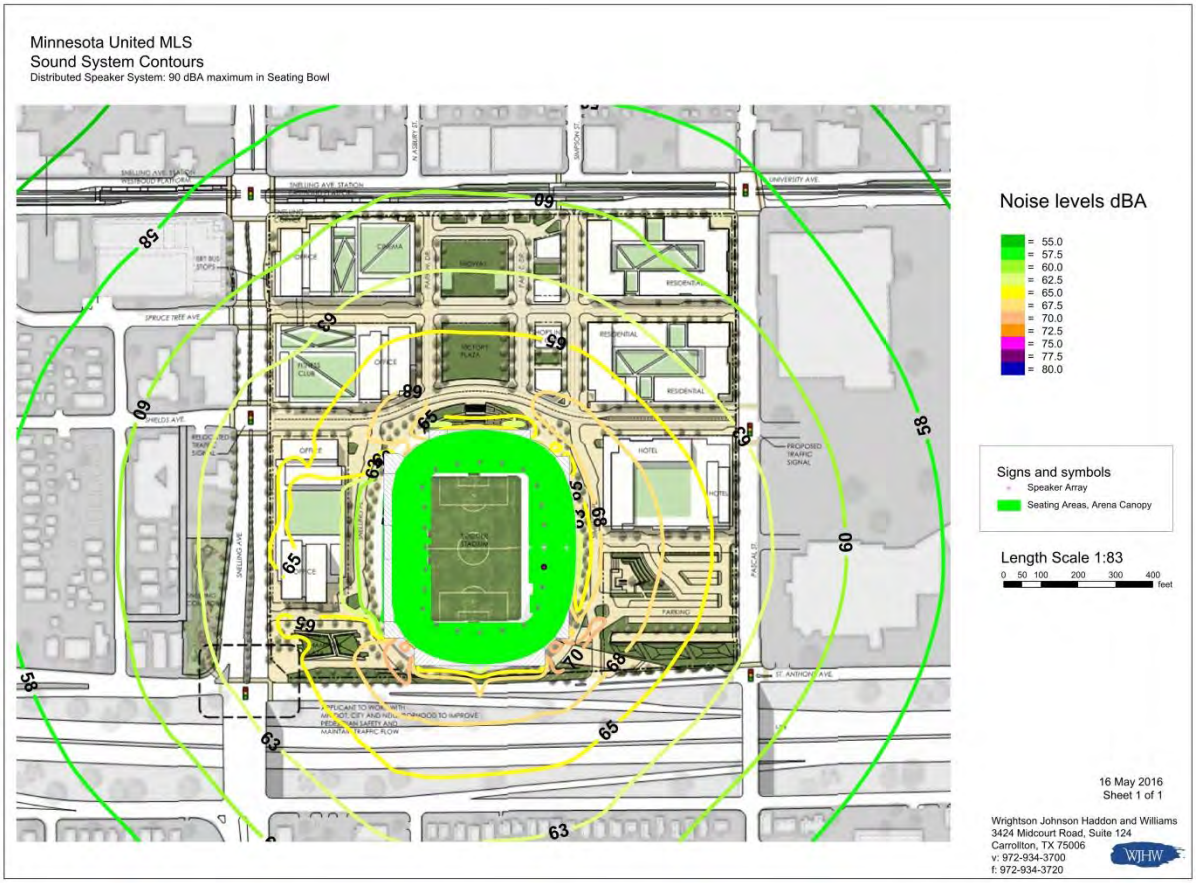


Figure 4 - Noise Contours of Distributed Speaker System with Concept Development Plan

As can be seen from the noise contour overlay on the concept development plan, there is a change for permanent and temporary (hotel) residential use. The distance of these potential developments indicates that, during soccer games, the City noise regulations will be exceeded. Construction of Class II receptor uses within the 65 dBA contour will require mitigation through decreased stadium sound levels or other means, including possible sound level variance.

OVERVIEW OF EXPECTED NOISE IMPACTS AND POTENTIAL MITIGATION MEASURES

Calculated sound levels from the stadium permanent seating bowl sound system and crowd noise, based on the typical MLS game presentation, the current sound system configuration, the current architectural design, and reference noise level measurements, are not expected to

exceed the City of St. Paul daytime noise level standard at the closest noise-sensitive uses. During nighttime hours, the sound system may exceed the applicable sound level limit, depending on how long an event extends beyond 10:00 pm and how loudly the sound system is operated. Crowd noise may also exceed the City's nighttime limits.

Large, amplified music concerts are expected to exceed both the daytime and nighttime City sound level limits at the nearest residential properties. While it is possible for concerts to be compliant with the City regulations, this would require reducing source sound levels at the assumed mix position of about 85 dBA, which is significantly lower than typical practice for large outdoor music concerts.

As the house sound system has the potential to exceed the City noise level limits, it is recommended that:

- The overall system loudness should be electronically limited so that levels in the spectator seating cannot exceed levels that are compliant with the City standards. The calculations assume a maximum of 90 dBA at the spectator seating to limit the noise level at the closest residences to 65 dBA L_{10}.
- Sporting events must be scheduled so that regulation play is completed by 10 pm.
- Plaza amplified sound sources are to be configured and operated at levels which are consistent with the City noise standards.
- Any amplified music associated with stadium events, such as small musical groups performing pre-game in the seating bowl or exterior plaza, must be limited in loudness to comply with the City noise ordinance.
- Continuous pre-game and half time stadium sound system levels will likely have to be lower than in game announcements, in order to meet the City noise regulations.
- Future development on the stadium site should be designed with the understanding of the activities occurring at and noise levels generated by the stadium.

Please call should you have any questions or need additional information.

Best Regards,
WRIGHTSON, JOHNSON, HADDON & WILLIAMS, INC.

Jack Wrightson
Principal

Cc; Bruce Miller - Populous
Tom Falgien - WJHW

MN United Stadium
Ambient Noise Measurements

David Braslau Associates, Inc.

10 May 2016

Results of ambient sound level monitoring at three locations near the proposed stadium are presented and discussed here.

Locations of the final monitoring sites are shown on page 3.

The originally identified south site was used to set up my meters, even though the neighbor was afraid it might be stolen.

The originally identified west site was relocated. (We had permission from the church to set up at the site, which I did -- but another church member saw the meter and picked it up since he thought it might be stolen!) Finally, the neighbor adjacent to the church lot let me set up in his fenced-in back yard, very close to the original site.

The originally identified north site owner never got back to me with permission to access the property. This was the only residential property with a site open the south. Luckily, I noticed the Culver's parking lot "islands" and got permission to set up there. Noise from traffic in the parking lot did not appear to a major problem, as was shown in the actual time history data.


North Site
West Site
South Site
UNIVERSITY AVE
PARCEL 3 - OWNED BY RD MANAGEMENT
9.95 ACRES
10.90 ACRES
4.90 ACRES
PARCEL 2 - UNDER OPTION BY CITY OF SAINT PAUL HRA
Sherburne Ave
University Ave W
St Anthony Ave
Spruce Tree Ave
Shields Ave
Roblyn Ave
Carroll Ave
Snelling Ave & Carroll Ave
Google earth
44°57'13.62" N 93°09'47.67" W elev 947 ft eye alt 4838 ft

The oblique aerial photo on Page 5 shows the location of the south meter location.

The location was in a empty lot separated from the I-94 frontage road by one row of houses. Traffic noise from I-94 dominated the area. This site provided levels that the second row of homes would experience. Levels at the first row along the frontage road would probably be about 9 dBA higher (5 dBA for closer distance and 4 dBA for lack of attenuation from the row of houses). The third row of homes would probably be about 7-8 dBA lower.

Photos of the meter follow.


N
I-94
Meter South
© 2016 Google
Google earth
1991
44°57'02.72" N 93°09'51.05" W elev 931 ft eye alt 1786 ft

South-looking-South.jpg

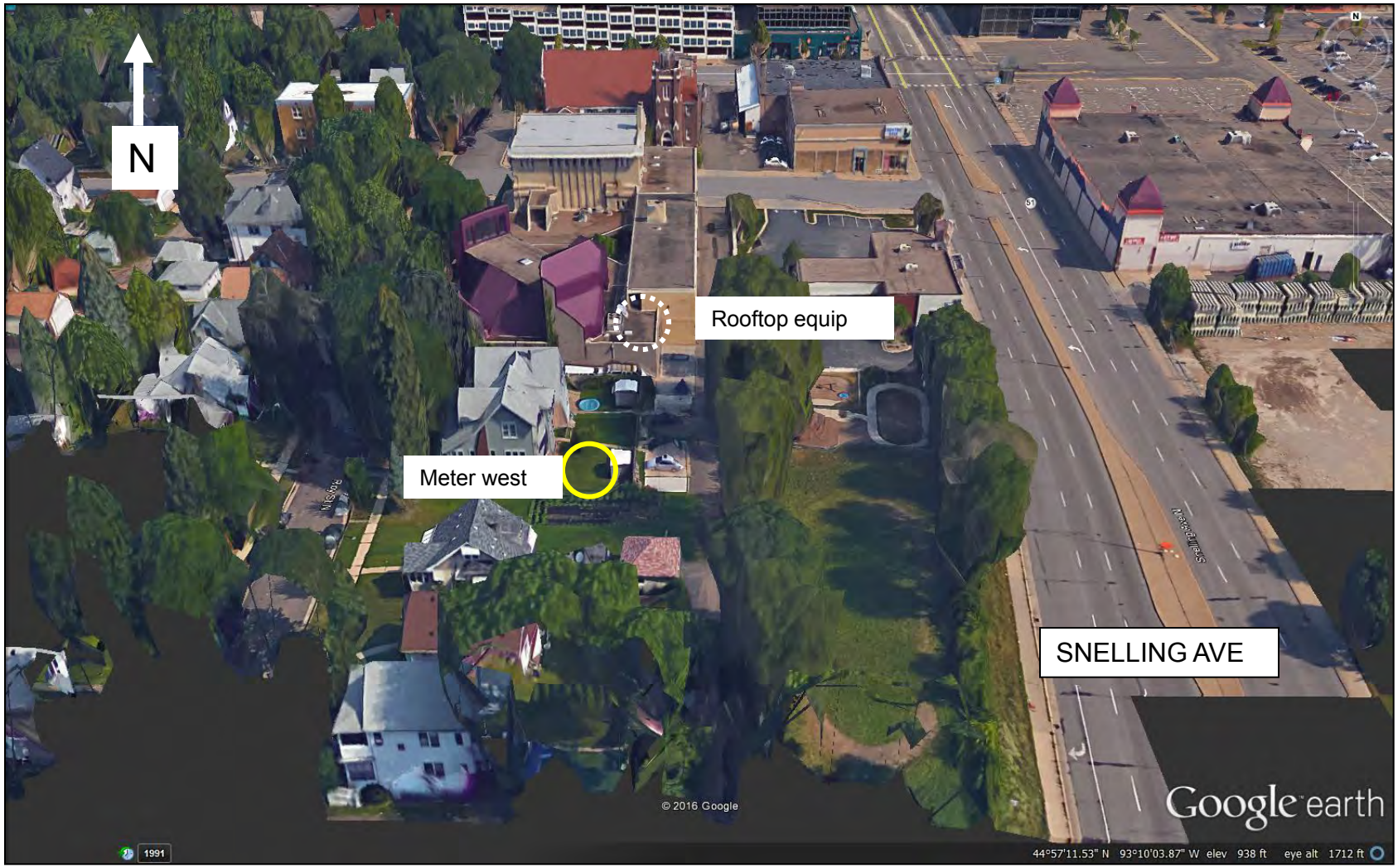
South-Looking-North.jpg

The aerial photo on Page 9 shows the location of the west meter location.

One would expect that noise level from Snelling Avenue would be higher but it is slightly depressed below the open green area, and often slow due to queuing a the I-94 ramp signals.

As will be seen from the data below, the rooftop unit at the church contributed to background level but only near the end of the monitoring period.

Photos of the meter follow. The fence was visual only and the small shed did not seem to have any effect on the traffic noise level.


N
Rooftop equip
Meter west
SNELLING AVE
© 2016 Google
Google earth
1991
44°57'11.53" N 93°10'03.87" W elev 938 ft eye alt 1712 ft

West-Looking-East.jpg

West-Looking-West.jpg

The aerial photo on Page 9 shows the location of the north meter location.

As explained above, a meter on the parking lot island provided one of the only sites open to the south, not blocked by buildings. The originally selected site was the home just north of the meter.

A photo of the meter looking towards the south (University Avenue) follows. .

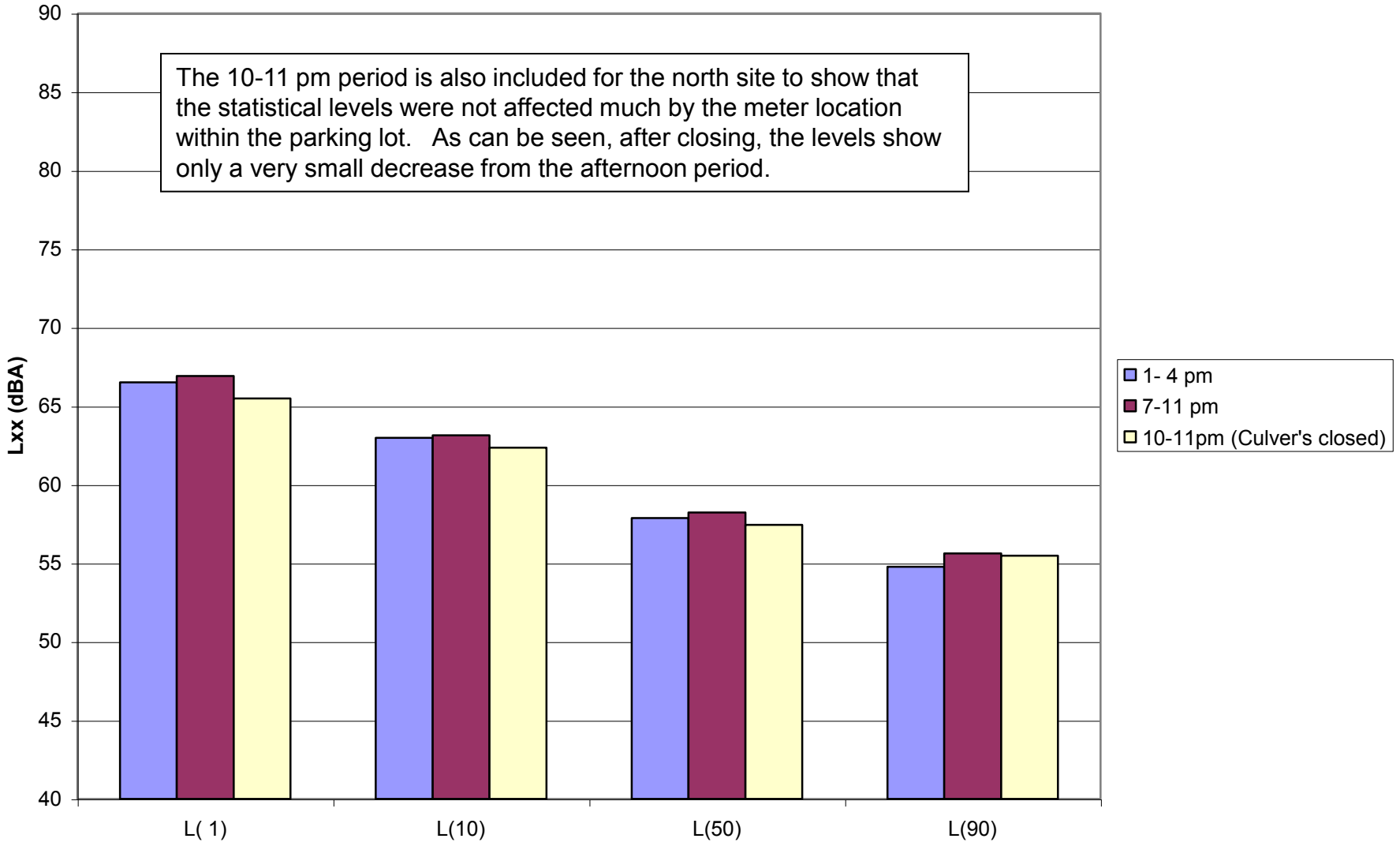

N
Culver's
Meter north
University Avenue
© 2016 Google
Google earth
1991
44°57'20.39" N 93°09'47.03" W elev 926 ft eye alt 1692 ft

North-Looking-South.jpg

Averaged statistical noise descriptors at the three monitoring sites for the event time periods you identified are presented below.

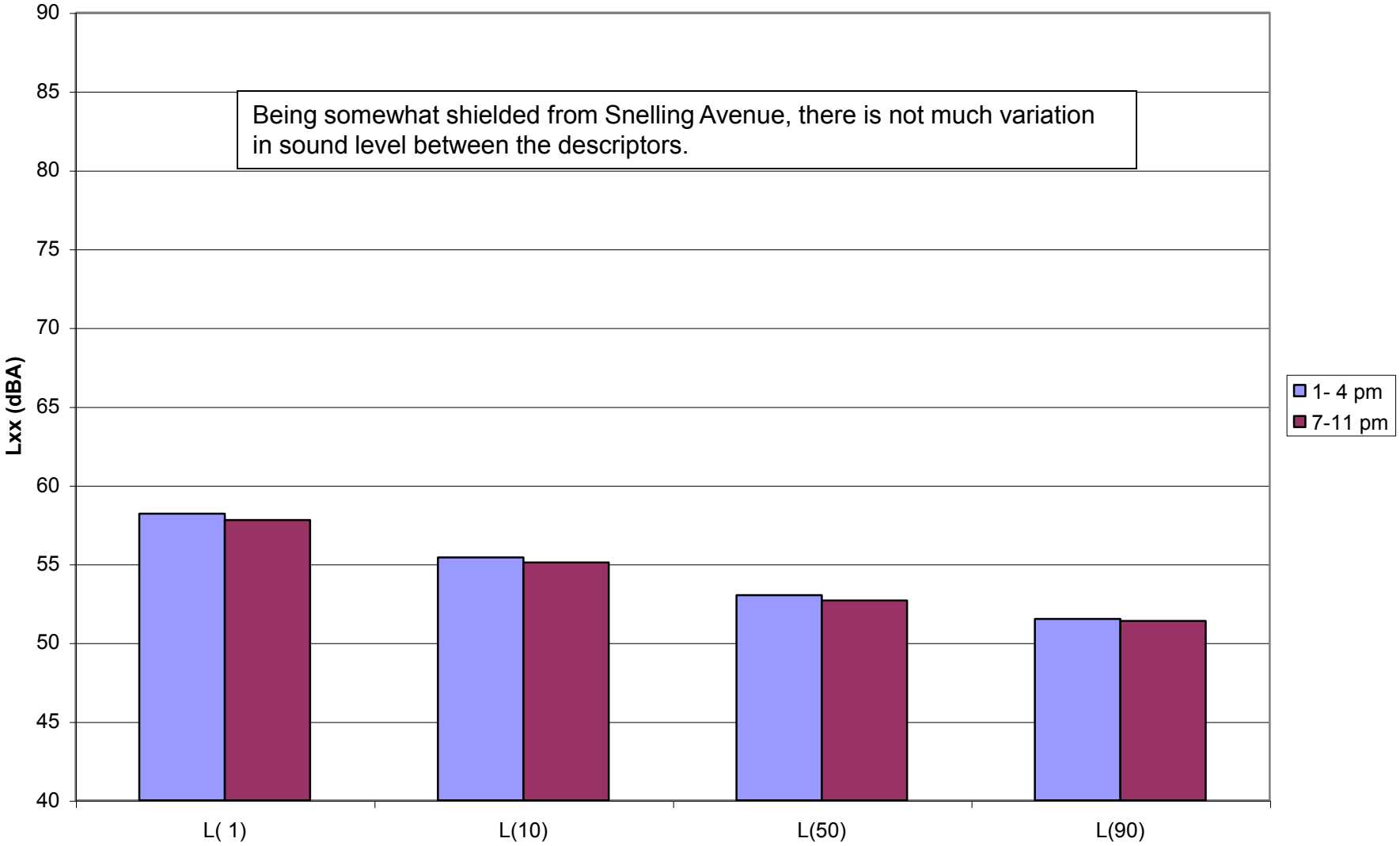
More detailed results for each of the meter sites are included after these three summary slides.

Event Time Lxx Averages - North



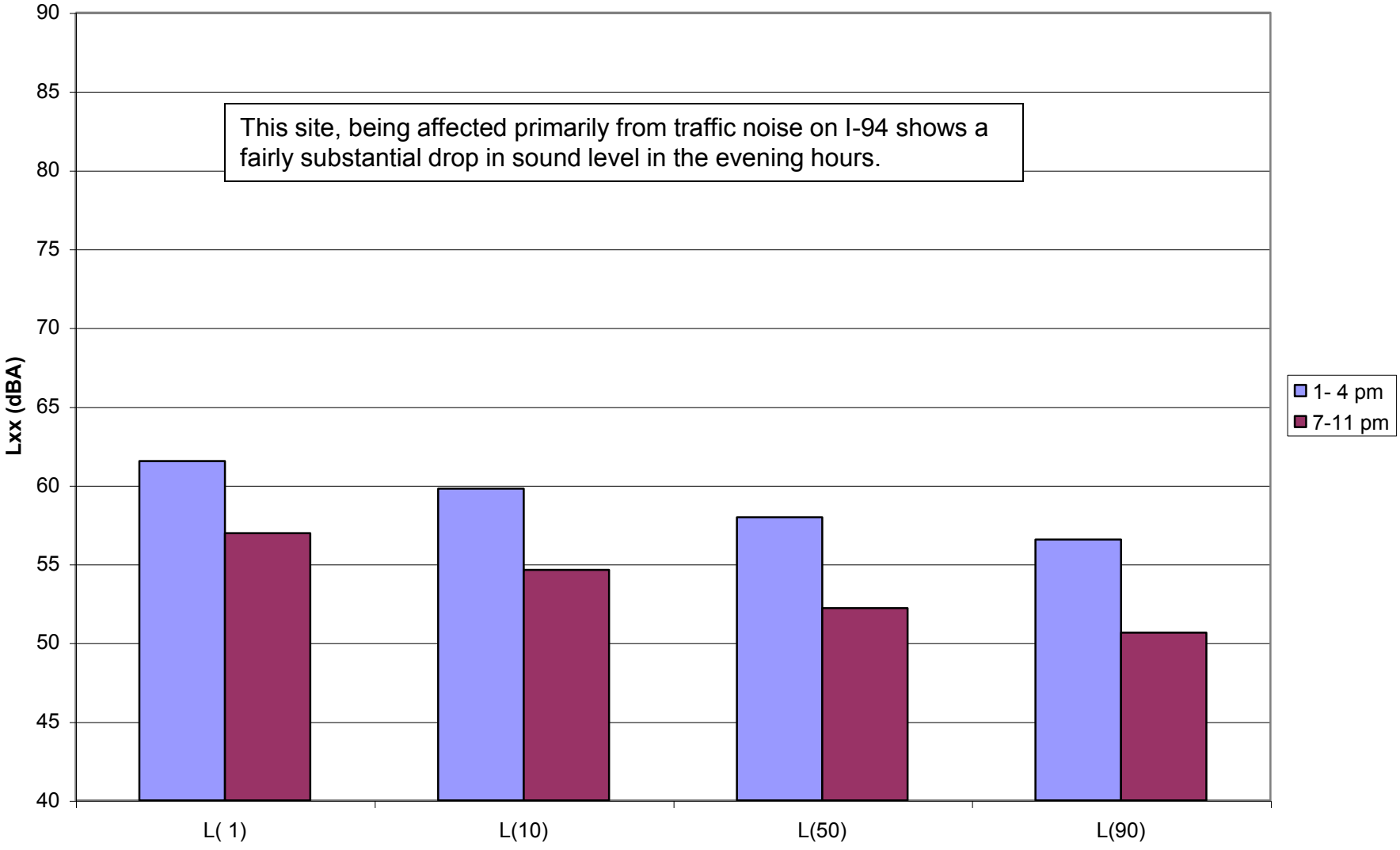
LD820-North\Int-07-xls C-Event-Time-Lxx-North

Event Time Lxx Averages - West



LD820-West\Int-06-xls C-Event-Time-Lxx-West

Event Time Lxx Averages - South

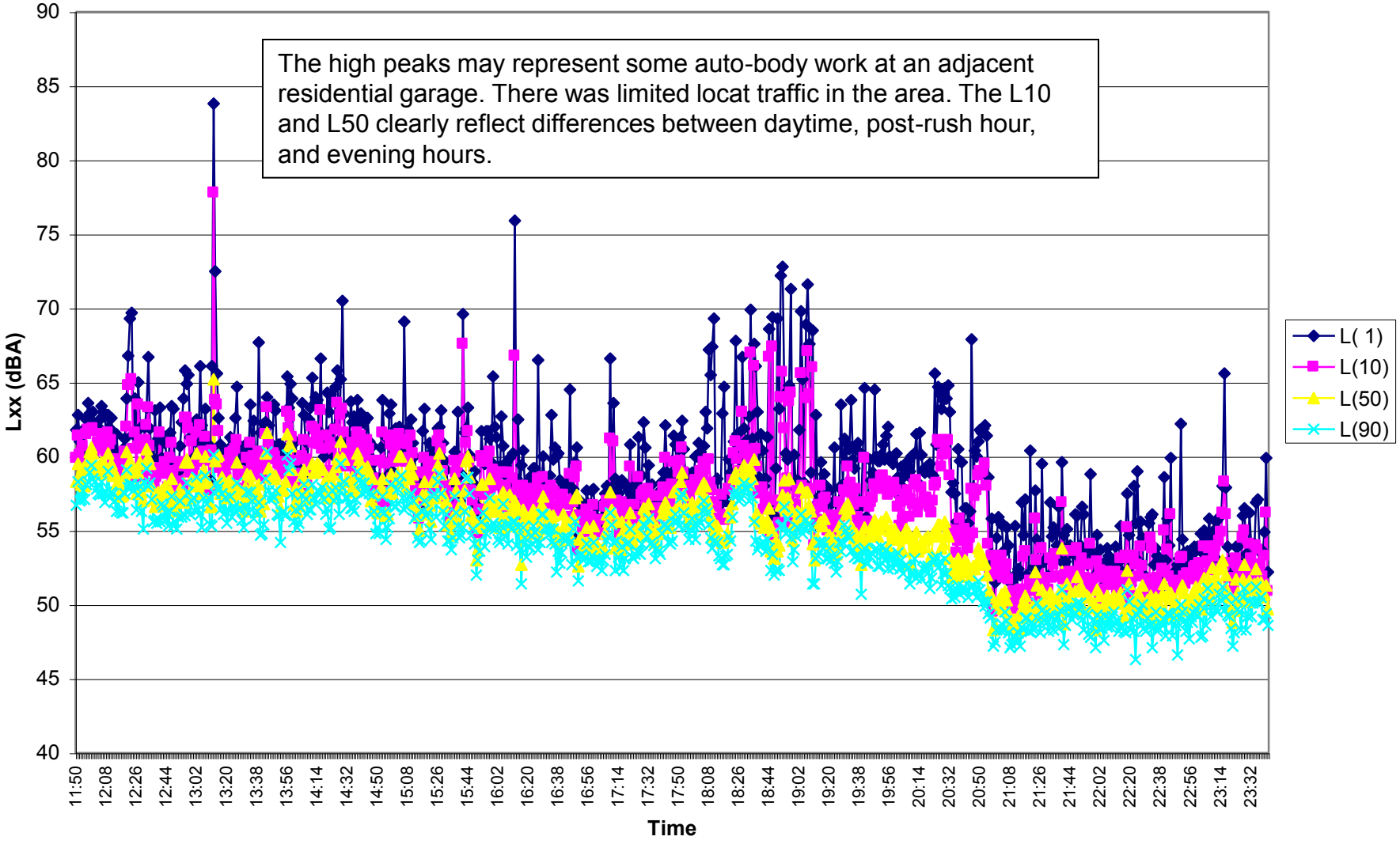


LD820-South\Int-07-xls C-Event-Time-Lxx-South

South Meter

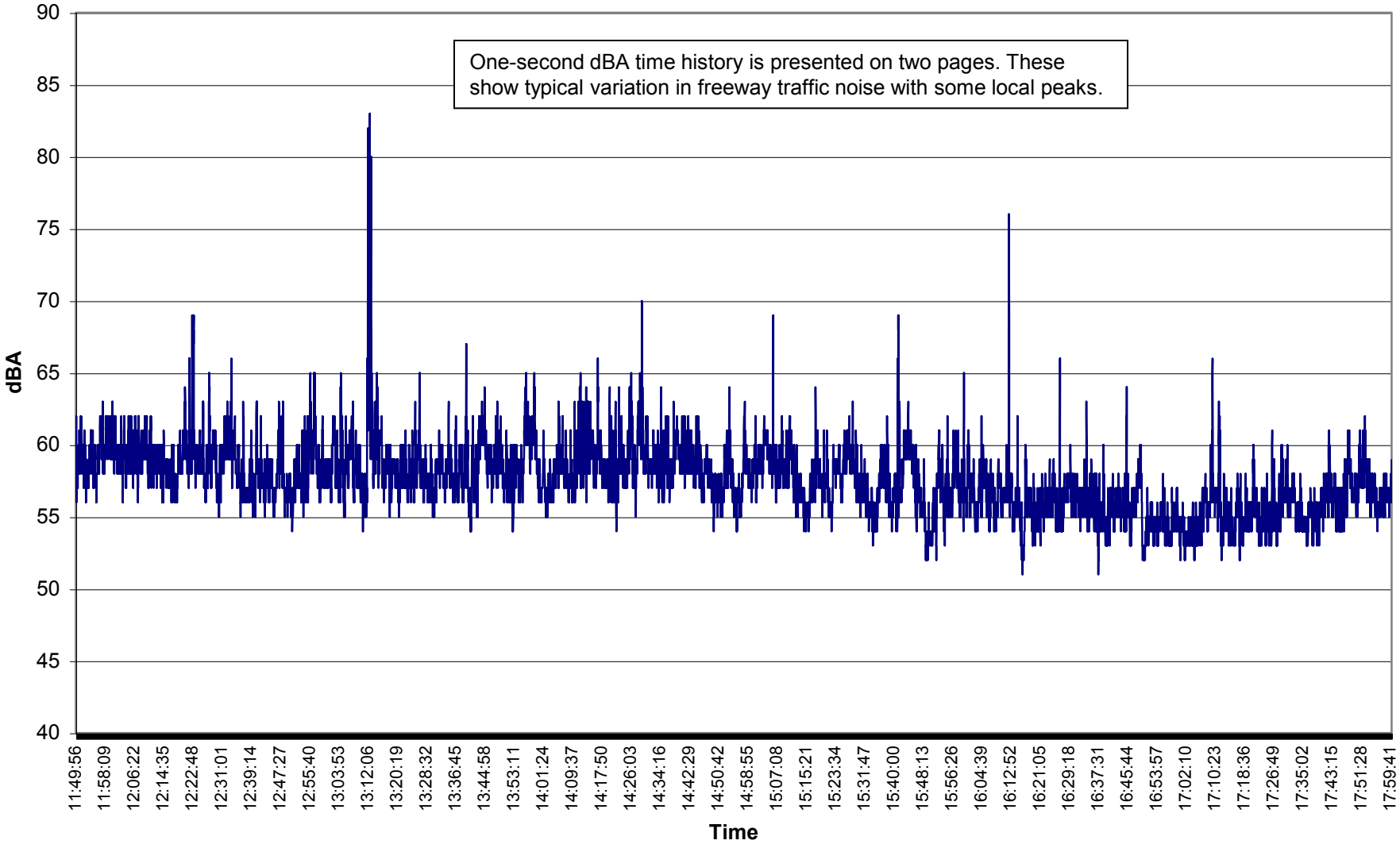
The following four charts present more detailed data from the south meter site

1-minute Intervals-South

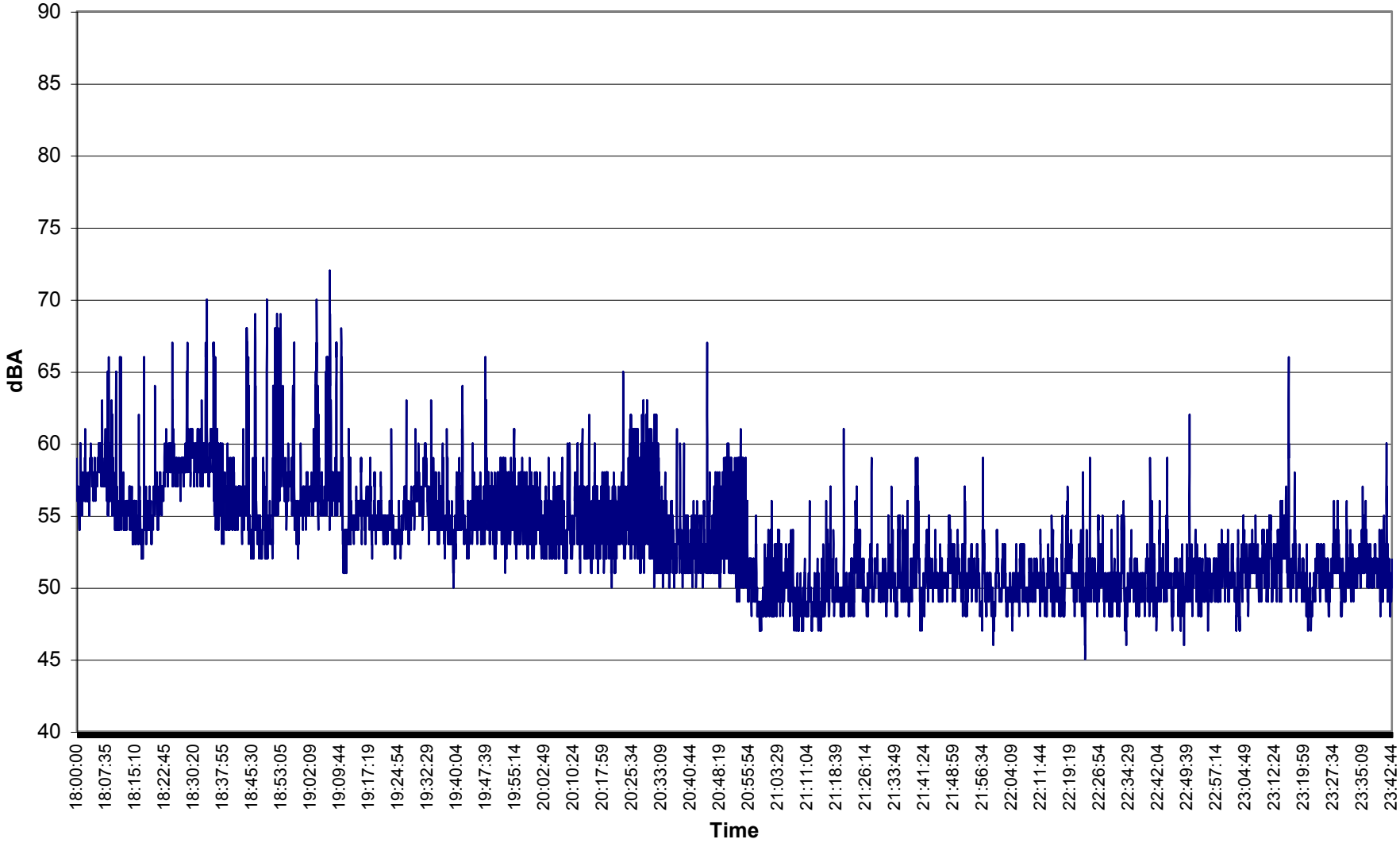


LD820-South\Int-07.xls

1-second Time-History-South (1200-1800)

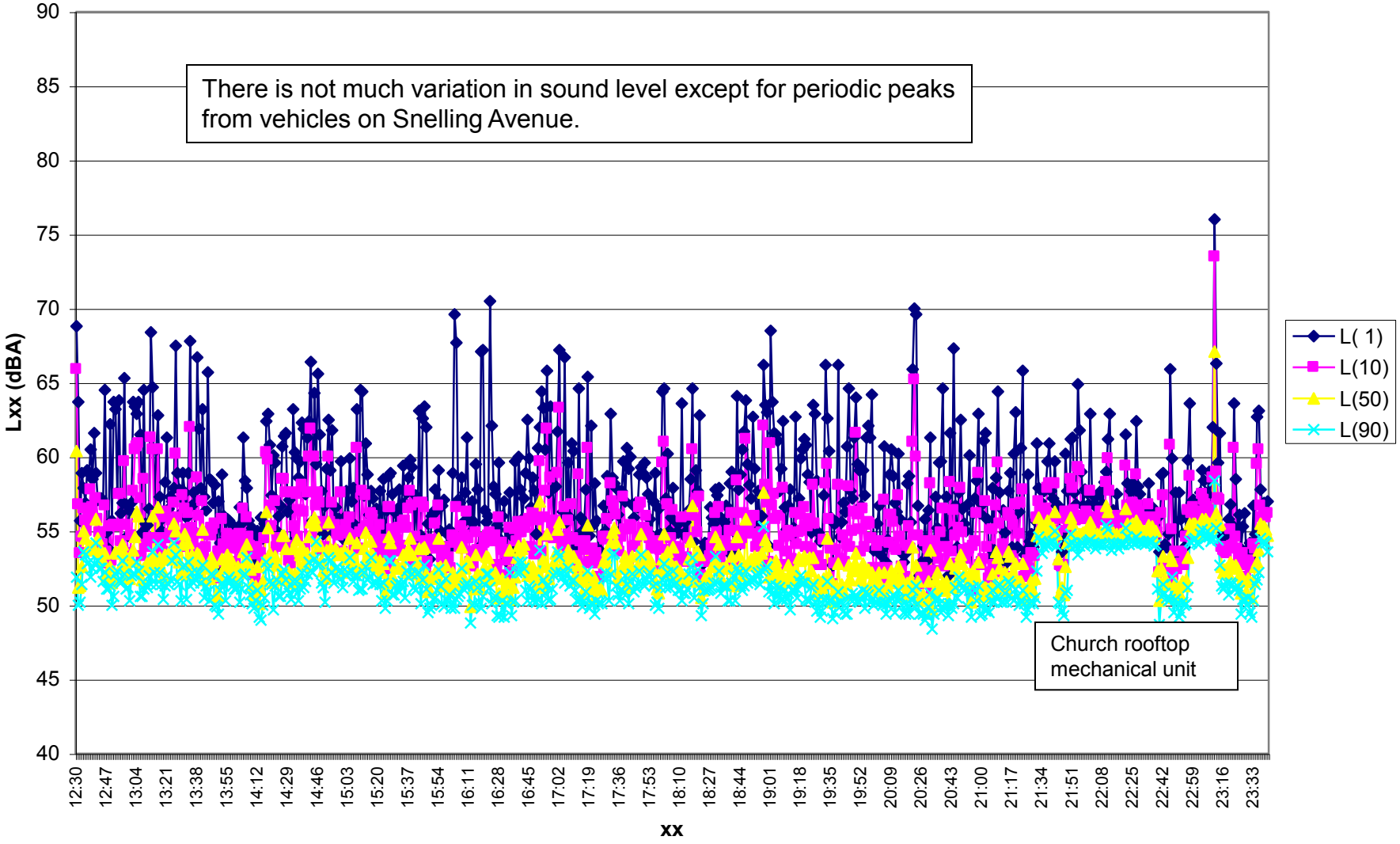


1-second Time-History-South (1800-2400)



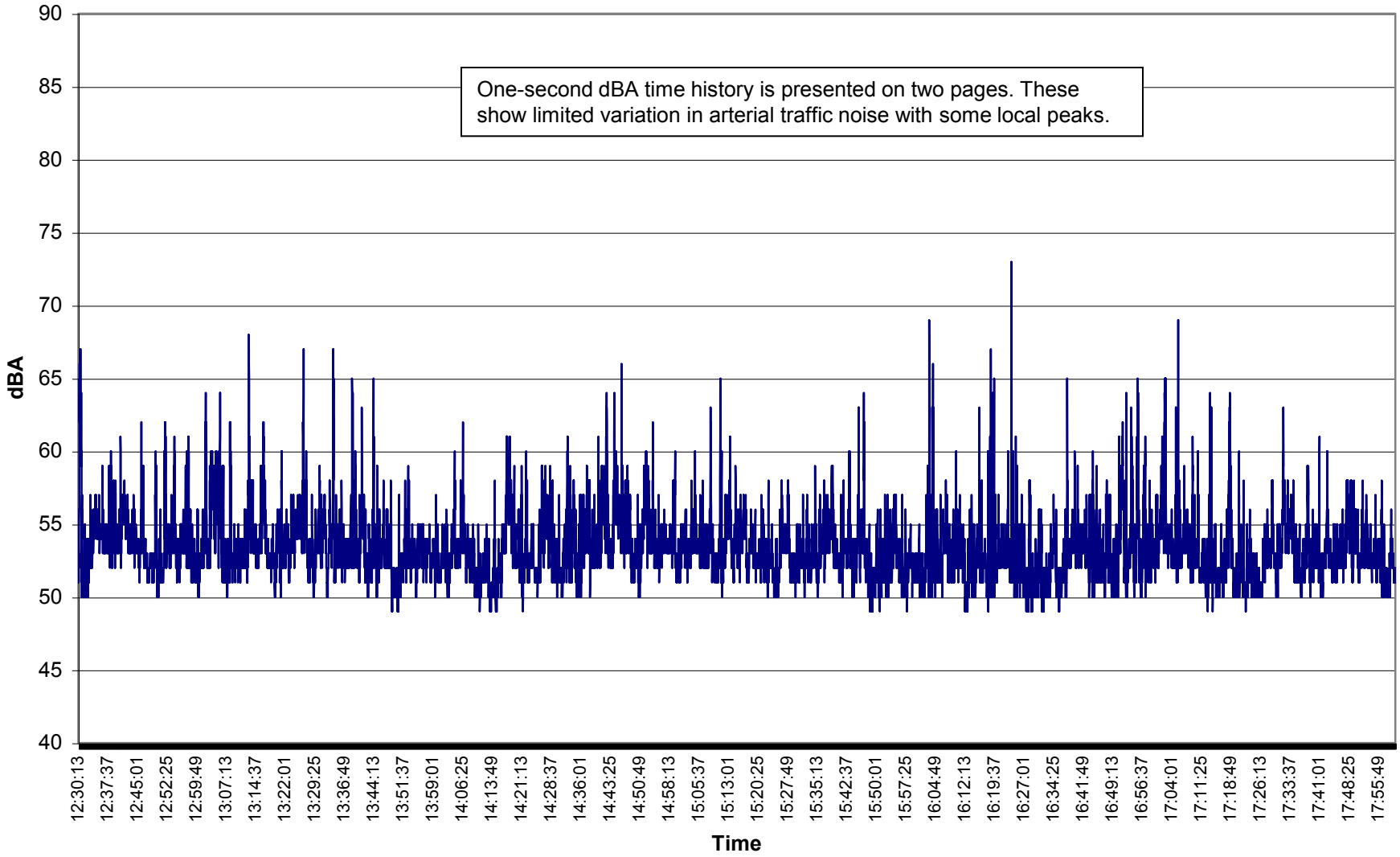
LD820-South\Time-Hist.xls

1-minute Intervals - West



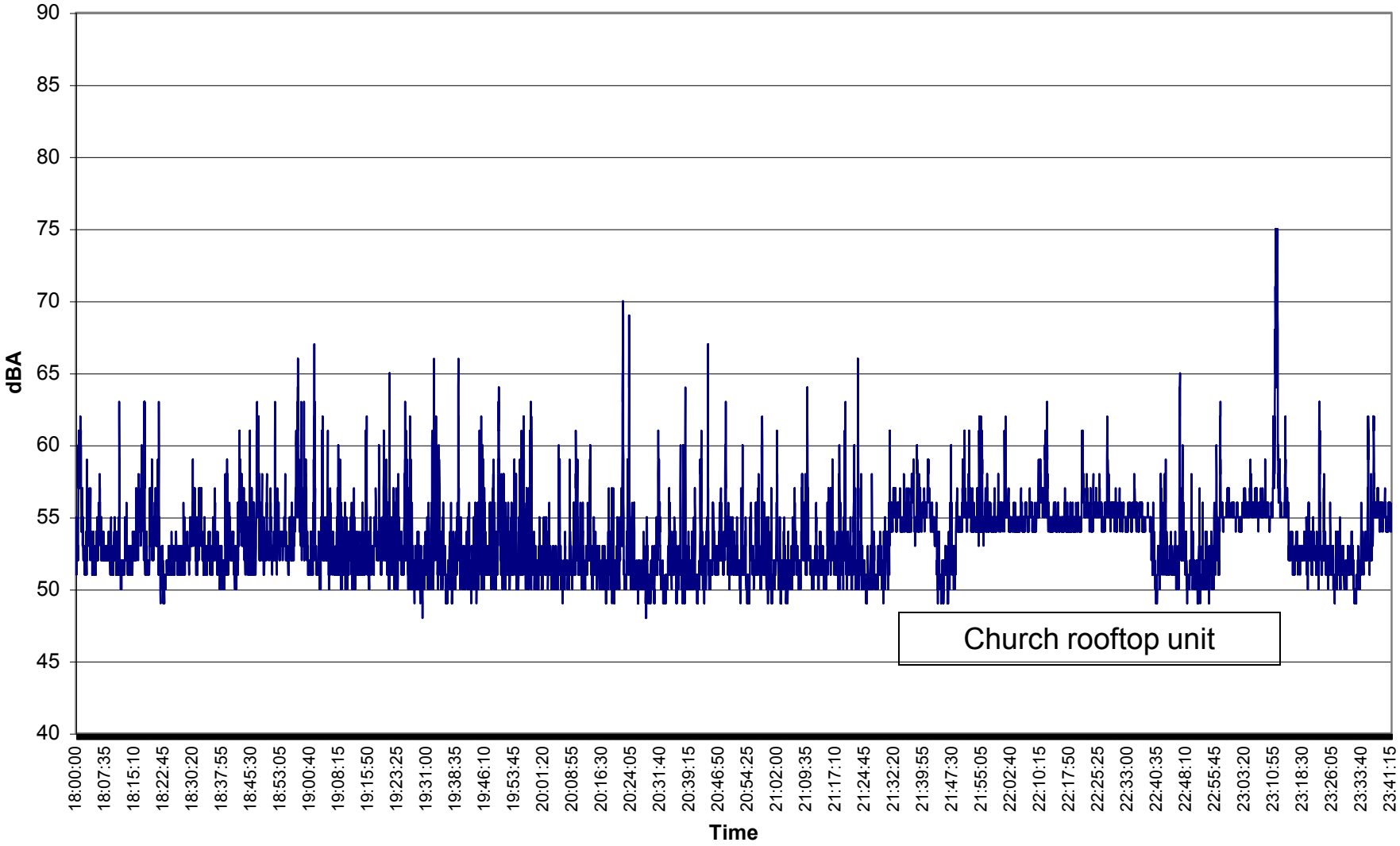
LD820-West\nt-06.xls

1-second Time History West 1230-1800



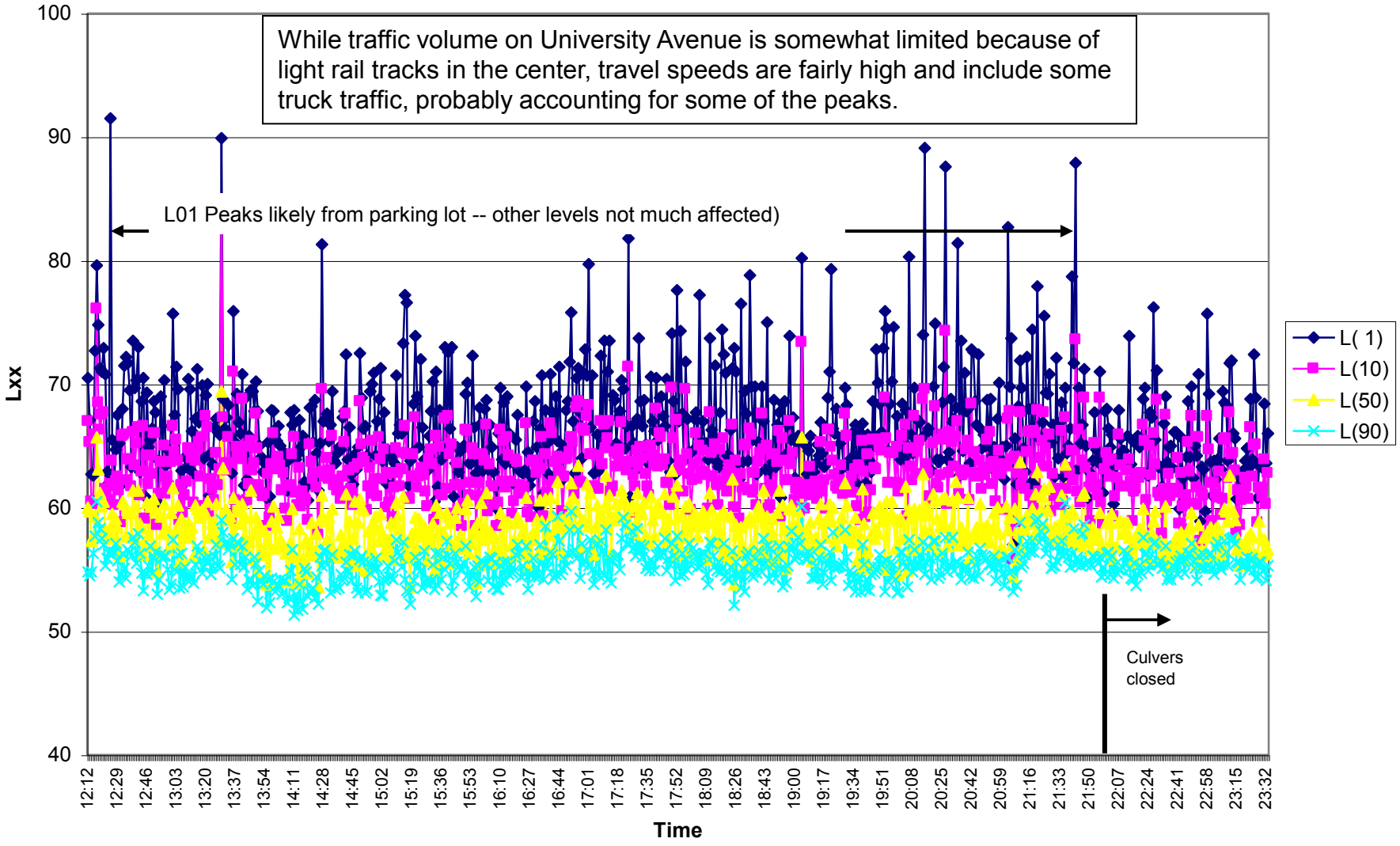
LD820-West\Time-Hist.xls

1-second Time History West-1800-2330



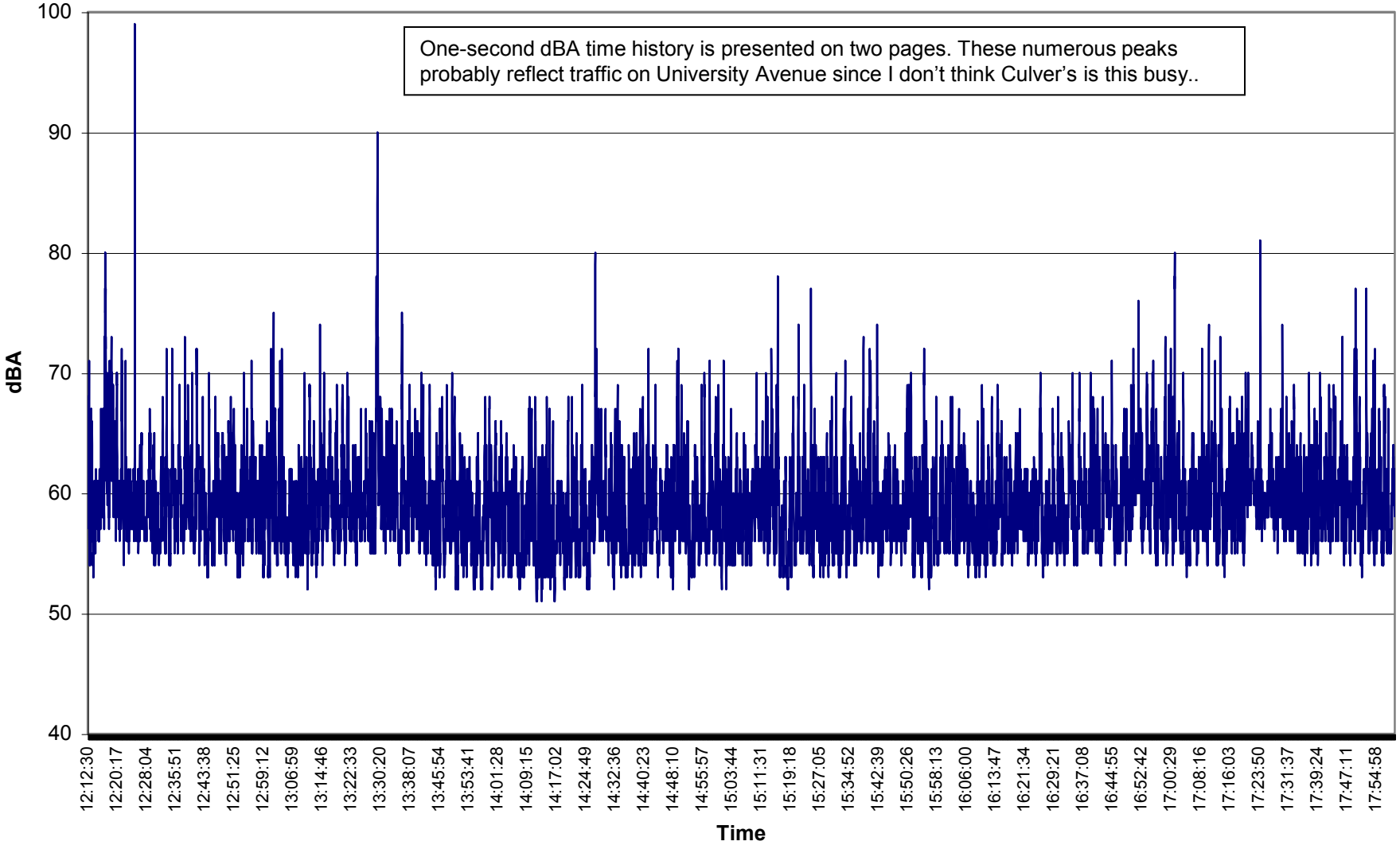
LD820-WestTime-Hist.xls

1-minute Intervals - North



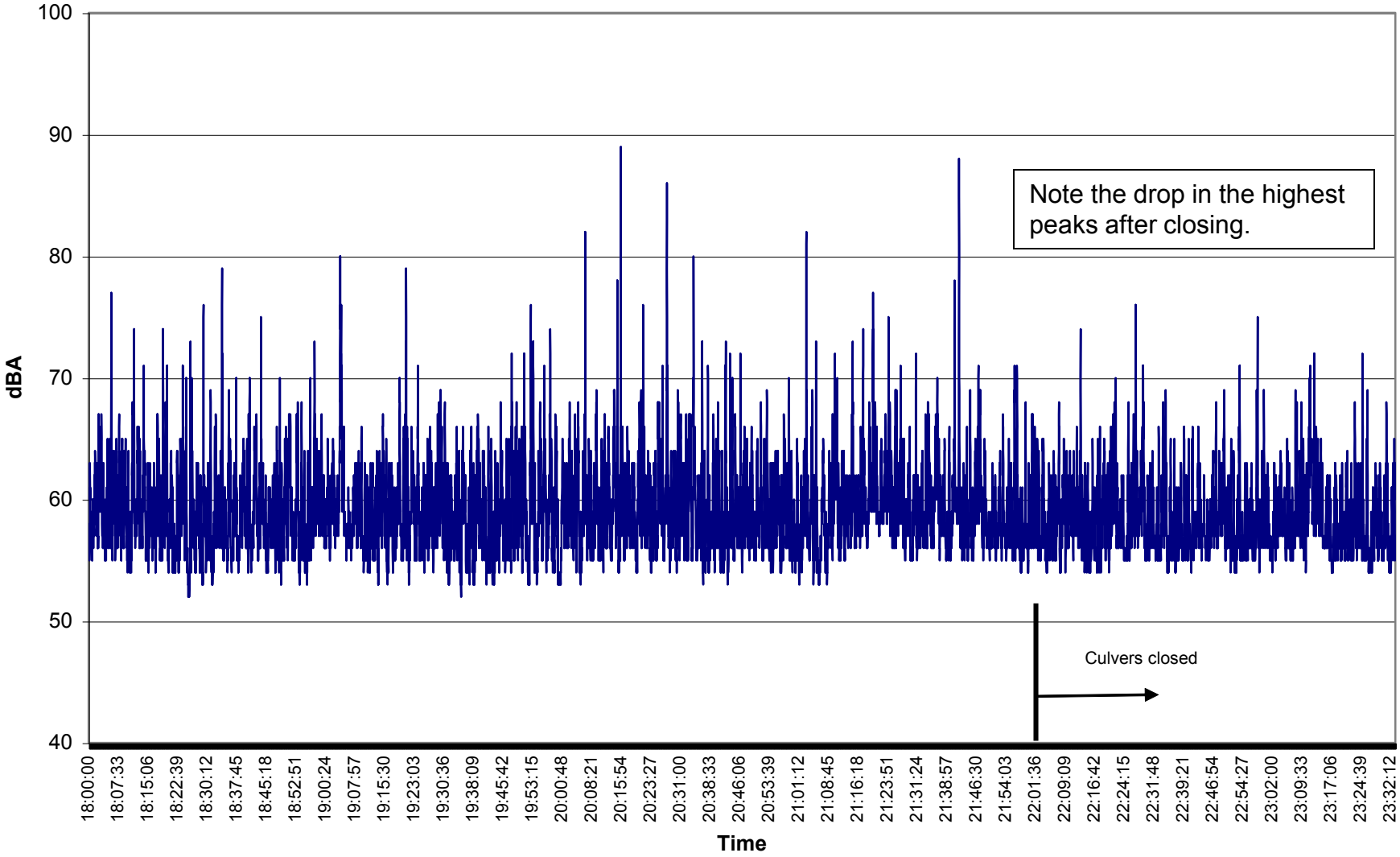
LD820-North\Int-07.xls

North Time History 1200-1800



LD820-North\Time-Hist.xls

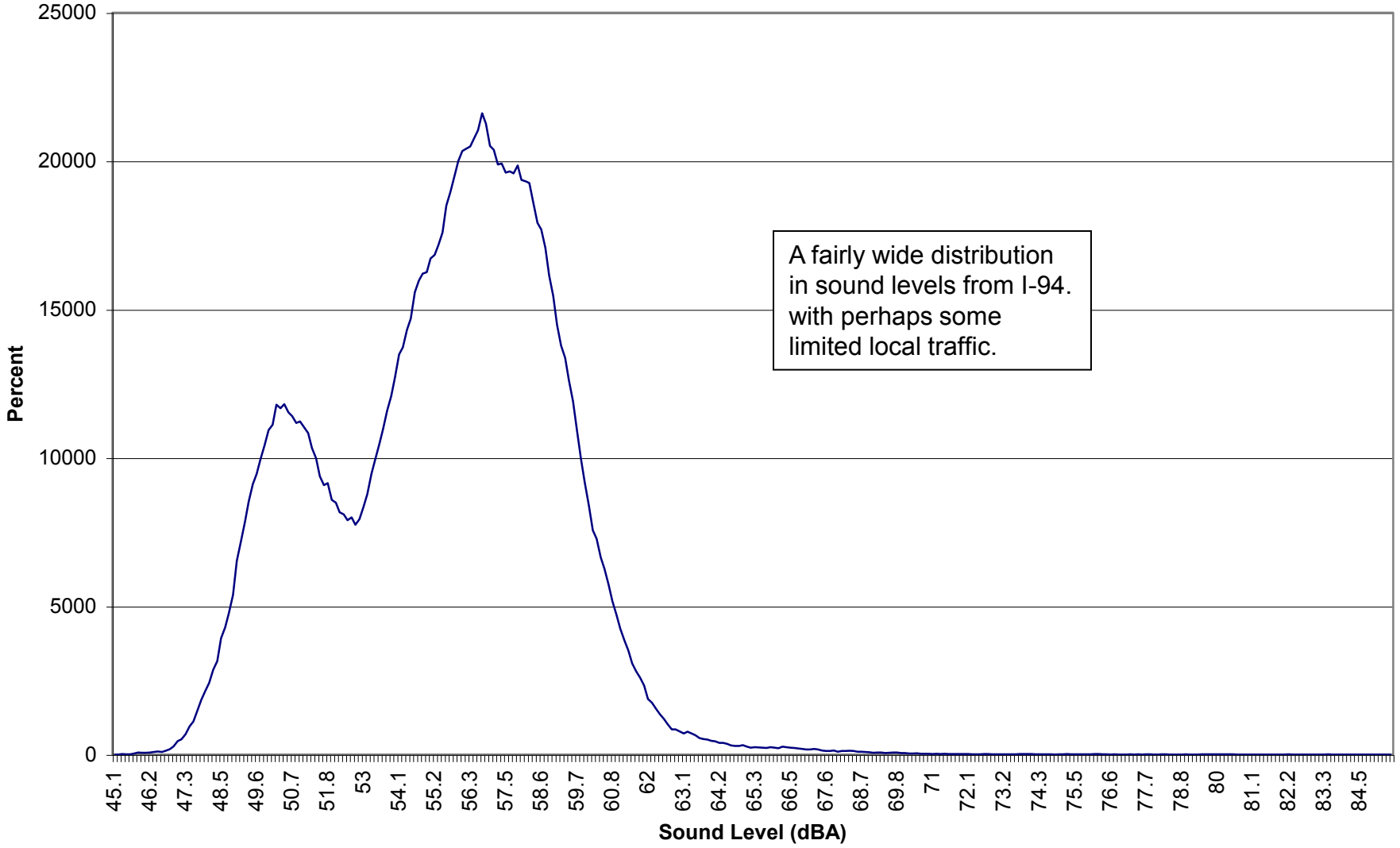
1-second Time History North - 1800-2330



LD820-North\Time-Hist.xls

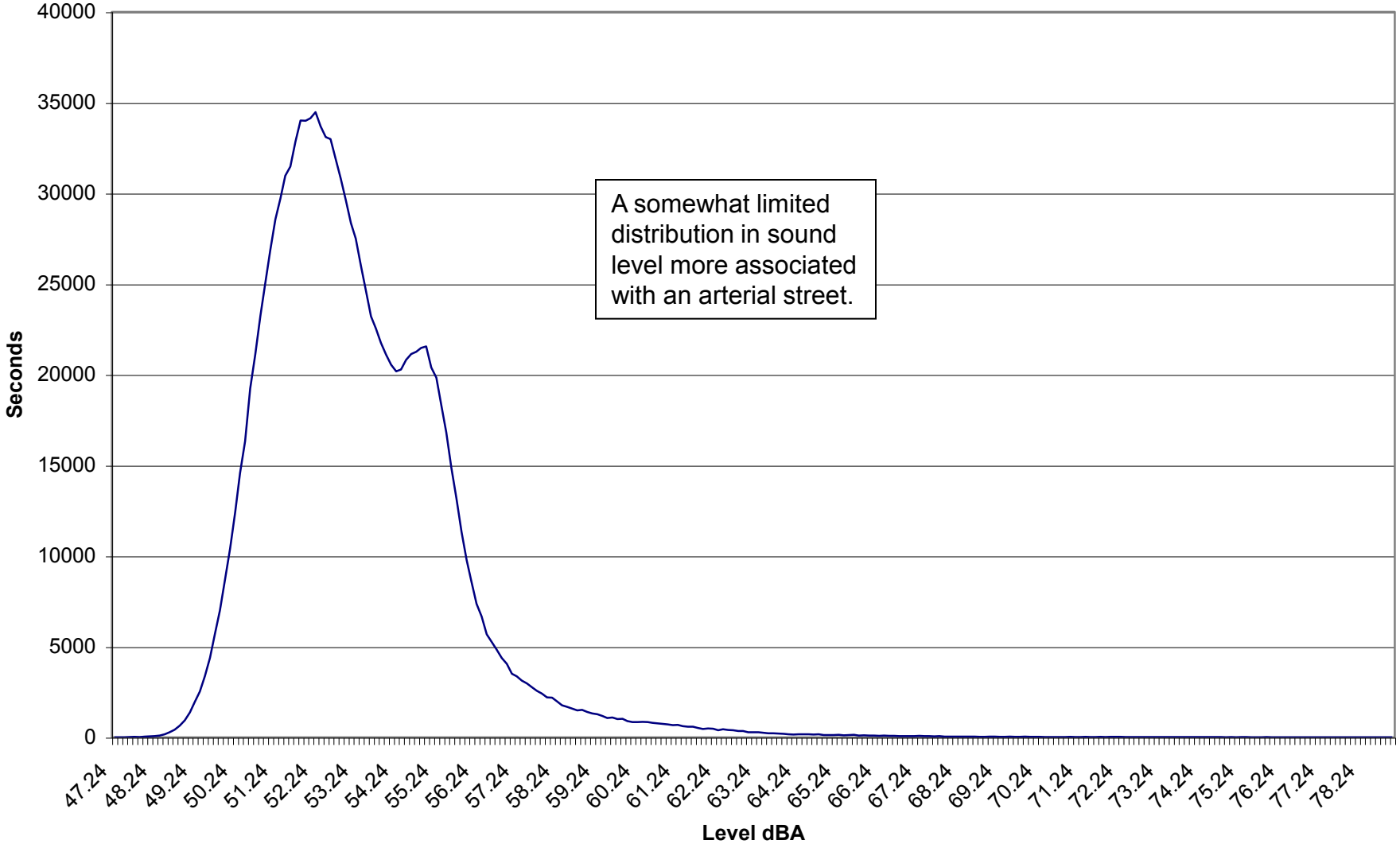
Overall dBA level histograms are presented below to give a general idea of the differences in sound level characteristics at the three sites.

South Site Histogram



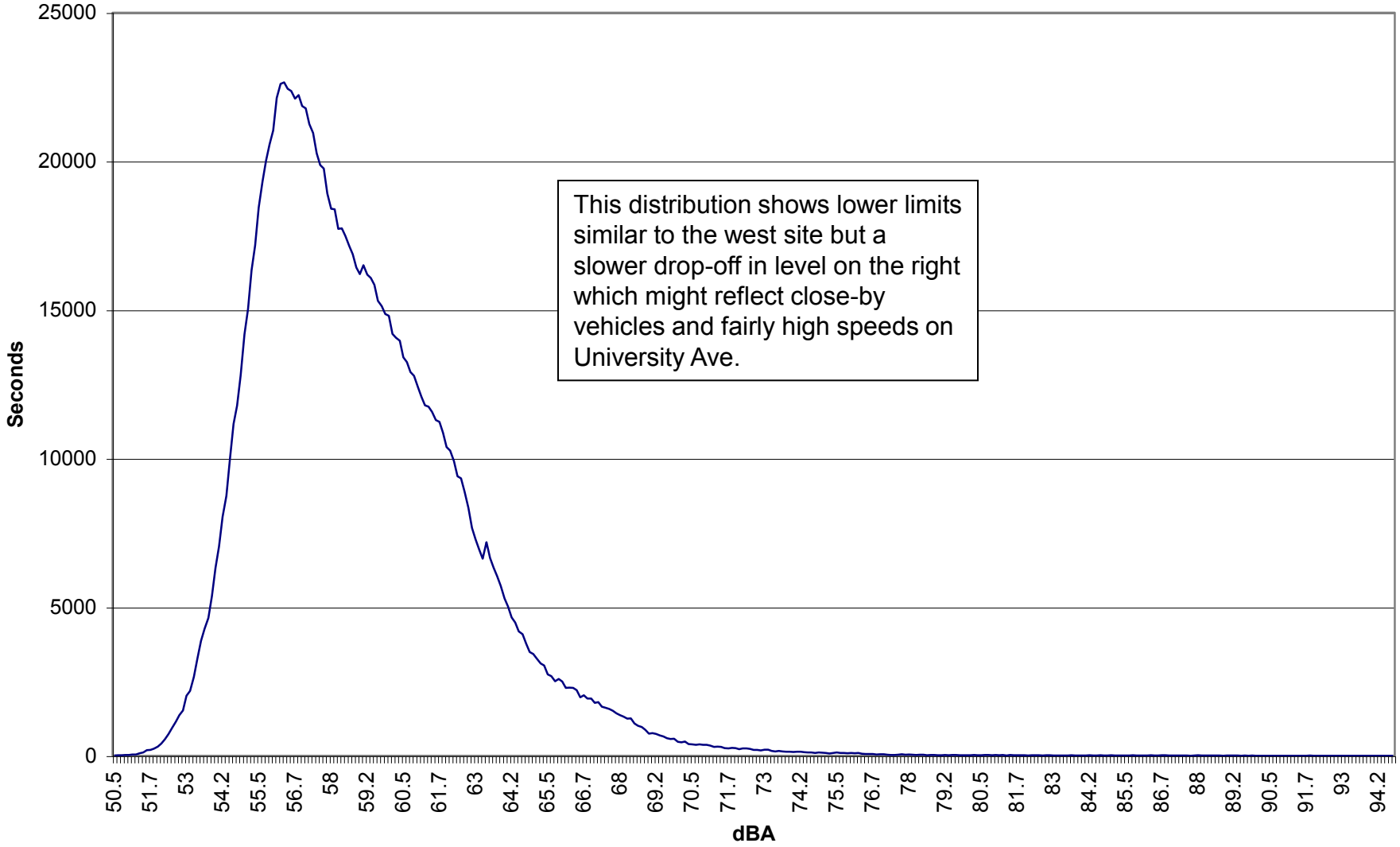
LD820-Southt\histogram.xls

West Site Histogram



LD820-West\histogram.xls

North Site Historgram



LD820-North\histogram.xls

Some summary observations

Ambient sound levels in the area are primarily associated with moving traffic on different types of roadways.

Except for the rooftop level captured at the West site, no unusual tonal or varying sound levels were observed in the area.

The spectrum associated with traffic is generally fairly broad band sound.

Spreadsheets of the data can also be provided.

Please direct questions to:

David Braslau

david@braslau

612-331-4571

Appendix E

Vehicular Noise Analysis

SRF Consulting Group, Inc. | Engineers Planners Designers

Memorandum

SRF No. 9154

To: Josh Williams, Senior Planner
City of St. Paul

From: Brett Danner, Senior Associate
Pat Corkle, PE, PTOE, Principal

Date: May 20, 2016

Subject: Snelling Midway AUAR Area Traffic Noise Analysis

Vehicular Traffic Noise Analysis

A traffic noise analysis was completed for the proposed Major League Soccer (MLS) stadium and surrounding mixed-use development located in the southeast quadrant of the University Avenue/Snelling Avenue intersection in St. Paul, MN. An Alternative Urban Areawide Review (AUAR) is being prepared for the proposed development. This traffic noise analysis was prepared to inform the noise-related section of the AUAR document (Item 17 –Noise).

The State of Minnesota's noise pollution rules are outlined in Minnesota Rules Chapter 7030. Under Minn. R. 7030.0030 (Noise Control Requirement), local governments are required to take reasonable measures to prevent the approval of land use activities that will violate the state noise standards immediately upon the establishment of the land use.[1] Minn. R. 7030.0030 states:

> *No person may violate the standards established in part 7030.0040, unless exempted by Minnesota Statutes, section 116.07, subdivision 2a. Any municipality having authority to regulate land use shall take all reasonable measures within its jurisdiction to prevent the establishment of land use activities listed in noise area classification (NAC) 1, 2, or 3 in any location where the standards established in part 7030.0040 will be violated immediately upon establishment of the land use.*

The main objective of this traffic noise analysis is to assist the City of St. Paul in fulfilling its responsibilities under Minn. R. 7030.0030. The analysis includes identifying existing and future (with and without the proposed development) traffic noise levels at the AUAR area, as well as identifying reasonable measures to minimize or mitigate noise impacts at planned land uses within the AUAR area. In addition, traffic noise levels are identified at existing land uses surrounding the AUAR area. This traffic noise analysis was completed consistent with the guidance described in the Minnesota

[1] Minnesota Pollution Control Agency. November 2015. A Guide to Noise Control In Minnesota. Acoustical Properties, Measurement, Analysis, and Regulation available at. https://www.pca.state.mn.us/air/noise-program.

Department of Transportation's (MnDOT) highway noise policy (MnDOT Noise Policy for Type I Federal-aid Projects as per 23 CFR 772, effective June 15, 2015).[2]

Introduction

General Project Description

MUSC Holdings LLC proposes to build an 18,000 seat professional soccer stadium with expansion and standing room capacity to accommodate a maximum of 25,500 visitors (plus 500 employees) in the AUAR area. The AUAR area is bounded by Snelling, University, and St. Anthony Avenues and Pascal Street in Saint Paul's Midway area (see Figure 1). The remainder of the site will be redeveloped in a phased manner to accommodate a mixed-use development including retail and service commercial, hospitality, residential, office, potentially institutional uses and public and private open space.

Background Information on Noise

Noise is defined as any unwanted sound. Sound travels in a wave motion and produces a sound pressure level. This sound pressure level is commonly measured in decibels. Decibels (dB) represent the logarithm of the ratio of a sound energy relative to a reference sound energy. For highway traffic noise, an adjustment, or weighting, of the high- and low- pitched sound is made to approximate the way that an average person hears sound. The adjusted sound levels are stated in units of "A-weighted decibels" (dBA). A sound increase of 3 dBA is barely noticeable by the human ear, a 5 dBA increase is clearly noticeable, and a 10 dBA increase is heard as twice as loud. For example, if the sound energy is doubled (i.e., the amount of traffic doubles), there is a 3 dBA increase in noise, which is just barely noticeable to most people. On the other hand, if traffic increases by a factor of ten times, the resulting sound level will increase by about 10 dBA and be heard to be twice as loud.

In Minnesota, traffic noise impacts are evaluated by measuring and/or modeling the traffic noise levels that are exceeded 10 percent and 50 percent of the time during the hours of the day and/or night that have the loudest traffic scenario. These numbers are identified as the L_{10} and L_{50} levels, respectively. The L_{10} value is the noise level that is exceeded for a total of 10 percent, or 6 minutes, of an hour. The L_{50} value is the noise level that is exceeded for a total of 50 percent, or 30 minutes, of an hour.

[2] The MnDOT Noise Policy is available online on the MnDOT Office of Environmental Stewardship website at http://www.dot.state.mn.us/environment/noise/pdf/mndot-2015-noise-policy.pdf.

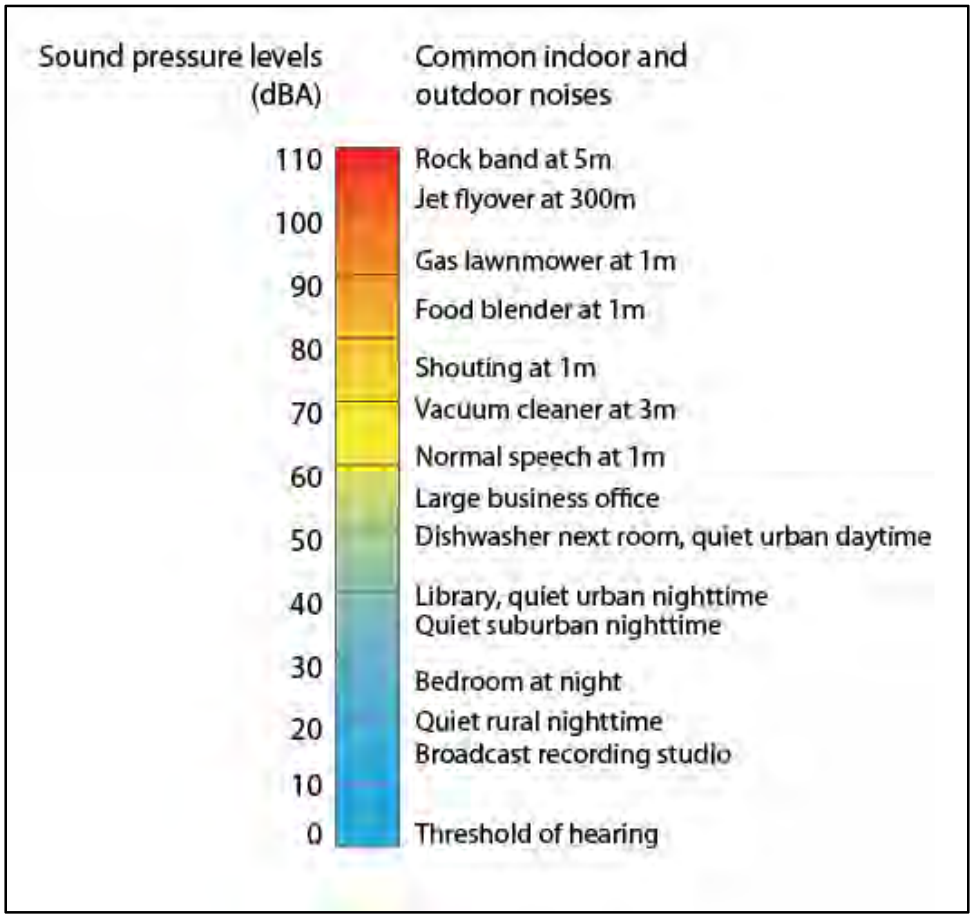
Figure 1. AUAR Area Boundary

Source: Minnesota United MLS Stadium and Surrounding Mixed-Use Urban Village. Scoping Environmental Assessment Worksheet (EAW).

Figure 5-3: AUAR Boundary Area.

Figure 2 provides a rough comparison of the noise levels of some common noise sources.

Figure 2. Decibel Levels of Common Noise Sources



Source: Minnesota Pollution Control Agency. 2016. Noise Program available at https://www.pca.state.mn.us/air/noise-program.

Along with the volume of traffic and other factors (e.g., topography of the area and vehicle speed) that contribute to the loudness of traffic noise, the distance of a receptor from a sound's source is also an important factor. Sound level decreases as distance from a source increases. A general rule regarding sound level decrease due to increasing distance from a line source (roadway) that is commonly used is: beyond approximately 50 feet from the sound source, each doubling of distance from the line source over hard ground (such as pavement or water) will reduce the sound level by 3 dBA, whereas each doubling of distance over soft ground (such as vegetated or grassy ground) results in a sound level decrease of 4.5 dBA.

Minnesota State Noise Standards

Minnesota state noise standards have been established for daytime and nighttime periods. For residential land uses (identified as Noise Area Classification 1 or NAC-1), the state standards for L_{10} are 65 dBA for daytime and 55 dBA for nighttime; the state standards for L_{50} are 60 dBA for daytime and 50 dBA for nighttime. The Minnesota Pollution Control Agency (MPCA) defines daytime as 7:00 a.m. to 10:00 p.m. and nighttime from 10:00 p.m. to 7:00 a.m. State noise standards are depicted in Table 1. Minnesota noise standards apply to the outdoor atmosphere (i.e., exterior noise levels).

Table 1. Minnesota State Noise Standards

Land Use	Code	Daytime L10 (4)	Daytime L50 (4)	Nighttime L10 (5)	Nighttime L50 (5)
Residential	NAC-1 (1)	65 dBA	60 dBA	55 dBA	50 dBA
Commercial	NAC-2 (2)	70 dBA	65 dBA	70 dBA	65 dBA
Industrial	NAC-3 (3)	80 dBA	75 dBA	80 dBA	75 dBA

(1) NAC-1 includes household units, transient lodging and hotels, educational, religious, cultural, entertainment, camping, and picnicking land uses.

(2) NAC-2 includes retail and restaurants, transportation terminals, professional offices, parks, recreational, and amusement land uses.

(3) NAC-3 includes industrial manufacturing, transportation facilities (except terminals), and utilities land uses.

(4) Daytime hours from 7:00 a.m. to 10:00 p.m.

(5) Nighttime hours from 10:00 p.m. to 7:00 a.m.

State noise standards apply to trunk highway facilities and roadways within the cities of Minneapolis and St. Paul. Exemptions to state noise standards are found in Minnesota Statutes 2000, Section 116.07 subd. (2a). There it is stated the conditions and roadway types that are exempt from the State noise standards.

Analysis Methodology

Affected Environment

The AUAR area is located in Ramsey County in the City of St. Paul. The AUAR area is an approximately 34.5-acre property. The AUAR area is bordered by Snelling Avenue to the west and Pascal Street to the east. University Avenue and the Green Line Light Rail Transit (LRT) corridor are located along the northern side of the AUAR area. The southern side of the AUAR area is bordered by St. Anthony Avenue (a one-way westbound frontage road) and I-94. Existing noise sources in the vicinity of the AUAR area include noise generated by vehicular traffic as well as by LRT traffic (LRT vehicles and horn noise).

Noise Monitoring

Noise Level Monitoring Results

Noise level monitoring is commonly performed as part of a traffic noise study to document existing noise levels and to validate the noise model for the project (see discussion of "Field Measurements and Predicted Noise Levels" below). Existing noise levels were monitored at three locations within the AUAR area. Noise monitoring locations are illustrated in the AUAR area figure in Attachment A and described below.

- Monitoring Site 1 (M-1) is located along St. Anthony Avenue and the south side of the AUAR area, northwest of the Pascal Street/St. Anthony Avenue intersection.
- Monitoring Site 2 (M-2) is located along Pascal Street and the east side of the AUAR area, approximately half-way between University Avenue and St. Anthony Avenue.
- Monitoring Site 3 (M-3) is located is along the west side of the AUAR area near the Snelling Avenue/St. Anthony Avenue intersection.

Daytime noise levels were collected in April 2016 at the three receptor locations described above. Noise levels were monitored at each location twice; one 30-minute measurement during the morning and one 30-minute measurement during the afternoon.[3] A trained noise monitoring technician was present at each session for the entire field measurement session to ensure correct operation of the sound level meter (SLM). The field measurement results are presented below in Table 2. Monitored daytime traffic noise levels ranged from 63.0 dBA (L_{10}) to 70.5 dBA (L_{10}).

Table 2. Field Measurement Summary Table

Receptor ID	Location Description	Start Time	End Time	Measured Level, L10, dBA	Measured Level, L50, dBA
M-1	South side of AUAR area along St. Anthony Avenue	10:20 AM	10:50 AM	66.5	64.5
M-1	South side of AUAR area along St. Anthony Avenue	12:50 PM	1:20 PM	66.5	64.0
M-2	East side of AUAR area along Pascal Street	11:00 AM	11:30 AM	64.0	59.0
M-2	East side of AUAR area along Pascal Street	1:30 PM	2:00 PM	63.0	58.5

[3] The first measurement at monitoring site 3 (M-3) (southwest corner of AUAR area along Snelling Avenue) was completed at midday. See Table 2 for field measurement start and end times.

Receptor ID	Location Description	Start Time	End Time	Measured Level, L10, dBA	Measured Level, L50, dBA
M-3	Southwest corner of AUAR area along Snelling Avenue	11:45 AM	12:15 PM	70.0	65.0
M-3	Southwest corner of AUAR area along Snelling Avenue	2:15 PM	2:45 PM	70.5	65.0

Field Measurements and Predicted Noise Levels

Noise monitoring results are presented in Table 3 along with the computer modeling results for existing daytime traffic noise levels. Computer modeling results are based on classified traffic (e.g., cars, medium trucks, and heavy trucks) observed during the field measurements. The speeds used for the model predictions were posted speeds (e.g., 55 miles per hour on eastbound and westbound Interstate-94 [I-94], 30 mph on northbound and southbound Snelling Avenue). Noise monitoring results presented in Table 3 are an average of the applicable morning and afternoon field measurements described above.

Table 3. Field Measurements and Predicted Noise Levels

Receptor ID	Field Measurement, L10, dBA	Field Measurement, L50, dBA	Predicted, L10, dBA	Predicted, L50, dBA	Difference (Field – Predicted), L10, dBA	Difference (Field – Predicted), L50, dBA
M-1	66.5	64.3	69.5	68.2	3.0	3.9
M-2	63.5	58.8	65.1	59.6	1.6	0.8
M-3	70.3	65.0	73.3	67.8	3.0	2.8

A discrepancy equal to or less than 3.0 dBA between field measurements and predicted levels is considered acceptable for noise model validation. Monitored traffic noise levels (L_{10}) varied from 1.6 dBA below predicted noise levels at Site M-2 to 3.0 dBA below predicted levels at Site M-1 and Site M-3. The discrepancy between field measurements and predicted levels was equal to or less than the 3.0 dBA (L_{10}) threshold described above. Therefore, the prediction model was utilized without corrections.

Worst Hourly Traffic Noise Analysis

In general, higher traffic volumes, vehicle speeds, and greater numbers of heavy trucks increase the loudness of highway traffic noise. The worst hourly traffic noise impact typically occurs when traffic is flowing more freely (e.g., level of service C conditions) and when heavy truck volumes are the

greatest. For determining the worst-case traffic noise hour, traffic noise levels were modeled for six daytime time periods at 12 representative receptor locations within the AUAR area under existing conditions, taking into account the appropriate classified traffic mix (i.e., cars, medium trucks, heavy trucks)[4] and directional split in traffic volume (e.g., eastbound and westbound I-94, eastbound and westbound University Avenue, northbound and southbound Snelling Avenue). The speeds used for the model predictions were posted speeds.

The daytime L_{10} and L_{50} levels for each of the six modeled time periods are summarized in Table 4. For a majority of the 12 modeled receptor locations, the 9:00 a.m. to 10:00 a.m. period represents the worst-cast traffic noise hour during the daytime period. Based on this analysis, it was determined that the 9:00 a.m. to 10:00 a.m. period represents the worst-case traffic noise hour during the daytime period. The 9:00 a.m. to 10:00 a.m. hour represents a period of higher medium and heavy truck volumes on I-94 at the south end of the AUAR area. The 6:00 a.m. to 7:00 a.m. hour was identified as the loudest hour of the nighttime period because of higher traffic volumes just prior to the start of the morning peak period.

Traffic Noise Modeling

Noise modeling was done using the noise prediction program "MINNOISEV31", a version of the FHWA "STAMINA" model adapted by MnDOT for use in Minnesota. This model uses traffic volumes, speed, class of vehicle,[5] and the typical characteristics of the roadways being analyzed (e.g., roadway horizontal and vertical alignments). The noise modeling assumed free flow conditions through at-grade intersections on local roadways adjacent to the AUAR area (e.g., Snelling Avenue/St. Anthony Avenue intersection, Snelling Avenue/University Avenue intersection, University Avenue/Pascal Street intersection, Pascal Street/St. Anthony Avenue intersection).

[4] Identification of the worst-case traffic noise hour based on May 2006 and June 2002 vehicle classification counts for eastbound and westbound I-94 east of Lexington Avenue in St. Paul (MnDOT Vehicle Classification Count Site #1301), and on February 2016 vehicle classification counts for University Avenue and Lexington Avenue.

[5] The traffic noise analysis for the proposed development followed MnDOT's vehicle classification scheme for use in MINNOISE (cars, medium trucks, and heavy trucks). Cars includes passenger cars, vans, SUVs and pickup trucks; medium trucks include vehicles with six wheels and only two axles, motorcycles, and buses; and heavy trucks include vehicles with three or more axles. See also http://www.dot.state.mn.us/environment/noise/policy/2011.html.

Table 4. Worst Hourly Traffic Noise Summary (Existing Modeled Daytime Noise Levels By Time Period)

Receptor ID	7:00 – 8:00 AM, L_{10}, dBA	7:00 – 8:00 AM, L_{50}, dBA	9:00 – 10:00 AM, L_{10}, dBA	9:00 – 10:00 AM, L_{50}, dBA	11:00 AM – Noon L_{10}, dBA	11:00 AM – Noon L_{50}, dBA	1:00 – 2:00 PM, L_{10}, dBA	1:00 – 2:00 PM, L_{50}, dBA	3:00 – 4:00 PM, L_{10}, dBA	3:00 – 4:00 PM, L_{50}, dBA	5:00 – 6:00 PM, L_{10}, dBA	5:00 – 6:00 PM, L_{50}, dBA
N0	65.5	55.4	67.6	57.8	68.2	59.2	69.2	60.0	68.9	60.5	69.3	61.5
N50	62.5	56.1	63.5	57.0	63.4	57.5	64.4	58.0	63.9	58.5	63.7	58.7
N100	60.7	56.9	61.5	57.3	61.0	57.3	62.0	57.8	61.4	58.0	61.0	57.8
E0	66.3	58.8	66.6	58.6	65.9	58.7	66.6	58.8	66.9	59.7	66.6	60.2
E50	63.2	59.3	63.6	59.2	62.6	58.9	63.4	59.0	63.4	59.4	62.5	59.0
E100	61.7	59.4	62.0	59.4	61.0	58.8	61.7	59.1	61.6	59.3	60.6	58.6
S0	73.5	70.3	73.7	69.9	72.8	69.4	73.3	69.5	73.3	70.0	72.1	69.2
S50	70.4	67.9	70.5	67.7	69.7	67.0	70.0	67.2	70.0	67.5	68.6	66.5
S100	68.5	66.2	68.5	66.1	67.9	65.3	68.1	65.6	68.0	65.8	66.6	64.6
W0	70.0	63.3	70.5	63.3	69.8	63.2	70.7	63.8	70.8	64.8	70.8	65.6
W50	65.8	62.1	66.3	62.0	65.4	61.6	66.2	62.1	66.1	62.7	65.6	62.7
W100	63.7	61.4	64.1	61.4	63.3	60.8	63.9	61.3	63.8	61.6	63.2	61.2
State Standard (NAC-1)	65	60	65	60	65	60	65	60	65	60	65	60
State Standard (NAC-2)	70	65	70	65	70	65	70	65	70	65	70	65
State Standard (NAC-3)	80	75	80	75	80	75	80	75	80	75	80	75

Traffic data for noise model input files included existing[6] and forecast traffic volumes for roadways surrounding the AUAR area. Forecast volumes for the future No Build Alternative (without the proposed development) were based on a 0.5 percent annual growth rate in background traffic volumes. Forecast volumes for the future Build scenario (with the proposed development) include the background traffic growth identified for the No Build Alternative plus the additional traffic generated by planned land uses at the AUAR area. Year 2035 was identified as the future year for analysis. Full build out conditions of the AUAR area are expected to be completed by year 2035.

The daytime hour of analysis was the 9:00 a.m. to 10:00 a.m. hour (see Worst Hourly Traffic Noise Analysis discussion above). The nighttime hour of analysis was the 6:00 a.m. to 7:00 a.m. hour. Traffic noise levels were also analyzed using future (2035) volumes for weekend event arrival (1:00 p.m. – 2:00 p.m.) and departure (4:00 p.m. – 5:00 p.m.) periods. Weekend event arrival and departure periods were evaluated because of higher background traffic levels compared to weekday event periods.

The traffic characteristics used to develop the noise model input from average daily traffic (ADT) volumes is provided in Appendix B. Modeled hourly traffic volumes by vehicle classification for existing conditions, the No Build Alternative, and the Build Alternative scenarios (with proposed development and weekend event conditions) are provided in Attachment C. To account for when congested conditions cause reduce speeds during event arrival and departure periods, a default traffic volume of 1,500 vehicles per lane per hour was used in the noise model input files for I-94, and 700 vehicles per lane per hour for local roadways where appropriate. The posted speed limit was used as the traffic speed for all noise model input files.

The proposed development is anticipated to include construction of new roadways internal to the site. At this stage in the planning process, there is not adequate engineering information (e.g., roadway alignment, profiles, etc.) available to accurately incorporate this internal street network into the traffic noise analysis. The traffic noise analysis was completed based on the existing roadway network surrounding the project site. Existing noise sources in the vicinity of the AUAR area includes traffic noise as well as noise generated from operations of the Green Line LRT. This analysis only considers L_{10} and L_{50} noise levels generated by vehicles (cars, medium trucks, heavy trucks) traveling on area roadways and does not include an evaluation of Green Line LRT.

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[6] Existing traffic volumes from MnDOT annual average daily traffic (AADT) counts (Minnesota Department of Transportation. Office of Transportation Data and Analysis. Traffic Data & Analysis. http://www.dot.state.mn.us/traffic/data/tma.html).

Predicted Noise Levels and Noise Impacts

Noise Receptors

AUAR Area Receptors

Traffic noise levels were identified at 68 representative receptors located at incremental distances from the right of way limits along the north, east, south, and west sides of the AUAR area (e.g., 0 feet, 50 feet, 100 feet, 150 feet, 200 feet, 250 feet, 300 feet, 350 feet, and 400 feet). The purpose of locating representative receptors at these locations was to identify setback distances from existing right of way where modeled traffic noise levels would be at or below state daytime and nighttime standards for different noise area classifications. This analysis was based on existing topography, and assumed no intervening barriers or structures between the modeled receptor locations and roadways adjacent to the AUAR area. AUAR area receptor locations are illustrated in Attachment A.

Receptors Surrounding the AUAR Area

Traffic noise impacts were also assessed by modeling noise levels at representative receptor sites adjacent to the AUAR area along local streets (Snelling Avenue, University Avenue, and Pascal Street). Traffic noise levels were modeled at 12 representative receptor locations representing residential, commercial/office, and transportation (Snelling Avenue LRT Station) uses. Modeled receptors were located at exterior areas where frequent human use occurs. In instances where there was no apparent exterior area of frequent use, the modeled receptor was located at the façade of the building. Modeled receptor locations surrounding the AUAR area are illustrated in Attachment A.

Noise Model Results

AUAR Area Receptors

Daytime and Nighttime Analysis Results

Results of the noise modeling analysis for AUAR area receptors under existing conditions, the future (2035) No Build Alternative, and the future (2035) Build Alternative are tabulated in Table 5 (daytime) and Table 6 (nighttime). The results of the traffic noise modeling analysis are summarized below.

Existing daytime L_{10} noise levels at modeled receptor locations within the AUAR area range from 59.1 dBA to 73.7 dBA, whereas L_{50} noise levels range from 56.8 dBA to 69.9 dBA. Existing nighttime L_{10} modeled noise levels range from 57.9 dBA to 73.0 dBA, whereas L_{50} noise levels range from 52.2 dBA to 69.8 dBA.

Table 5. Traffic Noise Model Results (AUAR Area Receptors) (Daytime Levels)

Receptor ID	Distance from R/W	Existing, L_{10}, dBA	Existing, L_{50}, dBA	No Build (2035), L_{10}, dBA	No Build (2035, L_{50}, dBA	No Build – Existing, L_{10}, dBA	No Build – Existing, L_{50}, dBA	Build (2035), L_{10}, dBA	Build (2035), L_{50}, dBA	Build – Existing, L_{10}, dBA	Build – Existing, L_{50}, dBA
N0	0 feet	67.2	57.6	67.7	58.3	0.5	0.7	68.0	58.7	0.8	1.1
N50	50 feet	63.2	56.9	63.6	57.5	0.4	0.6	63.9	57.9	0.7	1.0
N100	100 feet	61.2	57.3	61.5	57.8	0.3	0.5	61.7	58.0	0.5	0.7
N150	150 feet	60.0	57.4	60.3	57.9	0.3	0.5	60.5	58.1	0.5	0.7
N200	200 feet	59.3	57.5	59.7	57.9	0.4	0.4	59.9	58.1	0.6	0.6
N250	250 feet	59.1	57.5	59.4	58.0	0.3	0.5	59.6	58.2	0.5	0.7
N300	300 feet	59.1	57.7	59.4	58.1	0.3	0.4	59.6	58.3	0.5	0.6
N350	350 feet	59.2	57.8	59.6	58.2	0.4	0.4	59.7	58.4	0.5	0.6
N400	400 feet	59.4	58.0	59.8	58.5	0.4	0.5	59.9	58.6	0.5	0.6
E0	0 feet	66.6	58.6	67.0	59.2	0.4	0.6	67.6	60.1	1.0	1.5
E50	50 feet	63.6	59.1	63.9	59.7	0.3	0.6	64.3	60.1	0.7	1.0
E100	100 feet	62.0	59.3	62.3	59.8	0.3	0.5	62.5	60.1	0.5	0.8
E150	150 feet	61.2	59.3	61.5	59.7	0.3	0.4	61.7	59.9	0.5	0.6
E200	200 feet	60.8	59.2	61.2	59.6	0.4	0.4	61.4	59.8	0.6	0.6
E250	250 feet	60.7	59.1	61.0	59.5	0.3	0.4	61.2	59.7	0.5	0.6
State Standard	NAC-1	65	60	65	60	--	--	65	60	--	--
State Standard	NAC-2	70	65	70	65	--	--	70	65	--	--
State Standard	NAC-3	80	75	80	75	--	--	80	75	--	--

Table 5. Traffic Noise Model Results (AUAR Area Receptors) (Daytime Levels)

Receptor ID	Distance from R/W	Existing, L_{10}, dBA	Existing, L_{50}, dBA	No Build (2035), L_{10}, dBA	No Build (2035, L_{50}, dBA	No Build – Existing, L_{10}, dBA	No Build – Existing, L_{50}, dBA	Build (2035), L_{10}, dBA	Build (2035), L_{50}, dBA	Build – Existing, L_{10}, dBA	Build – Existing, L_{50}, dBA
E300	300 feet	60.6	59.1	61.0	59.5	0.4	0.4	61.1	59.7	0.5	0.6
E350	350 feet	60.6	59.1	61.0	59.5	0.4	0.4	61.1	59.7	0.5	0.6
E400	400 feet	60.6	59.1	61.0	59.5	0.4	0.4	61.1	59.7	0.5	0.6
S0	0 feet	73.7	69.9	74.0	70.4	0.3	0.5	74.1	70.6	0.4	0.7
S50	50 feet	70.5	67.7	70.8	68.2	0.3	0.5	70.9	68.3	0.4	0.6
S100	100 feet	68.5	66.1	68.9	66.5	0.4	0.4	69.0	66.6	0.5	0.5
S150	150 feet	67.1	64.8	67.4	65.3	0.3	0.5	67.6	65.4	0.5	0.6
S200	200 feet	66.0	63.8	66.3	64.3	0.3	0.5	66.4	64.4	0.4	0.6
S250	250 feet	65.0	63.0	65.4	63.4	0.4	0.4	65.5	63.6	0.5	0.6
S300	300 feet	64.2	62.3	64.6	62.7	0.4	0.4	64.7	62.9	0.5	0.6
S350	350 feet	63.5	61.7	63.9	62.1	0.4	0.4	64.0	62.3	0.5	0.6
S400	400 feet	62.9	61.2	63.3	61.6	0.4	0.4	63.4	61.8	0.5	0.6
W0	0 feet	70.5	63.3	70.9	63.9	0.4	0.6	71.6	64.8	1.1	1.5
W50	50 feet	66.3	62.0	66.6	62.5	0.3	0.5	67.1	63.1	0.8	1.1
W100	100 feet	64.1	61.4	64.4	61.8	0.3	0.4	64.8	62.2	0.7	0.8
State Standard	NAC-1	65	60	65	60	--	--	65	60	--	--
State Standard	NAC-2	70	65	70	65	--	--	70	65	--	--
State Standard	NAC-3	80	75	80	75	--	--	80	75	--	--

Table 5. Traffic Noise Model Results (AUAR Area Receptors) (Daytime Levels)

Receptor ID	Distance from R/W	Existing, L_{10}, dBA	Existing, L_{50}, dBA	No Build (2035), L_{10}, dBA	No Build (2035, L_{50}, dBA	No Build – Existing, L_{10}, dBA	No Build – Existing, L_{50}, dBA	Build (2035), L_{10}, dBA	Build (2035), L_{50}, dBA	Build – Existing, L_{10}, dBA	Build – Existing, L_{50}, dBA
W150	150 feet	62.9	60.9	63.3	61.3	0.4	0.4	63.6	61.7	0.7	0.8
W200	200 feet	62.3	60.5	62.6	61.0	0.3	0.5	62.9	61.3	0.6	0.8
W250	250 feet	61.9	60.3	62.3	60.7	0.4	0.4	62.5	61.0	0.6	0.7
W300	300 feet	61.6	60.1	62.0	60.5	0.4	0.4	62.2	60.7	0.6	0.6
W350	350 feet	61.4	59.9	61.8	60.3	0.4	0.4	62.0	60.5	0.6	0.6
W400	400 feet	61.3	59.8	61.7	60.2	0.4	0.4	61.8	60.4	0.5	0.6
State Standard	NAC-1	65	60	65	60	--	--	65	60	--	--
State Standard	NAC-2	70	65	70	65	--	--	70	65	--	--
State Standard	NAC-3	80	75	80	75	--	--	80	75	--	--

Table 6. Traffic Noise Model Results (AUAR Area Receptors) (Nighttime Levels)

Receptor ID	Distance from R/W	Existing, L_{10}, dBA	Existing, L_{50}, dBA	No Build (2035), L_{10}, dBA	No Build (2035, L_{50}, dBA	No Build – Existing, L_{10}, dBA	No Build – Existing, L_{50}, dBA	Build (2035), L_{10}, dBA	Build (2035), L_{50}, dBA	Build – Existing, L_{10}, dBA	Build – Existing, L_{50}, dBA
N0	0 feet	62.2	52.2	62.6	52.8	0.4	0.6	62.9	53.0	0.7	0.8
N50	50 feet	60.1	55.0	60.4	55.4	0.3	0.4	60.7	55.5	0.6	0.5
N100	100 feet	58.6	55.9	58.8	56.3	0.2	0.4	59.1	56.4	0.5	0.5
N150	150 feet	58.0	56.2	58.2	56.5	0.2	0.3	58.4	56.6	0.4	0.4
N200	200 feet	57.9	56.4	58.2	56.7	0.3	0.3	58.3	56.8	0.4	0.4
N250	250 feet	58.0	56.6	58.3	56.9	0.3	0.3	58.4	57.0	0.4	0.4
N300	300 feet	58.2	56.8	58.5	57.1	0.3	0.3	58.6	57.2	0.4	0.4
N350	350 feet	58.5	57.0	58.8	57.4	0.3	0.4	58.8	57.5	0.3	0.5
N400	400 feet	58.8	57.3	59.1	57.6	0.3	0.3	59.1	57.7	0.3	0.4
E0	0 feet	64.5	57.1	64.9	57.5	0.4	0.4	65.6	57.6	1.1	0.5
E50	50 feet	62.0	58.5	62.3	58.8	0.3	0.3	62.9	58.8	0.9	0.3
E100	100 feet	60.8	58.7	61.0	59.0	0.2	0.3	61.5	59.1	0.7	0.4
E150	150 feet	60.4	58.6	60.6	58.9	0.2	0.3	60.9	59.0	0.5	0.4
E200	200 feet	60.2	58.5	60.5	58.9	0.3	0.4	60.6	59.0	0.4	0.5
E250	250 feet	60.1	58.5	60.4	58.8	0.3	0.3	60.5	58.9	0.4	0.4
State Standard	NAC-1	55	50	55	50	--	--	55	50	--	--
State Standard	NAC-2	70	65	70	65	--	--	70	65	--	--
State Standard	NAC-3	80	75	80	75	--	--	80	75	--	--

Table 6. Traffic Noise Model Results (AUAR Area Receptors) (Nighttime Levels)

Receptor ID	Distance from R/W	Existing, L_{10}, dBA	Existing, L_{50}, dBA	No Build (2035), L_{10}, dBA	No Build (2035, L_{50}, dBA	No Build – Existing, L_{10}, dBA	No Build – Existing, L_{50}, dBA	Build (2035), L_{10}, dBA	Build (2035), L_{50}, dBA	Build – Existing, L_{10}, dBA	Build – Existing, L_{50}, dBA
E300	300 feet	60.1	58.5	60.4	58.8	0.3	0.3	60.5	58.9	0.4	0.4
E350	350 feet	60.1	58.5	60.4	58.8	0.3	0.3	60.5	58.9	0.4	0.4
E400	400 feet	60.2	58.6	60.4	58.9	0.2	0.3	60.5	59.0	0.3	0.4
S0	0 feet	73.0	69.8	73.3	70.3	0.3	0.5	73.4	70.3	0.4	0.5
S50	50 feet	70.1	67.4	70.4	67.8	0.3	0.4	70.4	67.8	0.3	0.4
S100	100 feet	68.2	65.7	68.5	66.1	0.3	0.4	68.5	66.1	0.3	0.4
S150	150 feet	66.8	64.4	67.1	64.8	0.3	0.4	67.1	64.9	0.3	0.5
S200	200 feet	65.6	63.4	65.9	63.8	0.3	0.4	66.0	63.9	0.4	0.5
S250	250 feet	64.7	62.6	65.0	62.9	0.3	0.3	65.0	63.0	0.3	0.4
S300	300 feet	63.9	61.9	64.2	62.2	0.3	0.3	64.2	62.3	0.3	0.4
S350	350 feet	63.2	61.3	63.5	61.6	0.3	0.3	63.5	61.7	0.3	0.4
S400	400 feet	62.6	60.7	62.9	61.1	0.3	0.4	62.9	61.1	0.3	0.4
W0	0 feet	68.0	60.4	68.3	61.0	0.3	0.6	68.9	61.7	0.9	1.3
W50	50 feet	64.5	60.4	64.8	60.9	0.3	0.5	65.1	61.3	0.6	0.9
W100	100 feet	62.7	60.2	63.0	60.6	0.3	0.4	63.2	60.9	0.5	0.7
State Standard	NAC-1	55	50	55	50	--	--	55	50	--	--
State Standard	NAC-2	70	65	70	65	--	--	70	65	--	--
State Standard	NAC-3	80	75	80	75	--	--	80	75	--	--

Table 6. Traffic Noise Model Results (AUAR Area Receptors) (Nighttime Levels)

Receptor ID	Distance from R/W	Existing, L_{10}, dBA	Existing, L_{50}, dBA	No Build (2035), L_{10}, dBA	No Build (2035, L_{50}, dBA	No Build – Existing, L_{10}, dBA	No Build – Existing, L_{50}, dBA	Build (2035), L_{10}, dBA	Build (2035), L_{50}, dBA	Build – Existing, L_{10}, dBA	Build – Existing, L_{50}, dBA
W150	150 feet	61.9	59.9	62.2	60.3	0.3	0.4	62.4	60.5	0.5	0.6
W200	200 feet	61.4	59.7	61.7	60.1	0.3	0.4	61.9	60.2	0.5	0.5
W250	250 feet	61.2	59.5	61.5	59.9	0.3	0.4	61.6	60.0	0.4	0.5
W300	300 feet	61.0	59.4	61.3	59.7	0.3	0.3	61.4	59.9	0.4	0.5
W350	350 feet	60.9	59.2	61.2	59.6	0.3	0.4	61.3	59.7	0.4	0.5
W400	400 feet	60.8	59.1	61.1	59.5	0.3	0.4	61.2	59.6	0.4	0.5
State Standard	NAC-1	55	50	55	50	--	--	55	50	--	--
State Standard	NAC-2	70	65	70	65	--	--	70	65	--	--
State Standard	NAC-3	80	75	80	75	--	--	80	75	--	--

Future (2035) daytime L_{10} modeled noise levels within the AUAR area under the No Build Alternative are predicted to range from 59.4 dBA to 74.0 dBA, whereas L_{50} noise levels are predicted to range from 57.4 dBA to 70.4 dBA. Future nighttime L_{10} modeled noise levels under the No Build Alternative within the AUAR area are predicted to range from 58.2 dBA to 73.3 dBA, whereas L_{50} noise levels are predicted to range from 52.8 dBA to 70.3 dBA. Modeled daytime traffic noise levels are predicted to increase by 0.3 dBA to 0.5 dBA (L_{10}) under the No Build Alternative compared to existing conditions. This noise level increase is due to the background traffic growth from existing to future No Build conditions.

Future (2035) daytime L_{10} modeled noise levels within the AUAR area under the Build scenario (with the proposed development) are predicted to range from 59.6 dBA to 74.1 dBA, whereas L_{50} modeled noise levels range from 57.8 dBA to 70.6 dBA. Nighttime L_{10} modeled noise levels within the AUAR area under Build conditions are predicted to range from 58.3 dBA to 73.4 dBA, whereas L_{50} modeled noise levels are predicted to range from 53.0 dBA to 70.3 dBA. Modeled daytime and nighttime traffic noise levels are predicted to increase by 0.3 dBA to 1.1 dBA (L_{10}) under Build scenario conditions compared to existing conditions.

Modeled noise levels under future Build scenario conditions are compared to state daytime and nighttime standards for NAC-1 (residential land uses), NAC-2 (commercial uses) and NAC-3 (industrial uses) below.

- Modeled daytime L_{10} noise levels within the AUAR area were projected to exceed State daytime standards for NAC-1 (65 dBA) at distances ranging from 50 feet to 300 feet from area roadways. Modeled daytime L_{50} noise levels within the AUAR area were projected to exceed state standards for NAC-1 (60 dBA) out to 400 feet from adjacent roadways.
- Modeled nighttime L_{10} and L_{50} noise levels were predicted to exceed state nighttime standards for NAC-1 at all modeled receptor locations within the AUAR area.
- Modeled L_{10} and L_{50} noise levels were predicted to be below state daytime standards for NAC-2 at all modeled receptor locations along University Avenue and Pascal Street, and at distances ranging from 50 feet to 200 feet along Snelling Avenue and St. Anthony Avenue.
- Modeled L_{10} and L_{50} noise levels were predicted to be below state nighttime standards for NAC-2 at all modeled receptor locations within the AUAR area along University Avenue, Pascal Street, and Snelling Avenue. Modeled L_{10} and L_{50} noise levels were predicted to be below state nighttime standards for NAC-2 at distances of up to 150 feet from St. Anthony Avenue.
- Modeled L_{10} and L_{50} noise levels were predicted to be below state daytime and nighttime standards for NAC-3 at all modeled receptor locations within the AUAR area.

Weekend Event Arrival and Departure Periods

Results of the noise modeling analysis for AUAR area receptors during weekend event arrival (1:00 p.m. – 2:00 p.m.) and departure (4:00 p.m. – 5:00 p.m.) periods are tabulated in Table 7. In general, daytime traffic noise levels for the weekday worst noise hour were predicted to be approximately 1 dBA (L_{10}) greater than weekend event arrival and departure periods. Modeled L_{10} noise levels at one receptor location at the north end of the AUAR area (Receptor N0) and west side of the AUAR area (Receptor W0) were greater during event arrival and departure periods compared to the weekday worst noise hour. This is because of the higher traffic volumes along Snelling Avenue and University Avenue adjacent to the AUAR area during site events as compared to weekday traffic volumes.

Receptors Surrounding the AUAR Area

Daytime and Nighttime Analysis Results

Results of the noise modeling analysis for receptor locations adjacent to the AUAR area under existing conditions, the future (2035) No Build Alternative, and the future (2035) Build Alternative are tabulated in Table 8 (daytime) and Table 9 (nighttime). The results of the traffic noise modeling analysis are summarized below.

Existing daytime L_{10} noise levels at modeled receptor locations surrounding the AUAR area range from 57.3 dBA to 74.0 dBA, whereas L_{50} noise levels range from 53.1 dBA to 70.1 dBA. Existing nighttime L_{10} modeled noise levels range from 54.8 dBA to 73.5 dBA, whereas L_{50} noise levels range from 51.9 dBA to 69.8 dBA.

Future (2035) daytime L_{10} noise levels at modeled receptor locations surrounding the AUAR area under the No Build Alternative are predicted to range from 57.6 dBA to 74.4 dBA, whereas L_{50} noise levels are predicted to range from 53.6 dBA to 70.5 dBA. Future nighttime L_{10} modeled noise levels under the No Build Alternative at receptor locations surrounding the AUAR area are predicted to range from 55.0 dBA to 73.8 dBA, whereas L_{50} noise levels are predicted to range from 52.1 dBA to 70.2 dBA. Modeled daytime traffic noise levels are predicted to increase by 0.3 dBA to 0.5 dBA (L_{10}) under the No Build Alternative compared to existing conditions.

Table 7. Traffic Noise Model Results (AUAR Area Receptors) (Future Event Arrival and Departure Traffic)

Receptor ID	Distance from R/W	Build (2035), L_{10}, dBA	Build (2035), L_{50}, dBA	Event Arrival (2035), L_{10}, dBA	Event Arrival (2035), L_{50}, dBA	Build – Arrival, L_{10}, dBA	Build – Arrival, L_{50}, dBA	Event Departure (2035), L_{10}, dBA	Event Departure (2035), L_{50}, dBA	Build – Departure, L_{10}, dBA	Build – Departure, L_{50}, dBA
N0	0 feet	68.0	58.7	68.6	60.3	-0.6	-1.6	68.7	60.4	-0.7	-1.7
N50	50 feet	63.9	57.9	63.8	58.6	0.1	-0.7	63.8	58.7	0.1	-0.8
N100	100 feet	61.7	58.0	61.3	58.1	0.4	-0.1	61.3	58.2	0.4	-0.2
N150	150 feet	60.5	58.1	60.0	57.8	0.5	0.3	60.0	57.9	0.5	0.2
N200	200 feet	59.9	58.1	59.2	57.7	0.7	0.4	59.3	57.7	0.6	0.4
N250	250 feet	59.6	58.2	58.9	57.6	0.7	0.6	58.9	57.6	0.7	0.6
N300	300 feet	59.6	58.3	58.9	57.7	0.7	0.6	58.9	57.7	0.7	0.6
N350	350 feet	59.7	58.4	58.9	57.8	0.8	0.6	58.9	57.8	0.8	0.6
N400	400 feet	59.9	58.6	59.1	57.9	0.8	0.7	59.1	57.9	0.8	0.7
E0	0 feet	67.6	60.1	67.1	60.1	0.5	0.0	67.6	60.5	0.0	-0.4
E50	50 feet	64.3	60.1	63.3	59.6	1.0	0.5	63.8	59.7	0.5	0.4
E100	100 feet	62.5	60.1	61.6	59.3	0.9	0.8	61.9	59.4	0.6	0.7
E150	150 feet	61.7	59.9	60.7	59.1	1.0	0.8	60.9	59.2	0.8	0.7
State Standard	NAC-1	65	60	65	60	--	--	65	60	--	--
State Standard	NAC-2	70	65	70	65	--	--	70	65	--	--
State Standard	NAC-3	80	75	80	75	--	--	80	75	--	--

Table 7. Traffic Noise Model Results (AUAR Area Receptors) (Future Event Arrival and Departure Traffic)

Receptor ID	Distance from R/W	Build (2035), L_{10}, dBA	Build (2035), L_{50}, dBA	Event Arrival (2035), L_{10}, dBA	Event Arrival (2035), L_{50}, dBA	Build – Arrival, L_{10}, dBA	Build – Arrival, L_{50}, dBA	Event Departure (2035), L_{10}, dBA	Event Departure (2035), L_{50}, dBA	Build – Departure, L_{10}, dBA	Build – Departure, L_{50}, dBA
E200	200 feet	61.4	59.8	60.4	59.0	1.0	0.8	60.5	59.0	0.9	0.8
E250	250 feet	61.2	59.7	60.2	58.9	1.0	0.8	60.3	58.9	0.9	0.8
E300	300 feet	61.1	59.7	60.1	58.8	1.0	0.9	60.2	58.9	0.9	0.8
E350	350 feet	61.1	59.7	60.1	58.8	1.0	0.9	60.1	58.8	1.0	0.9
E400	400 feet	61.1	59.7	60.1	58.8	1.0	0.9	60.1	58.8	1.0	0.9
S0	0 feet	74.1	70.6	73.2	69.9	0.9	0.7	73.3	70.1	0.8	0.5
S50	50 feet	70.9	68.3	69.8	67.4	1.1	0.9	69.8	67.5	1.1	0.8
S100	100 feet	69.0	66.6	67.9	65.7	1.1	0.9	67.9	65.7	1.1	0.9
S150	150 feet	67.6	65.4	66.5	64.4	1.1	1.0	66.4	64.4	1.2	1.0
S200	200 feet	66.4	64.4	65.3	63.4	1.1	1.0	65.3	63.4	1.1	1.0
S250	250 feet	65.5	63.6	64.4	62.6	1.1	1.0	64.4	62.6	1.1	1.0
S300	300 feet	64.7	62.9	63.6	61.9	1.1	1.0	63.6	61.9	1.1	1.0
S350	350 feet	64.0	62.3	62.9	61.3	1.1	1.0	62.9	61.3	1.1	1.0
S400	400 feet	63.4	61.8	62.4	60.8	1.0	1.0	62.3	60.8	1.1	1.0
State Standard	NAC-1	65	60	65	60	--	--	65	60	--	--
State Standard	NAC-2	70	65	70	65	--	--	70	65	--	--
State Standard	NAC-3	80	75	80	75	--	--	80	75	--	--

Table 7. Traffic Noise Model Results (AUAR Area Receptors) (Future Event Arrival and Departure Traffic)

Receptor ID	Distance from R/W	Build (2035), L_{10}, dBA	Build (2035), L_{50}, dBA	Event Arrival (2035), L_{10}, dBA	Event Arrival (2035), L_{50}, dBA	Build – Arrival, L_{10}, dBA	Build – Arrival, L_{50}, dBA	Event Departure (2035), L_{10}, dBA	Event Departure (2035), L_{50}, dBA	Build – Departure, L_{10}, dBA	Build – Departure, L_{50}, dBA
W0	0 feet	71.6	64.8	72.1	66.3	-0.5	-1.5	70.9	64.9	0.7	-0.1
W50	50 feet	67.1	63.1	66.9	63.5	0.2	-0.4	66.3	62.9	0.8	0.2
W100	100 feet	64.8	62.2	64.4	62.1	0.4	0.1	64.0	61.8	0.8	0.4
W150	150 feet	63.6	61.7	63.0	61.3	0.6	0.4	62.8	61.1	0.8	0.6
W200	200 feet	62.9	61.3	62.2	60.8	0.7	0.5	62.1	60.6	0.8	0.7
W250	250 feet	62.5	61.0	61.7	60.4	0.8	0.6	61.6	60.3	0.9	0.7
W300	300 feet	62.2	60.7	61.4	60.1	0.8	0.6	61.3	60.0	0.9	0.7
W350	350 feet	62.0	60.5	61.1	59.8	0.9	0.7	61.1	59.8	0.9	0.7
W400	400 feet	61.8	60.4	60.9	59.6	0.9	0.8	60.9	59.6	0.9	0.8
State Standard	NAC-1	65	60	65	60	--	--	65	60	--	--
State Standard	NAC-2	70	65	70	65	--	--	70	65	--	--
State Standard	NAC-3	80	75	80	75	--	--	80	75	--	--

Table 8. Traffic Noise Model Results (Receptors Surrounding AUAR Area) (Daytime Levels)

Receptor ID	Land Use	State NAC	Existing, L_{10}, dBA	Existing, L_{50}, dBA	No Build (2035), L_{10}, dBA	No Build (2035, L_{50}, dBA	No Build – Existing, L_{10}, dBA	No Build – Existing, L_{50}, dBA	Build (2035), L_{10}, dBA	Build (2035), L_{50}, dBA	Build – Existing, L_{10}, dBA	Build – Existing, L_{50}, dBA
A	Res.	1	**74.0**	**70.1**	**74.4**	**70.5**	0.4	0.4	**74.6**	**70.8**	0.6	0.7
B	Res.	1	**65.5**	**63.5**	**65.8**	**64.0**	0.3	0.5	**66.0**	**64.2**	0.5	0.7
C	Com.	2	70.0	63.2	**70.5**	63.8	0.5	0.6	**71.1**	64.6	1.1	1.4
D	Com.	2	67.3	61.9	67.7	62.4	0.4	0.5	68.3	63.1	1.0	1.2
E	Com.	2	**70.3**	63.6	**70.7**	64.1	0.4	0.5	**71.3**	64.9	1.0	1.3
F	Trans.	2	67.7	59.6	68.1	60.2	0.4	0.6	68.5	60.6	0.8	1.0
G	Com.	2	66.8	57.7	67.2	58.3	0.4	0.6	67.7	58.6	0.9	0.9
H	Com.	2	65.9	56.8	66.3	57.4	0.4	0.6	66.7	57.7	0.8	0.9
I	Com.	2	66.0	56.6	66.4	57.2	0.4	0.6	66.9	57.5	0.9	0.9
J	Com.	2	66.5	57.3	67.0	57.9	0.5	0.6	67.4	58.3	0.9	1.0
K	Com.	2	57.3	53.1	57.6	53.6	0.3	0.5	57.7	53.8	0.4	0.7
L	Com.	2	58.5	56.5	58.9	56.9	0.4	0.4	59.1	57.1	0.6	0.6
State Standard	Res.	NAC-1	65	60	65	60	--	--	65	60	--	--
State Standard	Com.	NAC-2	70	65	70	65	--	--	70	65	--	--
State Standard	Indust.	NAC-3	80	75	80	75	--	--	80	75	--	--

Bold numbers exceed State daytime standards (L_{10} and/or L_{50}).

Land use codes: Res. = residential; Com. = retail commercial/office; Trans. = LRT Station & Platform Area; Indust. = Industrial.

Table 9. Traffic Noise Model Results (Receptors Surrounding AUAR Area) (Nighttime Levels)

Receptor ID	Land Use	State NAC	Existing, L_{10}, dBA	Existing, L_{50}, dBA	No Build (2035), L_{10}, dBA	No Build (2035, L_{50}, dBA	No Build – Existing, L_{10}, dBA	No Build – Existing, L_{50}, dBA	Build (2035), L_{10}, dBA	Build (2035), L_{50}, dBA	Build – Existing, L_{10}, dBA	Build – Existing, L_{50}, dBA
A	Res.	1	**73.5**	**69.8**	**73.8**	**70.2**	0.3	0.4	**74.0**	**70.3**	0.5	0.5
B	Res.	1	**65.1**	**63.1**	**65.4**	**63.5**	0.3	0.4	**65.5**	**63.6**	0.4	0.5
C	Com.	2	67.7	60.5	68.0	61.0	0.3	0.5	68.6	61.8	0.9	1.3
D	Com.	2	65.3	59.6	65.6	60.1	0.3	0.5	66.0	60.7	0.7	1.1
E	Com.	2	66.9	59.2	67.3	59.8	0.4	0.6	68.0	60.7	1.1	1.5
F	Trans.	2	63.4	54.8	63.8	55.4	0.4	0.6	64.2	55.7	0.8	0.9
G	Com.	2	62.9	53.3	63.3	53.8	0.4	0.5	63.7	54.2	0.8	0.9
H	Com.	2	62.0	52.4	62.4	53.0	0.4	0.6	62.7	53.3	0.7	0.9
I	Com.	2	61.9	51.9	62.3	52.4	0.4	0.5	62.6	52.8	0.7	0.9
J	Com.	2	62.3	52.4	62.7	53.0	0.4	0.6	63.2	53.5	0.9	1.1
K	Com.	2	54.8	52.1	55.0	52.1	0.2	0.0	55.0	52.2	0.2	0.1
L	Com.	2	57.7	56.1	57.9	56.4	0.2	0.3	58.2	56.5	0.5	0.4
State Standard	Res.	NAC-1	65	60	65	60	--	--	65	60	--	--
State Standard	Com.	NAC-2	70	65	70	65	--	--	70	65	--	--
State Standard	Indust.	NAC-3	80	75	80	75	--	--	80	75	--	--

Bold numbers exceed State nighttime standards (L_{10} and/or L_{50}).

Land use codes: Res. = residential; Com. = retail commercial/office; Trans. = LRT Station & Platform Area; Indust. = Industrial.

Future (2035) daytime L_{10} noise levels at modeled receptor locations surrounding the AUAR area under the Build Alternative (with the proposed development) are predicted to range from 57.7 dBA to 74.6 dBA, whereas L_{50} modeled noise levels range from 53.8 dBA to 70.8 dBA. Nighttime L_{10} noise levels at modeled receptor locations surrounding the AUAR area under the Build Alternative are predicted to range from 55.0 dBA to 74.4 dBA, whereas L_{50} modeled noise levels are predicted to range from 52.2 dBA to 70.3 dBA. Modeled daytime and nighttime traffic noise levels are predicted to increase by 0.2 dBA to 1.1 dBA (L_{10}) under Build Alternative conditions compared to existing conditions.

Modeled noise levels at receptor locations surrounding the AUAR area in comparison to state daytime and nighttime standards for NAC-1 (residential land uses) and NAC-2 (commercial uses) are described below.

- Modeled noise levels exceed State daytime and nighttime L_{10} and L_{50} standards for NAC-1 at residential land uses along the west side of Snelling Avenue and north of St. Anthony Avenue under existing conditions, the future No Build Alternative, and future Build Alternative.
- In general, modeled noise levels are below State daytime L_{10} and L_{50} standards for NAC-2 at modeled commercial receptor locations surrounding the AUAR area under existing conditions, the future No Build Alternative, and future Build Alternative. Modeled daytime L_{10} noise levels at one commercial receptor location adjacent to the Snelling Avenue/University Avenue intersection exceeds state daytime standards for NAC-2 under existing conditions, the future No Build Alternative, and future Build Alternative.
- Modeled noise levels are below State nighttime L_{10} and L_{50} standards for NAC-2 for all commercial receptor locations surrounding the AUAR area under existing conditions, the future No Build Alternative, and future Build Alternative.

Weekend Event Arrival and Departure Periods

Results of the noise modeling analysis during weekend event arrival (1:00 p.m. – 2:00 p.m.) and departure (4:00 p.m. – 5:00 p.m.) periods for receptors surrounding the AUAR area are tabulated in Table 10. Modeled noise levels at commercial receptor locations along Snelling Avenue and University Avenue were predicted to be approximately 1 dBA (L_{10}) up to nearly 3 dBA (L_{50}) greater during event arrival and departure periods compared to the weekday worst noise hour. This is because of the higher traffic volumes along Snelling Avenue and University Avenue during site events compared to weekday traffic volumes.

Table 10. Traffic Noise Model Results (Receptors Surrounding Area) (Future Event Arrival and Departure Traffic)

Receptor ID	Land Use	State NAC	Build (2035), L_{10}, dBA	Build (2035), L_{50}, dBA	Event Arrival (2035), L_{10}, dBA	Event Arrival (2035), L_{50}, dBA	Build – Arrival, L_{10}, dBA	Build – Arrival, L_{50}, dBA	Event Departure (2035), L_{10}, dBA	Event Departure (2035), L_{50}, dBA	Build – Departure, L_{10}, dBA	Build – Departure, L_{50}, dBA
A	Res.	1	**74.6**	**70.8**	**73.4**	**70.2**	1.2	0.6	**74.3**	**70.9**	0.3	-0.1
B	Res.	1	**66.0**	**64.2**	**65.1**	**63.6**	0.9	0.6	**65.2**	**63.6**	0.8	0.6
C	Com.	2	**71.1**	64.6	**70.8**	**65.3**	0.3	-0.7	**71.5**	**65.9**	-0.4	-1.3
D	Com.	2	68.3	63.1	67.9	63.6	0.4	-0.5	68.4	63.9	-0.1	-0.8
E	Com.	2	**71.3**	64.9	**71.0**	**65.5**	0.3	-0.6	**71.6**	**66.1**	-0.3	-1.2
F	Trans.	2	68.5	60.6	69.2	62.5	-0.7	-1.9	69.3	62.6	-0.8	-2.0
G	Com.	2	67.7	58.6	68.8	60.9	-1.1	-2.3	68.9	61.1	-1.2	-2.5
H	Com.	2	66.7	57.7	67.9	60.1	-1.2	-2.4	68.1	60.4	-1.4	-2.7
I	Com.	2	66.9	57.5	68.1	60.0	-1.2	-2.5	68.3	60.3	-1.4	-2.8
J	Com.	2	67.4	58.3	68.6	60.7	-1.2	-2.4	68.8	61.0	-1.4	-2.7
K	Com.	2	57.7	53.8	57.4	53.6	0.3	0.2	56.9	53.3	0.8	0.5
L	Com.	2	59.1	57.1	58.2	56.5	0.9	0.6	58.4	56.5	0.7	0.6
State Standard	Res.	NAC-1	65	60	65	60	--	--	65	60	--	--
State Standard	Com.	NAC-2	70	65	70	65	--	--	70	65	--	--
State Standard	Indust.	NAC-3	80	75	80	75	--	--	80	75	--	--

Bold numbers exceed State daytime standards (L_{10} and/or L_{50}).

Land use codes: Res. = residential; Com. = retail commercial/office; Trans. = LRT Station & Platform Area; Indust. = Industrial.

Mitigation Strategies

AUAR Area Site Plan

As described in the previous section, modeled traffic noise levels are projected to exceed state noise standards for NAC-1 and NAC-2, depending upon the location within the AUAR area. The following strategies were evaluated to prevent future traffic noise impacts and minimize/mitigate the effects of traffic noise on future development within the AUAR area.

The AUAR area site plan is illustrated in Appendix A. The AUAR area is anticipated to be redeveloped in a phased manner to accommodate a mixed-use development including retail and service commercial, hospitality, residential, office, and open space uses. As shown in the site plan, locating outdoor use areas towards the interior of residential, hospitality, and office buildings will help prevent traffic noise impacts at these future uses. Locating outdoor uses in this manner results in greater setback distances from adjacent roadways (e.g., modeled L_{10} noise levels at approximately 50 feet from University Avenue and Pascal Street were projected to be below state daytime L_{10} standards for NAC-1). The buildings themselves also function to shield the outdoor use areas from traffic noise generated on nearby roadways.

The AUAR area site plan identifies two public assembly areas: one at the north end of the AUAR area along University Avenue and another in the southwest corner of the AUAR area at the Snelling Avenue/St. Anthony Avenue intersection (see AUAR area site plan figure in Attachment A). Public assembly areas are classified under NAC-2. The daytime and nighttime noise standards for NAC-2 are 70 dBA (L_{10}) and 65 dBA (L_{50}) (see Table 1).

The first public assembly area is located at the north end of the AUAR area along University Avenue. Modeled L_{10} and L_{50} traffic noise levels at the north end of the AUAR area at 50 feet from University Avenue are projected to be below state daytime and nighttime standards for NAC-2 (see Receptor N50 in Table 5 and Table 6).[7] Providing a setback from University Avenue would prevent traffic noise impacts for any future public assembly area at this location.

A second public assembly area is located in the southwest corner of the AUAR area at the Snelling Avenue/St. Anthony Avenue intersection. Traffic noise levels were modeled at a representative receptor located in the middle of the public assembly area (see Receptor CP-1 in the AUAR area figure in Attachment A). Daytime modeled noise levels at Receptor CP-1 were 70.2 dBA (L_{10}) and 68.0 dBA (L_{50}), whereas nighttime modeled noise levels at Receptor CP-1 were 69.8 dBA (L_{10}) and

[7] The traffic noise analysis described in this memorandum does not account for noise generated by Green Line LRT operations (e.g., LRT cars, horn noise).

67.4 dBA (L_{50}). Modeled L_{10} and L_{50} traffic noise levels at Receptor CP-1 are projected to exceed state daytime and/or nighttime standards for NAC-2 under future (2035) Build conditions.

A noise wall was evaluated in the southwest corner of the AUAR area along Snelling Avenue and St. Anthony Avenue, adjacent to Receptor CP-1. The evaluation of this noise barrier was completed following the procedures and criteria identified in the MnDOT Highway Noise Policy. The total length of the modeled noise wall was approximately 475 feet. The height of the modeled noise wall was 20 feet. A gap was included in the noise wall to accommodate the sidewalk connection through the public assembly area to pedestrian crossings at the Snelling Avenue/St. Anthony Avenue intersection.

Results of the noise wall evaluation are tabulated in Table 11 (daytime) and Table 12 (nighttime). The modeled noise wall does not achieve a minimum 5 dBA reduction to be considered acoustically feasible; therefore, a noise wall is not recommended at this location.

Receptors Surrounding the AUAR Area

Traffic noise levels are projected to increase by less than 1 dBA (L_{10}) at modeled receptor locations surrounding the AUAR area under future Build Alternative conditions compared to future No Build Alternative conditions. Additional traffic generated during weekend stadium event periods is projected to increase traffic noise levels by approximately 1 dBA (L_{10}) at commercial receptor locations along Snelling Avenue and University Avenue compared to future Build Alternative conditions (weekday worst noise hour). As a general rule, a change in sound levels of 3 dBA is barely noticeable by the human ear.

Modeled traffic noise levels currently exceed state standards for NAC-1 at residential receptor locations west of the AUAR area along Snelling Avenue, exceed state standards under the future No Build Alternative, and exceed state standards under future Build Alternative conditions. In general, modeled traffic noise levels at commercial receptor locations surrounding the AUAR area are below state standards for NAC-2 under existing, future No Build Alternative, and future Build Alternative conditions. Therefore, mitigation measures at modeled receptor locations surrounding the AUAR area were not considered.

Table 11. Noise Wall Evaluation Results (Daytime) (Southwest Quadrant of AUAR Area)

Receptor ID	Daytime L10, Build 2035 (no wall)	Daytime L10, Build 2035 (with noise wall)	Reduction (in dBA) with noise barrier	Number of residences, commercial or industrial establishments	Number of benefited residences, commercial or industrial establishments (1)	Design goal reduction ≥7 dBA (2)	Length of barrier (feet)	Wall Area (sq ft) (3)	Total cost of wall $20/sq ft	Cost/ Benefited Receptor
CP-1	70.2	66.4	3.8	1	0	0	475	8,800	$176,000	N/A

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise wall must meet a noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier to be considered reasonable.

(3) Noise wall surface area includes tapers at wall ends.

Table 12. Noise Wall Evaluation Results (Nighttime) (Southwest Quadrant of AUAR Area)

Receptor ID	Nighttime L10, Build 2035 (no wall)	Nighttime L10, Build 2035 (with noise wall)	Reduction (in dBA) with noise barrier	Number of residences, commercial or industrial establishments	Number of benefited residences, commercial or industrial establishments (1)	Design goal reduction ≥7 dBA (2)	Length of barrier (feet)	Wall Area (sq ft) (3)	Total cost of wall $20/sq ft	Cost/ Benefited Receptor
CP-1	69.8	66.2	3.6	1	0	0	475	8,800	$176,000	N/A

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise wall must meet a noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier to be considered reasonable.

(3) Noise wall surface area includes tapers at wall ends.

Conclusions and Recommendations

AUAR Area Receptors

Traffic noise levels were modeled at 68 representative receptor locations within the AUAR area. Receptors were located at incremental distances along University Avenue, Pascal Street, St. Anthony Avenue, and Snelling Avenue, ranging from 0 feet (at the right of way limits) up to 400 feet from the right of way limits.

Daytime L_{10} modeled noise levels within the AUAR area are predicted to range from 59.6 dBA to 74.1 dBA under future (2035) Build conditions, whereas daytime L_{50} modeled noise levels are predicted to range from 57.8 dBA to 70.6 dBA. Daytime traffic noise levels are projected to increase by approximately 0.4 dBA to 1.1 dBA (L_{10}) compared to existing conditions. Nighttime L_{10} modeled noise levels within the AUAR area are predicted to range from 58.3 dBA to 73.4 dBA under future (2035) Build conditions, whereas nighttime L_{50} modeled noise levels are predicted to range from 53.0 dBA to 70.3 dBA. Nighttime traffic noise levels are projected to increase by approximately 0.3 dBA to 1.1 dBA (L_{10}) compared to existing conditions.

Depending upon the location within the AUAR area, modeled traffic noise levels are projected to exceed state daytime and nighttime L_{10} and L_{50} standards for NAC-1 and NAC-2. Recommended strategies to help prevent future traffic noise impacts on development within the AUAR area include incorporating setback distances between area roadways and outdoor uses and locating buildings within the AUAR area between outdoor use areas and adjacent roadways.

The AUAR area site plan identifies two public assembly areas. Modeled noise levels at the public assembly area at the north end of the AUAR area along University Avenue are projected to be below state daytime and nighttime L_{10} and L_{50} standards for NAC-2, assuming a setback distance of at least 50 feet or greater. Modeled noise levels at a public assembly area in the southwest corner of the AUAR area along Snelling Avenue and St. Anthony Avenue are projected to exceed state daytime and nighttime L_{10} and/or L_{50} standards for NAC-2. A modeled noise wall adjacent to this public assembly area along Snelling Avenue and St. Anthony Avenue was not acoustically feasible (i.e., did not achieve a minimum 5 dBA reduction in traffic noise levels).

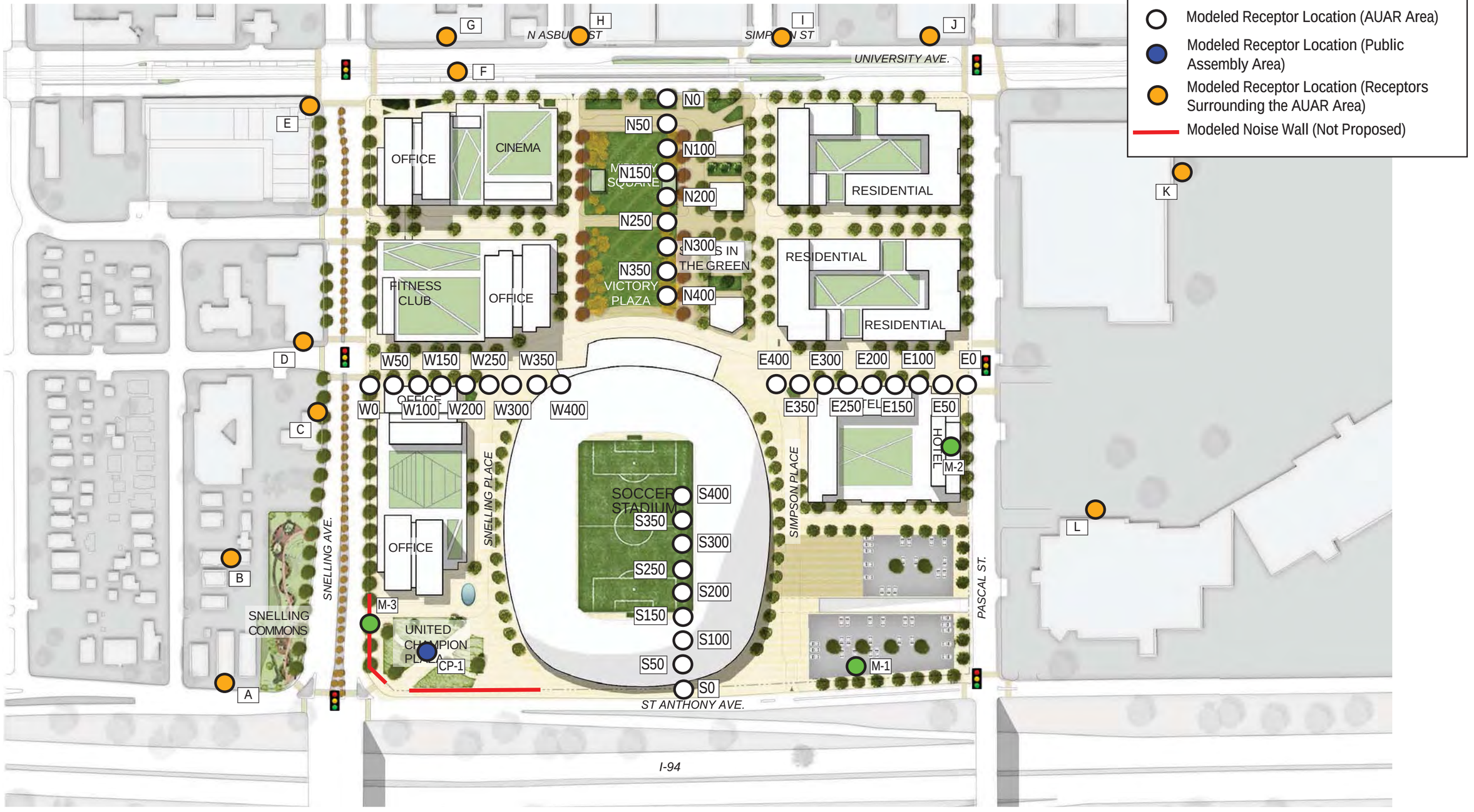
Receptors Surrounding the AUAR Area

Traffic noise levels were modeled at 12 representative receptor locations surrounding the AUAR area along Snelling Avenue, University Avenue, and Pascal Street. Future (2035) daytime L_{10} noise levels at modeled receptor locations surrounding the AUAR area with the proposed development are predicted to range from 57.7 dBA to 74.6 dBA, whereas L_{50} modeled noise levels range from 53.8 dBA to 70.8 dBA. Nighttime L_{10} noise levels at modeled receptor locations surrounding the AUAR area under the Build scenario are predicted to range from 55.0 dBA to 74.4 dBA, whereas L_{50} modeled noise levels are predicted to range from 52.2 dBA to 70.3 dBA. Modeled daytime and

nighttime traffic noise levels are predicted to increase by 0.2 dBA to 1.1 dBA (L_{10}) under Build Alternative conditions compared to existing conditions.

Modeled traffic noise levels would exceed state daytime and nighttime L_{10} and L_{50} standards for NAC-1 at residential receptor locations west of the AUAR area and Snelling Avenue under future No Build and Build conditions. Modeled traffic noise levels would exceed state daytime L_{10} standards for NAC-2 at one commercial receptor location at the Snelling Avenue/University Avenue intersection under future No Build and Build conditions. Modeled traffic noise levels at other commercial receptor locations surrounding the AUAR area would be below state daytime and nighttime standards for NAC-2 under future No Build and Build conditions. Because modeled traffic noise levels are either below state standards or would exceed state standards regardless of the No Build or Build Alternatives, mitigation measures at modeled receptor locations surrounding the AUAR area were not evaluated.

Attachment A (AUAR Area Master Plan)



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SRF Consulting Group, Inc.

0169154
April 2016

RK Midway Master Plan - Traffic Noise Analysis

Snelling Midway Stadium Environmental Review
City of St. Paul

Figure 3

Attachment B (Noise Model Traffic Assumptions)

Table 13. Traffic Characteristics, Noise Model Input (I-94)

	Traffic Volume (% of Daily Traffic)	Directional Split	Vehicle Class (% Cars)	Vehicle Class (% Medium Trucks)	Vehicle Class (% Heavy Trucks)	Modeled Speed (mph)
Daytime (9:00 a.m. to 10:00 a.m.)	5.5%	48% EB/ 52% WB	93% EB/ 93% WB	3% EB/ 2% WB	4% EB/ 5% WB	55 mph
Nighttime (6:00 a.m. to 7:00 a.m.)	5.6%	38% EB/ 62% WB	93% EB/ 95% WB	3% EB/ 1% WB	4% EB/ 4% WB	55 mph
Weekend Event Arrival	7.6%	54% EB/ 46% WB	97% EB/ 97% WB	1% EB/ 1% WB	2% EB/ 2% WB	55 mph
Weekend Event Departure	7.1%	47% EB/ 53% WB	97% EB/ 97% WB	1% EB/ 1% WB	2% EB/ 2% WB	55 mph

Source: Noise model input assumptions based on traffic count data from MnDOT loop detector site S479, MnDOT loop detector site S549, and MnDOT Vehicle Classification Count Site #1301. Vehicle classification percentages may not add to 100 percent due to rounding.

Table 14. Traffic Characteristics, Noise Model Input (Interchange Ramps)

	Traffic Volume (% of Daily Traffic)	Directional Split	Vehicle Class (% Cars)	Vehicle Class (% Medium Trucks)	Vehicle Class (% Heavy Trucks)	Modeled Speed (mph)
Daytime (9:00 a.m. to 10:00 a.m.)	5.3% to 6.6%	N/A	96.2%	3.4%	0.4%	40 mph
Nighttime (6:00 a.m. to 7:00 a.m.)	2.9% to 4.4%	N/A	96.7%	3.1%	0.2%	40 mph
Weekend Event Arrival	From traffic study	N/A	98.9%	0.7%	0.3%	40 mph
Weekend Event Departure	From traffic study	N/A	98.9%	0.7%	0.3%	40 mph

Source: Noise model input assumptions based on traffic count data from MnDOT loop detector site 2500, site 2637, site 2671, and site 3170. Vehicle classification based on 24-hour traffic counts collected in February 2016 at the University Avenue/Lexington Avenue intersection. Vehicle classification percentages may not add to 100 percent due to rounding.

Table 15. Traffic Characteristics, Noise Model Input (Local Roadways, North/South)

	Traffic Volume (% of Daily Traffic)	Directional Split	Vehicle Class (% Cars)	Vehicle Class (% Medium Trucks)	Vehicle Class (% Heavy Trucks)	Modeled Speed (mph)
Daytime (9:00 a.m. to 10:00 a.m.)	5.3%	51% NB/ 49% SB	96.2%	3.4%	0.4%	30 mph
Nighttime (6:00 a.m. to 7:00 a.m.)	2.7%	50% NB/ 50% SB	96.7%	3.1%	0.2%	30 mph
Weekend Event Arrival	From traffic study	From traffic study	98.9%	0.7%	0.3%	30 mph
Weekend Event Departure	From traffic study	From traffic study	98.9%	0.7%	0.3%	30 mph

Source: Noise model input assumptions based on 24-hour traffic counts (by vehicle classification) collected in February 2016 at the University Avenue/Lexington Avenue intersection. Vehicle classification percentages may not add to 100 percent due to rounding.

Table 16. Traffic Characteristics, Noise Model Input (Local Roadways, East/West)

	Traffic Volume (% of Daily Traffic)	Directional Split	Vehicle Class (% Cars)	Vehicle Class (% Medium Trucks)	Vehicle Class (% Heavy Trucks)	Modeled Speed (mph)
Daytime (9:00 a.m. to 10:00 a.m.)	4.8%	55% EB/ 45% WB	96.2%	3.4%	0.4%	30 mph
Nighttime (6:00 a.m. to 7:00 a.m.)	1.5%	44% EB/ 56% WB	96.7%	3.1%	0.2%	30 mph
Weekend Event Arrival	From traffic study	From traffic study	98.9%	0.7%	0.3%	30 mph
Weekend Event Departure	From traffic study	From traffic study	98.9%	0.7%	0.3%	30 mph

Source: Noise model input assumptions based on 24-hour traffic counts (by vehicle classification) collected in February 2016 at the University Avenue/Lexington Avenue intersection. Vehicle classification percentages may not add to 100 percent due to rounding.

Attachment C (Noise Model Traffic Volume Inputs)

Table 17. Modeled Hourly Traffic Volumes for Existing Daytime Conditions

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
I-94 (west of Snelling Ave.)	55 mph	Eastbound	3,904	126	168
I-94 (east of Snelling Ave.)	55 mph	Eastbound	3,634	117	156
I-94 (east of Snelling Ave.)	55 mph	Westbound	3,937	85	212
I-94 (west of Snelling Ave.)	55mph	Westbound	4,229	91	227
I-94/Snelling Ave. northeast ramp	40 mph	Westbound	651	23	3
I-94/Snelling Ave. northwest ramp	40 mph	Westbound	1,027	36	4
I-94/Snelling Ave. southeast ramp	40 mph	Eastbound	535	19	2
I-94/Snelling Ave. southwest ramp	40 mph	Eastbound	912	32	4
Snelling Ave. (south of I-94)	30 mph	Northbound	1,118	40	5
Snelling Ave. (I-94 to University Ave.)	30 mph	Northbound	871	31	4
Snelling Ave. (north of University Ave.)	30 mph	Northbound	793	28	3
Snelling Ave. (north of University Ave.)	30 mph	Southbound	762	27	3
Snelling Ave. (I-94 to University Ave.)	30 mph	Southbound	837	30	3
Snelling Ave. (south of I-94)	30 mph	Southbound	1,074	38	4
University Ave. (west of Snelling Ave.)	30 mph	Eastbound	414	15	2
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	378	13	2
University Ave. (east of Pascal St.)	30 mph	Eastbound	434	15	2
University Ave. (east of Pascal St.)	30 mph	Westbound	355	13	1

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Westbound	310	11	1
University Ave. (west of Snelling Ave.)	30 mph	Westbound	339	12	1
Pascal St. (north of University Ave.)	30 mph	Northbound & Southbound	206	7	1
Pascal St. (University Ave. to St. Anthony Ave.)	30 mph	Northbound & Southbound	428	15	2
Pascal St. (south of St. Anthony Ave.)	30 mph	Northbound & Southbound	219	8	1
St. Anthony Ave. (east of Pascal St.)	30 mph	Westbound	372	13	2
St. Anthony Ave. (Pascal St. to Snelling Ave.)	30 mph	Westbound	372	13	2
St. Anthony Ave. (west of Snelling Ave.)	30 mph	Westbound	76	3	0
Concordia Ave. (west of Snelling Ave.)	30 mph	Eastbound	8	0	0
Concordia Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	270	10	1
Concordia Ave. (east of Pascal St.)	30 mph	Eastbound	270	10	1

Table 18. Modeled Hourly Traffic Volumes for Existing Nighttime Conditions

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
I-94 (west of Snelling Ave.)	55 mph	Eastbound	3,147	102	135
I-94 (east of Snelling Ave.)	55 mph	Eastbound	2,929	94	126
I-94 (east of Snelling Ave.)	55 mph	Westbound	4,882	51	206
I-94 (west of Snelling Ave.)	55mph	Westbound	5,134	166	221
I-94/Snelling Ave. northeast ramp	40 mph	Westbound	436	14	1
I-94/Snelling Ave. northwest ramp	40 mph	Westbound	745	24	2
I-94/Snelling Ave. southeast ramp	40 mph	Eastbound	305	10	1
I-94/Snelling Ave. southwest ramp	40 mph	Eastbound	492	16	1
Snelling Ave. (south of I-94)	30 mph	Northbound	561	18	1
Snelling Ave. (I-94 to University Ave.)	30 mph	Northbound	437	18	1
Snelling Ave. (north of University Ave.)	30 mph	Northbound	398	13	1
Snelling Ave. (north of University Ave.)	30 mph	Southbound	398	13	1
Snelling Ave. (I-94 to University Ave.)	30 mph	Southbound	437	18	1
Snelling Ave. (south of I-94)	30 mph	Southbound	561	18	1
University Ave. (west of Snelling Ave.)	30 mph	Eastbound	104	3	0
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	95	3	0
University Ave. (east of Pascal St.)	30 mph	Eastbound	109	3	0
University Ave. (east of Pascal St.)	30 mph	Westbound	139	4	0

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Westbound	121	4	0
University Ave. (west of Snelling Ave.)	30 mph	Westbound	132	4	0
Pascal St. (north of University Ave.)	30 mph	Northbound & Southbound	106	3	0
Pascal St. (University Ave. to St. Anthony Ave.)	30 mph	Northbound & Southbound	219	7	0
Pascal St. (south of St. Anthony Ave.)	30 mph	Northbound & Southbound	112	4	0
St. Anthony Ave. (east of Pascal St.)	30 mph	Westbound	191	6	0
St. Anthony Ave. (Pascal St. to Snelling Ave.)	30 mph	Westbound	191	6	0
St. Anthony Ave. (west of Snelling Ave.)	30 mph	Westbound	39	1	
Concordia Ave. (west of Snelling Ave.)	30 mph	Eastbound	4	0	0
Concordia Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	138	4	0
Concordia Ave. (east of Pascal St.)	30 mph	Eastbound	138	4	0

Table 19. Modeled Hourly Volumes for No Build (2035) Alternative Daytime Conditions

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
I-94 (west of Snelling Ave.)	55 mph	Eastbound	4,292	138	195
I-94 (east of Snelling Ave.)	55 mph	Eastbound	3,995	129	172
I-94 (east of Snelling Ave.)	55 mph	Westbound	4,185	90	225
I-94 (west of Snelling Ave.)	55mph	Westbound	4,649	100	250
I-94/Snelling Ave. northeast ramp	40 mph	Westbound	717	25	3
I-94/Snelling Ave. northwest ramp	40 mph	Westbound	1,130	40	5
I-94/Snelling Ave. southeast ramp	40 mph	Eastbound	589	29	2
I-94/Snelling Ave. southwest ramp	40 mph	Eastbound	1,003	35	4
Snelling Ave. (south of I-94)	30 mph	Northbound	1,230	43	5
Snelling Ave. (I-94 to University Ave.)	30 mph	Northbound	958	34	4
Snelling Ave. (north of University Ave.)	30 mph	Northbound	872	31	4
Snelling Ave. (north of University Ave.)	30 mph	Southbound	838	30	3
Snelling Ave. (I-94 to University Ave.)	30 mph	Southbound	921	33	4
Snelling Ave. (south of I-94)	30 mph	Southbound	1,182	42	5
University Ave. (west of Snelling Ave.)	30 mph	Eastbound	455	16	2
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	417	15	2
University Ave. (east of Pascal St.)	30 mph	Eastbound	477	17	2
University Ave. (east of Pascal St.)	30 mph	Westbound	391	14	2

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Westbound	341	12	1
University Ave. (west of Snelling Ave.)	30 mph	Westbound	372	13	2
Pascal St. (north of University Ave.)	30 mph	Northbound & Southbound	227	8	1
Pascal St. (University Ave. to St. Anthony Ave.)	30 mph	Northbound & Southbound	472	17	2
Pascal St. (south of St. Anthony Ave.)	30 mph	Northbound & Southbound	242	9	1
St. Anthony Ave. (east of Pascal St.)	30 mph	Westbound	410	15	2
St. Anthony Ave. (Pascal St. to Snelling Ave.)	30 mph	Westbound	410	15	2
St. Anthony Ave. (west of Snelling Ave.)	30 mph	Westbound	84	3	0
Concordia Ave. (west of Snelling Ave.)	30 mph	Eastbound	8	0	0
Concordia Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	298	11	1
Concordia Ave. (east of Pascal St.)	30 mph	Eastbound	298	11	1

Table 20. Modeled Hourly Volumes for No Build (2035) Alternative Nighttime Conditions

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
I-94 (west of Snelling Ave.)	55 mph	Eastbound	3,459	112	149
I-94 (east of Snelling Ave.)	55 mph	Eastbound	3,220	104	138
I-94 (east of Snelling Ave.)	55 mph	Westbound	4,275	45	180
I-94 (west of Snelling Ave.)	55mph	Westbound	5,880	180	240
I-94/Snelling Ave. northeast ramp	40 mph	Westbound	481	15	1
I-94/Snelling Ave. northwest ramp	40 mph	Westbound	819	26	2
I-94/Snelling Ave. southeast ramp	40 mph	Eastbound	335	11	1
I-94/Snelling Ave. southwest ramp	40 mph	Eastbound	541	17	1
Snelling Ave. (south of I-94)	30 mph	Northbound	617	20	1
Snelling Ave. (I-94 to University Ave.)	30 mph	Northbound	481	15	1
Snelling Ave. (north of University Ave.)	30 mph	Northbound	438	14	1
Snelling Ave. (north of University Ave.)	30 mph	Southbound	438	14	1
Snelling Ave. (I-94 to University Ave.)	30 mph	Southbound	481	15	1
Snelling Ave. (south of I-94)	30 mph	Southbound	617	20	1
University Ave. (west of Snelling Ave.)	30 mph	Eastbound	114	4	0
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	105	3	0
University Ave. (east of Pascal St.)	30 mph	Eastbound	120	4	0
University Ave. (east of Pascal St.)	30 mph	Westbound	153	5	0

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Westbound	133	4	0
University Ave. (west of Snelling Ave.)	30 mph	Westbound	145	5	0
Pascal St. (north of University Ave.)	30 mph	Northbound & Southbound	116	4	0
Pascal St. (University Ave. to St. Anthony Ave.)	30 mph	Northbound & Southbound	242	8	0
Pascal St. (south of St. Anthony Ave.)	30 mph	Northbound & Southbound	124	4	0
St. Anthony Ave. (east of Pascal St.)	30 mph	Westbound	210	7	0
St. Anthony Ave. (Pascal St. to Snelling Ave.)	30 mph	Westbound	210	7	0
St. Anthony Ave. (west of Snelling Ave.)	30 mph	Westbound	43	1	0
Concordia Ave. (west of Snelling Ave.)	30 mph	Eastbound	4	0	0
Concordia Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	153	5	0
Concordia Ave. (east of Pascal St.)	30 mph	Eastbound	153	5	0

Table 21. Modeled Hourly Volumes for Proposed Development (2035) Daytime Conditions

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
I-94 (west of Snelling Ave.)	55 mph	Eastbound	4,359	141	187
I-94 (east of Snelling Ave.)	55 mph	Eastbound	4,063	131	175
I-94 (east of Snelling Ave.)	55 mph	Westbound	4,185	90	225
I-94 (west of Snelling Ave.)	55mph	Westbound	4,722	102	254
I-94/Snelling Ave. northeast ramp	40 mph	Westbound	889	31	4
I-94/Snelling Ave. northwest ramp	40 mph	Westbound	1,291	46	5
I-94/Snelling Ave. southeast ramp	40 mph	Eastbound	729	26	3
I-94/Snelling Ave. southwest ramp	40 mph	Eastbound	1,145	40	5
Snelling Ave. (south of I-94)	30 mph	Northbound	1,261	45	5
Snelling Ave. (I-94 to University Ave.)	30 mph	Northbound	1,153	41	5
Snelling Ave. (north of University Ave.)	30 mph	Northbound	918	32	4
Snelling Ave. (north of University Ave.)	30 mph	Southbound	882	31	4
Snelling Ave. (I-94 to University Ave.)	30 mph	Southbound	1,108	39	5
Snelling Ave. (south of I-94)	30 mph	Southbound	1,212	43	5
University Ave. (west of Snelling Ave.)	30 mph	Eastbound	484	17	2
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	444	16	2
University Ave. (east of Pascal St.)	30 mph	Eastbound	516	18	2
University Ave. (east of Pascal St.)	30 mph	Westbound	422	15	2

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Westbound	364	13	2
University Ave. (west of Snelling Ave.)	30 mph	Westbound	396	14	2
Pascal St. (north of University Ave.)	30 mph	Northbound & Southbound	227	8	1
Pascal St. (University Ave. to St. Anthony Ave.)	30 mph	Northbound & Southbound	599	21	2
Pascal St. (south of St. Anthony Ave.)	30 mph	Northbound & Southbound	298	11	1
St. Anthony Ave. (east of Pascal St.)	30 mph	Westbound	441	16	2
St. Anthony Ave. (Pascal St. to Snelling Ave.)	30 mph	Westbound	441	16	2
St. Anthony Ave. (west of Snelling Ave.)	30 mph	Westbound	84	3	0
Concordia Ave. (west of Snelling Ave.)	30 mph	Eastbound	8	0	0
Concordia Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	342	12	1
Concordia Ave. (east of Pascal St.)	30 mph	Eastbound	342	12	1

Table 22. Modeled Hourly Volumes for Proposed Development (2035) Nighttime Conditions

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
I-94 (west of Snelling Ave.)	55 mph	Eastbound	3,514	113	151
I-94 (east of Snelling Ave.)	55 mph	Eastbound	3,275	106	141
I-94 (east of Snelling Ave.)	55 mph	Westbound	4,275	45	180
I-94 (west of Snelling Ave.)	55mph	Westbound	5,580	180	240
I-94/Snelling Ave. northeast ramp	40 mph	Westbound	596	19	1
I-94/Snelling Ave. northwest ramp	40 mph	Westbound	936	30	2
I-94/Snelling Ave. southeast ramp	40 mph	Eastbound	415	13	1
I-94/Snelling Ave. southwest ramp	40 mph	Eastbound	618	20	1
Snelling Ave. (south of I-94)	30 mph	Northbound	633	20	1
Snelling Ave. (I-94 to University Ave.)	30 mph	Northbound	579	19	1
Snelling Ave. (north of University Ave.)	30 mph	Northbound	461	15	1
Snelling Ave. (north of University Ave.)	30 mph	Southbound	461	15	1
Snelling Ave. (I-94 to University Ave.)	30 mph	Southbound	579	19	1
Snelling Ave. (south of I-94)	30 mph	Southbound	633	20	1
University Ave. (west of Snelling Ave.)	30 mph	Eastbound	122	4	0
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	112	4	0
University Ave. (east of Pascal St.)	30 mph	Eastbound	130	4	0
University Ave. (east of Pascal St.)	30 mph	Westbound	165	5	0

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Westbound	142	5	0
University Ave. (west of Snelling Ave.)	30 mph	Westbound	155	5	0
Pascal St. (north of University Ave.)	30 mph	Northbound & Southbound	116	4	0
Pascal St. (University Ave. to St. Anthony Ave.)	30 mph	Northbound & Southbound	307	10	1
Pascal St. (south of St. Anthony Ave.)	30 mph	Northbound & Southbound	153	5	0
St. Anthony Ave. (east of Pascal St.)	30 mph	Westbound	226	7	0
St. Anthony Ave. (Pascal St. to Snelling Ave.)	30 mph	Westbound	226	7	0
St. Anthony Ave. (west of Snelling Ave.)	30 mph	Westbound	43	1	0
Concordia Ave. (west of Snelling Ave.)	30 mph	Eastbound	4	0	0
Concordia Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	175	6	0
Concordia Ave. (east of Pascal St.)	30 mph	Eastbound	175	6	0

Table 23. Modeled Hourly Volumes for Proposed Development (2035) Daytime Conditions (Future Event Arrival Period)

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
I-94 (west of Snelling Ave.)	55 mph	Eastbound	5,820	60	120
I-94 (east of Snelling Ave.)	55 mph	Eastbound	4,365	45	90
I-94 (east of Snelling Ave.)	55 mph	Westbound	4,356	45	90
I-94 (west of Snelling Ave.)	55mph	Westbound	5,820	60	120
I-94/Snelling Ave. northeast ramp	40 mph	Westbound	945	7	3
I-94/Snelling Ave. northwest ramp	40 mph	Westbound	1,329	9	4
I-94/Snelling Ave. southeast ramp	40 mph	Eastbound	652	5	2
I-94/Snelling Ave. southwest ramp	40 mph	Eastbound	2,364	17	7
Snelling Ave. (south of I-94)	30 mph	Northbound	1,385	10	4
Snelling Ave. (I-94 to University Ave.)	30 mph	Northbound	2,077	15	6
Snelling Ave. (north of University Ave.)	30 mph	Northbound	1,214	9	4
Snelling Ave. (north of University Ave.)	30 mph	Southbound	1,323	9	4
Snelling Ave. (I-94 to University Ave.)	30 mph	Southbound	1,420	10	4
Snelling Ave. (south of I-94)	30 mph	Southbound	1,319	9	4
University Ave. (west of Snelling Ave.)	30 mph	Eastbound	521	4	2
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	684	5	2
University Ave. (east of Pascal St.)	30 mph	Eastbound	865	5	3
University Ave. (east of Pascal St.)	30 mph	Westbound	691	5	2

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Westbound	717	5	2
University Ave. (west of Snelling Ave.)	30 mph	Westbound	437	3	1
Pascal St. (north of University Ave.)	30 mph	Northbound & Southbound	222	2	1
Pascal St. (University Ave. to St. Anthony Ave.)	30 mph	Northbound & Southbound	755	5	2
Pascal St. (south of St. Anthony Ave.)	30 mph	Northbound & Southbound	744	5	2
St. Anthony Ave. (east of Pascal St.)	30 mph	Westbound	655	5	2
St. Anthony Ave. (Pascal St. to Snelling Ave.)	30 mph	Westbound	507	4	2
St. Anthony Ave. (west of Snelling Ave.)	30 mph	Westbound	103	1	0
Concordia Ave. (west of Snelling Ave.)	30 mph	Eastbound	15	0	0
Concordia Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	605	4	2
Concordia Ave. (east of Pascal St.)	30 mph	Eastbound	592	4	2

Table 24. Modeled Hourly Volumes for Proposed Development (2035) Daytime Conditions (Future Event Departure Period)

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
I-94 (west of Snelling Ave.)	55 mph	Eastbound	5747	59	118
I-94 (east of Snelling Ave.)	55 mph	Eastbound	4365	45	90
I-94 (east of Snelling Ave.)	55 mph	Westbound	4365	45	90
I-94 (west of Snelling Ave.)	55mph	Westbound	5820	60	120
I-94/Snelling Ave. northeast ramp	40 mph	Westbound	597	4	2
I-94/Snelling Ave. northwest ramp	40 mph	Westbound	2499	18	8
I-94/Snelling Ave. southeast ramp	40 mph	Eastbound	946	7	3
I-94/Snelling Ave. southwest ramp	40 mph	Eastbound	1236	9	4
Snelling Ave. (south of I-94)	30 mph	Northbound	1385	10	4
Snelling Ave. (I-94 to University Ave.)	30 mph	Northbound	1193	8	4
Snelling Ave. (north of University Ave.)	30 mph	Northbound	1275	9	4
Snelling Ave. (north of University Ave.)	30 mph	Southbound	1118	8	3
Snelling Ave. (I-94 to University Ave.)	30 mph	Southbound	2077	15	6
Snelling Ave. (south of I-94)	30 mph	Southbound	1385	10	4
University Ave. (west of Snelling Ave.)	30 mph	Eastbound	497	4	2
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	706	5	2
University Ave. (east of Pascal St.)	30 mph	Eastbound	671	5	2
University Ave. (east of Pascal St.)	30 mph	Westbound	680	5	2

Roadway Segment	Modeled Speed (miles per hour, MPH)	Direction	Traffic Characteristics, Cars	Traffic Characteristics, Medium Trucks	Traffic Characteristics, Heavy Trucks
University Ave. (Snelling Ave. to Pascal St.)	30 mph	Westbound	760	5	2
University Ave. (west of Snelling Ave.)	30 mph	Westbound	537	4	2
Pascal St. (north of University Ave.)	30 mph	Northbound & Southbound	289	2	1
Pascal St. (University Ave. to St. Anthony Ave.)	30 mph	Northbound & Southbound	875	6	3
Pascal St. (south of St. Anthony Ave.)	30 mph	Northbound & Southbound	835	6	3
St. Anthony Ave. (east of Pascal St.)	30 mph	Westbound	719	5	2
St. Anthony Ave. (Pascal St. to Snelling Ave.)	30 mph	Westbound	756	5	2
St. Anthony Ave. (west of Snelling Ave.)	30 mph	Westbound	43	0	0
Concordia Ave. (west of Snelling Ave.)	30 mph	Eastbound	15	0	0
Concordia Ave. (Snelling Ave. to Pascal St.)	30 mph	Eastbound	360	3	1
Concordia Ave. (east of Pascal St.)	30 mph	Eastbound	430	3	1

Appendix F

Transportation Study

Snelling Midway Soccer Stadium

DRAFT Transportation Study

Prepared for

Josh Williams, City of St. Paul

SRF Consulting Group, Inc. | Engineers Planners Designers

May 31, 2016

SRF No. 0169154

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Executive Summary

Introduction

A transportation study was conducted for the proposed soccer stadium and surrounding mixed-use development located in the southeast quadrant of the University Avenue/Snelling Avenue intersection in Saint Paul, Minnesota. The main objectives of this study are to review future traffic operations within the study area, evaluate development traffic impacts to the adjacent roadway network, including the proposed site access and internal circulation, evaluate traffic impacts, evaluation of the transit and pedestrian/bike system and recommend any necessary transportation improvements to accommodate the proposed developments. In general, assumptions made for purposes of this analysis were conservative, in particular with regard to transit clearance times and availability of nearby parking for stadium events.

Analysis was completed for:

- Full Development (Master Plan) for Year 2035
  - No Build and Build Conditions
  - Weekday AM and PM Peak Hour Traffic
- Soccer Stadium Event for Year of Opening in Year 2018
  - Stadium capacity 20,000
  - No new development
  - No Build and Build Conditions
  - Saturday 2:00 p.m. Start Time
    - Arrival Peak 1:00 to 2:00 p.m.
    - Departure Peak 4:00 p.m. to 5:00 p.m.
- Soccer Stadium for Year 2035
  - Stadium capacity 25,500
  - Full Development based on the Master Plan
  - No Build and Build Conditions
  - Saturday 2:00 p.m. Start Time
    - Arrival Peak 1:00 to 2:00 p.m.
    - Departure Peak 4:00 p.m. to 5:00 p.m.

The City of Saint Paul PED and Public Works, Ramsey County Public Work, Minnesota Department of Transportation, Metro Transit and FWHA met seven (7) times from January 28, 2016 to May 16, 2016 to discuss and coordinate elements of the transportation study.

Overall Transportation Analysis Inputs

Data Collection - The existing traffic and pedestrian volumes were reviewed during eight (8) different time periods at 30 intersections shown in Figure 2.

Background Traffic Forecasts - Traffic forecasts were developed for year 2018 and 2035 no build conditions using an annual background growth rate of one-half percent. The annual background growth rate is based on results from the Twin Cities Regional Travel Demand Model.
Intersection Evaluation Measurement Criteria - For the development scenario, overall intersection LOS A through LOS D is generally considered acceptable in the Twin Cities Metro Area for weekday peak hour traffic, with LOS E and F unacceptable. For the events scenarios, event traffic should dissipate in around one hour. Typically have acceptable LOS during the arrival of the event traffic.

Proposed Access to the development is proposed at the following locations in year 2035, shown in Figure 7, which includes modifying access at the Snelling Avenue and Spruce Tree Avenue intersection to a right-in/right-out only and relocate the traffic signal to a new full intersection at Shields. Realigning access on Pascal Street to line-up across from access points to Walmart and Cub.

Directional Distribution of the site trips are shown in Figure 8 for the development and Figure 15 for the event traffic. Development trips will be more regional in the future with the inclusion of the large office component. The traffic distribution for the event is based on other ticket information from other event venues, current soccer ticket sales and overall population density.

Proposed Development Analysis

Two development scenarios were evaluated for the proposed development. The development scenarios contain similar land uses, however, the sizes of the specific land uses differ from one another. These were:

1. Comprehensive Plan/Snelling Station TOD Development plan scenario,
2. RK Midway Master Plan Development plan

The RK Midway Master Plan includes 620 dwelling units, 1M square feet of Office, 370,000 square feet of shopping center, fitness club, movie theatre and supermarket, and 400 Hotel Spaces. This land use plan is slightly more intense than other and would generate 1,190 a.m. peak hour trips, 1,460 pm peak hour trips and 12,320 daily trip more than the existing site. Most of these new trips are generated by the office land use. These trips are more regional than the existing retail land use on the site.

Traffic Analysis – 2035 Development

2035 No Build Conditions – Weekday AM and PM Peak Hour

Results of the year 2035 No Build intersection capacity analysis indicate that all study intersections are expected to operate at an acceptable overall LOS D or better during the a.m. and p.m. peak hour with the proposed roadway geometry and traffic controls, except for the Snelling Avenue and Selby Avenue intersection during the a.m. peak hour.

Snelling Avenue during the p.m. peak is expected to be congested between I-94 and University Avenue and flow along Snelling Avenue south of the interchange is hindered by slower travel, high volumes and lane changing, however overall intersection is in the acceptable LOS D range.

2035 Build Conditions – Weekday AM and PM Peak Hour

Results of the year 2035 Build intersection capacity analysis indicate that all study intersections are expected to operate at an acceptable overall LOS D or better during the a.m. peak hour and p.m. peak hours with the new site access geometry and traffic controls, except for the Snelling Avenue and Selby Avenue intersection during the a.m. peak hour and the Hamline Avenue and Marshall Avenue intersection during the p.m. peak hour.

- The Snelling Avenue and Selby Avenue intersection is a no-build condition with no proposed mitigation.
- Poor operations are expected at the Hamline Avenue and Marshall Avenue intersection during the p.m. peak hour under the build condition. Based on preliminary analysis, providing an eastbound right-turn lane will improve to acceptable overall intersection operations. The improvement would require removing on-street parking stalls near the intersection, however, it may only be needed during the p.m. peak hour of the day. Another alternative would be adding left-turn lanes to Hamline Avenue.
- During the p.m. peak hour, intersections on Snelling Avenue between Thomas Avenue and Selby Avenue are expected to operate at an overall LOS D, however, side-street queuing and delay is expected, similar to year 2035 no build conditions. A rolling type queue is expected along southbound Snelling Avenue. The newly constructed westbound approach of the Snelling Avenue and Shields Avenue intersection is expected to have maximum queues of over 750 feet, which will potentially extend into the on-site parking structures.

Key Findings for Full Build Development

1. To improve Snelling Avenue operations, the traffic signal at Spruce Tree Avenue should be relocated to Shields Avenue. This will require modifications/reconstruction of Snelling Avenue to Shields Avenue. Shields Avenue will need three westbound approach lanes to accommodate the amount of traffic leaving the proposed office land use along Snelling.
2. Snelling Avenue will have intersections operating at acceptable LOS (delay) under the No Build and Build conditions. However, while all intersections are expected to operate at LOS D from Shields Avenue to Selby Avenue, the high volume, queues, and lane changing south of the I-94 interchange makes the area feel congested under no build and build conditions.
3. The only intersection that goes from an acceptable LOS in No Build to an unacceptable LOS in Build is at Hamline Avenue and Marshall Avenue. Mitigation would not be required with the year of opening of the Stadium or initial development. Addition of an eastbound right-turn lane (by time of day with the removal of on-street parking) would provide acceptable overall level of service or by providing left-turn lanes on Hamline Avenue.
4. Traffic signal timing within the study area would need to be updated to accommodate future development traffic.
5. The proposer should encourage future land use to use the transit system with Green Line LRT, A-Line BRT and the other regular Metro Transit service adjacent to the site. Consider travel demand management (TDM) measures to encourage the use of these facilities.

Soccer Stadium Events

As part of the Snelling Midway Stadium Alternative Urban Areawide Review (AUAR), an analysis was conducted to address transportation issues related to the proposed soccer stadium. The proposed stadium is expected to have a capacity of 20,000 for the 2018 year of opening with the opportunity to expand to a capacity of 25,500 by year 2035 and would include full re-development of the site.

The assumptions for the analysis are based on conditions prior to implementing mitigation strategies and could change based on mitigation strategies that are implemented. This analysis is intended to identify potential issues that will require further investigation. These could be strategies to increase auto-occupancy, provide additional parking, provide staging areas for transit, or provide pre and post-game activities.

Traffic Analysis Event Assumptions

Traffic Volumes - For the study area intersections were collected for events occurring on a weekday evening (7:00 p.m. start time), weekend afternoon (2:00 p.m. start time) and a weekend evening (7:00 p.m. start time). Typical matches last for approximately two hours. Based on a review of the traffic volumes collected, the weekend afternoon background volume was significantly higher than the other two scenarios.

Parking Availability - Included evaluation of on-site and nearby off-site parking within a one mile walking distance was completed for both a year of opening and future year full-build out scenario for event parking. The goal of the transportation analysis was to determine mitigation strategies such that parking in adjacent residential neighborhoods is not needed to meet event demand. Similarly, accommodating event parking in nearby lots or ramps on a first-come, first-serve basis is also unreliable, as capacity may vary from event to event, and staffing costs and insurance concerns may limit participation of lot/ramp owners.

Auto Occupancy - Based on prior experience with travel behavior characteristics for sports stadium around Twin Cities and around the country, it was estimated that 2.75 people per vehicle would be used as an average auto occupancy for all analysis time periods.

Event Traffic Characteristics - The arrival peak will be smoother and spread out over the course of the arrival hour, while the departure typically occurs all within about a half-hour interval. Not all event trips leave or arrive during the peak hour.

Year 2018 Event Conditions

Trip Generation - To account for traffic impacts associated with the proposed stadium development, trip generation estimates for weekend afternoon event (match starting at 2:00 p.m.) were developed. The highest background traffic is generated by the near-by retail land uses, connections to other destinations and access to I-94.

Transportation Mode

The year 2018 event transportation mode share is presented below. These are expected to differ from the mode share values in the year 2035 full build conditions.

Walk/Bike/Local Bus/Private Shuttle/Charter Bus would combined total of these modes would accommodate 2,000 (10 percent) for a weekday match and 3,000 (15 percent) for a weekend match.

Drive to Site - On-Site Parking is expected to keep changing as development occurs. For year of opening, it is expected that approximately 400 vehicles may be able to park on-site, which will equate to approximately 1,100 fans or 5.5 percent of fans for a capacity event.

Drive to near Site - Off-Site Adjacent Parking takes into account parking not on site, but within walking distance of the stadium. An assumption was made that a minimum of approximately 350 parking spaces, accommodating 1,000 fans, or 5 percent.

Arrive on Green Line LRT or A-Line BRT**.** The LRT mode share was identified that with a full one-hour utilization of both the eastbound and westbound LRT, approximately 6,200 fans or 31 percent will be able to utilize the LRT to arrive at the proposed stadium. The A-Line BRT is not operational until summer of 2016, based on the crush load and expected occupancy of the BRT buses, approximately 700 attendees or three and half percent of event fans.

Shuttle Buses to Remote Parking. The remaining event patrons would be take another mode. The proposed mitigation strategy has been proposed to provide a shuttle service to off-site parking facilities. Based on the crush load and 115 to 130 bus trips (40 to 50 buses), approximately 7,975 (weekend) to 8,975 (weekday) fans or 40 to 45 percent will utilize the shuttle bus service. Remote parking locations have not been confirmed.

The capacity of the stadium is expected to be approximately 20,000 patrons in year 2018. The trip generation estimates, shown in **Table S-1** (person trips, not vehicle trips), were developed using the described mode share.

Table S-1
Person Trip Generation Estimates – 20,000 Patrons

Modes	Percent of Total	Weekday		Percent of Total	Weekend	
		Arrival	Departure		Arrival	Departure
Non-Auto or LRT/BRT	10.0%	2,000	2,000	15.0%	3,000	3,000
On Site Parking	5.5%	1,100	1,100	5.5%	1,100	1,100
Off Site Parking	4.8%	965	965	4.8%	965	965
LRT/BRT	34.8%	6,960	6,960	34.8%	6,960	6,960
Off-Site Shuttles	44.9%	8,975	8,975	39.9%	7,975	7,975
Totals	100.0%	20,000	20,000	100.0%	20,000	20,000

Results of the trip generation estimates indicate that approximately 10 percent of trips for an event will occur using an automobile within the study area.

Traffic Analysis – Year 2018 Event Conditions

During the departure peak hour, minor issues are anticipated in the peak exiting half hour of event departure traffic. The majority of exiting vehicles are destined to exit in the half hour immediately after the game ends, which causes a spike in traffic volumes. Congestion is observed in the model at the following:

- Snelling Avenue and Shields Avenue intersection and along Snelling Avenue to St. Anthony Avenue. With a majority of vehicles destined to westbound I-94, expect queues from the southbound right-turn at St. Anthony Avenue and westbound thru on St. Anthony Avenue at Snelling Avenue.
- This queueing on St. Anthony Avenue could spill back from Snelling Avenue to Pascal Street and have an effect of a rolling queue from the parking lot exit on Pascal Street to the on-ramp at Snelling Avenue. Because of the amount of volume on Pascal Street after a match, driveway access from Midway Shopping Center, Walmart, and Cub will be busy.
- The event vehicles clear within one hour of the match. Mainly because of the limited number of parking spaces near the facility.

Multi-Modal Transportation Analysis - Year 2018 Event Conditions

A transportation model VISSIM/VISWALK was completed to analyze all modes (pedestrian/bicycle, LRT, transit, shuttle). The Saturday afternoon event departure conditions at 4 p.m. were analyzed with the proposed access configuration and a full capacity event (20,000) to determine potential multi-modal transportation impacts due to the increased pedestrian, transit and vehicular traffic. Results of the detailed transportation analysis focus on the average travel time and queues for event patrons heading to these mode types, along with the expected amount of space needed to accommodate the queues.

The assumptions to complete the transportation analysis and are included in the mitigation strategies. These include the following items:

- 10 minute headways for all LRT and BRT transit vehicles – Depending on the time and day of the event, this project may need to request the schedule be changed to higher frequency service.
- Three-vehicle LRT – It was noted during site observations that on Saturdays, it is common to run two-vehicle LRT. This was assumed to be the full three-vehicle LRT at the end of an event. The project needs to work with Metro Transit.
- Based on data collected on LRT, of the 540 person crush-load capacity approximately 480 event patrons could board the LRT, while about 70 people could board the BRT.
- Approximately 40 to 50 shuttle buses would need to make 115 to 130 shuttle bus trips. At this point, the assumption is that shuttle buses would operate along Saint Anthony Avenue on the southeast corner of the site. It was assumed that a complete round trip for the shuttle bus could be completed in approximately 20 to 30 minutes in order to run two to three shuttle bus trips per hour requiring the parking facilities are two to three miles away.

Results from the transportation analysis, shown in **Table S-2**, indicate the largest queue and average travel time for pedestrians using LRT/BRT to depart an event. The travel time is based on the time between the patron leaving the stadium and boarding the LRT/BRT vehicle. With a slightly larger number of patrons destined on westbound LRT, it is expected that the queue length and travel time would be larger than eastbound.

Table S-2
Transportation Analysis Results – LRT/BRT

Direction and Mode	Maximum Queue (Peds)	Average Travel Time (Minutes)
Westbound LRT	2,050	30
Eastbound LRT	1,700	20 to 25
Northbound BRT	150	10 to 15
Southbound BRT	150	10 to 15

- The BRT is expected to finish boarding in about one hour
- Westbound LRT event passengers board the final train approximately one hour and 15 minutes after the completion of the event.
- Based on these guidelines, a minimum westbound queueing area of approximately 16,500 square feet and minimum eastbound queueing area of approximately 13,750 square feet would be necessary.
- It is expected that the BRT queuing would be accommodated by the existing sidewalk infrastructure.

Results from the shuttle bus transportation analysis, shown in **Table S-3**, indicate the largest queue and average travel time for 7,200 patrons using a shuttle bus to depart a Saturday event. Based on the current site plan, there is room for up to four or five buses in the shuttle area. The buses would need to be staged, perhaps along St. Anthony Avenue east of Pascal Street or to the north on Pascal Street. The departure shuttling need to be efficient to maximize the shuttle bus loading area.

Table S-3
Transportation Analysis Results – Shuttle Bus

Mode	Maximum Queue (Peds)	Travel Time (Minutes)
Shuttle Bus Queue	3,050	20

- It is expected to take between one hour and an hour and fifteen minutes to clear the shuttle bus area.
- This queue will require a minimum queuing space of approximately 25,000 sf.

Key Findings for Year of Opening Event - 2018

Many more event patrons will want to drive directly to the event than can be accommodated by the parking on-site or within walking distance. This could result in significant traffic congestion, circulation trying to find a space, illegal parking and overall frustration. An event Transportation Management Plan (TMP) is needed to safely and efficiently get event patrons to and from the event while minimizing impact to the local business and residents.

- For a weekend event, it is expected that approximately 10 to 15 percent of event patrons will walk, bike, or take local bus locally to the site, and approximately 10 percent of event patrons will be able to park on-site or off-site within a walking distance. The remaining 75 to 80 percent of patrons are expected to use LRT/BRT and shuttle buses.
- Approximately 35 percent of event patrons will be able to utilize LRT/BRT, however, the time to clear the site may slightly exceed one hour after the event and dependent on actual demand.
- The remaining 40 percent (45 percent on a weekday) will need to be shuttled to remote parking within two to three miles. This operation may need to utilize 40 to 50 buses, depending on where the remote parking is located. The time to clear the site may take slightly over one hour.
- Storage and waiting areas for pedestrians using transit or shuttle service will need to be defined and will require additional event staff outside of the facility to manage it.
- A minimum westbound LRT queueing area of approximately 16,500 square feet and minimum eastbound LRT queueing area of approximately 13,750 square feet would be necessary. The shuttle bus pedestrian queue will require a minimum queuing space of approximately 25,000 square feet. Both of these queues are expected to take just over one hour to clear out.
- The I-94/Snelling interchange is a key vehicular bottleneck in the system. Event patrons should be encourage to use adjacent interchanges when arriving and departing the event. Shuttle bus service along Saint Anthony may need to be reconsidered because of this bottleneck.
- The area has a significant amount of retail land use. Weekend (Saturday) events starting between 1:00 p.m. and 5:00 p.m. and ending between 3:00 p.m. and 7:00 p.m. place the event traffic during the busiest business times and background traffic. Capacity events should be encouraged for a 7:00/7:30 p.m. start time with departure at 9:00/9:30 p.m.

Year 2035 Event Conditions

To identify potential impacts associated with the proposed soccer stadium events under full build conditions, traffic forecasts for year 2035 conditions (i.e. year of full build of adjacent development) were reviewed. The year 2035 conditions take into account general area background growth, trips generated by the adjacent buildings on the proposed site, and the additional trips generated by a soccer stadium event. The proposed soccer stadium has the potential to expand to a capacity of 25,500 by the year 2035, therefore, this analysis will consider this larger event attendance in addition to the adjacent development. The following sections provide details on the background traffic forecasts, estimated trip generation, and intersection capacity analysis for year 2035 conditions.

Trip Generation - To account for traffic impacts associated with the proposed stadium development, trip generation estimates for weekend afternoon event (match starting at 2:00 p.m.) were developed. The highest background traffic is generated by the near-by retail land uses, connections to other destinations and access to I-94.

Transportation Mode

The year 2035 event transportation mode share is presented below. These are expected to differ from the mode share values in the year 2018.

Walk/Bike/Local Bus/Private Shuttle/Charter Bus would combined total of these modes would accommodate 3,500 (14 percent) for a weekday match and 4,600 (18 percent) for a weekend match. Higher share than in 2018 due to the proposed land uses including residential and hotel.

Drive to Site - On-Site Parking is expected to keep changing as development occurs. For year of opening, it is expected that approximately 2,000 vehicles may be able to park on-site, which will equate to approximately 5,525 fans or 22 percent of fans for a capacity event.

Drive to near Site - Off-Site Adjacent Parking takes into account parking not on site, but within walking distance of the stadium. An assumption was made that a minimum of approximately 350 parking spaces, accommodating 1,000 fans, or 4.5 percent.

Arrive on Green Line LRT or A-Line BRT**.** The LRT mode share was identified that with a full one-hour utilization of both the eastbound and westbound LRT, approximately 6,200 fans or 24 percent will be able to utilize the LRT to arrive at the proposed stadium. The A-Line BRT is not operational until summer of 2016, based on the crush load and expected occupancy of the BRT buses, approximately 700 attendees or three percent of event fans.

Shuttle Buses to Remote Parking. The remaining event patrons would be take another mode. The proposed mitigation strategy has been proposed to provide a shuttle service to off-site parking facilities. Based on the crush load and 100 to 120 bus trips, approximately 7,150 (weekend) to 8,250 (weekday) fans or 28 to 33 percent will utilize the shuttle bus service. Remote parking locations have not been confirmed.

The capacity of the stadium is expected to be approximately 25,500 patrons in year 2035. The trip generation estimates, shown in **Table S-4** (person trips, not vehicle trips), were developed using the described mode share.

Table S-4
Person Trip Generation Estimates – 25,500 Patrons

Modes	Percent of Total	Weekday		Percent of Total	Weekend	
		Arrival	Departure		Arrival	Departure
Non-Auto or LRT/BRT	14.0%	3,515	3,515	18.1%	4,605	4,605
On Site Parking	22.0%	5,650	5,650	22.0%	5,650	5,650
Off Site Parking	4.5%	1,155	1,155	4.5%	1,155	1,155
LRT/BRT	27.3%	6,960	6,960	27.3%	6,960	6,960
Off-Site Shuttles	32.2%	8,250	8,250	28.1%	7,150	7,150
Totals	100.0%	25,500	25,500	100.0%	25,500	25,500

Traffic Analysis – Year 2035 Event Conditions

Based on the traffic analysis for the 25,500 capacity event and future development, congestion is observed at the following:

- During the arrival peak hour on a weekend afternoon, there is expected to be queuing in the northbound direction of Snelling Avenue from south of Selby Avenue to the I-94 interchange. This is due to the eastbound left-turning volume at Snelling Avenue and Concordia Avenue intersection coming from I-94 heading to the on-site event parking ramp along Snelling Avenue. Poor intersection operations and queuing are expected on Concordia Avenue and the I-94 eastbound off-ramp west of Snelling Avenue and Northbound Snelling Avenue from Concordia Avenue to Selby Avenue.
- During the departure peak hour, the analysis identified congestion at the Snelling Avenue and Shields Avenue intersection and along the driveways on Pascal Street. Traffic volumes during the exiting peak hour are large along Snelling Avenue, and with much of the traffic destined to the westbound I-94 on-ramp, significant southbound right-turn queueing from St. Anthony Avenue to Shields Avenue and westbound thru traffic on St Anthony at Snelling Avenue. This is due to the added parking on the west side of the site along Snelling Avenue. Because these two major movements conflict with one another queues are expected in both directions. This queueing on St. Anthony Avenue could spill back from Snelling Avenue to Pascal Street and have an effect of a rolling queue from the parking lot exit on Pascal Street. Because of the amount of volume on Pascal Street after a match, driveway access from Midway Shopping Center, Walmart, and Cub will be difficult.
- The site is expected to take approximately one and a half to two hours to clear with the on-site parking to be the last to clear.

- The event arrival conditions (queues and poor LOS) at Snelling Avenue and Concordia Avenue and almost two hours to leave the site do not meet expectations for an event.

Key Findings for Year 2035 Capacity Event

Additional findings beyond those for year of opening (2018):

- The site will continue to change as re-development occurs. An updated TMP should be prepared each year to account for the changes.
- The additional on-site parking, all located along Snelling Avenue, departing at one access point, is challenging. **The on-site parking will require one and a half to *two hours* to clear.**
- Additional parking should be found away from the site and have good access to the other interchanges to I-94, not Snelling Avenue.
- In order to clear event traffic in one hour (besides on-site vehicles), slightly more shuttle bus service may be needed. It is expected that the new residential uses, office, and hotel will result in more event patrons walking to the event.
- Weekend start times should be even more encouraged to start later in the day, although, the significant amount of vehicles departing from the site at Shields Avenue after an event will be problematic any time.
- Issues are expected along Snelling Avenue during both the arrival and departure peak hours. During arrivals, the eastbound left-turning volume at the Concordia Avenue/Snelling Avenue intersection is expected to back-up onto the Snelling Avenue exit ramp and potentially onto I-94. Additionally, the northbound direction of Snelling Avenue between Concordia Avenue and Selby Avenue is expected to be congested. Typically, other event arrivals do not result in such poor operations.
- During the departure peak hour, poor operations are expected when exiting the site through the Snelling Avenue and Shields Avenue intersection. With the majority of these vehicles destined to I-94 westbound, the Snelling Avenue and St. Anthony Avenue intersection is expected to be over capacity and will not be able to accommodate all of the event traffic within one hour. It is expected to take **one and a half to two hours** to clear event traffic.
- These event departure issues along Snelling Avenue are expected to impact the shuttle bus delivery and pick-up area along St. Anthony Avenue. Due to these impacts, the shuttle bus area may not be able to clear the shuttle pedestrian queue within a one hour timeframe.
- These potential traffic issues will need to be evaluated with any expansion plans in the future.

Mitigation Measures

This section relates to mitigation needed based on the re-development of the entire site and not related to traffic generated by an event at the soccer stadium. It is important to remember that the proposed plan has just a slight increase in the amount of retail space compared to the existing site. The retail trips are more local in nature. The site does propose new office space of around 1 million square feet. These trips are typically more regional.

At the completion of full development, the new improvements should include the following:

Internal roadway system connections to public roadways

1. Two internal north-south roadways that connect to University Avenue (partial access; right-in/right-out only) and the easterly north-south roadway connecting to Saint Anthony as a right-in/right-out access and western north-south roadway terminating in the site.
2. Two east-west roadways that connect Snelling Avenue and Pascal Street
    a. Extension of Spruce Tree would have modified access resulting in right-in/right-out only movements with the traffic signal removed at Snelling Avenue and full access at Pascal Street
    b. Extension of Shields Avenue would result in a new full access signalized access at Shields Avenue and full access with potential of a traffic signal at Pascal Street
3. Pedestrian and bike accommodations internal to the site

Around the Site

4. Pedestrian sidewalk should be provided around the perimeter of the site, with a minimum width of eight feet.
5. Bike racks for a minimum of 400 bicycles should be provided.

Snelling Avenue – University Avenue to Shields Avenue

To address the close spacing of the Spruce Tree and University Avenue intersection;

6. Spruce Tree intersection
    a. Add a center median to only allow right-in/right-only access
    b. Remove the traffic signal ("relocated" to Shields Avenue)
7. University Avenue Intersection
    a. Extend Northbound left-turn lane from 50 feet to 250 feet
8. Shields Avenue
    a. New traffic signal ("relocated" from Spruce Tree Avenue)
    b. Add Southbound left-turn lane
    c. Two-lanes of approach for eastbound Shields Avenue (check alignment across intersection); left-thru lane and a right-turn lane (may be convertible to parking in off-peak hours)
    d. Three-lanes of approach for Westbound Shields Avenue with two providing left-turn movements; left-turn lane, left-thru lane and right turn lane

e. Traffic signal phasing can vary throughout the time of day, depending on traffic volume demand. It is expected that the new signal controller and signal heads will be able to accommodate both phasing options presented:
    i. Westbound protected/permissive (i.e flashing yellow arrow) left-turn phasing with no eastbound left-turn phasing (more efficient)
        1. Best operation with an assumed 20 foot wide pedestrian crossing only on the north side
        2. This option is recommended to be run during all peak hours
    ii. Split Phasing
        1. Pedestrian crossing only on the north side
        2. This may be run in off peak times

Pascal Street – University Avenue to Saint Anthony Avenue

With the new land use; access points should align across Pascal and left-turn lanes provided.

9. Shields Extension – New traffic signal (when warranted)
10. Re-stripe Pascal to provide a three-lane roadway (one thru lane in each direction with left-turn lane) with the additional space as a bike-lane or shoulder. Maintain Northbound left-turn lane at University Avenue and add Southbound right-turn lane at Saint Anthony
11. Sufficient width and right-of-way should be obtained to provide a five-lane roadway if needed in the future.
12. Saint Anthony – Install a permanent traffic control signal

Marshall Avenue / Hamline Avenue Intersection

The site does not generate much traffic going through this intersection, but enough to cause the intersection to be unacceptable. The operations can be mitigated with two solutions:

13. Add an Eastbound right-turn lane during the p.m. peak hour by restricting 100 feet of parking along Marshall Avenue.
    a. Alternative would be to add northbound and southbound left-turn lanes.
    b. This improvement is not needed with the initial development phases.

Snelling Avenue from University Avenue to Selby Avenue

The expected additional development generated traffic is expected to be a small increase south of the I-94 interchange, we know that today queues can somedays back from the I-94 Southbound ramp intersection onto the freeway. Snelling Avenue south of the interchange can feel congested with the number of vehicles changing lanes to Selby Avenue and queues blocking unsignalized intersections during the peaks.

14. Update traffic signal timing along Snelling Avenue for the six intersections for each phase of development.

Policy Measures

Encourage use of Transit

The site is served by great transit facilities with Central Corridor LRT (Green Line) along University Avenue and a new BRT (Bus Rapid Transit) "A-Line" starting in summer of 2016.

15. Consider implementing TDMP (Travel Demand Management Plan) strategies with future re-development
16. Land use guidance to promote TOD (Transit Orientated Developed) and complementary land uses

Mitigation – Event (Year of Opening 2018 – Capacity of 20,000)

Mitigating an event requires a management strategy and elements of that strategy. Based on the modeling of the events, the following items are needed to be addressed in a Transportation Management Plan (TMP) in order to clear the event traffic within one hour. The transportation management plan should be started after the AUAR and continue to within a few months of the first event. The TMP committee should include MnUnited Soccer Team, RK Midway, City of Saint Paul Planning and Public Works, Metro Transit, Ramsey County Public Works, MnDOT and FWHA. They should meet prior to every MLS soccer season to discuss potential modification to the site plan or transportation system.

Develop Transportation Management Plan

1. Event Traffic Control Plan
   The event traffic control plan is how the actual day of the event will be managed outside of the physical stadium. This would include diagrams of routing event patrons, key conflict points would be managed by traffic control officers. Providing storage areas, etc.
   a. Traffic control officer locations
   b. Managed Storage Areas for Transit, Shuttle and Charter Bus
   c. Temporary lane or roadway closures
   d. Permanent or temporary barriers are needed to restrict uncontrolled pedestrian crossings on Snelling Avenue (median) and Pascal Street. Internal roadways and walkways will require barriers to direct pedestrian flow.
   e. Event traffic signal timing plan
2. Parking Plan
   On-Site Parking is only expected to accommodate approximately 10 percent of a capacity crowd. There will be more demand for parking near the facility than can be accommodated. To reduce congestion and frustration caused by vehicles trying to find parking, communication must be stated that if you do not have a reserved parking space for the event, then please take transit or shuttle buses from (list where they can park and ride transit/shuttle service). Parking on-site and immediately (within one mile) near-by should be assigned and purchased with the tickets. Potentially, this should be considered for all locations in order to minimize confusion and maximize efficiency.
3. Transit Plan
   Metro Transit is currently working with a transit consultant to work through some of the potential issues for transit before and after events. Expectations are that LRT, A-Line BRT and regular bus service are expected to accommodate approximately 35 percent of a capacity event. The project will need to work with Metro Transit to provide as much capacity for event arrival and departure as possible.

4. Shuttle Service to Remote Parking Plan
   Expectation is this shuttle service to remote parking would accommodate around 40 to 45 percent of a capacity event. This would result in approximately 115 to 130 bus trips with a crush-load of 70 people and require 40 to 50 buses depending on the location of the remote parking. Two key elements of the shuttle service is the amount of space on-site required to stage event patrons waiting for the shuttles and finding remote parking areas within a reasonable distance.
5. Routing and Wayfinding Plan
   All event patrons are pedestrians at some point of their trip to or from the Stadium. The team will need to provide direction to Snelling Avenue LRT Station, A-Line BRT Station (University Avenue Station), Charter Bus/Private Shuttle Bus, Shuttle Bus service to remote parking (and perhaps more than one destination) and parking lots. This information is needed on-site, but other off-site signage and wayfinding maybe needed. The intent is provide the most efficient, safe and easy to understand plan to have a great patron experience.
6. Communication and Education Plan
   The technical analysis and the other plans need to be communicated to the event patrons, local businesses/residents and those who drive/walk/bike or take transit through the area. The transportation system will need its full capacity to accommodate the arrival and departure of the event. This information can be mailed to ticket holders, websites, on parking vouchers, with any ticket purchase, media outlets, email notifications to anyone, etc. Most importantly, not enough on-site parking with be available for the potential demand, and therefore event patrons need to use transit or shuttle bus service to remote parking
7. Incident Management and Safety Plan
   This would be completed by emergency responders. It would cover situations in the case of an incident or issue at the stadium.
8. Other Considerations
   Other items to consider that impact the transportation event include existing usage of the transportation system, how to manage the event by spreading out the peak demand and how the site might develop resulting in adaption of the plan to new conditions.
   a. Continue the transportation committee (TAC) to meet at least twice a year to discuss event scheduling, transportation issues, improvements, etc.
   b. With the amount of retail land use in the area, the existing volumes are high until 6:30 p.m. on both weekdays and weekends. Recommend considering games begin at 7:00 p.m. or later.
   c. Avoid over-lapping events at the University of Minnesota (TCF Bank), State Fair (operates for twelve days from late August into early September, ending on Labor Day) and Vikings (US Bank Stadium), as these events will likely consume remote parking, transit capacity and regional roadway capacity.
   d. The team should consider activities/concerts/etc. before and after match events to spread out arrival and departure times. Work with local businesses to participate or lead such events.
   e. Consider pre-sale of parking at all venues including on-site, near-by, and remote parking facilities. This will guarantee a parking space, reduce circulation and patron confusion and frustration.

f. Consider pre-sale (and open marketing) of bike spaces, and transit and shuttle to remote parking. Limit money transfer to speed up process.
g. Identify an Event Transportation Manager for the Stadium
h. TMP needs to adapt as site changes

Items that need to be incorporated into the Year of Opening Plan Mitigation

1. Transportation Management Plan that includes event traffic control, parking, transit, shuttle service, routing and wayfinding, and communication and education.
2. Create a transportation management committee. Stakeholders should include MnUnited Soccer Team, RK Midway representative, City of Saint Paul Planning and Public Works, Metro Transit, Ramsey County Public Works, MnDOT and FHWA.
3. Fencing down the median of Snelling Avenue and allowance for future boulevard fencing on the west side of Pascal Street (permanent or temporary)
4. Providing shuttle service to remote parking
5. Site Plan
    a. Identification of transit, charter bus, private shuttle and shuttle bus loading and unloading areas
    b. Sufficient waiting areas for transit, charter bus, private shuttle and shuttle bus patrons
    c. Identification of taxi and drop-off/pick-up areas
    d. Identify bike parking facilities

Mitigation – Event (Future Expansion – Capacity of 25,500)

The mitigation of event would be similar to the year of opening plan. It will also have the benefit of knowing how the transportation is working on the site. Without any increase in Metro Transit's capacity to accommodate event patrons, the additional 5,500 patrons would need to be accommodated by on-site parking and shuttle bus service, as transit service is assumed at capacity. The expected proposed on-site parking would be available in the office developments along Snelling Avenue. This will result in adding traffic to the busiest roadway and a key interchange (I-94/Snelling) in the transportation network. Only so many additional cars can be added and this becomes more challenging when the event is scheduled on a Saturday starting at 2:00 to 4:00 p.m. and ending around 4:00 or 6:00 p.m., as the area is very active.

The additional parking spaces is planned to be in the office parking ramp along Snelling Avenue. This ramp is only served by one access point and would result in the event arrival conditions (queues and poor LOS) at Snelling Avenue and Concordia Avenue and almost two hours to leave the site. This condition does not meet expectations set for the event. These potential traffic issues will need to be evaluated with any expansion plans in the future. No additional mitigation is proposed because so much will possibly change between the year of opening and the full development and potential expansion of the stadium capacity. All stakeholders would have the ability to see how the existing facility operates and how to improve it under changes in the future.

Introduction

SRF has completed a transportation study for the proposed soccer stadium and surrounding mixed-use development located in the southeast quadrant of the University Avenue/Snelling Avenue intersection in St. Paul, MN (see Figure 1: Project Location). The main objectives of this study are to review future traffic operations within the study area, evaluate development traffic impacts to the adjacent roadway network, including the proposed site access and internal circulation, evaluate traffic impacts, and recommend any necessary improvements to accommodate the proposed developments. The future analysis will include analysis of both development related impacts and soccer stadium events. The future development will be analyzed under full build out conditions and for purposes of the study are expected to be completed by year 2035. The soccer stadium events will be analyzed for both a year of opening condition (20,000 seat stadium), and for purposes of the study future year 2035 (25,500 seat stadium) condition. The following information provides the assumptions, analysis, findings and recommendations offered for consideration. These assumptions were derived from a series of six sub-TAC meetings comprised of consultant, City, County, State, and FHWA staff in order to achieve concurrence.

Existing Traffic Volumes

The existing traffic volumes were reviewed during eight (8) different time periods to establish a baseline in order to identify any future impacts associated with the proposed development and during expected soccer stadium event times. The evaluation of existing conditions includes turning movement and field observations. It should be noted that there will not be an intersection capacity analysis completed for existing conditions as part of this study.

Data Collection

Peak hour turning movement counts were collected during the following time periods:.

a) Weekday 7:30 a.m. to 8:30 a.m.
b) Weekday 4:45 p.m. to 5:45 p.m.
c) Weekday 6:00 p.m. to 7:00 p.m.
d) Weekday 9:00 p.m. to 10:00 p.m.
e) Saturday 1:00 p.m. to 2:00 p.m.
f) Saturday 4:00 p.m. to 5:00 p.m.
g) Saturday 6:00 p.m. to 7:00 p.m.
h) Saturday 9:00 p.m. to 10:00 p.m.

Existing traffic volumes were collected at locations shown in Figure 2. The time periods collected included a.m. and p.m. peak hours, and one hour before and after expected weekday and weekend Major League Soccer (MLS) games. A typical weekday game time is 7:00 p.m., while weekend games are typically between 2:00 p.m. and 7:00 p.m.

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SRF Consulting Group, Inc.

0169154
April 2016

Project Location

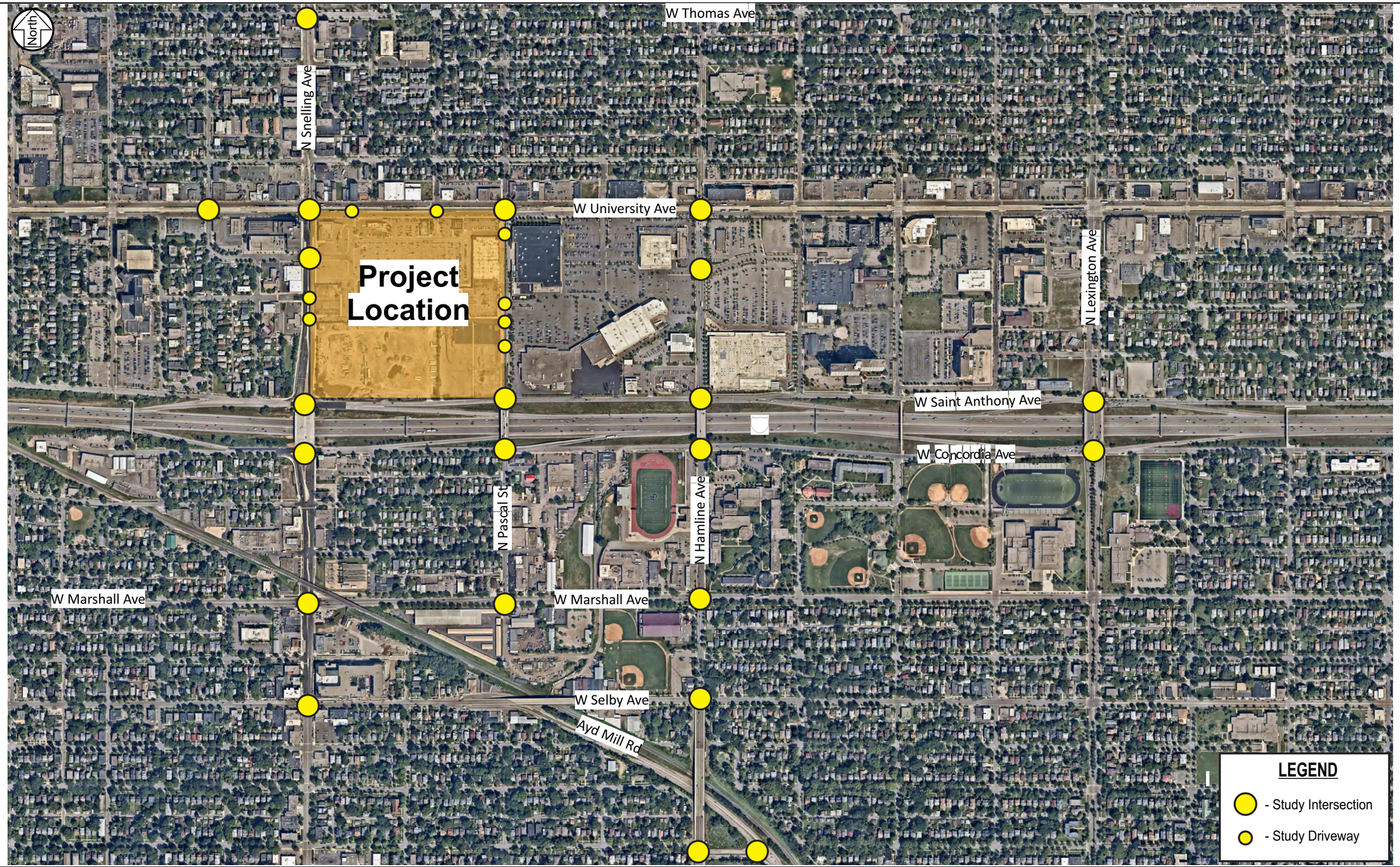
Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 1

In addition to the intersection turning movement counts and average daily traffic volumes (provided by the Minnesota Department of Transportation), observations were completed to identify roadway characteristics within the study area (i.e. roadway geometry, posted speed limits, and traffic controls). The posted speed limit along all study roadways is 30 miles per hour. Existing geometrics, traffic controls, and volumes for the a.m. and p.m. weekday peak hours in the study area are shown in Figures 3A and 3B. The remaining traffic volumes for the other time periods collected are shown in Appendix A. It should be noted that the midday peak hour was considered, however, the a.m. and p.m. peak hour experiences significantly higher volumes along Snelling Avenue for commuter peaks and therefore were selected. Additionally, the a.m. and p.m. peak hour peaks were selected based on the significant office component of the proposed development, which tends to peak during weekday a.m. and p.m. peak hours and not midday or weekend peaks.

Intersection Capacity Analysis

An existing intersection capacity analysis was not completed for the existing hours collected. These were deemed unnecessary as the future year 2035 no build conditions would be analyzed and these would be the comparison for the year 2035 build conditions. The year 2035 no build conditions are expected to be similar to the existing conditions due to the minimal background growth. The proposed development is expected to be built in several phases, and therefore not completed for the purpose of the study until year 2035.



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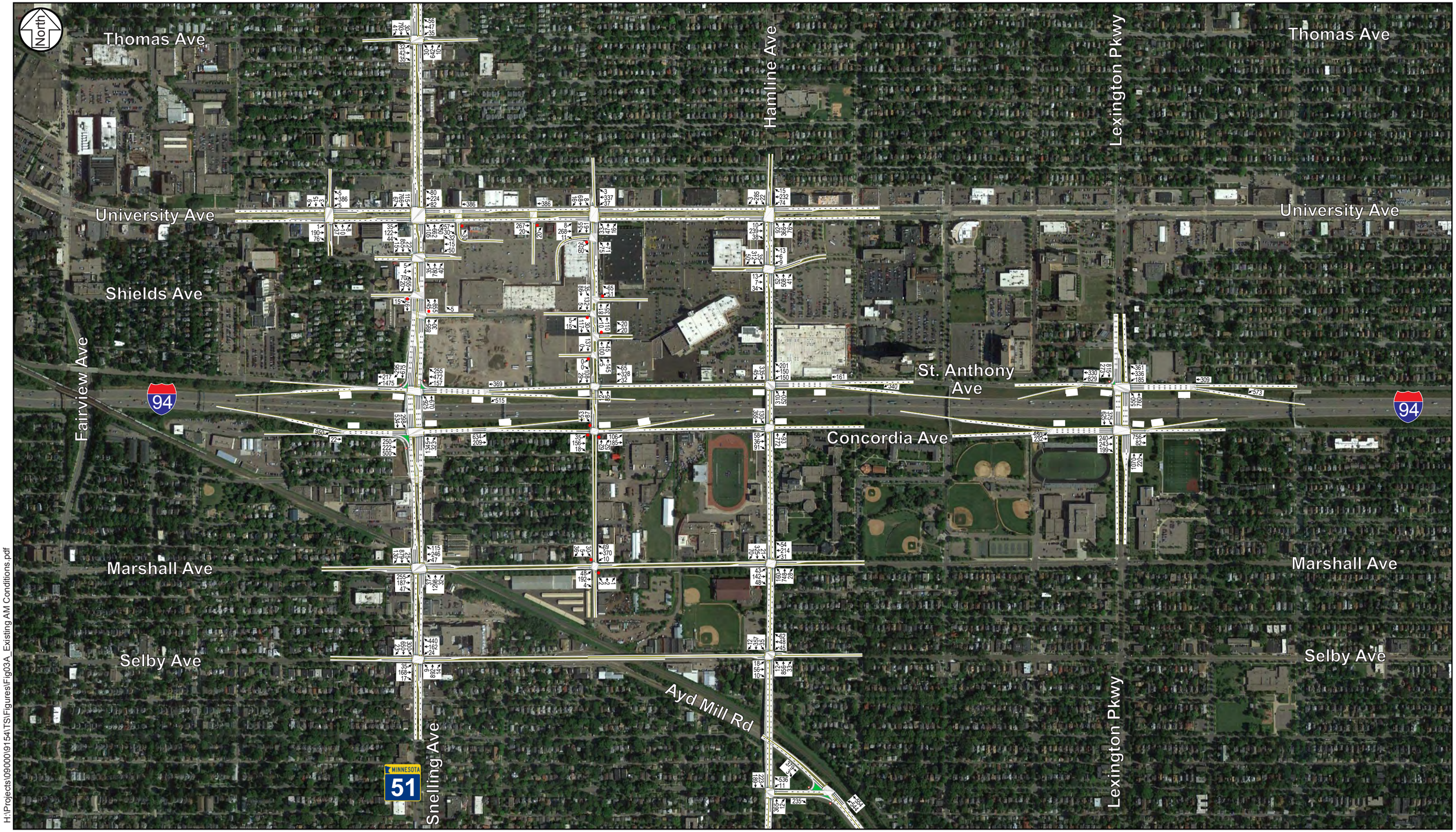
Data Collection Locations

Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 2



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Existing Weekday AM Peak Conditions

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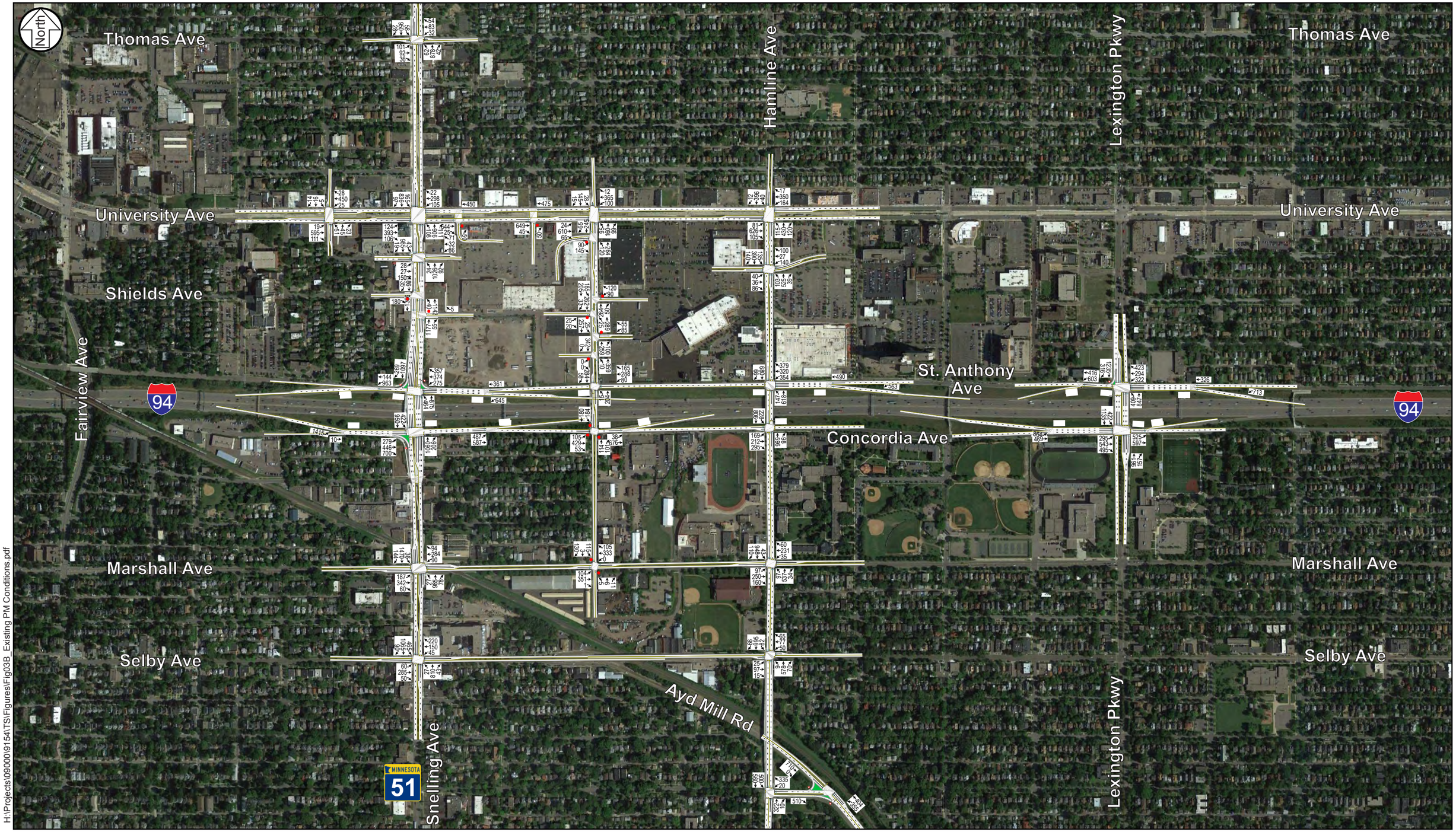
City of St. Paul

Figure 3A



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Existing Weekday PM Peak Conditions

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City of St. Paul

Figure 3B

Year 2035 No Build Conditions

Traffic Forecasts

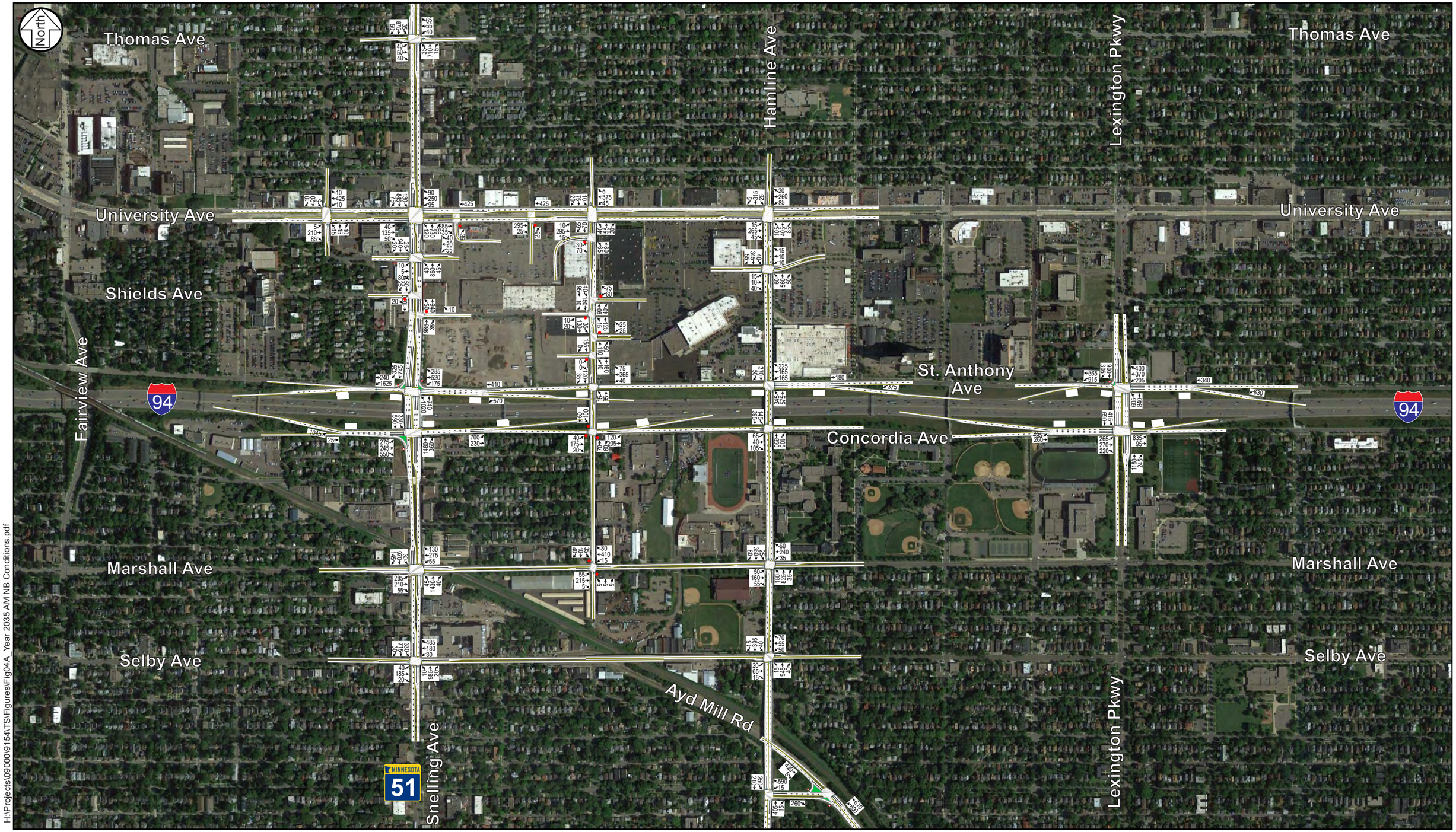
To determine the operational impact of the proposed development, a no build scenario was analyzed using the year 2035 traffic volumes and existing geometrics. Traffic forecasts were developed for year 2035 no build conditions (proposed year of full build out for purpose of the study) using an annual background growth rate of one-half percent. The annual background growth rate is based on results from the Twin Cities Regional Travel Demand Model. This growth rate provides a conservative approach and is consistent with previous traffic studies done in the area. The resultant year 2035 traffic forecasts for the a.m. and p.m. weekday peak hours, which include general background growth and trips generated by the proposed development, are shown in Figures 4A and 4B.

Intersection Capacity Analysis

The study intersections were analyzed using Synchro/SimTraffic (V9). Capacity analysis results identify a Level of Service (LOS), which indicates the quality of traffic flow through an intersection. Intersections are given a ranking from LOS A through LOS F. The LOS results are based on average delay per vehicle, which correspond to the delay threshold values shown in Table 1. LOS A indicates the best traffic operation, with vehicles experiencing minimal delays. LOS F indicates an intersection where demand exceeds capacity, or a breakdown of traffic flow. Overall intersection LOS A through LOS D is generally considered acceptable in the Twin Cities Metro Area for weekday peak hour traffic, but not for event traffic. LOS D describes operations with moderate traffic control delay. This level is typically assigned when the volume is nearing the capacity of the intersection where progression along the corridor is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures (i.e. not getting through during the green time) are noticeable. Events are intense peak flows resulting in intersections operating at LOS F, so mitigation strategies are needed to manage the large peak flow. The duration of the impacts from event traffic is measured as a level of effectiveness for the events. For this size venue, event traffic should dissipate in around one hour.

Table 1. Level of Service Criteria for Signalized and Unsignalized Intersections

LOS Designation	Signalized Intersection Average Delay/Vehicle (seconds)	Unsignalized Intersection Average Delay/Vehicle (seconds)
A	≤ 10	≤ 10
B	> 10 - 20	> 10 - 15
C	> 20 - 35	> 15 - 25
D	> 35 - 55	> 25 - 35
E	> 55 - 80	> 35 - 50
F	> 80	> 50



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Year 2035 AM Peak No Build Conditions

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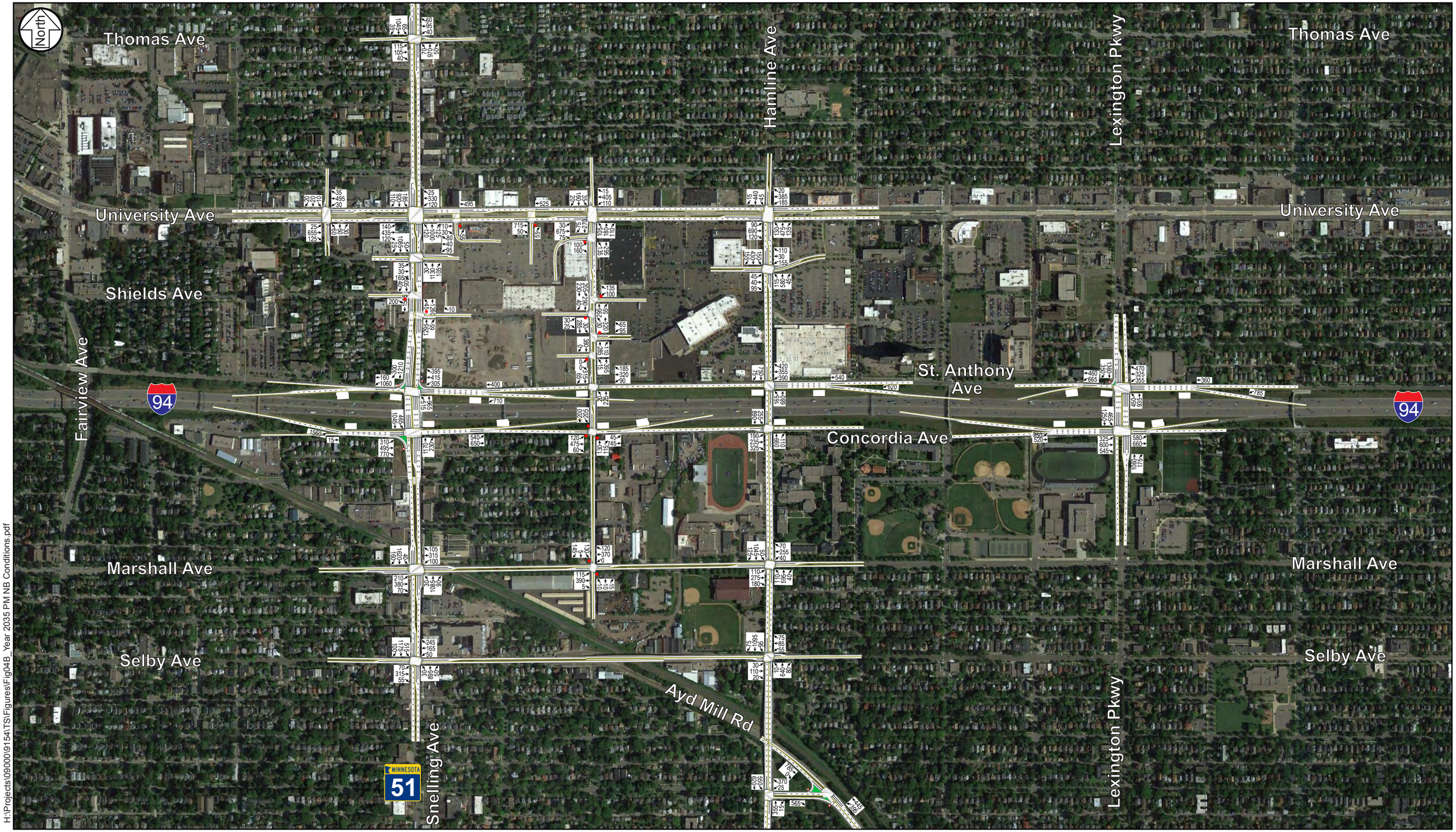
City of St. Paul

Figure 4A



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Year 2035 PM Peak No Build Conditions

Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 4B

For two-way stop controlled intersections, special emphasis is given to providing an estimate for the level of service of the side-street approach. Traffic operations at an unsignalized intersection with side-street stop control can be described in two ways. First, consideration is given to the overall intersection level of service. This takes into account the total number of vehicles entering the intersection and the capability of the intersection to support these volumes.

Second, it is important to consider the delay on the minor approach. Since the mainline does not have to stop, the majority of delay is attributed to the side-street approaches. It is typical of intersections with higher mainline traffic volumes to experience high levels of delay (i.e. poor levels of service) on the side-street approaches, but an acceptable overall intersection level of service during peak hour conditions.

To determine if the existing roadway network can accommodate the year 2035 no build traffic forecasts, a detailed intersection capacity analysis was completed using Synchro/SimTraffic software. It should be noted that Snelling Avenue was recently reconstructed between Marshall Avenue and University Avenue and no further geometric changes are considered in the near future.

Results of the year 2035 intersection capacity analysis shown in Table 2 indicate that all study intersections are expected to operate at an acceptable overall LOS D or better during the a.m. and p.m. peak hour with the existing roadway geometry and traffic controls, except for the Snelling Avenue and Selby Avenue intersection during the a.m. peak hour, notably the westbound approach. It should be noted that optimized signal timing was assumed under future conditions. Additionally, access onto Snelling Avenue during the p.m. peak is expected to be difficult between I-94 and University Avenue and flow along Snelling Avenue south of the interchange is hindered by slower travel, high volumes and lane changing, however overall intersection LOS/delay is in the acceptable range. The full simulation results for year 2035 no build conditions are presented in Appendix B.

The significant delay at the Snelling Avenue and Selby Avenue intersection during the a.m. peak hour is caused by the significant westbound right-turning movement at the intersection.

During the p.m. peak hour, significant queuing is expected along Snelling Avenue between Concordia Avenue and Selby Avenue. While the overall intersection LOS is expected to remain at an acceptable overall LOS D, significant side-street delay is expected. These queuing and delay issues are a product of the significant eastbound right-turn from Concordia Avenue to southbound Snelling Avenue and the large southbound left-turn volume from Snelling Avenue to Selby Avenue.

An evaluation of the arterial LOS on Snelling Avenue from Thomas Avenue to Selby Avenue, based on travel speed through the corridor and guidelines in the HCM was completed. The results show that the year 2035 no build conditions yield an arterial LOS near the LOS D/E threshold during the p.m. peak hour. LOS D/E conditions represent an arterial speed of about 40 percent of the typical free-flow speed. This is consistent with the individual intersection LOS and shows the congestion on the Snelling Avenue corridor that drivers will experience.

Table 2. Year 2035 No Build Intersection Capacity Analysis

Intersection	A.M. Peak Hour	P.M. Peak Hour
	LOS	LOS
University Avenue/Fry Street	A	B
Snelling Avenue/Thomas Avenue	B	B
Snelling Avenue/University Avenue	C	D
Snelling Avenue/Spruce Tree Avenue	A	D
Snelling Avenue/Shields Avenue(1)	A/A	D/**F**
Snelling Avenue/Midway Shopping Center Driveway(1)	A/A	C/**F**
Snelling Avenue/St. Anthony Avenue	B	D
Snelling Avenue/Concordia Avenue	B	D
Snelling Avenue/Marshall Avenue	D	D
Snelling Avenue/Selby Avenue	**F**	D
University Avenue/West Midway Shopping Center Driveway(1)	A/A	A/A
University Avenue/East Midway Shopping Center Driveway(1)	A/A	A/A
University Avenue/Pascal Street	B	B
Pascal Street/North Midway Shopping Center Driveway(1)	A/A	A/C
Pascal Street/Walmart Driveway(1)	A/A	A/C
Pascal Street/South Midway Shopping Center Driveway(1)	A/A	A/A
Pascal Street/Cub Driveway(1)	A/A	A/A
Pascal Street/St. Anthony Avenue	B	B
Pascal Street/Concordia Avenue(2)	A	B
Pascal Street/Marshall Avenue(1)	A/B	A/C
University Avenue/Hamline Avenue	C	C
Hamline Avenue/Midway Marketplace	A	B
Hamline Avenue/St. Anthony Avenue	B	C
Hamline Avenue/Concordia Avenue	B	B
Hamline Avenue/Marshall Avenue	C	D
Hamline Avenue/Selby Avenue	B	B
Hamline Avenue/Ashland Avenue	B	B
Ayd Mill Road/Ashland Avenue	B	B
Lexington Avenue/St. Anthony Avenue	C	C
Lexington Avenue/Concordia Avenue	C	C

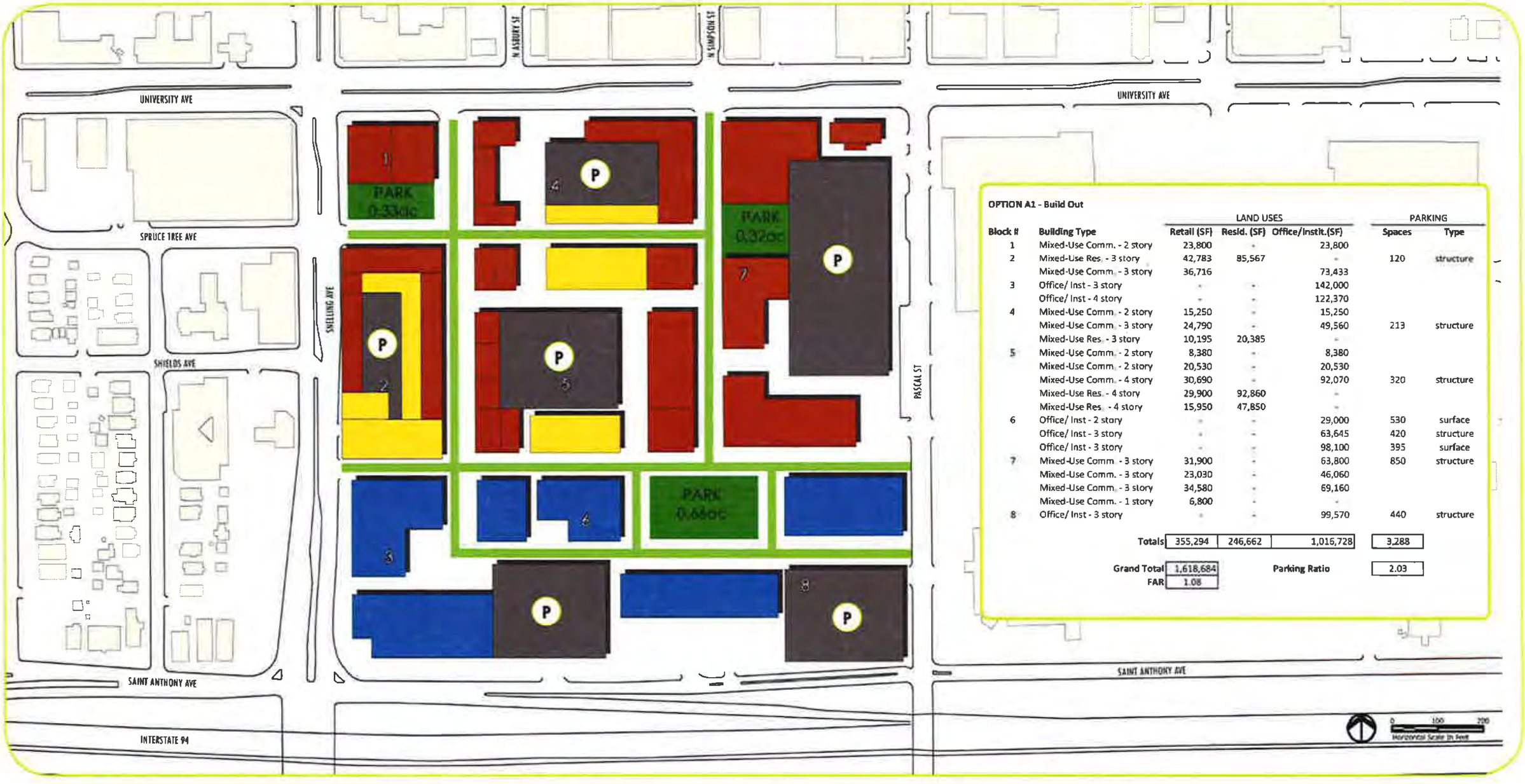
(1) Indicates an unsignalized intersection with side-street stop control, where the overall LOS is shown followed by the worst approach LOS. The delay shown represents the worst side-street approach delay.
(2) Indicates All-Way Stop Control

Proposed Development

The proposed mixed-use development is bound by St. Anthony Avenue, University Avenue, Snelling Avenue, and Pascal Street. There are two different development scenarios for the proposed development. The two development scenarios contain similar land uses, however, the sizes of the specific land uses differ from one another. Scenario one is referred to as the Comprehensive Plan/Snelling Station TOD Development plan scenario, shown in Figure 5 and scenario two is referred to as the RK Midway Master Plan Development plan, shown in Figure 6. Under each plan the proposed development is expected to include a mixture of uses, including multi-family apartments, office, service retail type uses. In the RK Midway Master Plan, a 20,000 person capacity soccer stadium that is expandable to a capacity of 25,500 is also included. For purposes of this study, the proposed development was assumed to be fully operational by the year 2035. However, the proposed soccer stadium will be completed initially by year 2018. The Comprehensive Plan/Snelling TOD development framework has been accepted by the city and will be compared to the proposed Master Plan. The development scenario with a higher intensity of trip generation will be analyzed. Trips will be generated for both scenarios and compared with the existing site trips to find out the total of the new external trips to the network. The existing site is approximately currently 80 percent occupied.

Access to the proposed development is proposed at the following locations in year 2035, shown in Figure 7. The access modifications and mitigation to the existing site include:

- Modifying access at the Snelling Avenue and Spruce Tree Avenue intersection to a right-in/right-out only and relocate the traffic signal to a new full intersection at Shields.
    - This results in removal of the northbound and southbound left-turn lanes along Snelling Avenue. In conjunction, the northbound left-turn lane on Snelling Avenue at University Avenue is able to be lengthened.
- Constructing a westbound approach to the Shields Avenue and allowing for a full access intersection. It is expected that this intersection will become a signalized intersection under full build conditions.
    - A southbound left-turn lane would be constructed at Shields Avenue.
    - Westbound geometry is expected to include a left-turn lane, a shared left-turn and thru lane, and a right-turn lane.
- Realigning access on Pascal Street to line-up across from access points to Walmart and Cub.
    - Under full build conditions, there is potential that a traffic signal will be installed at the site access point (extension of Shields) that aligns with the Walmart driveway.



OPTION A1 - Build Out

Block #	Building Type	LAND USES Retail (SF)	Resid. (SF)	Office/Instit.(SF)	PARKING Spaces	Type
1	Mixed-Use Comm. - 2 story	23,800	-	23,800		
2	Mixed-Use Res. - 3 story	42,783	85,567	-	120	structure
	Mixed-Use Comm. - 3 story	36,716		73,433		
3	Office/ Inst - 3 story	-	-	142,000		
	Office/ Inst - 4 story	-	-	122,370		
4	Mixed-Use Comm. - 2 story	15,250	-	15,250		
	Mixed-Use Comm. - 3 story	24,790	-	49,560	213	structure
	Mixed-Use Res. - 3 story	10,195	20,385	-		
5	Mixed-Use Comm. - 2 story	8,380	-	8,380		
	Mixed-Use Comm. - 2 story	20,530	-	20,530		
	Mixed-Use Comm. - 4 story	30,690	-	92,070	320	structure
	Mixed-Use Res. - 4 story	29,900	92,860	-		
	Mixed-Use Res. - 4 story	15,950	47,850	-		
6	Office/ Inst - 2 story	-	-	29,000	530	surface
	Office/ Inst - 3 story	-	-	63,645	420	structure
	Office/ Inst - 3 story	-	-	98,100	395	surface
7	Mixed-Use Comm. - 3 story	31,900	-	63,800	850	structure
	Mixed-Use Comm. - 3 story	23,030	-	46,060		
	Mixed-Use Comm. - 3 story	34,580	-	69,160		
	Mixed-Use Comm. - 1 story	6,800	-	-		
8	Office/ Inst - 3 story	-	-	99,570	440	structure
	Totals	355,294	246,662	1,016,728	3,288	
	Grand Total	1,618,684		Parking Ratio	2.03	
	FAR	1.08				

LEGEND: MIXED USE COMMERCIAL; MIXED USE RESIDENTIAL; OFFICE / INSTITUTIONAL; PARKS / OPEN SPACE; PARKING RAMP; EXISTING BUILDING; SURFACE PARKING LOT; BLOCK NUMBER

0 100 200 Horizontal Scale in Feet

April 17, 2014

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April 2016

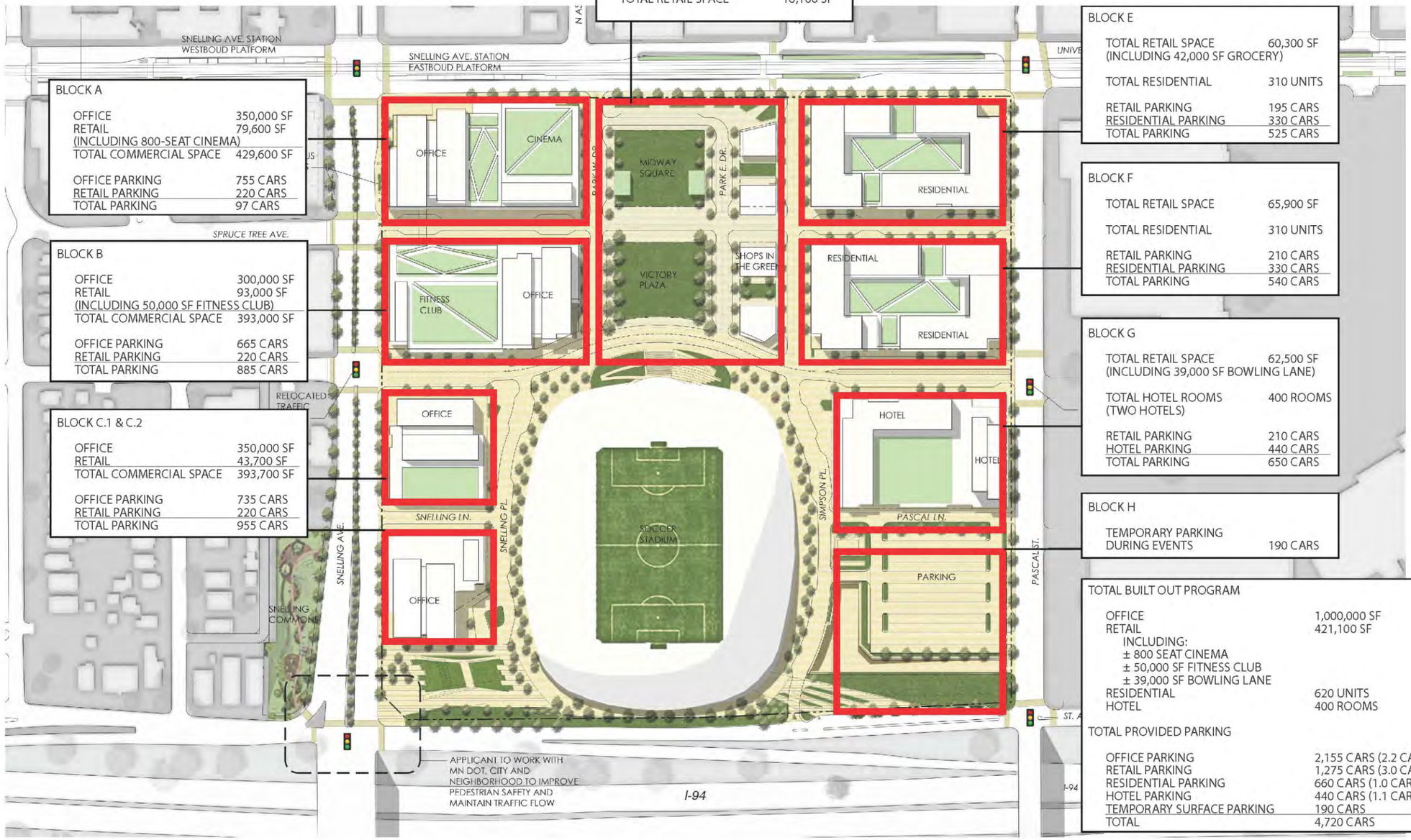
Snelling TOD Station/City Comprehensive Plan Site Plan

Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 5

Plan Date: May 24, 2016

PROGRAM



BLOCK A

OFFICE	350,000 SF
RETAIL	79,600 SF
(INCLUDING 800-SEAT CINEMA)	
TOTAL COMMERCIAL SPACE	429,600 SF
OFFICE PARKING	755 CARS
RETAIL PARKING	220 CARS
TOTAL PARKING	97 CARS

BLOCK B

OFFICE	300,000 SF
RETAIL	93,000 SF
(INCLUDING 50,000 SF FITNESS CLUB)	
TOTAL COMMERCIAL SPACE	393,000 SF
OFFICE PARKING	665 CARS
RETAIL PARKING	220 CARS
TOTAL PARKING	885 CARS

BLOCK C.1 & C.2

OFFICE	350,000 SF
RETAIL	43,700 SF
TOTAL COMMERCIAL SPACE	393,700 SF
OFFICE PARKING	735 CARS
RETAIL PARKING	220 CARS
TOTAL PARKING	955 CARS

BLOCK D

TOTAL RETAIL SPACE	16,100 SF

BLOCK E

TOTAL RETAIL SPACE (INCLUDING 42,000 SF GROCERY)	60,300 SF
TOTAL RESIDENTIAL	310 UNITS
RETAIL PARKING	195 CARS
RESIDENTIAL PARKING	330 CARS
TOTAL PARKING	525 CARS

BLOCK F

TOTAL RETAIL SPACE	65,900 SF
TOTAL RESIDENTIAL	310 UNITS
RETAIL PARKING	210 CARS
RESIDENTIAL PARKING	330 CARS
TOTAL PARKING	540 CARS

BLOCK G

TOTAL RETAIL SPACE (INCLUDING 39,000 SF BOWLING LANE)	62,500 SF
TOTAL HOTEL ROOMS (TWO HOTELS)	400 ROOMS
RETAIL PARKING	210 CARS
HOTEL PARKING	440 CARS
TOTAL PARKING	650 CARS

BLOCK H

TEMPORARY PARKING DURING EVENTS	190 CARS

TOTAL BUILT OUT PROGRAM

OFFICE	1,000,000 SF
RETAIL	421,100 SF
INCLUDING:	
± 800 SEAT CINEMA	
± 50,000 SF FITNESS CLUB	
± 39,000 SF BOWLING LANE	
RESIDENTIAL	620 UNITS
HOTEL	400 ROOMS

TOTAL PROVIDED PARKING

OFFICE PARKING	2,155 CARS (2.2 CAR/1,000 SF)
RETAIL PARKING	1,275 CARS (3.0 CAR/1,000 SF)
RESIDENTIAL PARKING	660 CARS (1.0 CAR/DU)
HOTEL PARKING	440 CARS (1.1 CAR/RM)
TEMPORARY SURFACE PARKING	190 CARS
TOTAL	4,720 CARS

RK MIDWAY

MINNESOTA UNITED FC

S9ARCHITECTURE

POPULOUS

THIS CONCEPTUAL STUDY IS FOR PLANNING PURPOSE ONLY. SITE SPECIFIC INFORMATION SUCH AS SURVEY, EXISTING CONDITIONS, ZONING REQUIREMENTS MUST BE VERIFIED.

0' 50' 100' 200'

MIDWAY, ST. PAUL, MN
APRIL 18, 2016
(REVISED MAY 24, 2016)

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RK Midway Master Plan

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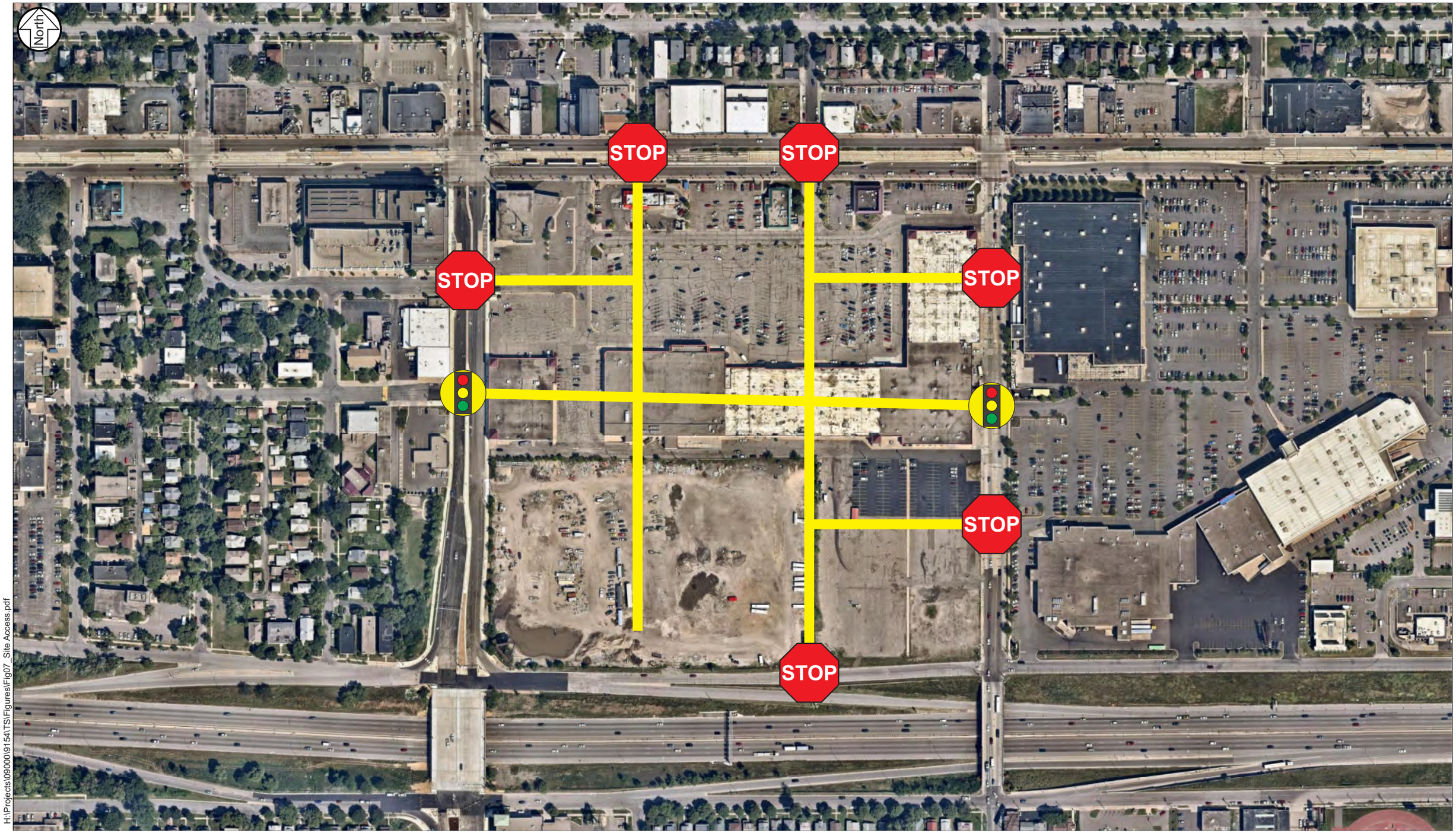
City of St. Paul

Figure 6



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Proposed Site Access Plan

Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 7

Trip Generation

In order to determine which development scenario would generate more external vehicle trips, a trip generation estimate for the proposed land uses in each plan was developed for the a.m. and p.m. weekday peak hours as well as a daily weekday basis. Trips are generated based on their land use sizes such as square footage, number of units, or seats. The trips are not generated based on the amount of parking spaces shown in the plans. Reductions were applied for trips between land uses (residential to retail) internal to the site, and for trips using other transportation modes besides a vehicle, and removal of the trips currently generated by the site.

The estimates for the Comprehensive Plan/Snelling Station TOD Development Plan from April 2014, shown in Table 3, were developed using the *ITE Trip Generation Manual, Ninth Edition*.

Table 3. Trip Generation Estimates – Comp. Plan/Snelling Station TOD Development Plan

Land Use Type *(ITE Code)*	Size	A.M. Peak Hour Trips		P.M. Peak Hour Trips		Daily Trips
		In	Out	In	Out	
Proposed Land Use						
Apartments *(220)*	225 Dwelling Units	23	92	91	49	1,496
General Office Building *(710)*	1,141,000 s.f.	1,566	214	289	1,411	12,585
Shopping Center *(820)*	355,000 s.f.	211	130	632	685	15,159
Total Trips		**1,800**	**436**	**1,012**	**2,145**	**29,240**
Internal Multi-Use Trip Reduction (10%)		**180**	**44**	**101**	**214**	**2,924**
Subtotal of External Trips		**1,620**	**392**	**911**	**1,931**	**26,316**
External Trip Mode Share						
Walk – 3%		49	12	27	58	789
Bike – 2%		32	8	18	39	526
LRT – 10%		162	39	91	193	2,632
Bus – 5%		81	20	46	97	1,316
Vehicle – 80%		1,296	313	729	1,544	21,053
Existing On-Site Trips (80% Occupied)		298	257	539	574	13,000
Total New External Vehicle Trips		**998**	**56**	**190**	**970**	**8,053**

Results of the trip generation estimates indicate the proposed development is expected to generate a total of approximately 1,054 a.m. peak hour, 1,160 p.m. peak hour and 8,053 daily *additional trips* to the network. This accounts for a 10 percent multi-use reduction (internal trips), which was developed based on the methodology within the *ITE Trip Generation Manual, Ninth Edition* and NCHRP Report 684: *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments.*

Additionally, a mode share was completed using results from the Twin Cities Regional Model and the Ford Site Mode Share Methodology completed by SRF Consulting Group. This mode share provides an estimate of multi-modal reductions and can be increased for non-vehicular traffic with the implementation of travel demand management (TDM) measures. With a higher non-vehicle share, traffic impacts would be expected to be less.

The estimates for the RK Midway Master Plan Development Plan from May 24, 2016, shown in Table 4, were developed using the *ITE Trip Generation Manual, Ninth Edition*.

Table 4. Trip Generation Estimates – RK Midway Master Plan Development Plan

Land Use Type *(ITE Code)*	Size	A.M. Peak Hour Trips		P.M. Peak Hour Trips		Daily Trips
		In	Out	In	Out	
Proposed Land Use						
Apartments *(220)*	620 Dwelling Units	63	253	250	135	4,123
General Office Building *(710)*	1,000,000 s.f.	1,373	187	253	1,237	11,030
Shopping Center *(820)*	278,000 s.f.	165	101	495	536	11,871
Hotel *(310)*	400 rooms	125	87	122	118	3,268
Movie Theater *(445)*	800 Seats	0	0	23	41	1,000
Fitness Club *(492)*	50,000 s.f.	35	35	101	76	1,647
Supermarket *(850)*	42,000 s.f	89	54	203	195	4,294
Total Trips		**1,850**	**717**	**1,447**	**2,338**	**37,233**
Internal Multi-Use Trip Reduction (15%)		**278**	**108**	**217**	**351**	**5,585**
Subtotal of External Trips		**1,572**	**609**	**1,230**	**1,987**	**31,648**
External Trip Mode Share						
Walk – 3%		47	18	37	60	949
Bike – 2%		31	12	25	40	633
LRT – 10%		157	61	123	199	3,165
Bus – 5%		79	31	62	99	1,582
Vehicle – 80%		1,258	488	984	1,589	25,318
Existing On-Site Trips (80% Occupied)		298	257	539	574	13,000
Total New External Vehicle Trips		**960**	**231**	**445**	**1,015**	**12,318**

Results of the trip generation estimates indicate the proposed development is expected to generate a total of approximately 1,191 a.m. peak hour, 1,460 p.m. peak hour and 12,318 daily *additional trips* to the network. This accounts for a 15 percent multi-use reduction (internal trips), which was developed based on the methodology within the *ITE Trip Generation Manual, Ninth Edition* and NCHRP Report 684: *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*. The higher multi-use reduction is a result of a higher amount of housing on site, which is expected to increase internal trips.

Once again, a mode share was completed using results from the Twin Cities Regional Model and the Ford Site Mode Share Methodology completed by SRF Consulting Group.

The results trip generation comparison between the Comprehensive Plan/Snelling Station TOD Plan and the RK Midway Master Plan indicated that the RK Midway Master Plan is expected to generate 4,265 additional daily trips and slightly more peak hour trips than the Comprehensive Plan/Snelling Station TOD Plan, and therefore, will be utilized to complete future year 2035 build conditions.

Year 2035 Build Conditions – Site Development

To identify potential impacts associated with the proposed development without a soccer event, traffic forecasts for year 2035 conditions (i.e. year of full build out) were reviewed. The year 2035 conditions take into account general area background growth, a reduction in existing site trips due to the removal of various buildings, and the new trips generated by the proposed development. The following sections provide details on the background traffic forecasts, estimated trip generation, and intersection capacity analysis for year 2035 conditions.

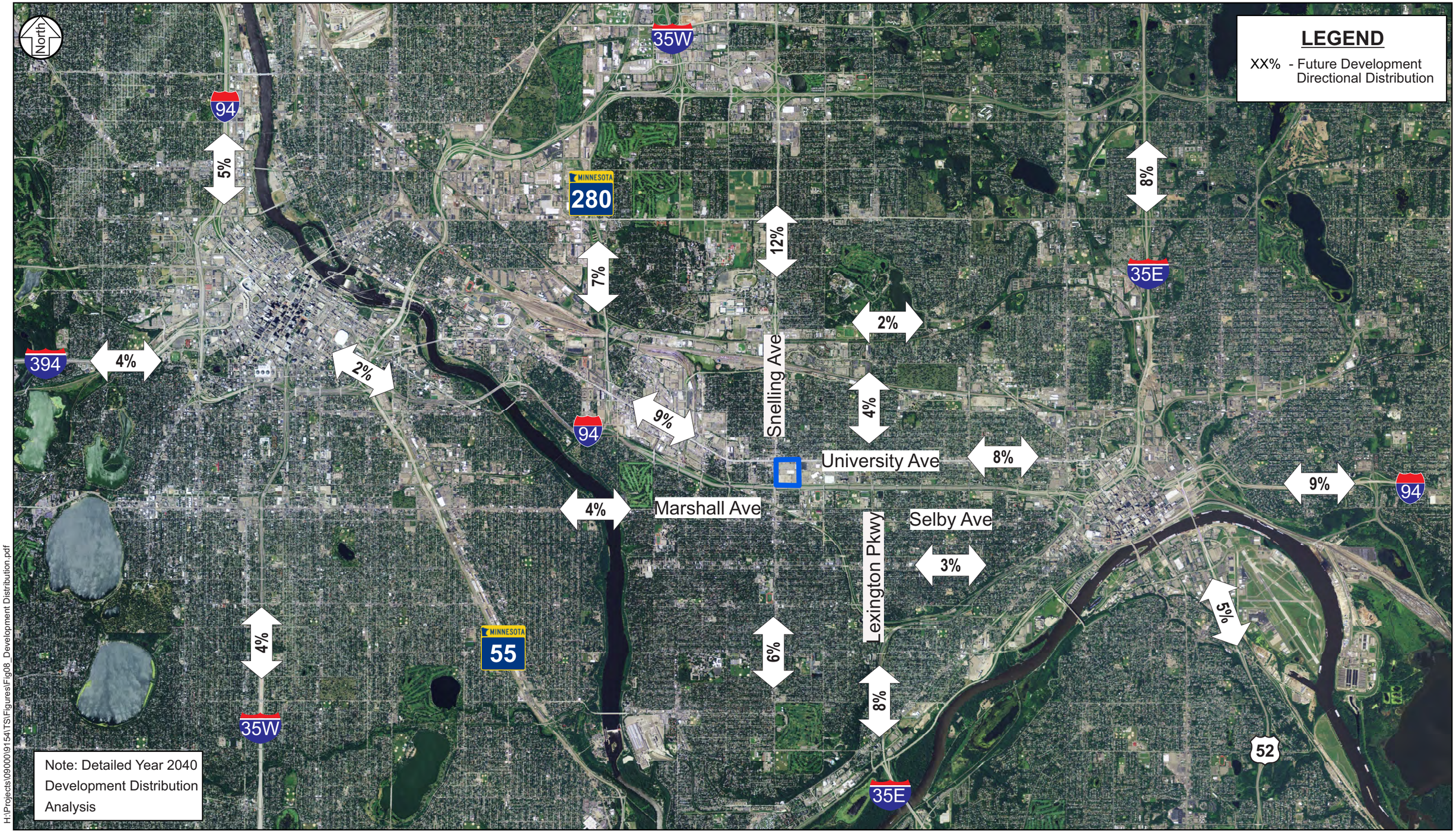
Background Traffic Growth

To account for general background growth and known adjacent developments in the area, an annual growth rate of one-half percent was applied to the existing peak hour traffic volumes to develop year 2035 background traffic forecasts. This growth rate is consistent with historical growth rates in the study area.

Trip Generation

Results of the previously completed trip generation estimates indicate the proposed development is expected to generate a total of approximately 1,191 a.m. peak hour, 1,460 p.m. peak hour and 12,318 daily new trips to the network. However based on the proposed land uses (i.e. the general retail), a portion of the trips using the site are expected to be from motorists already traveling along Snelling Avenue, University Avenue and Pascal Street within the study area. These trips are considered "pass-by" type trips. When accounting for the "pass-by" trip reductions (34 percent for retail based on the *ITE Trip Generation Manual, Ninth Edition*), the total new roadway network trip generation is expected to be approximately 1,091 a.m. peak hour, 1,110 p.m. peak hour and 8,363 daily trips.

Trips generated by the proposed development were distributed throughout the study area based on the directional distribution shown in Figure 8, which was developed based on existing travel patterns, the Twin Cities Regional Model, local business employee data, and engineering judgment. With the addition of the office space on site, the distribution of trips is expected to be more regional as opposed to the existing (i.e. only retail on-site) being more local. The resultant year 2035 traffic forecasts, which include general background growth and trips generated by the proposed development, are shown in Figures 9A and 9B.



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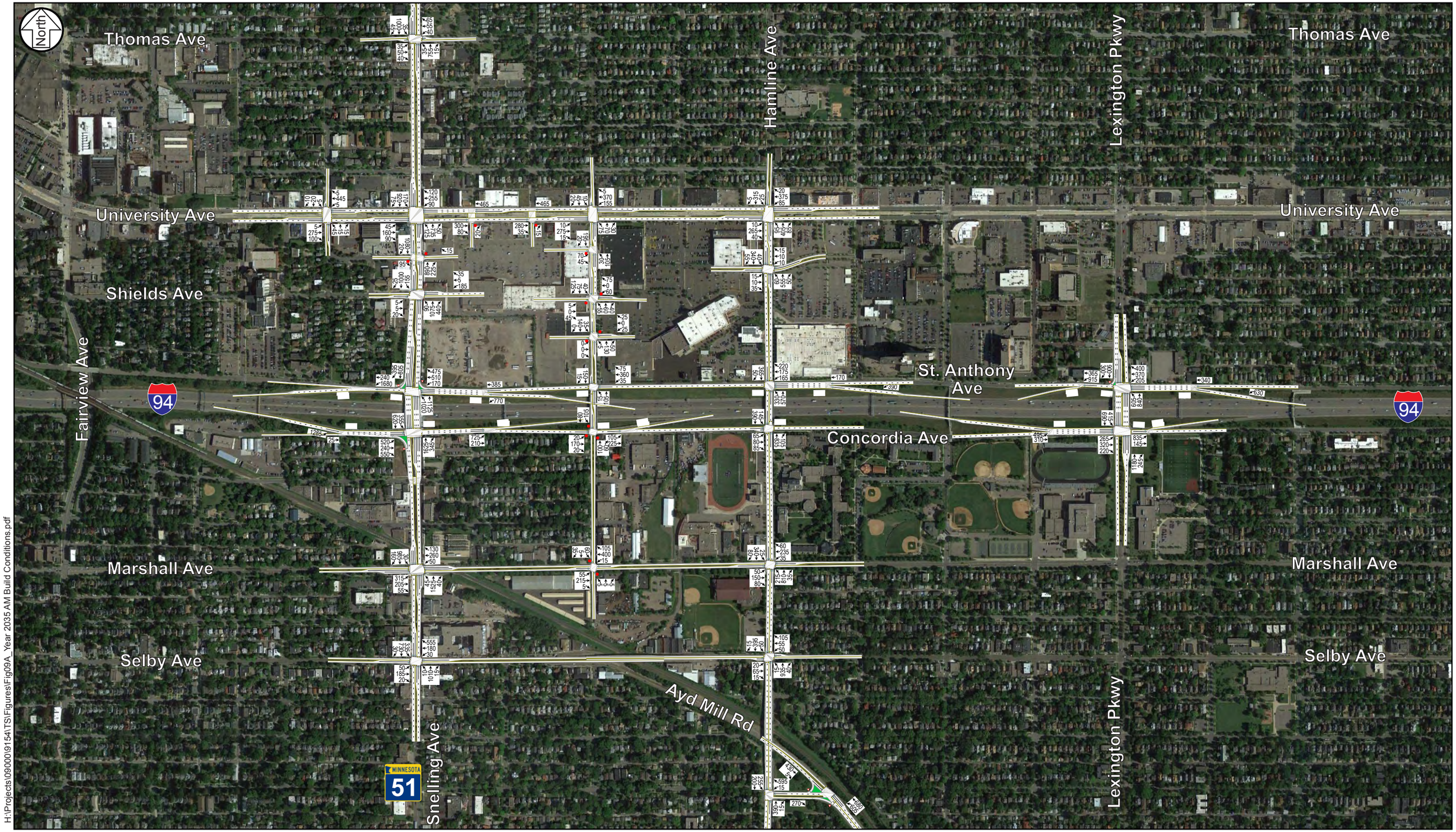
April 2016

Development Distribution

Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 8



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Year 2035 AM Peak Build Conditions

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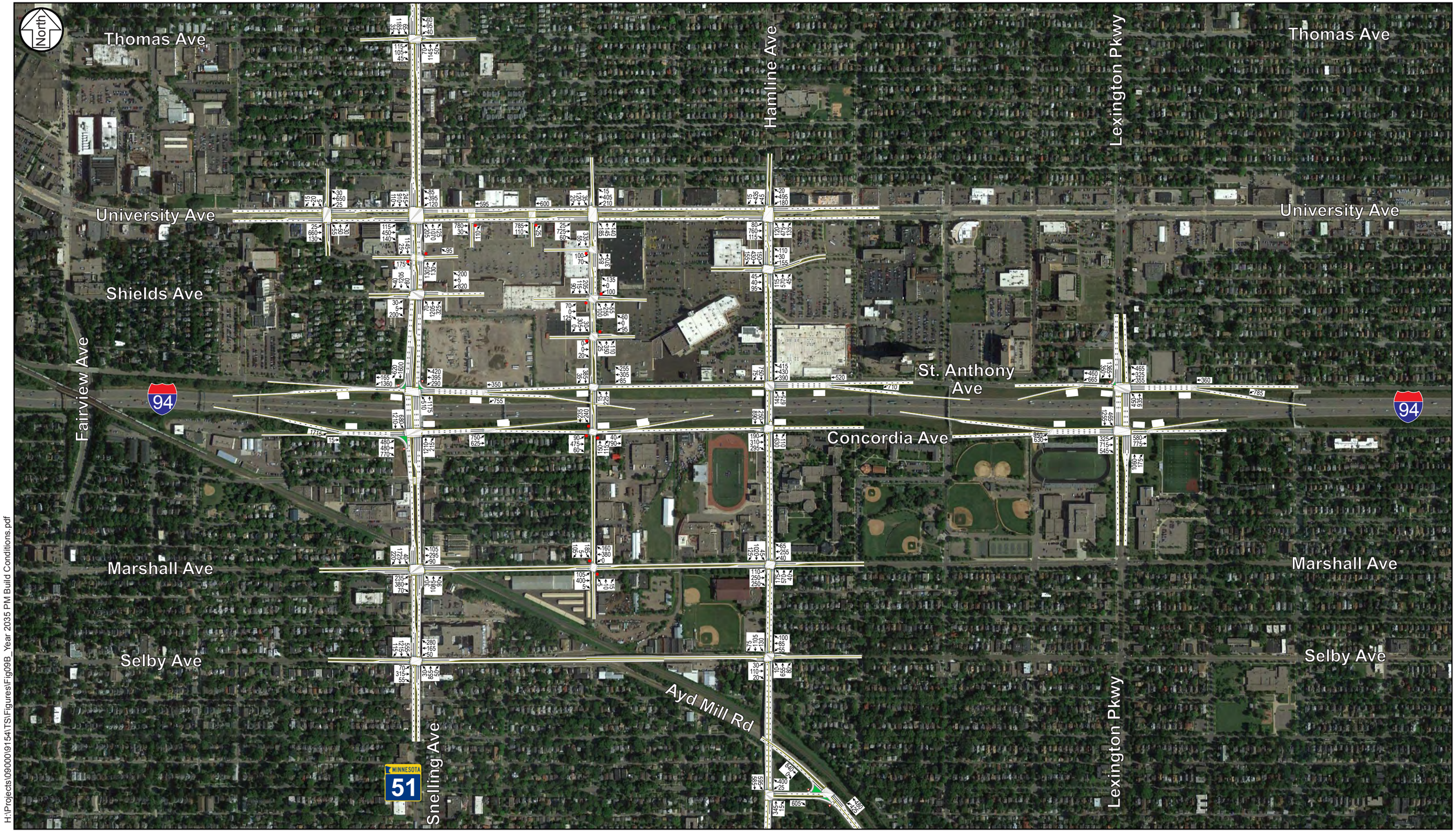
City of St. Paul

Figure 9A



H:\Projects\09000\9154\TS\Figures\Fig09B_Year 2035 PM Build Conditions.pdf

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Year 2035 PM Peak Build Conditions

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City of St. Paul

Figure 9B

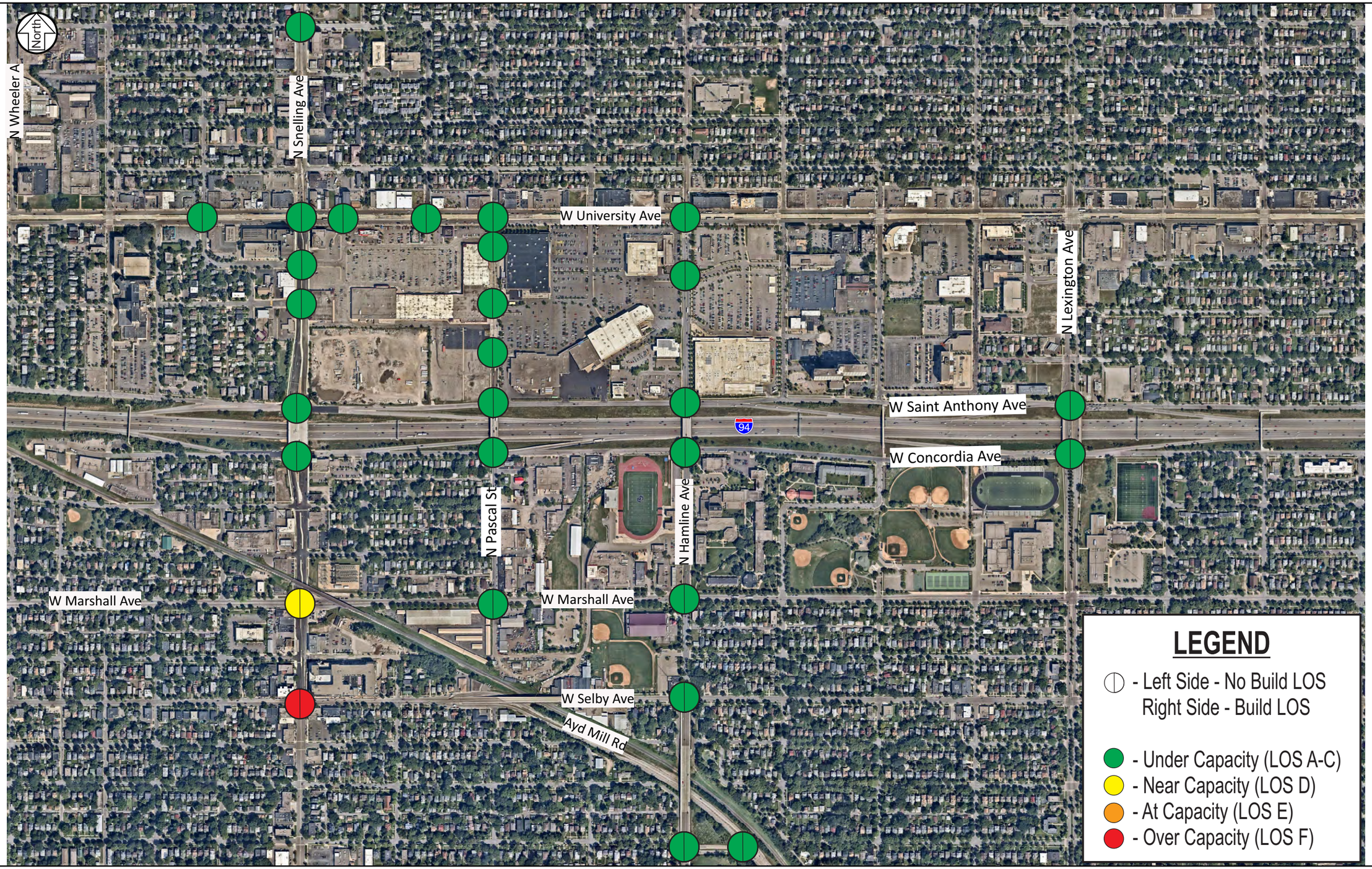
Intersection Capacity Analysis

Prior to completing the intersection capacity analysis for year 2035 build conditions, volumes were reviewed to determine preliminary geometry of the westbound approach of the Snelling Avenue and Shields Avenue intersection. Based on a review of the volumes, the westbound lanes of the intersection will require a left-turn lane, and a shared left-turn/thru lane and a right-turn lane. The right-turn lane is only needed during p.m. peak hour conditions, and can be converted to on-street parking during non-peak hours. With this configuration and the expected signal phasing, the south approach of the intersection is recommended to not include a pedestrian phase. A pedestrian phase and crosswalk would be provided on the north side of the intersection to allow pedestrians and bikes to cross Snelling Avenue. This will allow the large westbound left-turn movement from the development to operate in a permissive phase (i.e. flashing yellow arrow) in order to allow for improved intersection operations and eliminate potential pedestrian/vehicle safety conflicts.

Results of the year 2035 intersection capacity analysis shown in Table 5 indicate that all study intersections are expected to operate at an acceptable overall LOS D or better during the a.m. peak hour and p.m. peak hours with the previously described new site access geometry and traffic controls, except for the Snelling Avenue and Selby Avenue intersection during the a.m. peak hour and the Hamline Avenue and Marshall Avenue intersection during the p.m. peak hour. A comparison on the a.m. and p.m. peak hour analysis between year 2035 no build conditions and year 2035 build conditions in shown in Figures 10A and 10B. The full simulation results for year 2035 build conditions are presented in Appendix C.

The Snelling Avenue and Selby Avenue intersection is expected to continue to operate poorly during the a.m. peak hour due to the significant westbound right-turning volume. This is a no-build condition and mitigation is not identified. It should be noted that optimized signal timing for all study intersections was assumed under future build conditions.

During the p.m. peak hour, intersections of Snelling Avenue between Thomas Avenue and Selby Avenue are expected to operate at an overall LOS D, however, significant side-street queuing and delay is expected, similar to year 2035 no build conditions. A rolling type queue is expected along southbound Snelling Avenue. The newly constructed westbound approach of the Snelling Avenue and Shields Avenue intersection is expected to have queues of over 750 feet, which will potentially extend into the on-site parking structures. However, due to the nature of office trips, this is expected to only be a p.m. peak hour exiting issue. The queuing expected at these intersections is shown in Figures 11 and 12 for the area of Snelling Avenue between Thomas Avenue and Selby Avenue. The queues represent the average and 95th percentile queue from the a.m. or p.m. peak hours. It should be noted that since the new trips generated by the development would be office trips, these trips are generally more regional and destined for the near-by freeways. Therefore, the queues on Snelling Avenue south of the I-94 interchange are relatively similar between no build and build conditions since build conditions are expected to add on a minimal amount of trips within this area.



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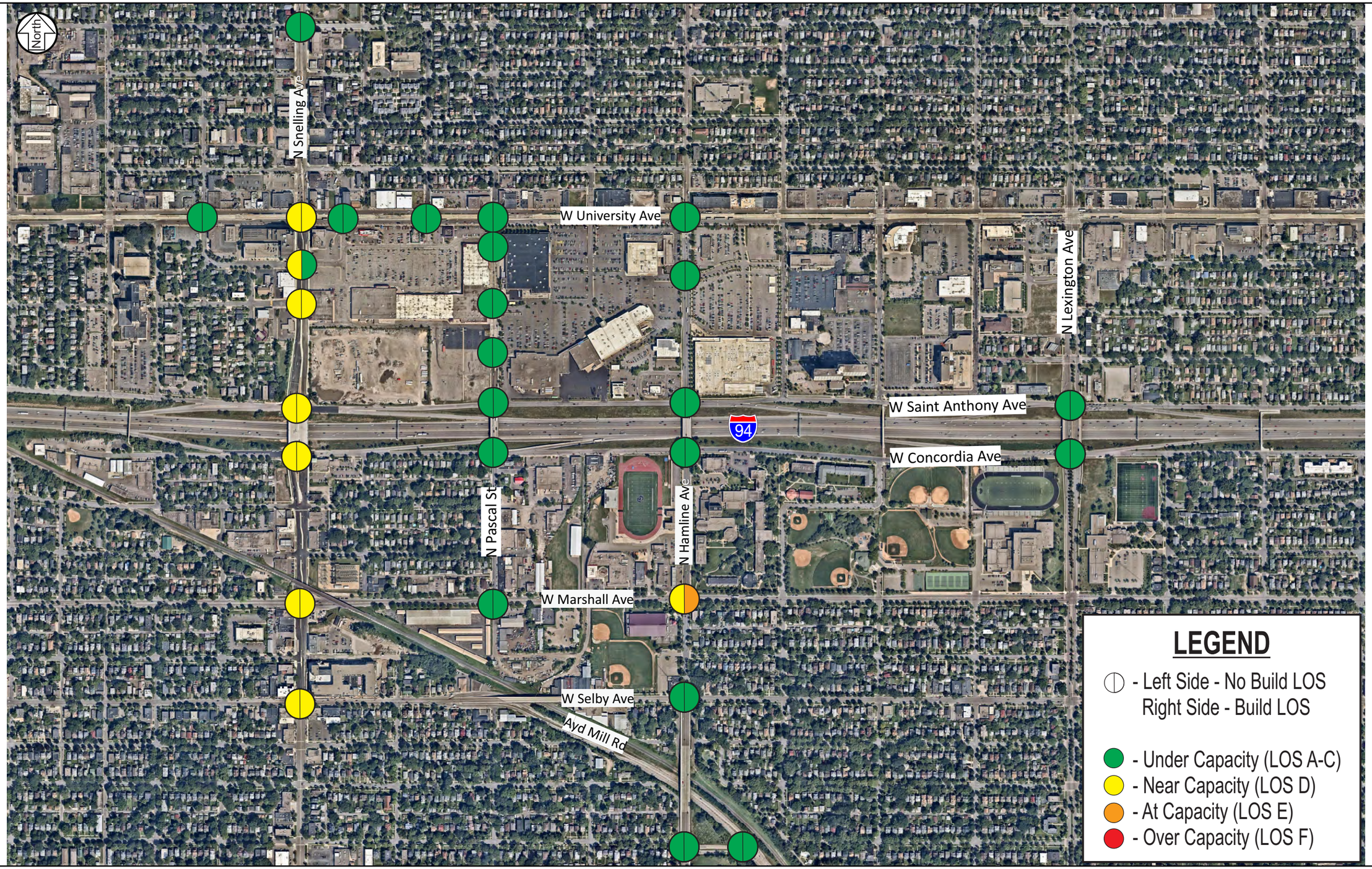
Year 2035 AM Peak Hour No Build and Build Traffic Analysis

Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 10A



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Year 2035 PM Peak Hour No Build and Build Traffic Analysis

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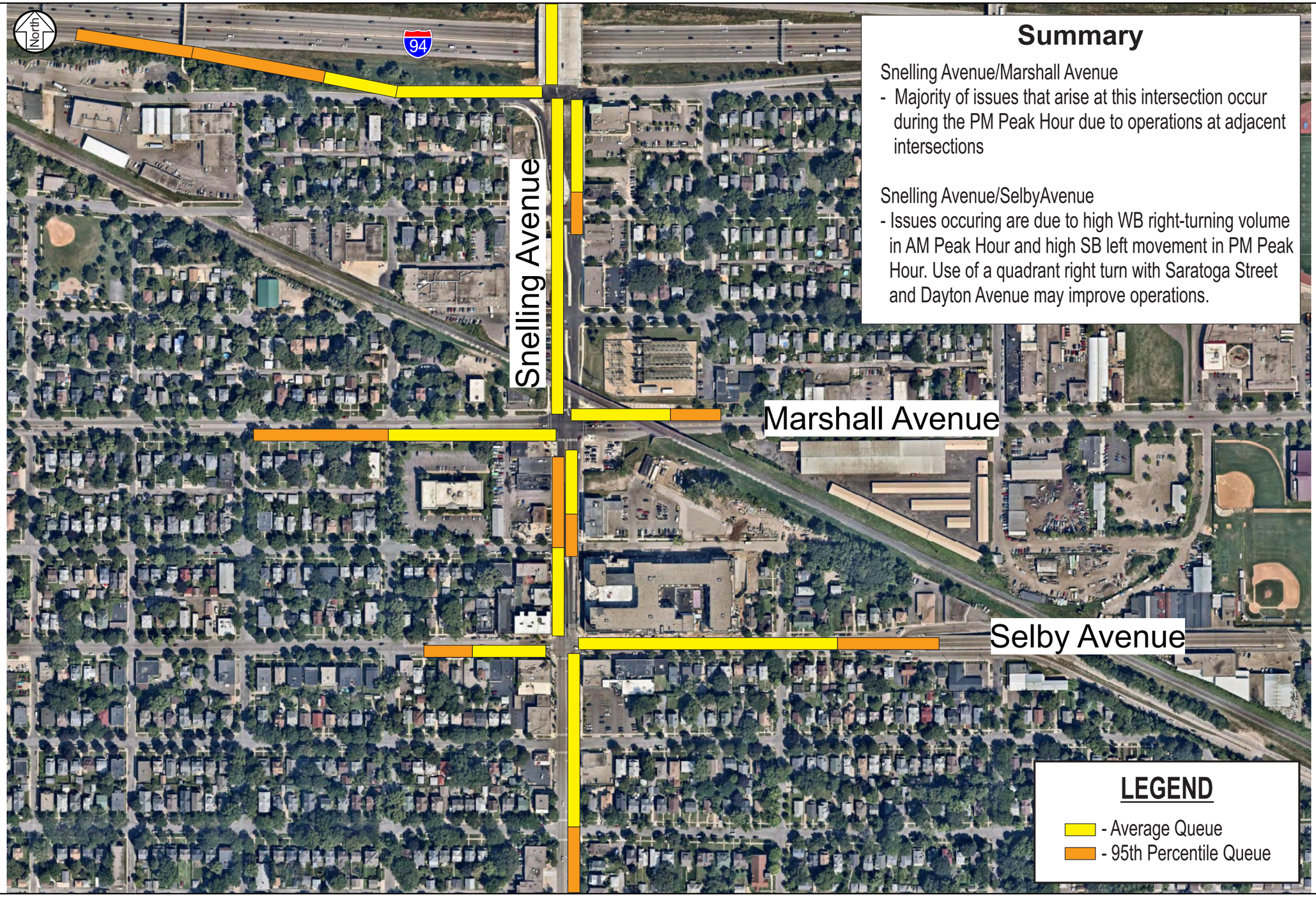
City of St. Paul

Figure 10B



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Year 2035 Build Analysis Queuing Information - Concordia Avenue to Selby Avenue

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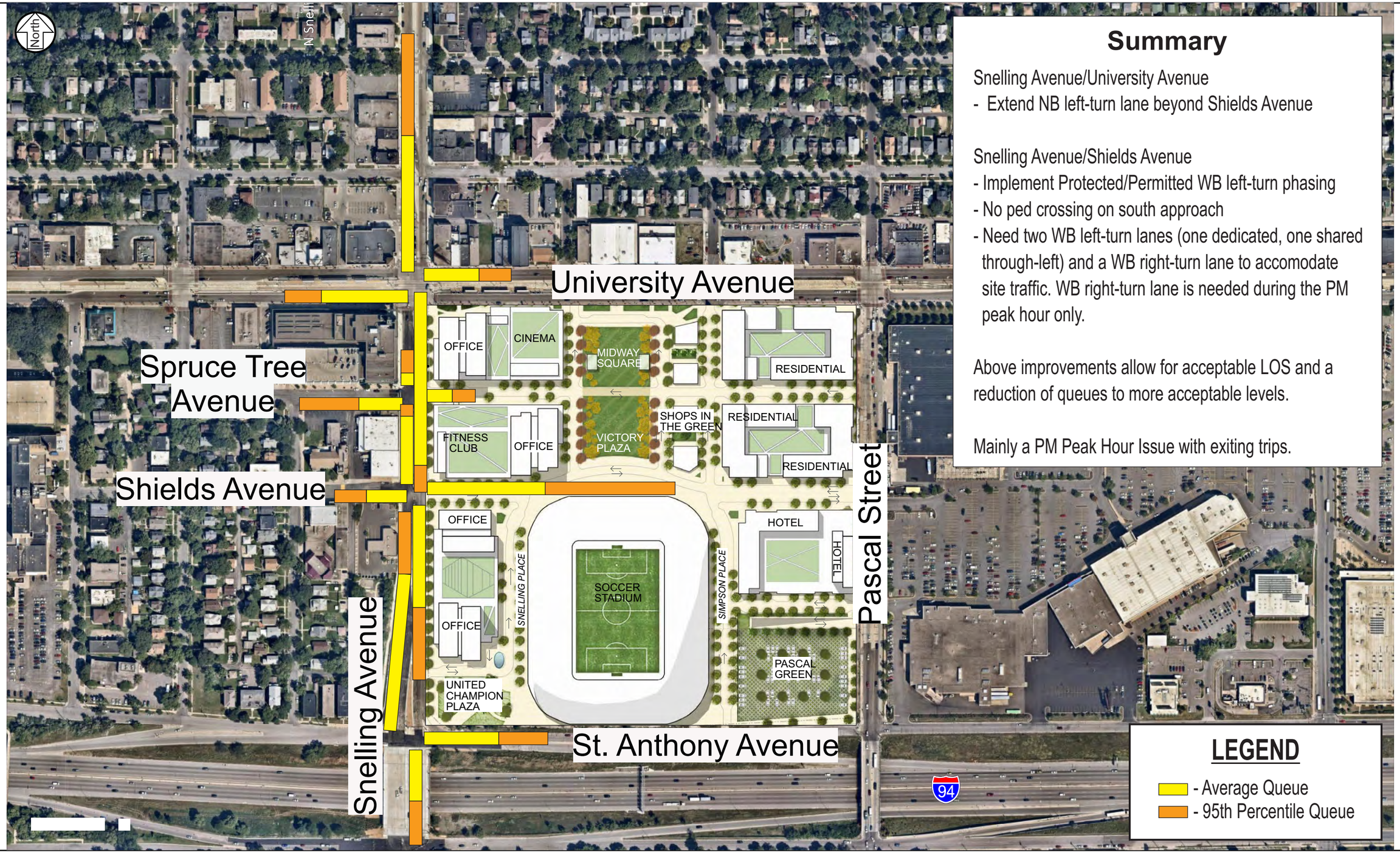
Figure 11



Summary

Snelling Avenue/University Avenue
- Extend NB left-turn lane beyond Shields Avenue

Snelling Avenue/Shields Avenue
- Implement Protected/Permitted WB left-turn phasing
- No ped crossing on south approach
- Need two WB left-turn lanes (one dedicated, one shared through-left) and a WB right-turn lane to accomodate site traffic. WB right-turn lane is needed during the PM peak hour only.

Above improvements allow for acceptable LOS and a reduction of queues to more acceptable levels.

Mainly a PM Peak Hour Issue with exiting trips.

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Year 2035 Build Analysis Queuing Information - University Avenue to St. Anthony Avenue

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Figure 12

Table 5. Year 2035 Build Intersection Capacity Analysis

Intersection	A.M. Peak Hour	P.M. Peak Hour
	LOS	LOS
University Avenue/Fry Street	A	B
Snelling Avenue/Thomas Avenue	B	B
Snelling Avenue/University Avenue	C	D
Snelling Avenue/Spruce Tree Avenue(1)	A/B	B/**F**
Snelling Avenue/Shields Avenue	B	D
Snelling Avenue/St. Anthony Avenue	C	D
Snelling Avenue/Concordia Avenue	C	D
Snelling Avenue/Marshall Avenue	D	D
Snelling Avenue/Selby Avenue	**F**	D
University Avenue/Asbury Street(1)	A/A	A/A
University Avenue/Simpson Place(1)	A/A	A/A
University Avenue/Pascal Street	B	C
Pascal Street/North Development Driveway(1)	A/A	A/B
Pascal Street/Shields Avenue(1)	A/A	A/C
Pascal Street/ South Development Driveway(1)	A/A	A/B
Pascal Street/St. Anthony Avenue	B	B
Pascal Street/Concordia Avenue(2)	A	B
Pascal Street/Marshall Avenue(1)	A/B	B/**E**
University Avenue/Hamline Avenue	C	D
Hamline Avenue/Midway Marketplace	A	B
Hamline Avenue/St. Anthony Avenue	B	C
Hamline Avenue/Concordia Avenue	B	C
Hamline Avenue/Marshall Avenue	C	**E**
Hamline Avenue/Selby Avenue	B	B
Hamline Avenue/Ashland Avenue	B	C
Ayd Mill Road/Ashland Avenue	B	B
Lexington Avenue/St. Anthony Avenue	C	C
Lexington Avenue/Concordia Avenue	D	C

(1) Indicates an unsignalized intersection with side-street stop control, where the overall LOS is shown followed by the worst approach LOS. The delay shown represents the worst side-street approach delay.
(2) Indicates All-Way Stop Control

The significant delay issues expected at the Hamline Avenue and Marshall Avenue intersection during the p.m. peak hour are due to the expected increase in volume making a northbound left-turn and eastbound right-turn at this intersection. Based on preliminary analysis, construction of an eastbound right-turn lane will improve overall intersection operations to an acceptable LOS. This would require removing some on-street parking stalls, however, it may only be needed during the peak hours of the day. Based on the analysis results, minimal mitigation may be necessary in order to allow for acceptable overall intersection operations within the study area.

A comparison of the arterial LOS on Snelling Avenue was completed between year 2035 no build and build conditions. The year 2035 build conditions experience very similar arterial LOS conditions near the LOS D/E threshold. In comparison to no build, this is approximately the same operations conditions along Snelling Avenue between Thomas Avenue and Selby Avenue. Both no build and build conditions are expected to experience a travel speed around 40 percent of the typical free-flow speed, meaning an average speed of about 12 miles per hour. This low travel speed is consistent with the congestion expected on the corridor.

Key Findings for Year 2035 Build Conditions

To improve Snelling Avenue operations, the traffic signal at Spruce Tree Avenue should be relocated to Shields Avenue. This will require modifications/reconstruction of Snelling Avenue to Shields Avenue. Shields Avenue will need a larger westbound approach to accommodate the amount of traffic leaving the proposed office land use along Snelling.

Snelling Avenue will have intersections operating at acceptable LOS (delay) under the No Build and Build. However, while all intersections are expected to operate at LOS D from Shields Avenue to Selby Avenue, the high volume, queues, and lane changing south of the I-94 interchange makes the area feel congested under no build and build conditions.

The only intersection that goes from an acceptable LOS in No Build to an unacceptable LOS in Build is at Hamline Avenue and Marshall Avenue. Mitigation would not be required with the year of opening of the Stadium or initial development. Addition of an eastbound right-turn lane (by time of day with the removal of on-street parking) would provide acceptable overall level of service.

Traffic signal timing within the study area is expected to be updated to accommodate future development travel pattern changes.

The proposer should encourage future land use to use the transit system with Green Line LRT, A-Line BRT and the other regular Metro Transit service adjacent to the site. Consider travel demand management (TDM) measures to encourage the use of these facilities.

Soccer Stadium

As part of the Snelling Midway Stadium Alternative Urban Areawide Review (AUAR), an analysis was conducted to address transportation issues related to the proposed soccer stadium. The proposed stadium is expected to have a capacity of 20,000 for the 2018 year of opening. The stadium is proposed to be constructed to allow for expansion to a capacity of 25,500 by year 2035, and will be located on land between University Avenue, I-94, Snelling Avenue, and Pascal Street as part of a larger overall redevelopment of the existing Midway shopping center. The soccer stadium is expected to open for the 2018 MLS season.

The transportation analysis was completed for all expected event time periods and included analysis of automobile traffic, transit, pedestrians, and bicyclists. Based on a review of other Midwestern teams, a typical MLS season consists of approximately 20 to 25 home matches (including preseason and exhibitions) and a potential for up to four home playoff matches. The following distribution of game days and times was assumed for this analysis in order to determine which time periods are most affected by event related traffic:

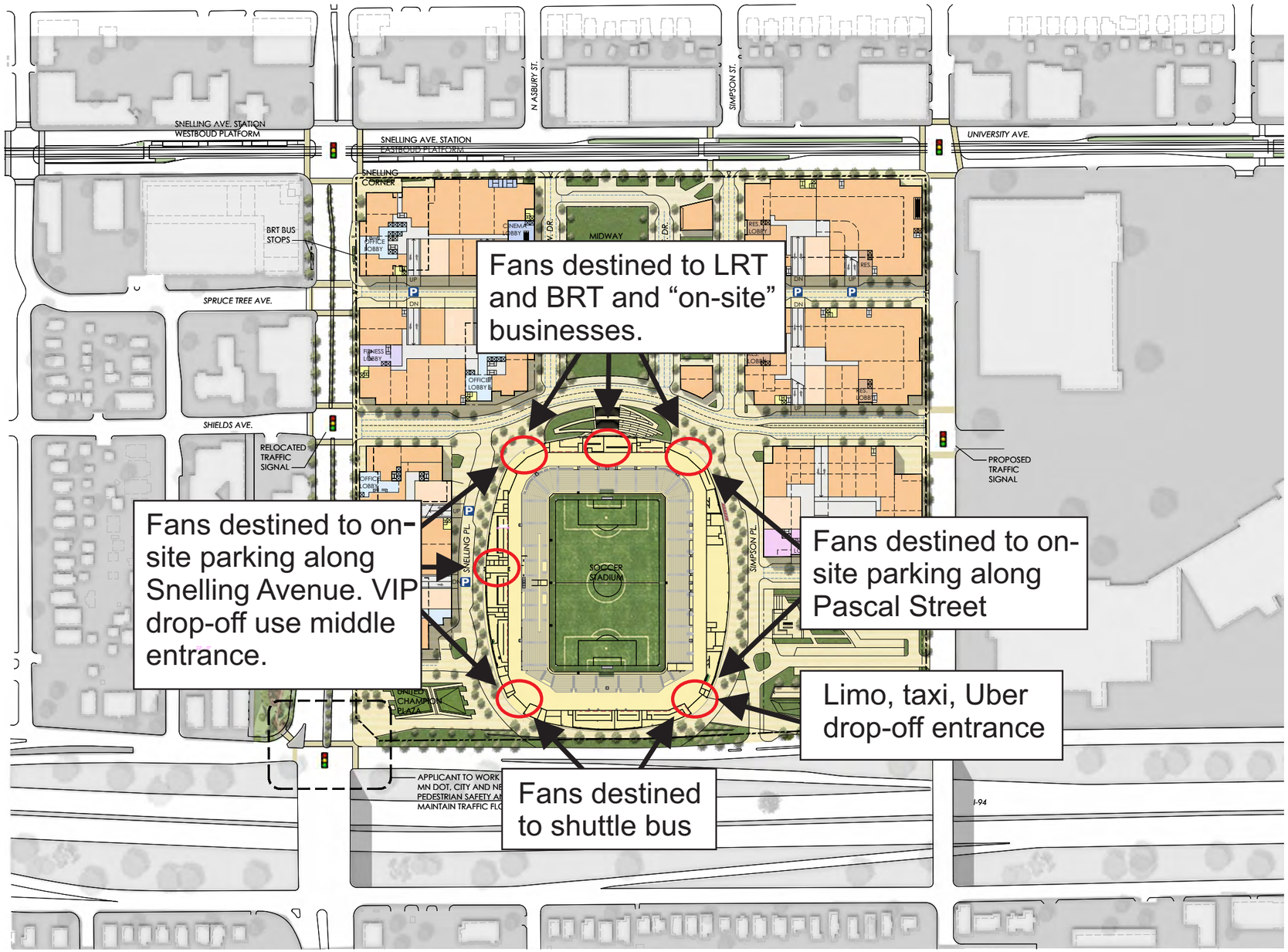
- Weekday Evening – 7:00 or 7:30 p.m. start time – approximately 5 games
- Saturday Afternoon – 2:00 or 4:00 p.m. start time – approximately 5 to 7games
- Saturday Evening – 7:00 or 7:30 p.m. start time - approximately 5 to 7 games
- Sunday Afternoon – 2:00 or 4:00 p.m. start times – approximately 5 to 7 games

Proposed access to the stadium is expected along the south edge of the building on St. Anthony Avenue, along the north edge of the building on the proposed Shields Avenue extension and access on both the east and west sides of the stadium. Each access is expected to attract a certain mode type. Each access and their respective mode type is shown in Figure 13.

The assumptions for the analysis are based on conditions prior to implementing mitigation strategies and could change based on mitigation strategies that are implemented. This analysis is intended to identify potential issues that will require further investigation/mitigation. These could be mitigation strategies to increase auto-occupancy, provide additional parking, provide staging areas for transit, or provide pre and post-game activities.

Traffic Analysis Assumptions

Traffic volumes for the study area intersections were collected for events occurring on a weekday evening (7:00 p.m. start time), weekend afternoon (2:00 p.m. start time) and a weekend evening (7:00 p.m. start time). Typical matches last for approximately two hours. Based on a review of the traffic volumes collected, the weekend afternoon background volume was significantly higher than the other two scenarios. This is due to the retail generated traffic peak that occurs on weekend afternoons. Therefore, the weekend afternoon peak scenario was selected for evaluation for worse-case conditions.



PARKING

NO. DATE. REVISION

KEY PLAN

S9ARCHITECTURE
115 FIFTH AVENUE
NEW YORK, NY 10003
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Owner:
RK MIDWAY LLC
C/O RD MANAGEMENT LLC
810 SEVENTH AVENUE, 10 TH FLOOR
NEW YORK, NY 10019

PROJECT TITLE:
SNELLING MIDWAY REDEVELOPMENT SITE MASTER PLAN

1562 UNIVERSITY AVENUE W.
SAINT PAUL, MN 55104

PROJECT NO.: 63260.00

DRAWING TITLE:

SCALE: PAGE:

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April 2016

Potential Stadium Access Plan

Snelling Midway Stadium Transportation Study
City of St. Paul

DN

Figure 13

The traffic operations analysis for the scenario was conducted for a one-hour time prior for event arrival and one-hour after for event departure. The event arrival is usually more spread-out, while the event departure is more concentrated. The traffic model used varying volumes within the analyzed one-hour time frame to reflect event traffic patterns. This allows for more accurate results and the magnitude of delay and queuing in the system. Event departure models were run longer than one-hour to determine when/if the duration of the event traffic exceeded one hour. To determine how event traffic will operate within the study area, the key intersections previously shown in Figure 2 were analyzed.

Parking Availability

An evaluation of on-site and adjacent off-site parking availability within a one mile walking distance was completed for both a year of opening and future year full-build out scenario for event parking. On-street parking is not a reliable source of event parking, and therefore was not included in this analysis as an option for meeting event parking needs. The goal of the transportation analysis was to determine mitigation strategies such that parking in adjacent residential neighborhoods is not needed to meet event demand. Similarly, accommodating event parking in nearby lots or ramps can also be unreliable. The available parking supply was divided into parking on site and parking to the north, east, south, and west. The parking supply on site is expected to change between 2018 and 2035 with full development of the site.

The adjacent (within one mile) off-site parking options are shown in Figure 14. These are only potential options that may allow event parking and no contractual agreements are in place. These businesses may not want parking for various reasons including various reasons including already being used, not current practice, insurance, licensing and sales tax. Therefore, an assumption was made that only those spaces proposed as part of site or master plan and the 350 spaces for which the City has already verified availability would be available for event use. This study identified approximately 2,500 potential off-site spaces within one mile of the proposed stadium.

Mode Split

A specific mode split was completed for both year 2018 (Capacity 20,000 attendees) and year 2035 (Capacity 25,500 attendees) conditions. The mode split for the two different conditions is expected to differ due to the amount of on-site parking, land use changes and the potential expansion of the stadium capacity by an additional 5,500 people. The mode split for fans at the proposed stadium is divided into five categories: 1) Non-Auto, LRT or BRT, which includes walking from home, biking, and regular Metro Transit bus service, 2) On-Site Parking, 3) Off-Site Parking within walking distance of the site, 4) Metro Transit's LRT (Green Line)/BRT (A-Line), and 5) Shuttles to off-site parking facilities. The complete mode share split breakdown in presented in Appendix D

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Potential Adjacent Off-Site Parking

Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 14

Auto Occupancy

Based on prior experience with travel behavior characteristics for sports stadia around Twin Cities and around the country, an estimate of 2.75 people per vehicle would be used for average auto occupancy for all event transportation analysis.

Event Traffic Characteristics

It is assumed that not 100 percent of the event traffic is expected to arrive or depart the stadium area during the one-hour analysis periods. Based on previous experience with sports stadia in the Twin Cities, a certain percentage of attendees will arrive or depart outside of the analysis hour, depending on the time of day, available activities within the area, and day of the week. Table 6 shows the percent of vehicles arriving/departing during the analysis hour for each scenario. These assumptions are slightly more intense than the other stadium event studies completed in the Twin Cities Metro because of the current limited restaurant and pre-game/post-game entertainment options.

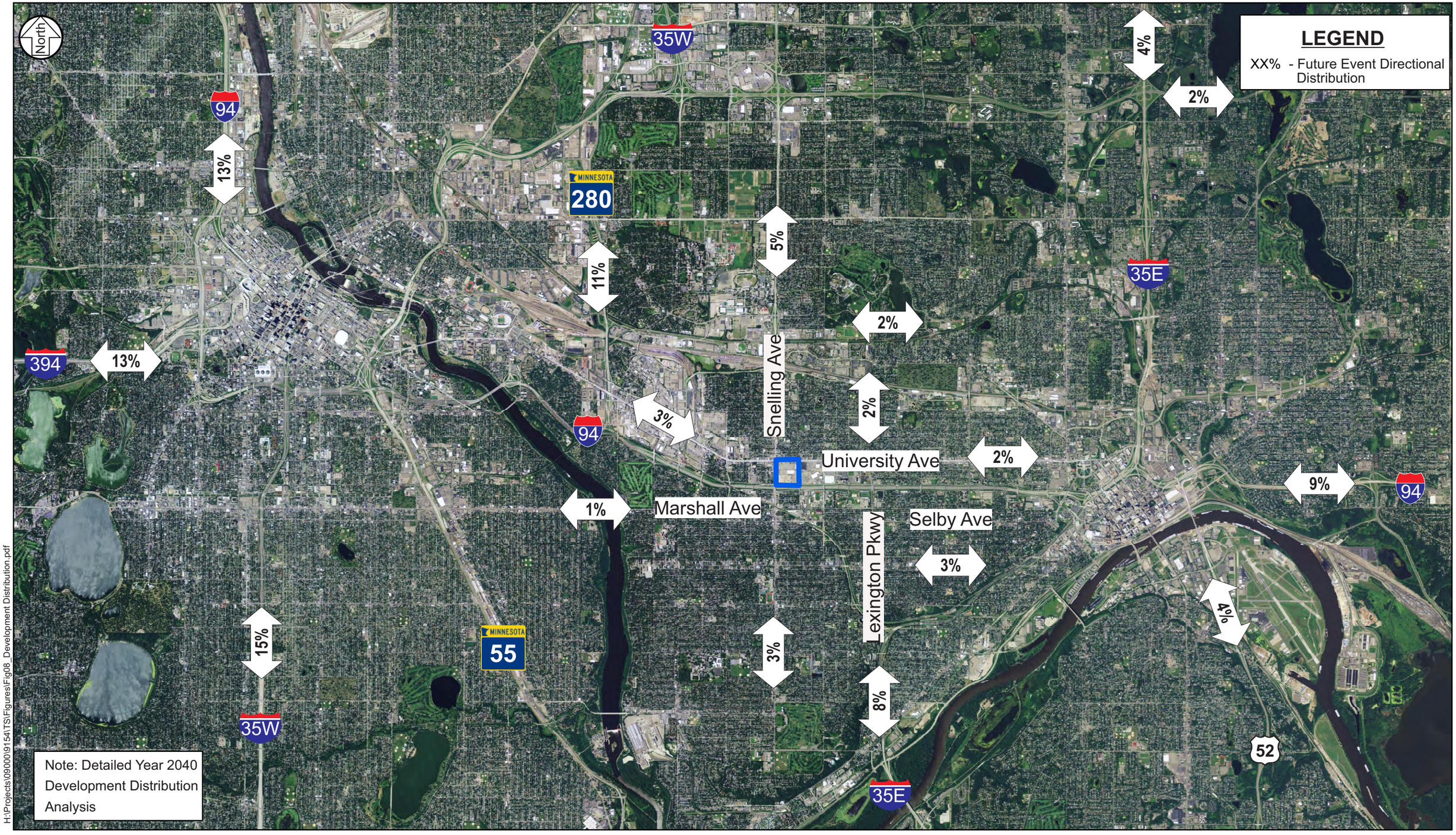
Table 6. Percent of Event Traffic to Arrive/Depart During Peak Hour

Scenario	Weekday		Weekend	
	2018	2035	2018	2035
Arrival	85%	70%	75%	65%
Departure	95%	95%	95%	90%

Based on arrival and departure observations from other local stadium events, peaks occur for vehicular and pedestrian traffic within the arrival and departure hours. Based on the mode share of this stadium, both the pedestrian and vehicle peak should occur at approximately the same time. It is anticipated that the arrival peak will be smoother and spread out over the course of the arrival hour, while the departure typically occurs all within about a half-hour interval.

Event Attendees Origin/Destination Information

Event attendees' origin/destination information is based on zip codes collected from individual and season ticket holders for other professional sports teams in the Twin Cities, the current Minnesota United team, and metro area population densities. The zip codes were mapped and assigned to the most efficient travel shed to the stadium from the zip code. The zip code information helps represent the likely distribution of event attendees within the metro area. . The directional distribution for an event based on season ticket holder information is shown in Figure 15.



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Development Distribution

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City of St. Paul

Figure 8

Year 2018 Event Conditions

To identify potential impacts associated with the proposed soccer stadium events, traffic forecasts for year 2018 conditions (i.e. the expected year of soccer stadium opening) were analyzed. The year 2018 conditions take into account general area background growth, a reduction in existing site trips due to the removal of various buildings on-site, and the additional trips generated by a soccer stadium event. It should be noted that analysis conducted for year 2018 conditions focuses solely on event scenarios since it is expected that any proposed on-site non-stadium development will not be constructed prior to 2018. The following sections provide details on the background traffic forecasts, estimated trip generation, and intersection capacity analysis for year 2018 conditions.

Roadway/Access Closures

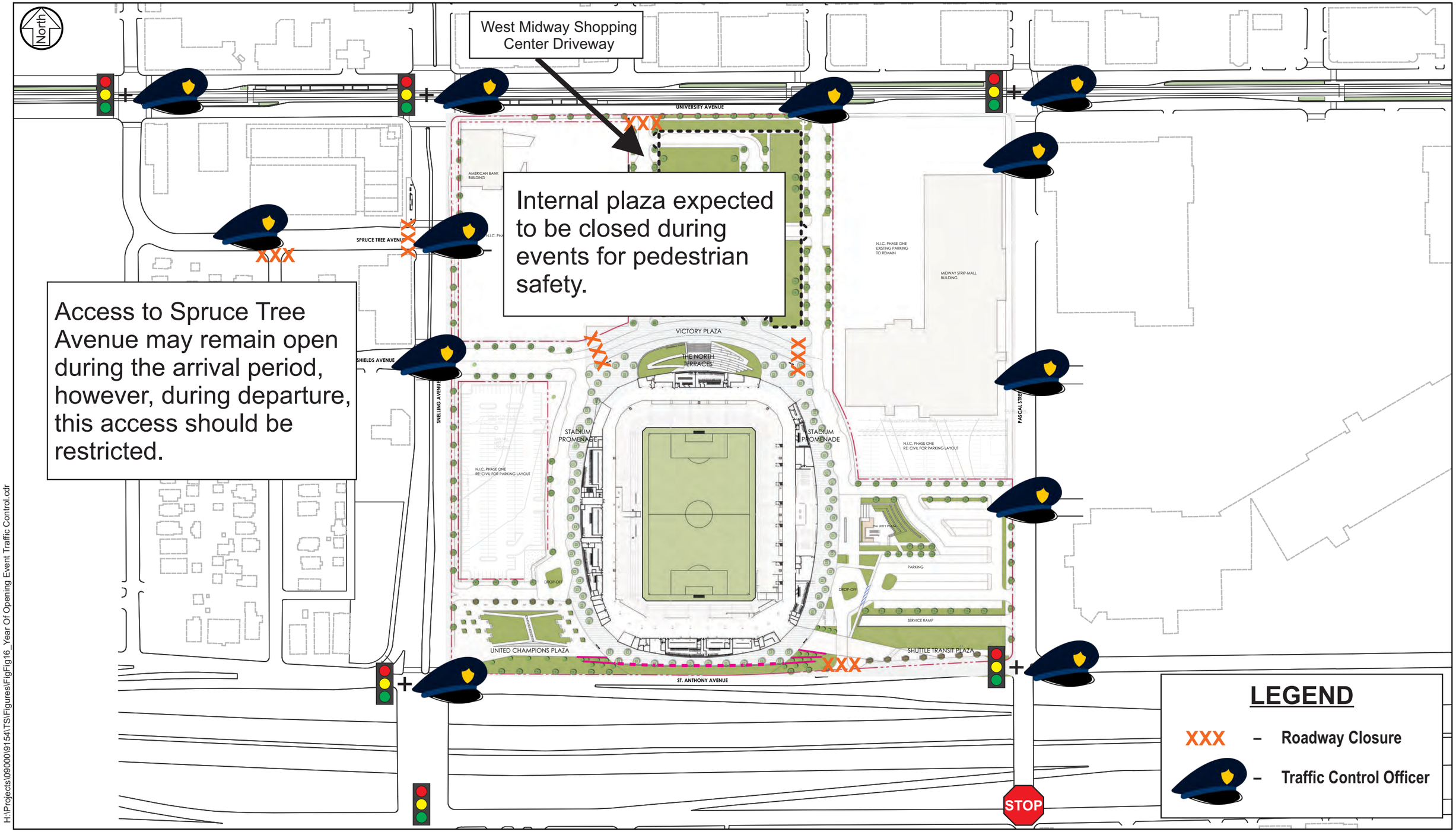
In the year of opening of the stadium, it is not expected that the full access modifications shown in Figure 6 will be completed. To allow for a safe and efficient flow of traffic, the following modifications are assumed for year of opening events:

- Traffic control officers at intersections adjacent to the site for arrival and departure times
- Restriction of traffic movements at the Snelling Avenue and Spruce Tree Avenue intersection during the post-game departure. This allows for safer pedestrian movements between the stadium and LRT.
- Restricting vehicles leaving the Spruce Tree Parking Ramp to only turning right and proceed north to the University Avenue and Fry Avenue intersection. Additionally, these motorists would be required to turn left onto westbound University Avenue.
- Close the University Avenue/West Midway Shopping Center Access for arrival and departure periods to allow for safer pedestrian movements between LRT and the stadium.

The following site access modifications for year of opening are shown in Figure 16.

Background Traffic Growth

To account for general background growth in the area, an annual growth rate of one-half percent was applied to the existing peak hour traffic volumes to develop year 2018 background traffic forecasts. This growth rate is consistent with historical growth rates in the study area and results from the Twin Cities Regional Demand Model. However, based on event management experience, it is anticipated that an event within the study area may have the effect of drivers modifying their trip to avoid the event traffic. For the analysis, it is assumed that 20 percent of background traffic will avoid interfering with event traffic either by modifying their route or completing their trip at a different time. These trips are still expected to occur to and from local area businesses, however, they are expected to occur at different times of the day in order to avoid the congestion of an event. This background traffic reduction is consistent with other studies completed for other Twin Cities sport's teams event traffic analysis competed by SRF. Mitigation strategies should include informing drivers using this area to use a different route or timeframe if not having an origin/destination in the area.



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Potential Year of Opening Event Traffic Control

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City of St. Paul

Figure 16

2018 Event Mode Share

The year 2018 event mode share will break down in more detail how the specific mode share numbers were developed for each mode. These are expected to differ from the mode share values in the year 2035 full build conditions.

Walk/Bike/Local Bus/Private Shuttle

The non-auto/LRT/BRT includes local bus service and people walking/biking to the event from their home or business. In order to determine the number of people walking to the site, an evaluation of the population of the metro was completed. It was determined that approximately one percent of the population lives within a one mile walking distance of the stadium. It was assumed that local area residents living close to the stadium would be more likely to attend since they are within walking distance. This results in an estimate of about three percent of event attendees. This number is expected to increase slightly to five percent during weekend events due to increased potential for family groups attending with potential guests within the walking distance.

The potential biking share of two percent was estimated from bike usage at Minnesota Twins games at Target Field.

The local bus service was evaluated to determine how many routes and number of trips are within the area. Figure 17 shows the existing transit stops and provides a proposed schedule for each transit option. Based on this data, it was assumed that approximately one and half percent of fans (about 250 people) will utilize existing transit service outside of LRT/BRT.

Charter bus usage for these events is difficult to estimate and therefore was assumed to be low in order to remain conservative. Charter bus usage from of Minnesota Twins games was used to assist with developing an estimate. It was determined that 200 (one percent) fans on weekdays and 600 fans (three percent) on weekends will utilize charter buses. The team does have a fan base outside the metro area based on current ticket purchases. Fans from Mankato, Rochester, St. Cloud, and Duluth would be likely candidates to use charter buses.

In addition to charter buses, local area private shuttle buses will bring fans to the match. These include local businesses/bars that may run shuttles to events from their business. Depending on the number of bars offering this service, this may vary, however, it was assumed that on weekdays about 400 (two percent) fans will arrive via private shuttle, and on the weekends, up to 600 (three percent) fans. An additional 100 (half percent) fans may arrive via taxi, Uber/Lyft, or limo service from other destinations.

The combined total of these modes would accommodate 2,000 (10 percent) for a weekday match and 3,000 (15 percent) for a weekend match.

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Transit Options Near the Proposed Stadium

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Figure 17

On-Site Parking

The on-site parking mode-split is expected to differ between year 2018 and year 2035. Based on discussions with City staff and the developer, a proposed on-site parking plan for year 2018 was developed, shown in Figure 18. From this plan, it is expected that approximately 400 vehicles may be able to park on-site during the year of opening, which will equate to approximately 1,100 fans (based on a 2.75 person occupancy), or 5.5 percent of fans for a capacity event. This parking plan is considered temporary and will change over time to accommodate site development as further site redevelopment occurs.

Off-Site Adjacent Parking

The off-site parking mode-split takes into account parking not on site, but within walking distance of the stadium. Potential off-site parking locations are previously shown in Figure 14. An assumption was made that a minimum of approximately 350 parking spaces, accommodating 965 fans, or 5 percent of the event fans for a capacity event, will be able to utilize off-site adjacent parking. This percentage could fluctuate depending on local area businesses' desire to utilize their lots during events for parking. At this time, the City has verified the availability of 350 nearby off-street parking spaces for event use.

Although many adjacent retail and office centers may have a surplus of parking, most of these lots are not gate controlled and not specifically used for public paid parking. Therefore, these spaces may not be available for event use. The decision to open up a private lot for event use is determined by the private lot landowner, who is responsible for permits, insurance, and additional employment cost to control the lots.

LRT/BRT

The LRT mode share was determined on available capacity of the LRT during the peak hours and the available crush load of approximately 540 people per three car train. It is anticipated that the LRT will need to run three-car trains during all game times with the expected 10 minute headways. The LRT and BRT stations are also shown in Figure 17.

The LRT mode split is expected to be heavily utilized under both year 2018 and year 2035 conditions. Data was collected to determine the amount of available capacity during event arrival and departures. It was assumed that in each three-car LRT, there is availability for a crush load of 540 patrons, and therefore, the existing utilization of the LRT was subtracted from the crush load to determine how much available event capacity exists. The amount of utilization for each scenario is shown in the complete mode share breakdown in Appendix D

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North

UNIVERSITY AVENUE

EASTBOUND PLATFORM

AMERICAN BANK BLDG.

McDONALD'S

PERKINS

ACE CASH

JJ's

BRT BUS STOPS

SPRUCE TREE AVENUE

SNELLING AVENUE

EXISTING PARKING

EXISTING RETAIL PARKING

LAWN

VICTORY PLAZA

BIKE LANES BOTH SIDES of SHIELDS AVE.

THE NORTH TERRACES

MIDWAY STRIP-MALL BUILDING

PASCAL STREET N.

PROPOSED TRAFFIC SIGNAL

SHIELDS AVENUE

RELOCATED TRAFFIC SIGNAL

STADIUM ENTRY

STADIUM ENTRY

TEMPORARY SURFACE PARKING - EVENT USE ONLY - 12 SPACES

~220 Spots

TEMPORARY SURFACE PARKING - EVENT USE ONLY - 100 SPACES

SNELLING PL

PROMENADE LANDSCAPE

SOCCER

STADIUM

PROMENADE LANDSCAPE

SIMPSON PL

EXISTING RETAIL PARKING

EAST PLAZA

~190 Spots

EVENT DROP-OFF/PICK-UP

DROP-OFF

LOADING DOCKS BELOW

SERVICE RAMP

2' HT. SCULPTED GRASS BERM

(3) 4' HT. SCULPTED GRASS BERMS

STADIUM ENTRY

STADIUM ENTRY

SHUTTLE TRANSIT PLAZA

UNITED CHAMPIONS PLAZA

ST. ANTHONY AVENUE

APPLICANT TO WORK WITH

PROMENADE LANDSCAPE 5" C
BOULEVARD LINDEN *Tilia Americana*
ACCOLADE ELM *Ulmus 'Accolad*
CONTINUOUS TREE TRENCH SYSTEM @

NORTH-SOUTH STREETSCAPE 5" C
OCTOBER GLORY RED MAPLE *Acer ru*
& CRIMSON KING MAPLE *Acer p*

EAST-WEST STREETSCAPE 5" C
SWAMP WHITE OAK *Quercus*
ACCOLADE ELM *Ulmus 'Ac*
CONTINUOUS TREE TRENCH SYSTEM

ORNAMENTAL TREES 10'
VARIETY of RIVER BIRCH, SERVICEBERR
HAWTHORN

SOD AREAS 6" P

ORNAMENTAL PLANTINGS #5 C
VARIETY of ORN. GRASSES, SUMAC, VI
BURNING BUSH, JUNIPERS

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Year of Opening On-Site Parking

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City of St. Paul

Figure 18

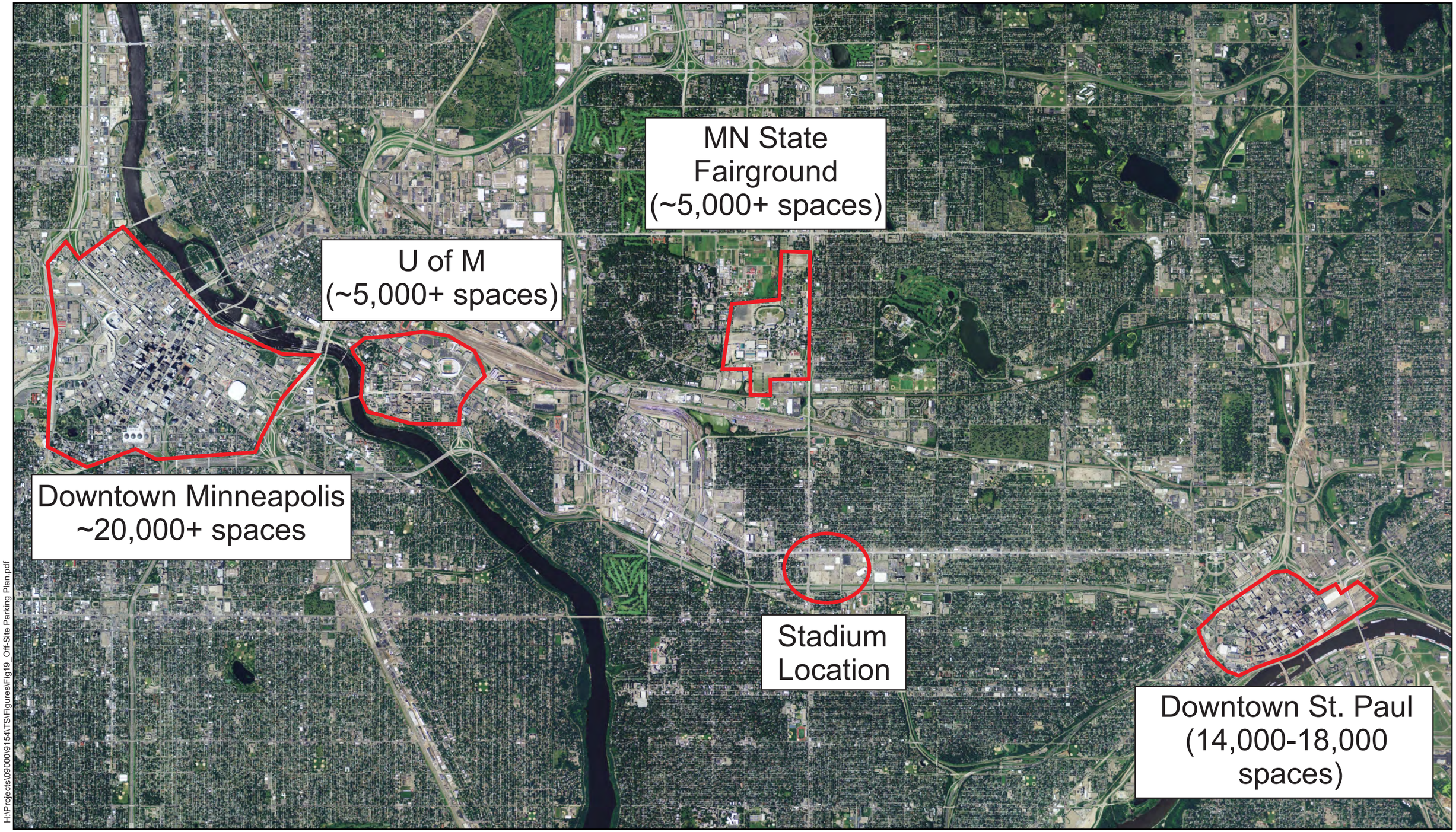
Based on comments from Metro Transit and observation of events, it is expected that most event patrons using LRT will arrive or depart one hour before or after the game. It is expected that the full hour before or after events will be fully utilized for both eastbound and westbound trains. These trains will be utilized by fans that are completing their trip without a car but live near the LRT stations outside of the walking distance, fans that park on-street in areas not near the stadium, or fans that park in ramps at the University of Minnesota, Downtown Minneapolis, Downtown St. Paul, and surrounding areas. These ramps are expected to be different locations than the ones identified for the park and ride shuttle users, unless the potential ramp has enough capacity to serve both LRT users and shuttle users. It was identified that with a full utilization of both the eastbound and westbound LRT, approximately 31 percent of fans will be able to utilize the LRT to arrive at the proposed stadium. Further discussions will be needed to further refine the parking locations.

It should be noted that based on the event distribution, the majority of fans will be coming from west of the site. Mitigation strategies will need to influence fans arriving via LRT to utilize stations to the east. The most likely candidates to consider this option would be fans in the north and south metro who may otherwise come from I-35W to potentially use I-35E and arrive east of the site and utilizing parking in downtown Saint Paul or near the capitol area.

The A-Line BRT is not operational until summer of 2016. However, a baseline assumption is shown in Appendix D. Based on discussions with Metro Transit, there is an assumed crush load of 70 people within a BRT bus with 10 minute headways both directions during many of the events. An assumption was made that the BRT will be fully utilized for one hour prior to and after the event. Based on the crush load and expected occupancy of the BRT buses, approximately 700 attendees or three and half percent of event fans will be able to utilize the BRT.

Shuttle Buses to Remote Parking

The remaining event patrons would be shuttles to remote parking facilities. A mitigation strategy has been proposed to provide a shuttle service to off-site parking facilities. These "park–and-ride lots" are desired to be located within a two to three mile (i.e. 20 to 30 minute round trip) radius as these shuttles are expected to operate a few trips back and forth to the stadium. Potential park-and-ride shuttle lots, along with estimated capacity, are shown in Figure 19. The number of potential identified remote parking spaces for events exceeds the number of parking spaces needed by a factor of approximately six (6). For purposes of this analysis, it is anticipated that a sufficient number of the spaces identified will be available at event times sufficient to provide for transportation to and from events for the number of anticipated patrons not served via other modes.



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Potential Park and Ride Shuttle Facilities

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City of St. Paul

Figure 19

Trip Generation

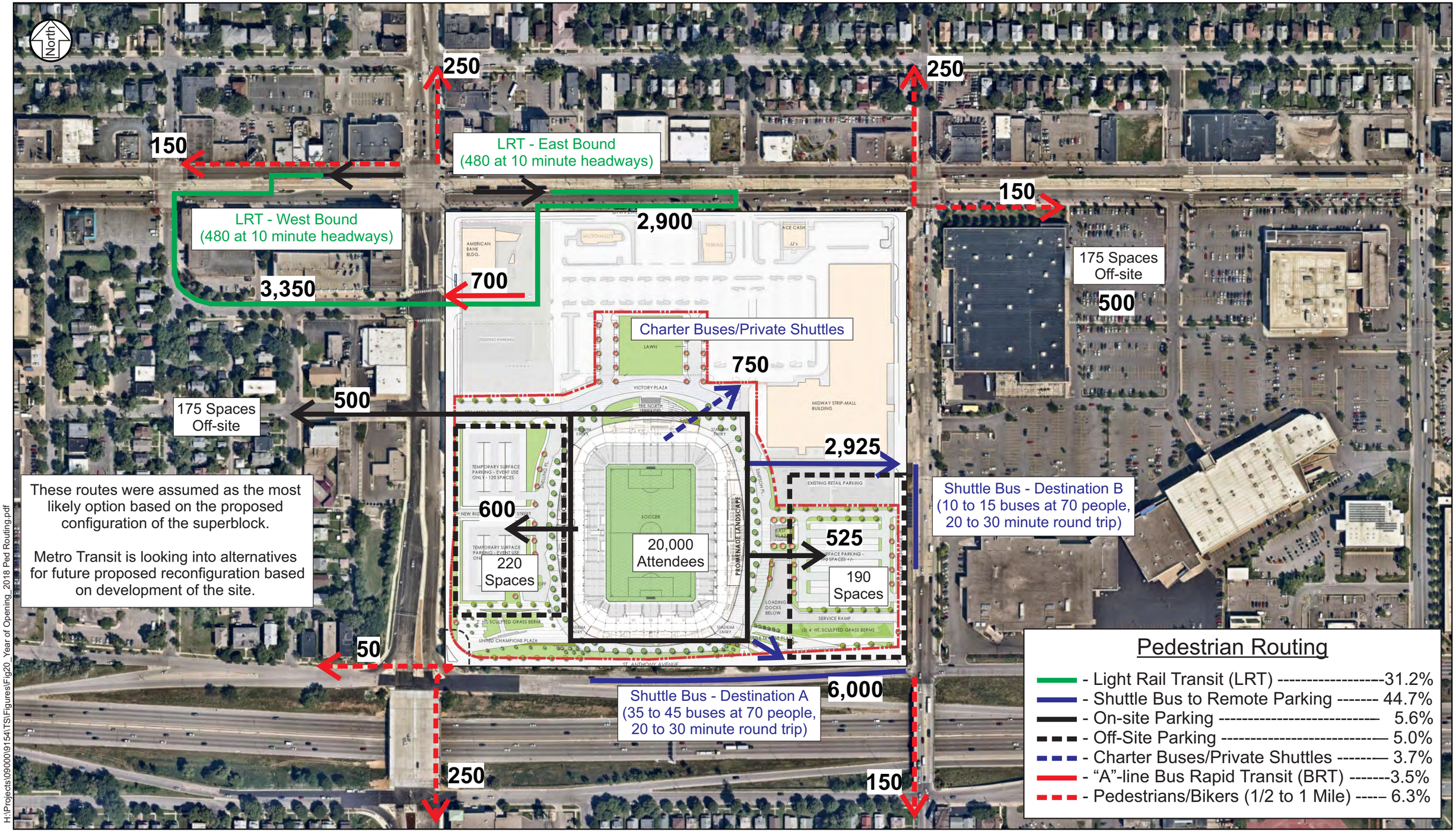
To account for traffic impacts associated with the proposed stadium development, trip generation estimates for weekend afternoon event (match starting at 2:00 p.m.) were developed. It should be noted that weekday evening and weekend evening events are possible, however, the weekend afternoon event was determined to have the highest background traffic, and therefore only this scenario was analyzed. The high background traffic is generated by the near-by retail land uses, connections to other destinations and access to I-94. Any mitigation as a result of the weekend afternoon event is expected to alleviate traffic concerns during the other two potential soccer match times.

The capacity of the stadium is expected to be approximately 20,000 patrons in year 2018. The trip generation estimates, shown in Table 7, were developed using the previously described mode share. It should be noted that the trips shown in Table 7 are person trips, not vehicle trips.

Table 7. Person Trip Generation Estimates – 20,000 Patrons

Modes	Percent of Total	Weekday		Percent of Total	Weekend	
		Arrival	Departure		Arrival	Departure
Non-Auto or LRT/BRT	10.0%	2,000	2,000	15.0%	3,000	3,000
On Site Parking	5.5%	1,100	1,100	5.5%	1,100	1,100
Off Site Parking	4.8%	965	965	4.8%	965	965
LRT/BRT	34.8%	6,960	6,960	34.8%	6,960	6,960
Off-Site Shuttles	44.9%	8,975	8,975	39.9%	7,975	7,975
Totals	100.0%	20,000	20,000	100.0%	20,000	20,000

Results of the trip generation estimates indicate that approximately 10 percent of trips for an event will occur using an automobile within the study area. A breakdown of the proposed person trip routes is shown in Figure 20. It is expected that for weekend events, walking and biking become more attractive options due to events occurring earlier in the day and the potential event patrons will have more available time to walk or bike from further distances. Trips generated by the proposed development were distributed throughout the study area based on the directional distribution shown in Figure 12, which was developed based on existing sports team's ticket information and engineering judgment. The resultant year 2018 event vehicular traffic forecasts, which include general background growth and trips generated by an event, are shown in Figures 21A and 21B.



H:\Projects\09000\169154\TS\Figures\Fig20_Year of Opening_2018 Ped Routing.pdf

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Year of Opening 2018 Event - Potential Pedestrian Routing of Capacity Event (Mode Selection - Potential Plan)

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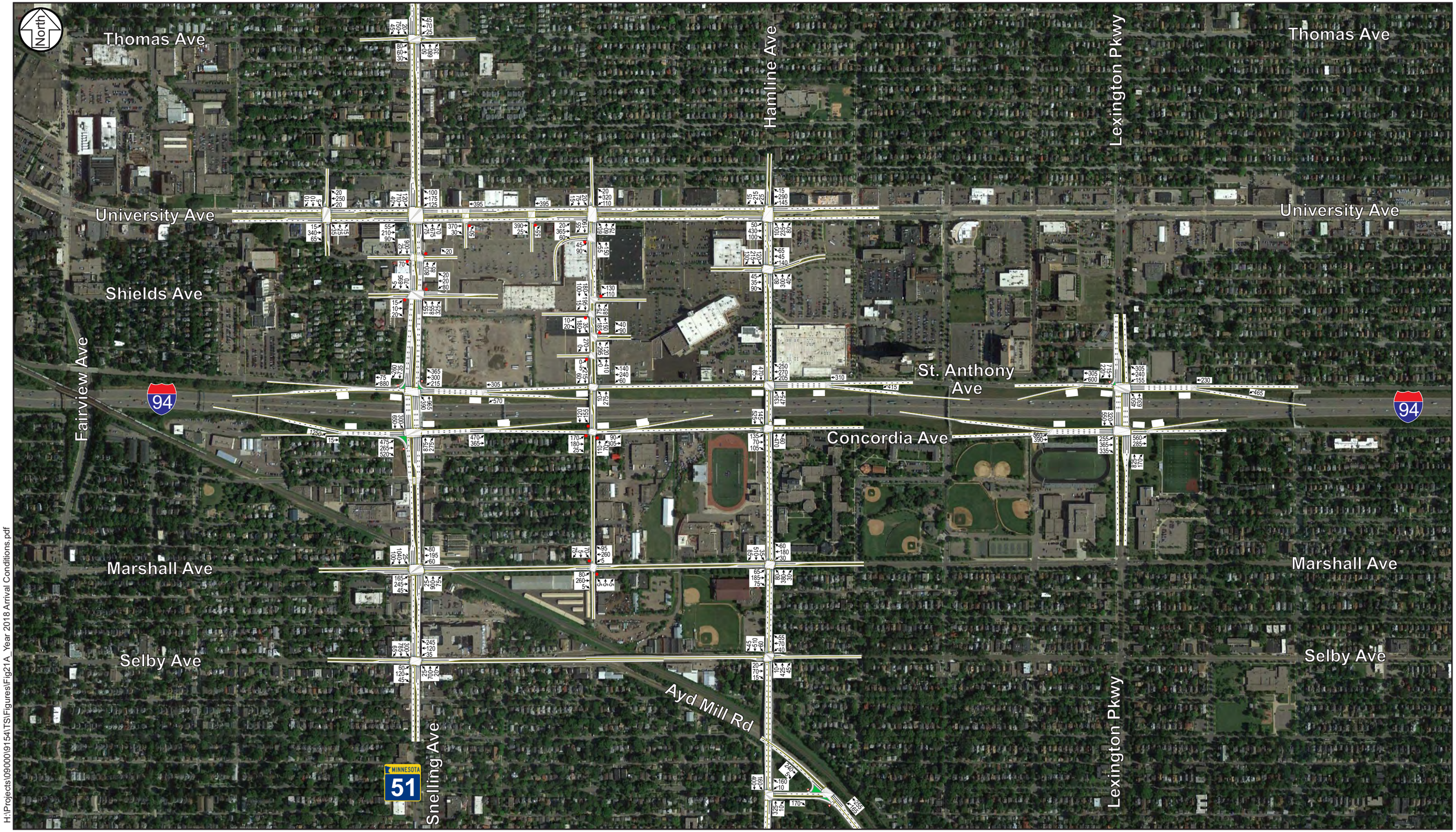
Figure 20



H:\Projects\09000\9154\TS\Figures\Fig21A_Year 2018 Arrival Conditions.pdf

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Year 2018 Weekend Afternoon Arrival Conditions (2:00 PM Event Start Time)

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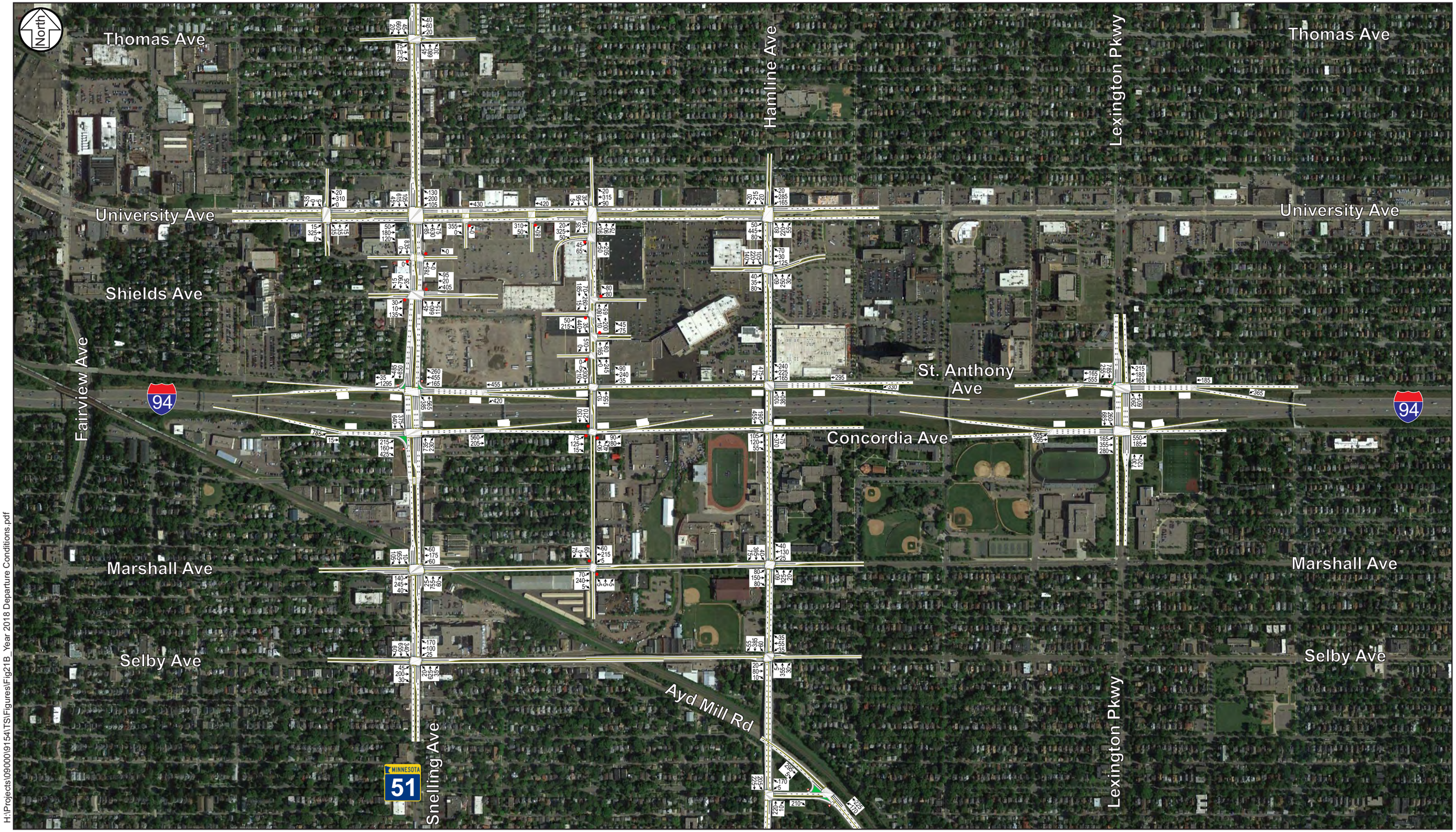
Figure 21A



H:\Projects\09000\9154\TS\Figures\Fig21B_Year 2018 Departure Conditions.pdf

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Year 2018 Weekend Afternoon Departure Conditions (4:00 PM Event Departure Time)

Snelling Midway Stadium Transportation Study
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Figure 21B

Intersection Capacity Analysis

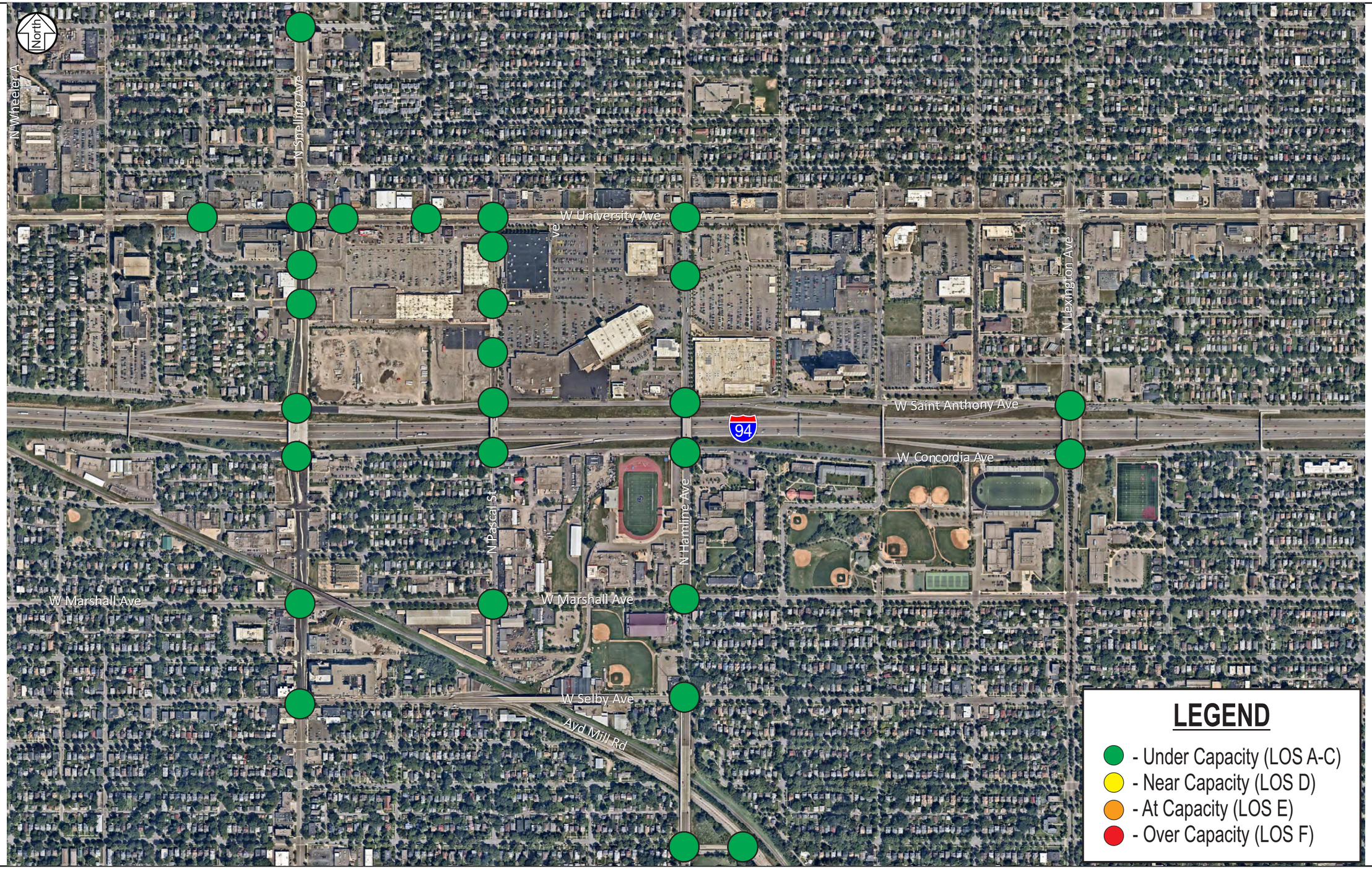
Weekend afternoon event conditions were analyzed with the proposed roadway configuration and a full capacity event to determine potential transportation impacts due to the increased pedestrian and vehicular traffic. It should be noted that weekday evening and weekend evening events are possible, however, the weekend afternoon event was determined to have the highest background traffic volumes, and therefore this worse-case scenario was analyzed. This is caused by the heavy retail peak that occurs on weekend afternoons within the study area. Any mitigation as a result of the weekend afternoon event is expected to alleviate traffic concerns during the other two potential soccer match times.

Events are intense peak flows resulting in intersections operating at LOS F, so mitigation strategies are needed to manage it. The amount of time needed to clear the departure will also be identified. Another metric is to identify if queues are impacting adjacent intersections and affecting network wide transportation options. Unacceptable conditions occur when queues begin to impact freeways free flow ability or limit the ability of transit options operation, especially if these occur over the course of more than one hour.

This scenario assumes an afternoon start time of 2:00 p.m. and departure time of 4:00 p.m. Arrival and departure traffic operations analysis were conducted for the hour before and after the match respectively. Based on the mode share methodology previously discussed, approximately 750 automobiles are assumed to drive to the site or have a parking space within walking distance for the event. It is expected that 75 percent of the vehicles (565) arrive prior to the game during the peak hour, and 95 percent of the vehicles (715) depart during the peak hour. It should be noted that an optimized event signal timing plan was assumed.

A detailed intersection capacity analysis was completed for vehicular traffic operations during the weekend afternoon arrival and departure using Synchro/SimTraffic. The analysis assumes there is no circulation of people looking for parking. The analysis was completed assuming everyone knows their destination (i.e parking/shuttle/transit) prior to coming to the events. This is necessary due to the limited amount of parking. Results of the detailed intersection capacity analysis are shown in Table 8. In addition, level of service results for the arrival and departure are shown in Figures 22A and 22B, respectively.

During the arrival peak hour on a weekend afternoon, it is not expected that any significant intersection operational issues will occur. These arrival trips are more spread-out than departure trips. It should be noted that a special game time arrival traffic signal optimization was assumed. A game time specific traffic signal plan is a recommended mitigation strategy, along with information to reduce vehicles searching for parking. The full simulation results for year of opening arrival and departure conditions are presented in Appendix E.



H:\Projects\09000\9154\TS\Figures\Fig22A_Year 2018 Weekend Arrival Traffic Analysis.pdf

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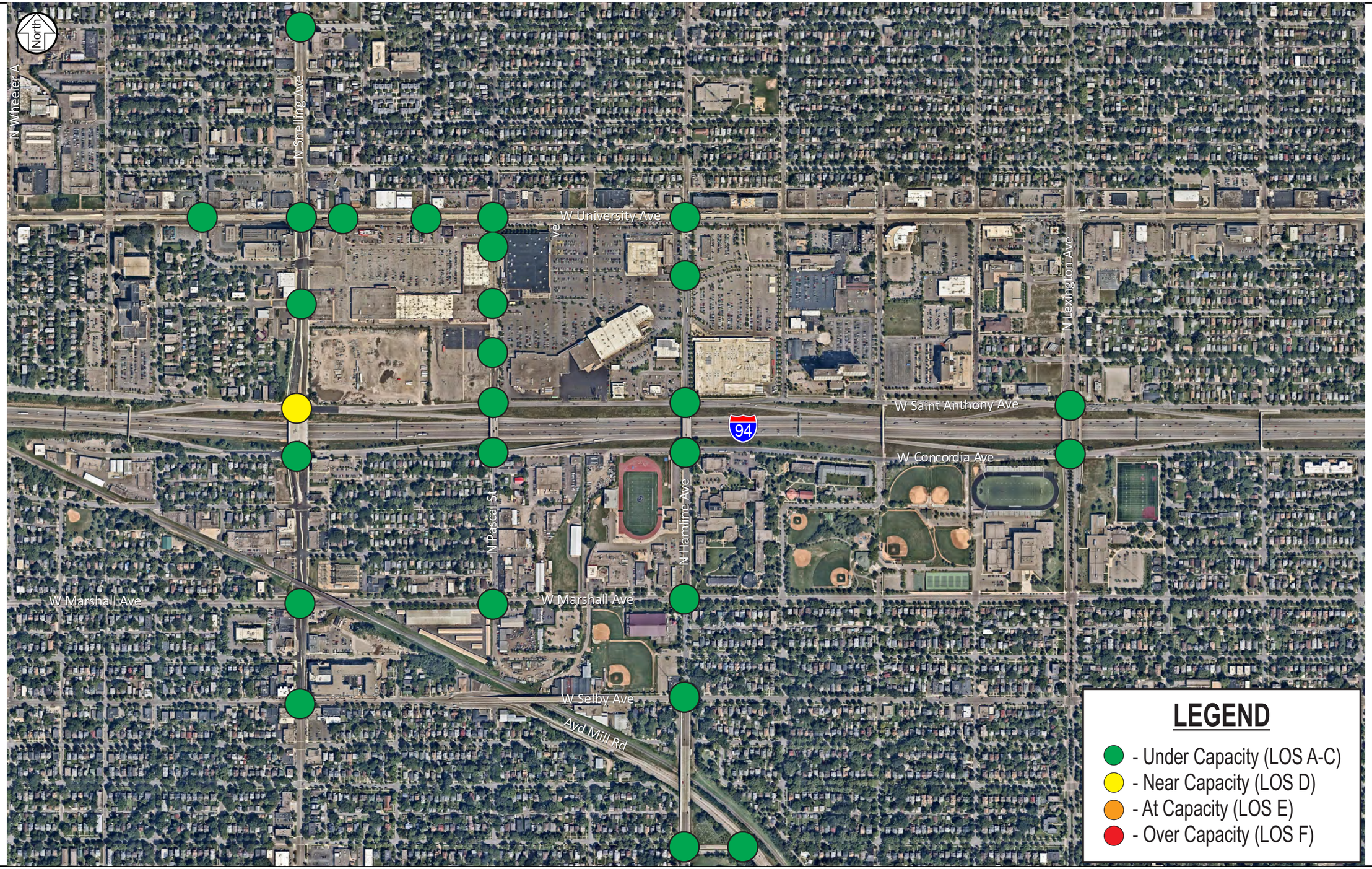
Year 2018 Weekend Arrival Traffic Analysis (2:00 PM Event Start Time)

Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 22A



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Year 2018 Weekend Departure Traffic Analysis (4:00 PM Event Departure Time)

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Figure 22B

Table 8. Year 2018 Weekend Afternoon Event Intersection Capacity Analysis

Intersection	Arrival (1:00 p.m.) Peak Hour	Departure (4:00 p.m.) Peak Hour
	LOS	LOS
University Avenue/Fry Street	B	A
Snelling Avenue/Thomas Avenue	B	B
Snelling Avenue/University Avenue	C	C
Snelling Avenue/Spruce Tree Avenue	B/C	--
Snelling Avenue/Shields Avenue	C	C
Snelling Avenue/St. Anthony Avenue	C	D
Snelling Avenue/Concordia Avenue	C	B
Snelling Avenue/Marshall Avenue	B	B
Snelling Avenue/Selby Avenue	B	B
University Avenue/West Midway Shopping Center Driveway(1)	A/A	--
University Avenue/East Midway Shopping Center Driveway(1)	A/A	A/A
University Avenue/Pascal Street	B	B
Pascal Street/North Midway Shopping Center Driveway(1)	A/A	A/A
Pascal Street/Walmart Driveway(1)	A/B	A/B
Pascal Street/South Midway Shopping Center Driveway(1)	A/B	A/B
Pascal Street/Cub Driveway(1)	A/C	A/B
Pascal Street/St. Anthony Avenue	C	C
Pascal Street/Concordia Avenue(2)	B	A
Pascal Street/Marshall Avenue(1)	A/B	A/B
University Avenue/Hamline Avenue	C	C
Hamline Avenue/Midway Marketplace	B	B
Hamline Avenue/St. Anthony Avenue	B	B
Hamline Avenue/Concordia Avenue	B	B
Hamline Avenue/Marshall Avenue	B	B
Hamline Avenue/Selby Avenue	A	A
Hamline Avenue/Ashland Avenue	B	B
Ayd Mill Road/Ashland Avenue	B	B
Lexington Avenue/St. Anthony Avenue	B	B
Lexington Avenue/Concordia Avenue	B	B

(1) Indicates an unsignalized intersection with side-street stop control, where the overall LOS is shown followed by the worst approach LOS. The delay shown represents the worst side-street approach delay.
(2) Indicates All-Way Stop Control

During the departure peak hour, minor issues are observed in the peak exiting half hour of event departure traffic. The majority of exiting vehicles are destined to exit in the half hour immediately after the game ends, which causes a spike in traffic volumes. Congestion is observed at the Snelling Avenue and Shields Avenue intersection and along Snelling Avenue to St. Anthony Avenue. With a majority of vehicles destined to westbound I-94, expect queues from the southbound right-turn queueing at St. Anthony Avenue to extend to Shields Avenue. Additionally, the majority of traffic from Pascal Street is also destined to the I-94 westbound on-ramp, which travels westbound on St. Anthony Avenue. Because these two major movements conflict with one another queues are expected in both directions. This queueing on St. Anthony Avenue could spill back from Snelling Avenue to Pascal Street and have an effect of a rolling queue from the parking lot exit on Pascal Street to the on-ramp at Snelling Avenue. Because of the amount of volume on Pascal Street after a match, driveway access from Midway Shopping Center, Walmart, and Cub will be difficult. It is anticipated that motorists that use these facilities will find alternate routes out of the shopping area, however, to remain conservative, these volumes were kept in the network at the specific driveway. **It should be noted the intersections with poor operations are expected to recover within one hour of the match.**

Detailed mitigation strategies for the year of opening event scenario are provided on page 73.

Multi-Modal Transportation Analysis

A transportation model VISSIM/VISWALK was completed to analyze all modes (pedestrian/bicycle, LRT, transit, shuttle).Weekend afternoon event conditions were analyzed with the proposed roadway configuration and a full capacity event (20,000) to determine potential multi-modal transportation impacts due to the increased pedestrian, transit and vehicular traffic.

This scenario assumes a weekend (Saturday) afternoon departure time of 4:00 p.m. The departure was analyzed because of the peak pedestrian flows leaving the stadium. The event modeled had 90 percent of the event patrons leaving the stadium a half-hour after the match. This will result in people queuing to board any of the transit or shuttle modes. Based on the mode share methodology previously discussed, approximately 7,000 patrons are destined for LRT/BRT, while approximately 8,000 patrons are destined to off-site shuttle bus parking.

A detailed transportation analysis was completed for the weekend departure using the VISSIM/VISWALK software (Version 7.00-16). Results of the detailed transportation analysis focus on the average travel time and queues for event patrons heading to these mode types, along with the expected amount of space needed to accommodate the queues.

Assumptions were necessary in order to complete the transportation analysis and are included in the mitigation strategies. These include the following items:

- 10 minute headways for all LRT and BRT transit vehicles – Depending on the time and day of the event, this project may need to request the schedule be changed to higher frequency service.
- Three-vehicle LRT – It was noted during site observations that on Saturdays, it is common to run two-vehicle LRT. This was assumed to be the full three-vehicle LRT at the end of an event. The project needs to work with Metro Transit.
- Based on data collected on LRT, approximately 480 people could board the LRT, while about 70 people could board the BRT.
- Approximately 40 to 50 shuttle buses – Would need 115 to 130 shuttle bus trips. At this point, the assumption is that shuttle buses would operate along Saint Anthony Avenue on the southeast corner of the site. Additionally, there may need to be storage for the shuttles prior to the event departure along St. Anthony Avenue east of Pascal Street or on Pascal Street to the north. Additionally, it was assumed that a complete round trip for the shuttle bus could be completed in approximately 20 to 30 minutes in order to run two to three shuttle bus trips per hour.
- For purposes of this analysis, pedestrians were routed to the LRT platform or bus stop based on routes shown in Figure 20. These routes were chosen based on understanding of likely configuration of the portion of the superblock north of the proposed extended Shields Avenue at the time of stadium opening in 2018. However, Metro Transit has looked at alternatives for pedestrian routing and staging that would also be feasible for accommodating transit riders. The alternatives implemented in 2018 will be determined in consultation with Metro Transit based on actual site configuration in 2018, and modified going forward as the remainder of the superblock redevelops.

Results from the LRT transportation analysis, shown in Table 9, indicate the largest queue and average travel time for pedestrians using LRT/BRT to depart an event. . The travel time is based on the time between the patron leaving the stadium and boarding the LRT/BRT vehicle. With a slightly larger number of patrons destined on westbound LRT, it is expected that the queue length and travel time would be larger than eastbound. **The BRT is expected to finish boarding in about one hour, while the LRT may board its final train about one and a half hours after the completion of the event.**

Table 9. Transportation Analysis Results – LRT/BRT

Direction and Mode	Maximum Queue (Peds)	Average Travel Time (Minutes)
Westbound LRT	2,050	30
Eastbound LRT	1,700	20 to 25
Northbound BRT	150	10 to 15
Southbound BRT	150	10 to 15

Based on the results from the LRT transportation analysis, it was observed that the larger westbound queue and travel time accounted for approximately the amount of time and queue length of one extra train. Screen captures of the event queues in relation to how much physical space they may require are shown in Appendix F. The maximum observed queues for westbound and eastbound LRT indicate the need for 2,050 and 1,700 pedestrians, respectively. Guidelines from the Highway Capacity Manual (HCM), a minimum of eight (8) sf per person is expected for capacity conditions for a pedestrian and for an event departure, it is expected that capacity conditions will occur. This maximum queue represents the maximum number of people who have left the stadium and arrived in the queue to board the LRT/BRT. The 7,000 event patrons utilizing LRT/BRT are expected to depart over the course of a half hour after the match, not all immediately at one time. This can be a result of fans attending post game entertainment or nearby bars/restaurants before arriving in the queue to board. Additionally, full LRT/BRT vehicles will be departing the stations immediately after the match. This applied similarity to the shuttle bus maximum queue results. Additional post-game entertainment opportunities could help mitigate the queue.

Based on these guidelines, a minimum westbound queueing area of approximately 16,500 sf and minimum eastbound queueing area of approximately 13,750 sf would be necessary. It is expected that the BRT queuing would be accommodated by the existing sidewalk infrastructure.

Results from the shuttle bus transportation analysis, shown in Table 10, indicate the largest queue and average travel time for 8,000 patrons using a shuttle bus to depart an event. It was assumed that approximately 115 to 130 shuttle bus trips would be necessary to clear the shuttle bus queue which would require 40 to 50 shuttle busses making round trips. Based on the site plan in Figure 13, there is room for up to four or five buses in the shuttle area. The buses would need to be staged, perhaps along St. Anthony Avenue east of Pascal Street or to the north on Pascal Street. The departure shuttling need to be efficient to maximize the shuttle bus loading area.

Table 10. Transportation Analysis Results – Shuttle Bus

Mode	Maximum Queue (Peds)	Travel Time (Minutes)
Shuttle Bus Queue	3,050	20

Based on the results from the shuttle bus transportation analysis, a maximum queue of 3,050 pedestrians is expected. **This queue will require a minimum queuing space of approximately 25,000 sf.** On average, a shuttle bus user is expected to wait for 20 minutes to board a shuttle bus. **It is expected to take between one hour and an hour and fifteen minutes to clear the shuttle bus area.**

Additional information regarding the pedestrian routes, specific platform loading areas, shuttle bus destinations, and other mitigation factors is provided in the mitigation section on page 72.

Key Findings for Year of Opening Event

More event patrons will want to drive directly to the event than can be accommodated by the parking assumed to be available on-site or within walking distance. Unless carefully managed, this could potentially result in significant traffic congestion, circulation trying to find a space, illegal parking and overall frustration. An event Transportation Management Plan (TMP) is needed to safely and efficiently get event patrons to and from the event while minimizing impact to the local business and residents.

- It is expected that approximately 10 to 15 percent of event patrons will walk, bike, or take local bus locally to the site, and approximately 10 percent of event patrons will be able to park on-site or off-site within a walking distance. The remaining 75 to 80 percent of patrons are expected to be divided up between LRT/BRT and shuttle buses.
- Approximately 35 percent of event patrons will be able to utilize LRT/BRT, however, the time to clear the site may slightly exceed one hour after the event.
- The remaining 45 percent will need to be shuttled to remote parking within two to three miles, preferred. This operation may need to utilize up to 40 to 50 buses, depending on where the remote parking is located. Once again, the time to clear the site may take slightly over one hour.
- Storage and waiting areas for pedestrians using transit or shuttle service will need to be defined and will require additional event staff outside of the facility to manage it.
- Based on Highway Capacity Manual guidelines, a minimum westbound LRT queueing area of approximately 16,500 sf and minimum eastbound LRT queueing area of approximately 13,750 sf would be necessary. The shuttle bus pedestrian queue will require a minimum queuing space of approximately 25,000 sf. Both of these queues are expected to take just over one hour to clear out.
- The I-94/Snelling interchange is a key bottleneck in the system. Event patrons should be encourage to use adjacent interchanges when arriving and departing the event. Shuttle bus service along Saint Anthony may need to be reconsidered because of this bottleneck.
- The area has a significant amount of retail land use. Weekend events starting between 1:00 p.m. and 5:00 p.m. and ending between 3:00 p.m. and 7:00 p.m. place the event traffic during the busiest business times and background traffic. Capacity events should be encouraged for a 7:00/7:30 p.m. start time with departure at 9:00/9:30 p.m.

Year 2035 Event Conditions

To identify potential impacts associated with the proposed soccer stadium events under full build conditions, traffic forecasts for year 2035 conditions (i.e. year of full build of adjacent development) were reviewed. The year 2035 conditions take into account general area background growth, trips generated by the adjacent buildings on the proposed site, and the additional trips generated by a soccer stadium event. The proposed soccer stadium has the potential to expand to a capacity of 25,500 by the year 2035, therefore, this analysis will consider this larger event attendance in addition to the adjacent development. The following sections provide details on the background traffic forecasts, estimated trip generation, and intersection capacity analysis for year 2035 conditions.

Roadway/Access Closures

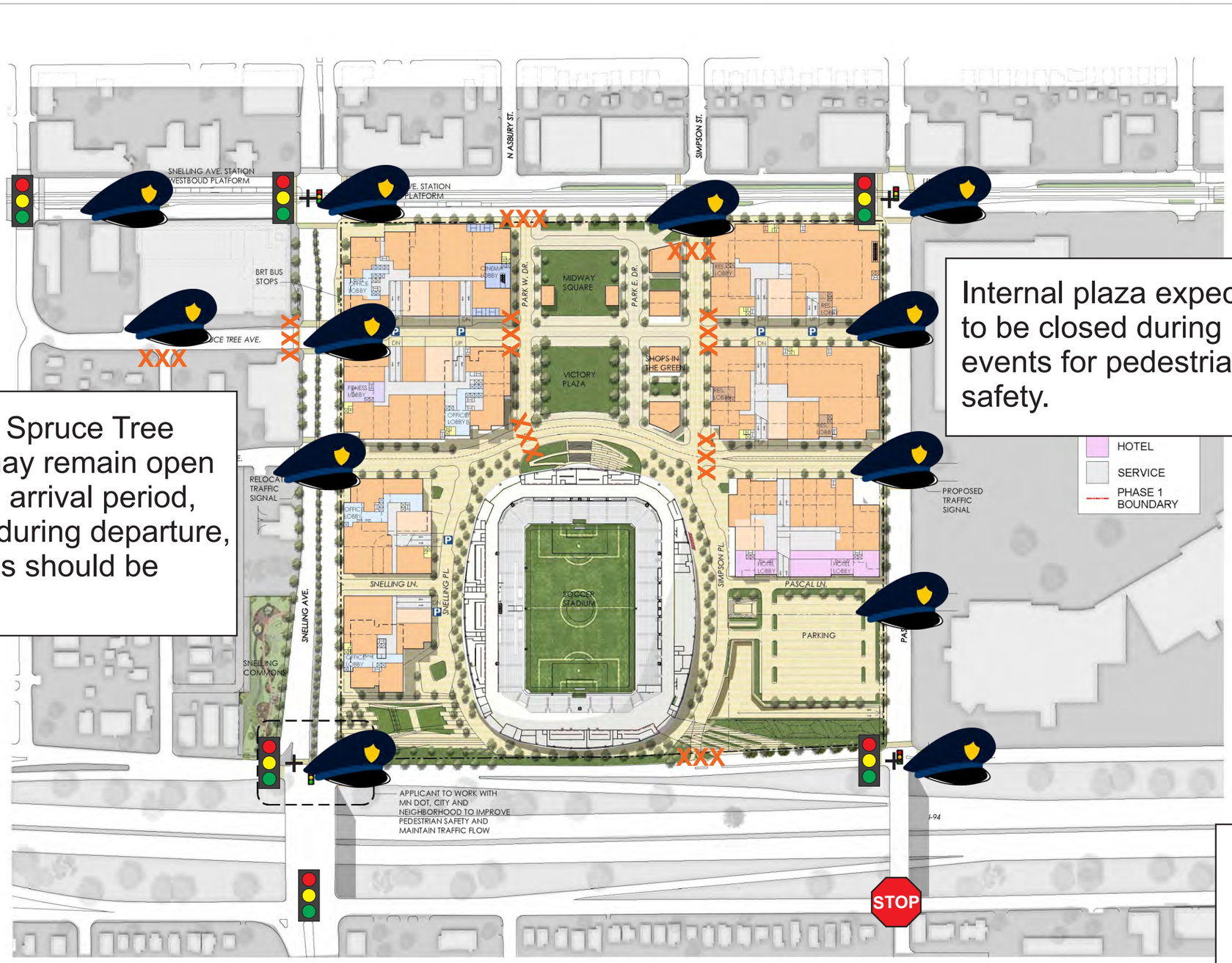
By the year 2035, it is expected that the full access modifications shown in Figure 6 will be completed. To allow for a safe and efficient flow of traffic, the following modifications are assumed for events:

- Traffic control officers at intersections adjacent to the site for arrival and departure times
- No traffic movements at the eastbound approach of the Snelling Avenue and Spruce Tree Avenue intersection during the post-game departure. This allows for safer pedestrian movements between the stadium and LRT.
- Restricting vehicles leaving the Spruce Tree Parking Ramp to only turning right and proceed north to the University Avenue and Fry Avenue intersection. Additionally, these motorists would be required to turn left onto westbound University Avenue.
- Close the University Avenue/Asbury Street access for arrival and departure periods to allow for safer pedestrian movements between LRT and the stadium.

The following site access modifications for year of opening are shown in Figure 23.

Background Traffic Growth

To account for general background growth in the area, an annual growth rate of one-half percent was applied to the existing peak hour traffic volumes to develop year 2035 background traffic forecasts. This growth rate is consistent with historical growth rates in the study area and results from the Twin Cities Regional Demand Model. However, based on event management experience, it is anticipated that an event within the study area may have the effect of drivers modifying their trip to avoid the event traffic. For the analysis, it is assumed that 20 percent of background traffic will avoid interfering with event traffic either by modifying their route or completing their trip at a different time. These trips are still expected to occur to and from local area businesses, however, they are expected to occur at different times of the day in order to avoid the congestion of an event. Mitigation strategies should include informing drivers using this area to use a different route or timeframe if not having an origin/destination in the area.



Access to Spruce Tree Avenue may remain open during the arrival period, however, during departure, this access should be restricted.

Internal plaza expected to be closed during events for pedestrian safety.

LEGEND

XXX – Roadway Closure

– Traffic Control Officer

KEY PLAN

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PROJECT TITLE:
SNELLING MIDWAY REDEVELOPMENT SITE MASTER PLAN

1562 UNIVERSITY AVENUE W.
SAINT PAUL, MN 55104

PROJECT NO.: 63260.00

DRAWING TITLE:
OVERALL GROUND FLOOR PLAN

SCALE: 1"=100' PAGE:

MP - 1.01

H:\Studio-9\63260.00 Midway St. Paul\63260.00 Dwgs\Sheets\MP-1.00 Overall Ground Floor Plan - ALT.dwg, 5/24/2016 5:26:46 PM

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Year 2035 Event Traffic Control

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City of St. Paul

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Figure 23

2035 Event Mode Share

The year 2035 event mode share will break down in more detail how the specific mode share numbers were developed for each mode.

Walk/Bike/Local Bus/Charter and Private Shuttle

The non-auto/LRT/BRT includes local bus service and people walking/biking to the event from their home or business. In order to determine the number of people walking to the site, an evaluation of the population of the metro was completed. It was determined that approximately one percent of the population lives within a one mile walking distance of the stadium. By year 2035, it was assumed that additional soccer fans would have moved into the surrounding area. Therefore, four percent of event patrons are expected to walk from the surrounding area for weekday events, and up to six percent during weekend events due to increase in full families attending with potential guests.

With the new development expected on site near the stadium, it is expected that a portion of these workers, residents, and hotel visitors will attend a match. During a weekday and weekend, it is assumed that approximately 800 fans (three percent) of the total attendance could come from people already on site. This assumption is consistent between weekday and weekend matches. It is expected that local businesses will supply a larger amount of fans on weekdays, while the hotel visitors for matches will be higher on weekends. This is based on game day information provided from local businesses near stadiums, other Twin Cities sports teams, and information gathered from hotels near the Xcel Energy Center.

The biking and local bus service mode share of two percent is not expected to change from year 2018 conditions. The combined total of all of these modes would accommodate 3,515 (14 percent) fans on weekdays and 4,605 (18 percent) fans on weekends.

The percentages for charter buses destined to outstate metro areas and local area bars is not expected to change from three percent between year 2018 and year 2035.

On-Site Parking

The on-site parking mode-split is expected to differ between year 2018 and year 2035. Based on discussions with City staff and the developer, a proposed on-site parking plan for year 2035 was developed, shown in Figure 24. From this plan, it is expected that approximately 2,050 vehicles may be able to park on-site during events in year 2035 mostly along Snelling Avenue, which will equate to approximately 5,650 fans (based on a 2.75 person occupancy), or 22 percent of fans for a capacity event. This parking plan is considered preliminary as future discussions with office tenants on site will be necessary to discuss available game day parking on weekdays and weekends.

Off-Site Adjacent Parking

The off-site parking mode-split takes into account parking not on site, but within walking distance of the stadium. Potential off-site parking locations are previously shown in Figure 16 for year 2018 conditions and are expected to minimally change for year 2035 conditions.

LRT/BRT

The LRT/BRT mode share is not expected to differ between year 2018 and year 2035 conditions. Under both scenarios, it was assumed that the LRT/BRT will be fully utilized to full capacity for one hour. This equates to 27.5 percent.

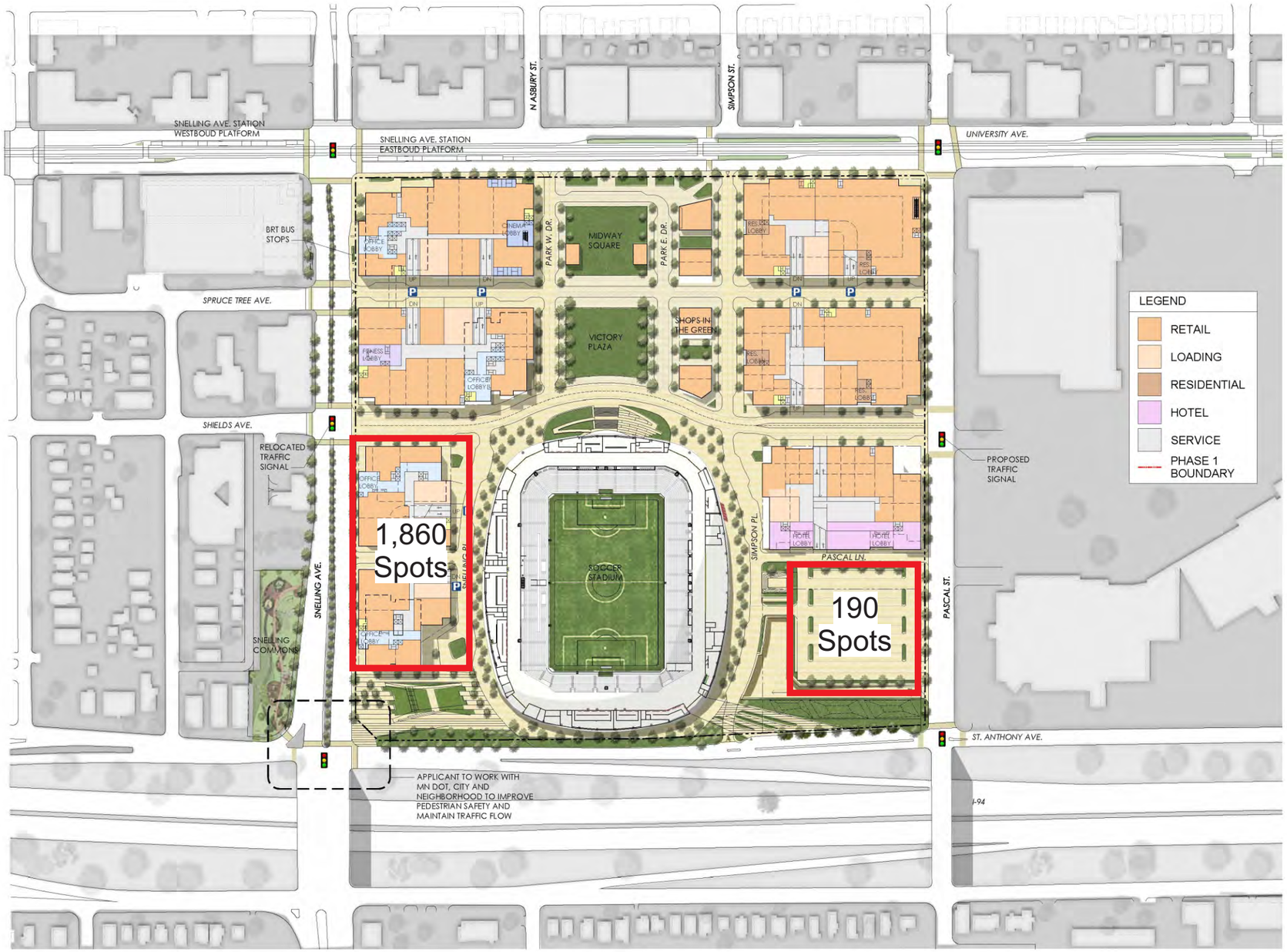
Shuttle Buses to Remote Parking

Once again all remaining event patrons that do not utilize the other modes are expected to arrive and depart the event utilizing a shuttle bus. The park and ride lots are desired to be located within a two to three mile radius as these shuttles are expected to operate a few trips back and forth to the stadium. Potential park and ride shuttle lots, along with capacity, were previously shown in Figure 19.

Trip Generation

To account for traffic impacts associated with the proposed stadium development, trip generation estimates for weekend afternoon event (match starting at 2:00 p.m.) were developed. It should be noted that weekday evening and weekend evening events are possible, however, the weekend afternoon event was determined to have the highest background traffic, and therefore this scenario was analyzed as the worse-case scenario. The high background traffic is generated by the near-by retail land uses, connections to other destinations and access to I-94. Any mitigation as a result of the weekend afternoon event is expected to alleviate traffic concerns during the other soccer match times.

The analysis completed was for a capacity of 25,500 patrons in year 2035 coinciding with the potential full development of the site. The trip generation estimates, shown in Table 11, were developed using the previously described mode share. It should be noted that the trips shown in Table 11 are person trips, not vehicle trips.



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NO. DATE REVISION

KEY PLAN

S9ARCHITECTURE
115 FIFTH AVENUE
NEW YORK, NY 10003
T 212.457.4077
S9ARCHITECTURE.COM

Owner:
RK MIDWAY LLC
C/O RD MANAGEMENT LLC
810 SEVENTH AVENUE, 10TH FLOOR
NEW YORK, NY 10019

PROJECT TITLE:
SNELLING MIDWAY REDEVELOPMENT SITE MASTER PLAN

1562 UNIVERSITY AVENUE W.
SAINT PAUL, MN 55104

PROJECT NO.: 63260.00

DRAWING TITLE:
OVERALL GROUND FLOOR PLAN

SCALE: 1"=100' PAGE:

MP - 1.01

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4/27/2016 (REVISED 5/24/2016)

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Year 2035 Event Traffic Parking (Estimated Availability)
Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 24

Table 11. Person Trip Generation Estimates – 25,500 Patrons

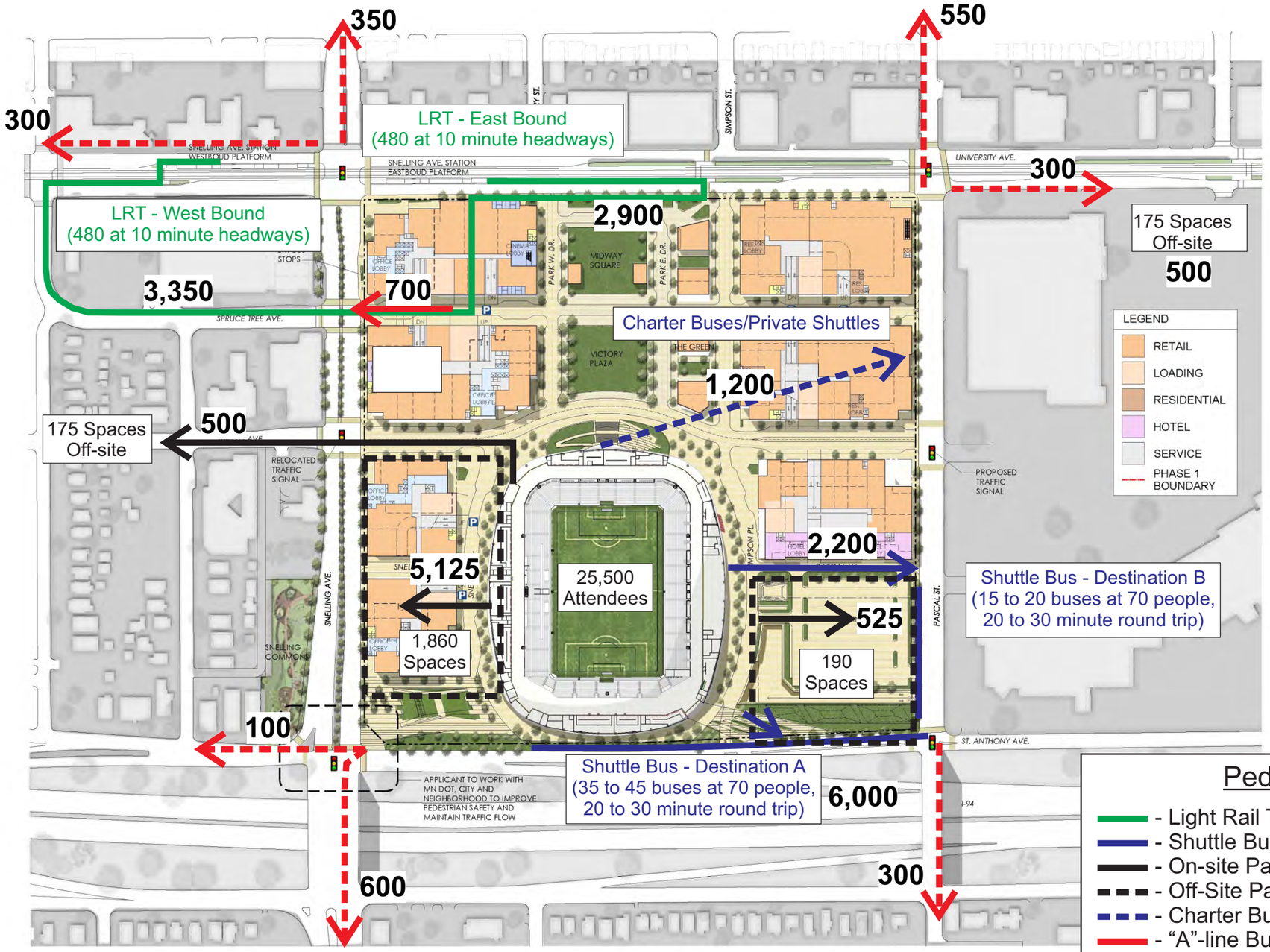
Modes	Percent of Total	Weekday		Percent of Total	Weekend	
		Arrival	Departure		Arrival	Departure
Non-Auto or LRT/BRT	14.0%	3,515	3,515	18.1%	4,605	4,605
On Site Parking	22.0%	5,650	5,650	22.0%	5,650	5,650
Off Site Parking	4.5%	1,155	1,155	4.5%	1,155	1,155
LRT/BRT	27.3%	6,960	6,960	27.3%	6,960	6,960
Off-Site Shuttles	32.2%	8,250	8,250	28.1%	7,150	7,150
Totals	100.0%	25,500	25,500	100.0%	25,500	25,500

Results of the trip generation estimates indicate that approximately 26.5 percent of trips for an event will occur using an automobile within the study area. A breakdown of the proposed person trip routes is shown in Figure 25. It is expected that for weekend events, walking and biking become more attractive options due to events occurring earlier in the day and the potential event patrons will have more available time to walk or bike from further distances.

Trips generated by the proposed event were distributed throughout the study area based on event attendees' origin/destination information is based on zip codes collected from individual and season ticket holders for other professional sports teams in the Twin Cities, the current Minnesota United team, and metro area population densities. The zip codes were mapped and assigned to the most efficient travel shed to the stadium from the zip code. The zip code information provides an accurate representation of where potential attendees are expected to be located in the metro area. The directional distribution is shown in Figure 15.

In addition to the trips generated by the event, the surrounding development on site is expected to generate a significant amount of trips within the study area. Assumptions were made in order to determine the trips generated during the weekend peak hours. Certain land uses had published trip generation from a combination of ITE, SRF locally collected data on weekends, and other local data from TripGeneration.org. Based on these sources, the trips were able to be adjusted from the a.m. and p.m. peak hour trips to better represent weekend peak hour arrival and departure time peak hour trips. These trip generation estimates can be found Appendix G.

The resultant year 2035 event traffic forecasts, which include general background growth, trips generated by the adjacent on-site development, and trips generated by an event, are shown in Figures 26A and 26B.



Pedestrian Routing

- Light Rail Transit (LRT) ----------24.5%
- Shuttle Bus to Remote Parking ------- 32.3%
- On-site Parking ---------- 22.1%
- Off-Site Parking ----------— 4.0%
- Charter Buses/Private Shuttles -------— 4.7%
- "A"-line Bus Rapid Transit (BRT) ------- 2.7%
- Pedestrians/Bikers (1/2 to 1 Mile) -----– 9.7%

NO. DATE REVISION

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SNELLING MIDWAY
REDEVELOPMENT SITE
MASTER PLAN

1562 UNIVERSITY AVENUE W.
SAINT PAUL, MN 55104

PROJECT NO.: 63260.00

DRAWING TITLE:
OVERALL
GROUND

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Year 2035 Event - Pedestrian Routing Capacity Event (Mode Selection - Potential Plan)

Snelling Midway Stadium Transportation Study
City of St. Paul

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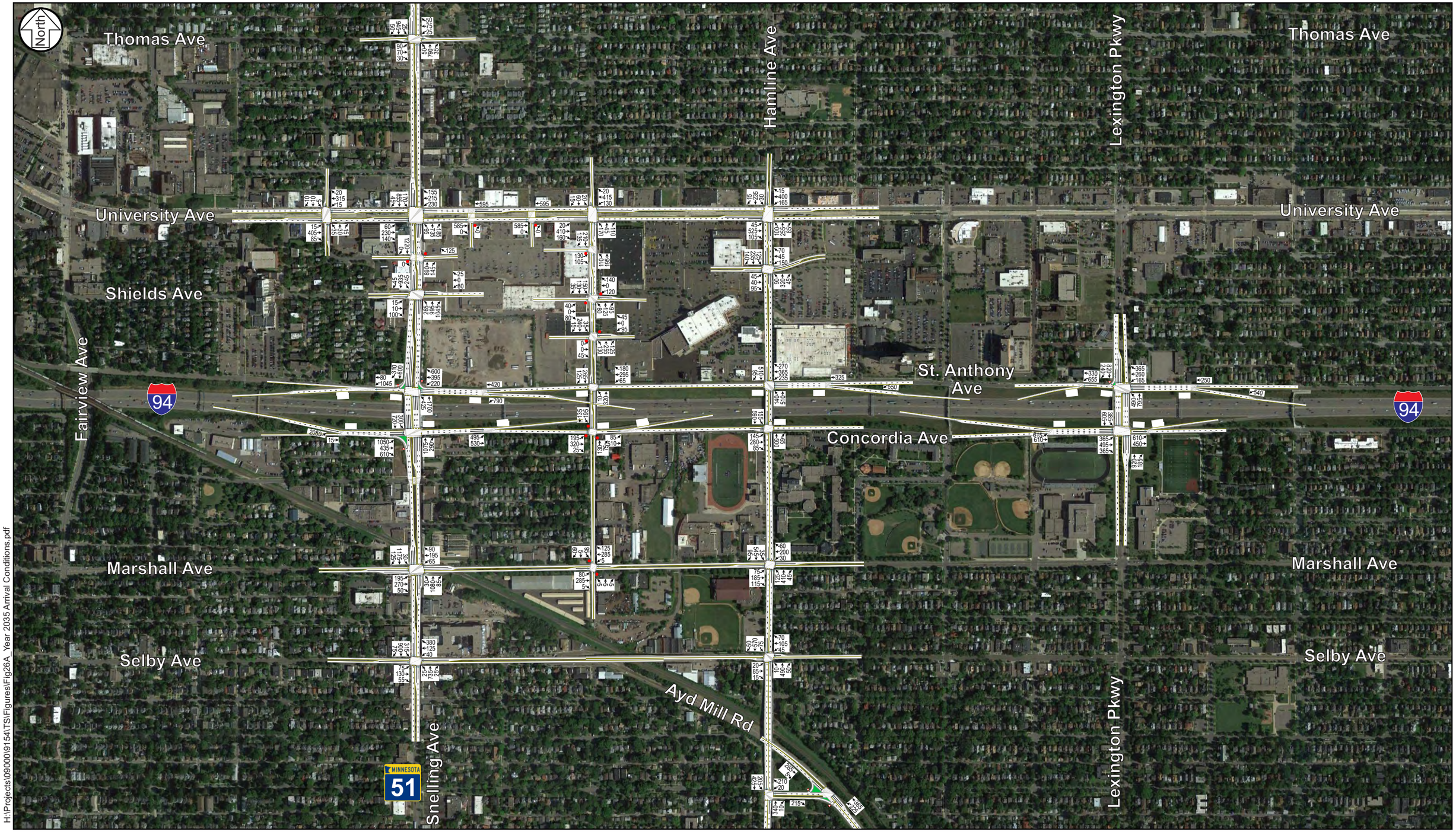
Figure 25



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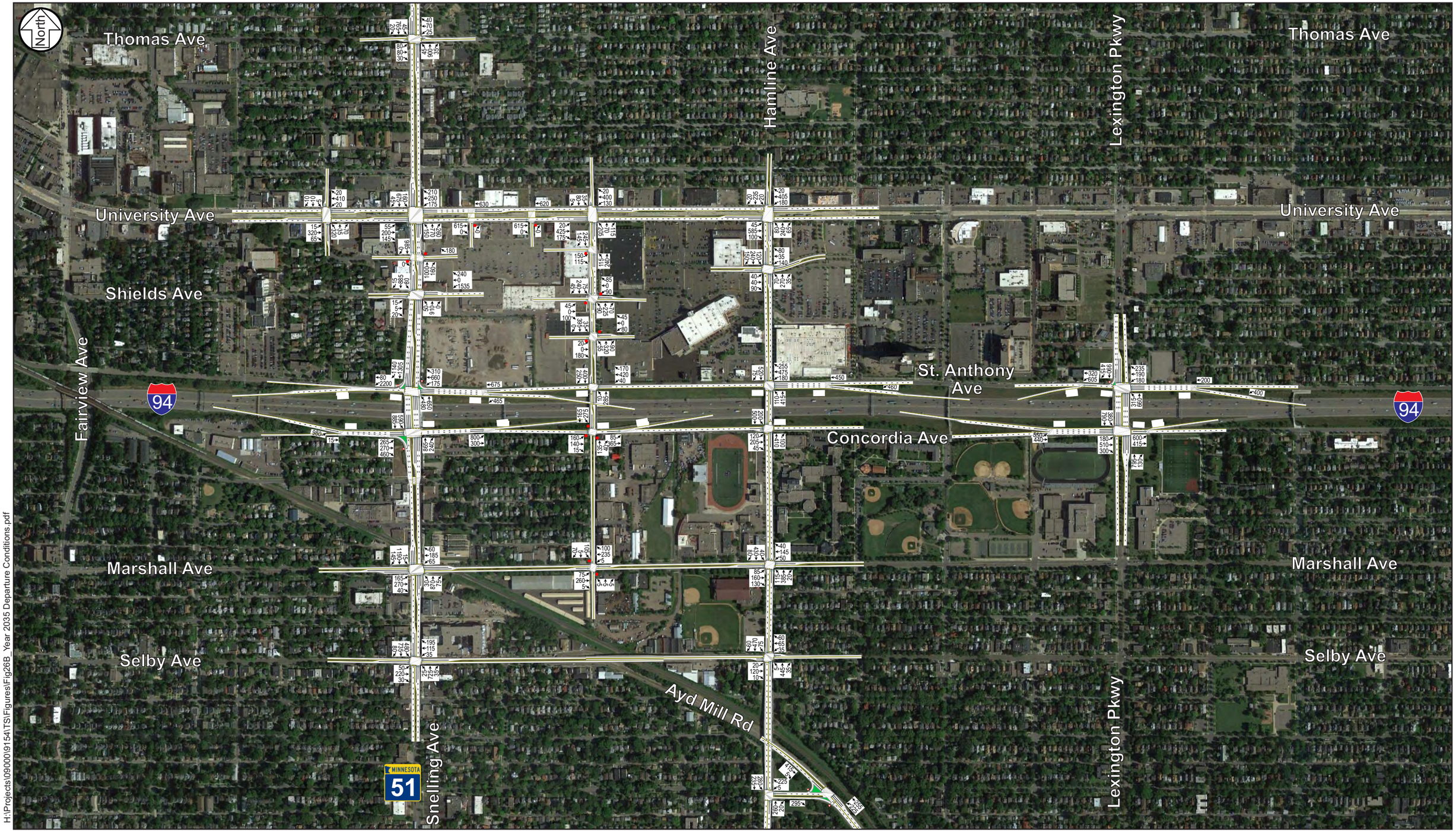
Year 2035 Weekend Afternoon Arrival Conditions (2:00 PM Event Start Time)

Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 26A



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Year 2035 Weekend Afternoon Departure Conditions (4:00 PM Event Departure Time)

Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 26B

Intersection Capacity Analysis

Weekend afternoon event conditions were analyzed with the proposed roadway configuration and a full capacity event to determine potential transportation impacts due to the increased pedestrian and vehicular traffic. It should be noted that weekday evening and weekend evening events are possible, however, the weekend afternoon event was determined to have the highest background traffic volumes, and therefore this worse-case scenario was analyzed. This is caused by the heavy retail peak that occurs on weekend afternoons within the study area. Any mitigation as a result of the weekend afternoon event is expected to alleviate traffic concerns during the other two potential soccer match times. As previously noted, overall intersection LOS A through LOS D is generally considered acceptable in the Twin Cities Metro Area for weekday peak hour traffic, but not for event traffic. Events are intense peak flows resulting in intersections operating at LOS F, so mitigation strategies are needed to manage it and limit the duration of the event traffic. Additionally, events can be measured by the effects queues have on other intersections within the study area. The amount of time needed to clear the departure will be identified as another measure of effectiveness.

This scenario assumes an afternoon start time of 2:00 p.m. and a departure time of 4:00 p.m. Arrival and departure traffic operations analysis were conducted for the hour before and after the match respectively. Based on the mode share methodology previously discussed, approximately 2,430 automobiles are assumed to drive to the site or have a sparking space within walking distance for the event. It is expected that 65 percent of the vehicles (1,580) arrive prior to the game during the peak hour, and 90 percent of the vehicles (2,190) depart during the peak hour.

A detailed intersection capacity analysis was completed for the weekend afternoon arrival and departure using Synchro/SimTraffic. Results of the detailed intersection capacity analysis are shown in Table 12. In addition, level of service results for the arrival and departure are shown in Figures 27A and 27B, respectively. The full simulation results for year 2035 arrival and departure conditions are presented in Appendix H.

During the arrival peak hour on a weekend afternoon, there is expected to be queuing in the northbound direction of Snelling Avenue from south of Selby Avenue to the I-94 interchange. This is due to the significant eastbound left-turning volume at Snelling Avenue and Concordia Avenue intersection coming from I-94 heading to the on-site event parking lot along Snelling Avenue. Additionally, a rolling eastbound queue is expected from the exit from I-94 to Concordia Avenue that will spill back onto the freeway exit ramp. In addition to causing significant queuing, the overall LOS is expected to be an overall LOS E at the Snelling Avenue and Concordia Avenue intersection and an overall LOS F at the Snelling Avenue and Selby Avenue intersection. This operation is caused by needing additional green time for event traffic coming from I-94, resulting in queuing south of Concordia Avenue to Selby Avenue. This significant northbound Snelling Avenue queue is a result of the I-94 exit at on Concordia Avenue eastbound left-turn requiring a significant amount of green time within the traffic signal cycle. The queuing caused by the arrival conditions is considered unacceptable if it extends onto the I-94 mainline. The expectation is that the freeway will be free-flowing, and these queues could cause safety concerns.

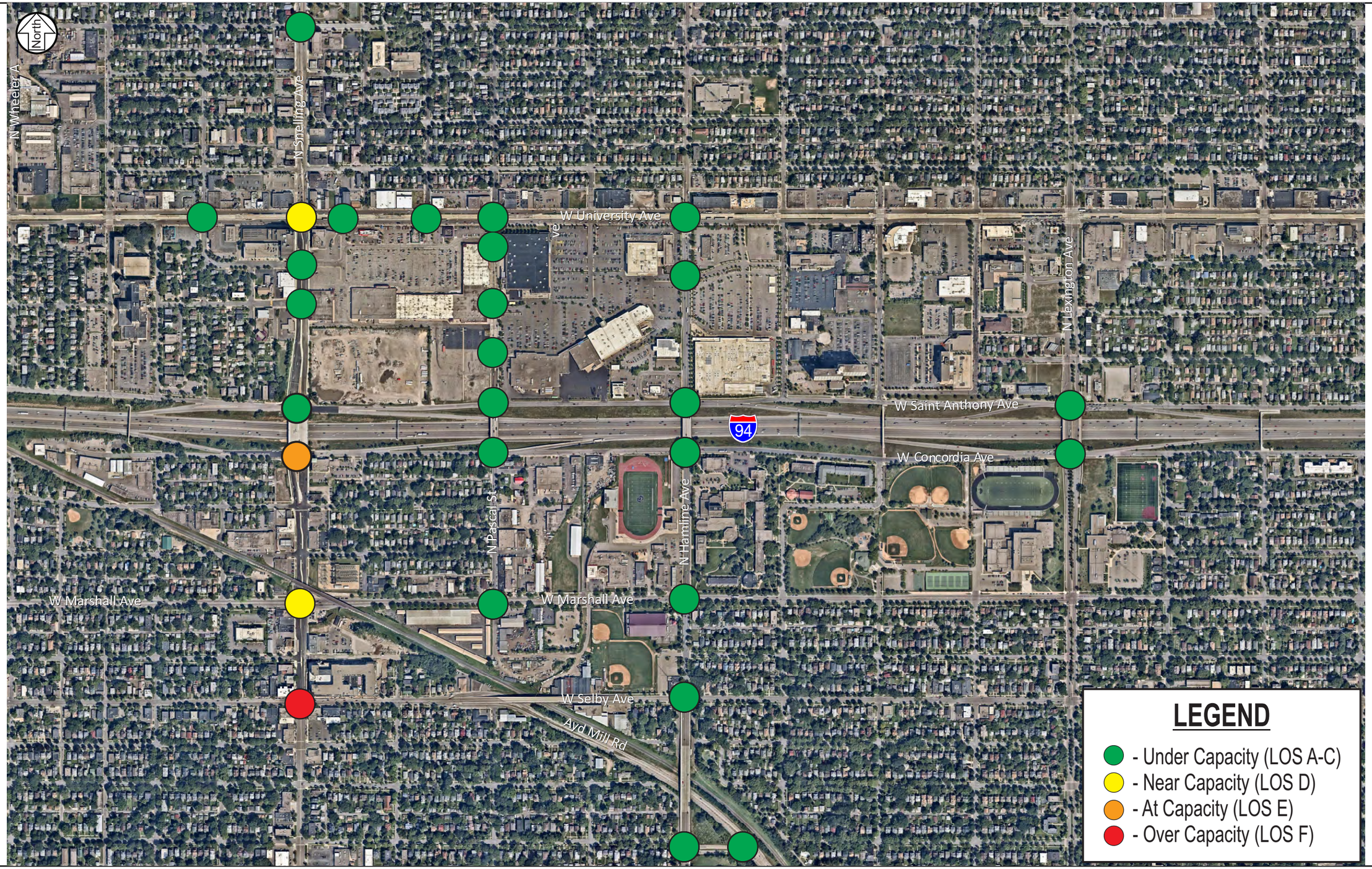
During the departure peak hour, issues are observed over the course of the peak hour for vehicular traffic. The majority of exiting vehicles are destined to exit in the half hour immediately after the end of the game, which causes a spike in traffic volumes. This is observed at the Snelling Avenue and Shields Avenue intersection and along the driveways on Pascal Street. Traffic volumes during the exiting peak hour are large along Snelling Avenue, and with much of the traffic destined to the westbound I-94 on-ramp, significant southbound right-turn queueing from St. Anthony Avenue to Shields Avenue is expected. This is due to the added parking on the west side of the site along Snelling Avenue. Additionally, the majority (~40 percent) of traffic from Pascal Street is also destined to the I-94 westbound on-ramp, which travels westbound on St. Anthony Avenue. Because these two major movements conflict with one another queues are expected in both directions. This queueing on St. Anthony Avenue could spill back from Snelling Avenue to Pascal Street and have an effect of a rolling queue from the parking lot exit on Pascal Street. Because of the amount of volume on Pascal Street after a match, driveway access from Midway Shopping Center, Walmart, and Cub will be difficult. It is anticipated that motorists that use these facilities will find alternate routes out of the shopping area, however, to remain conservative, these volumes were kept in the network at the specific driveway. Traffic control officers will be needed to control these access points. This significant queue along St. Anthony Avenue is also expected to have a major impact on the shuttle bus pick-up and drop-off area and could cause excessive delays for shuttles trying to depart. If the queuing does impact bus operations, the shuttle area may need to be moved for operational considerations. If the shuttle bus area is not allowed to work efficiently, this would cause an unacceptable condition. This includes leaving the shuttle area and getting to Snelling Avenue to depart to the park and ride locations.

The majority of the study intersections not immediately adjacent to the site are expected to operate at an acceptable overall LOS D or better, however the significant queuing and delay is one that cannot be mitigated without negatively impacting other aspects of the overall transportation network. **The significant queuing is expected to take approximately one and a half to two hours to clear.**

Table 12. Year 2035 Weekend Afternoon Event Intersection Capacity Analysis

Intersection	Arrival Peak Hour	Departure Peak Hour
	LOS	LOS
University Avenue/Fry Street	A	D
Snelling Avenue/Thomas Avenue	B	E
Snelling Avenue/University Avenue	D	F
Snelling Avenue/Spruce Tree Avenue	A/B	D/F
Snelling Avenue/Shields Avenue	C	F
Snelling Avenue/St. Anthony Avenue	C	E
Snelling Avenue/Concordia Avenue	E	C
Snelling Avenue/Marshall Avenue	D	B
Snelling Avenue/Selby Avenue	F	C
University Avenue/Asbury Street(1)	A/A	--
University Avenue/Simpson Place(1)	A/A	C/E
University Avenue/Pascal Street	C	C
Pascal Street/North Midway Shopping Center Driveway(1)	A/B	E/F
Pascal Street/Shields Avenue-Walmart Driveway(1)	A/B	F/F
Pascal Street/South Driveway-Cub Driveway(1)	A/B	F/F
Pascal Street/St. Anthony Avenue	B	F
Pascal Street/Concordia Avenue(2)	A	A
Pascal Street/Marshall Avenue(1)	A/B	A/A
University Avenue/Hamline Avenue	C	C
Hamline Avenue/Midway Marketplace	B	A
Hamline Avenue/St. Anthony Avenue	B	C
Hamline Avenue/Concordia Avenue	B	B
Hamline Avenue/Marshall Avenue	C	B
Hamline Avenue/Selby Avenue	B	B
Hamline Avenue/Ashland Avenue	B	B
Ayd Mill Road/Ashland Avenue	B	B
Lexington Avenue/St. Anthony Avenue	B	B
Lexington Avenue/Concordia Avenue	B	B

(1) Indicates an unsignalized intersection with side-street stop control, where the overall LOS is shown followed by the worst approach LOS. The delay shown represents the worst side-street approach delay.
(2) Indicates All-Way Stop Control



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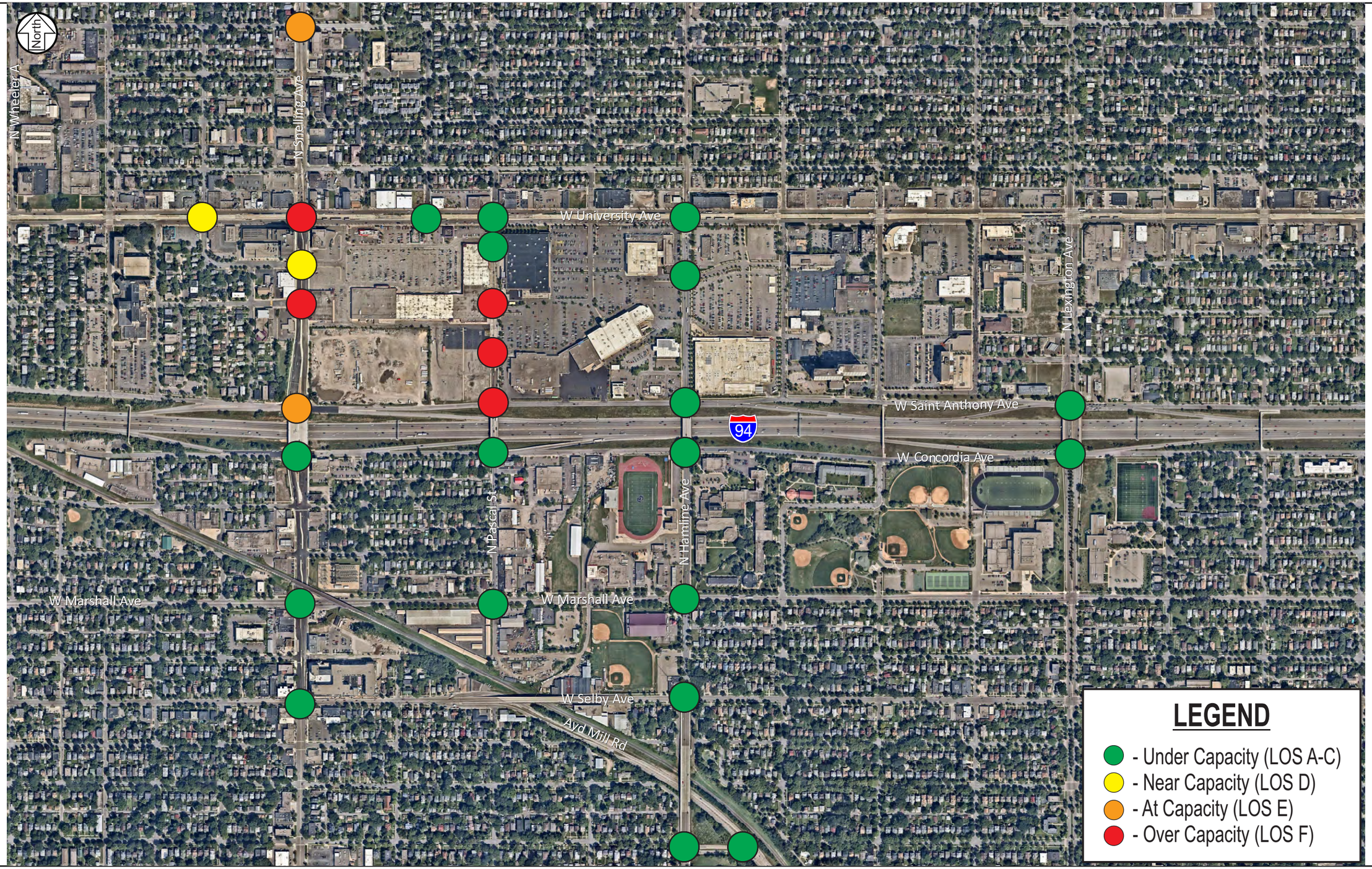
Year 2035 Weekend Arrival Traffic Analysis (2:00 PM Event Start Time)

Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 27A



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Year 2035 Weekend Departure Traffic Analysis (4:00 PM Event Departure Time)

Snelling Midway Stadium Transportation Study
City of St. Paul

Figure 27B

Key Findings for Year 2035 Capacity Event

Additional findings beyond those for year of opening (2018):

The site will continue to change as re-development occurs. An updated TMP should be prepared each year to account for the changes.

The additional on-site parking, all located along Snelling Avenue, departing at one access point, is challenging. The on-site parking will require almost **two hours to clear.**

Additional parking should be found away from the site and have good access to the other interchanges to I-94, not Snelling Avenue.

In order to clear event traffic in one hour (besides on-site vehicles), additional shuttle bus service will be needed. Although, it is expected that the new residential uses, office, and hotel will result in more event patrons walking to the event.

Weekend start times should be even more encouraged to start later in the day, although, the significant amount of vehicles departing from the site at Shields Avenue after an event will be problematic at any time.

Issues are expected along Snelling Avenue during both the arrival and departure peak hours. During arrivals, the significant eastbound left-turning volume at the Concordia Avenue/Snelling Avenue intersection is expected to back-up onto the Snelling Avenue exit ramp and potentially onto I-94. Additionally, the northbound direction of Snelling Avenue between Concordia Avenue and Selby Avenue is expected to suffer from the significant eastbound left-turning volume. Typically, other event arrivals do not result in such poor operations.

During the departure peak hour, significant issues are expected when exiting the site through the Snelling Avenue and Shields Avenue intersection. With the majority of these vehicles destined to I-94 westbound, the Snelling Avenue and St. Anthony Avenue intersection is expected to be significantly over capacity and will not be able to accommodate all of the event traffic within one hour. It is expected to take **one and a half to two hours** to clear event traffic due to the significant volumes heading westbound on Shields Avenue to southbound Snelling Avenue destined to the I-94 interchange.

These event departure issues along Snelling Avenue are expected to impact the shuttle bus delivery and pick-up area along St. Anthony Avenue. Due to these impacts, the shuttle bus area may not be able to operate as intended, which will impact how long the shuttle bus queue takes to dissipate. Additional shuttle areas may be necessary in order to clear the shuttle pedestrian queue within a one hour timeframe.

These potential traffic issues will need to be evaluated with any expansion plans in the future.

Mitigation Measures

This section relates to mitigation needed based on the re-development of the entire site and not related to traffic generated by an event at the soccer stadium. It is important to remember that the proposed plan has just a slight increase in the amount of retail space compared to the existing site. The retail trips are more local in nature. The site does propose new office space of around 1 million square feet. These trips are typically more regional.

Completion of full development

At the completion of full development, the new improvements should include the following:

Internal roadway system connections to public roadways:

17. Two internal north-south roadways that connect to University Avenue (partial access; right-in/right-out only) and the easterly north-south roadway connecting to Saint Anthony as a right-in/right-out access and western north-south roadway terminating in the site.
18. Two east-west roadways that connect Snelling Avenue and Pascal Street
    a. Extension of Spruce Tree would have modified access resulting in right-in/right-out only movements with the traffic signal removed at Snelling Avenue and full access at Pascal Street
    b. Extension of Shields Avenue would result in a new full access signalized access at Shields Avenue and full access with potential of a traffic signal at Pascal Street
19. Pedestrian and bike accommodations internal to the site

Around the Site

20. Pedestrian sidewalk should be provided around the perimeter of the site, with a minimum width of eight feet.
21. Bike racks for a minimum of 400 bicycles should be provided.

Snelling Avenue – University Avenue to Shields Avenue

To address the close spacing of the Spruce Tree and University Avenue intersection;

22. Spruce Tree intersection
    a. Add a center median to only allow right-in/right-only access
    b. Remove the traffic signal ("relocated" to Shields Avenue)
23. University Avenue Intersection
    a. Extend Northbound left-turn lane from 50 feet to 250 feet
24. Shields Avenue
    a. New traffic signal ("relocated" from Spruce Tree Avenue)
    b. Add Southbound left-turn lane

c. Two-lanes of approach for eastbound Shields Avenue (check alignment across intersection); left-thru lane and a right-turn lane (may be convertible to parking in off-peak hours)
d. Three-lanes of approach for Westbound Shields Avenue with two providing left-turn movements; left-turn lane, left-thru lane and right turn lane
e. Traffic signal phasing can vary throughout the time of day, depending on traffic volume demand. It is expected that the new signal controller and signal heads will be able to accommodate both phasing options presented:
    i. Westbound protected/permissive (i.e flashing yellow arrow) left-turn phasing with no eastbound left-turn phasing (more efficient)
        1. Best operation with an assumed 20 foot wide pedestrian crossing
        2. Pedestrian crossing is only feasible on the north side
        3. This option is recommended to be run during all peak hours
    ii. Split Phasing
        1. Pedestrian crossing only on the north side
        2. This may be run in off peak times

Pascal Street – University Avenue to Saint Anthony Avenue

With the new land use; access points should align across Pascal and left-turn lanes provided.

25. Shields Extension – New traffic signal (when warranted)
26. Re-stripe Pascal to provide a three-lane roadway (one thru lane in each direction with left-turn lane) with the additional space as a bike-lane or shoulder. Maintain Northbound left-turn lane at University Avenue and add Southbound right-turn lane at Saint Anthony
27. Sufficient width and right-of-way should be obtained to provide a five-lane roadway if needed in the future.
28. Saint Anthony – Install a permanent traffic control signal

Marshall Avenue / Hamline Avenue Intersection

The site does not generate much traffic going through this intersection, but enough to cause the intersection to be unacceptable. The operations can be mitigated with two solutions:

29. Add an Eastbound right-turn lane during the p.m. peak hour by restricting 100 feet of parking along Marshall Avenue.
    a. Alternative would be to add northbound and southbound left-turn lanes.
    b. This improvement is not needed with the initial development phases.

Snelling Avenue from University Avenue to Selby Avenue

The expected additional development generated traffic is expected to be a small increase south of the I-94 interchange, we know that today eastbound queues can somedays back from the I-94 eastbound ramp intersection onto the freeway due to southbound queuing on Snelling Avenue. Snelling Avenue south of the interchange can feel congested with the number of vehicles changing lanes to Selby Avenue and queues blocking unsignalized intersections during the peaks.

30. Update traffic signal timing along Snelling Avenue for the six intersections for each phase of development.

Policy Measures

Encourage use of Transit

The site is served by great transit facilities with Central Corridor LRT (Green Line) along University Avenue and a new BRT (Bus Rapid Transit) "A-Line" starting in summer of 2016.

31. Consider implementing TDMP (Travel Demand Management Plan) strategies with future re-development
32. Land use guidance to promote TOD (Transit Orientated Developed) and complementary land uses

Mitigation – Event (Year of Opening 2018 – Capacity of 20,000)

Mitigating an event requires a management strategy and elements of that strategy. Based on the modeling of the events, the following items are needed to be addressed in a Transportation Management Plan (TMP) ***in order to clear the event traffic within one hour***. The transportation management plan should be started after the AUAR and continue to within a few months of the first event. The TMP committee should include MnUnited Soccer Team, RK Midway, City of Saint Paul Planning and Public Works, Metro Transit, Ramsey County Public Works, MnDOT and FWHA. They should meet prior to every MLS soccer season to discuss potential modification to the site plan or transportation system.

9. Develop Transportation Management Plan
    a. The TMP will evaluate potential mitigation measures to determine the relative cost and effectiveness.
10. Event Traffic Control Plan
    The event traffic control plan is how the actual day of the event will be managed outside of the physical stadium. This would include diagrams of routing event patrons, key conflict points would be managed by traffic control officers. Providing storage areas, etc.
    a. Traffic Control Officers – They are needed to manage pedestrian flows and where modes (pedestrians, bikes, buses, cars or LRT) cross/conflict. Traffic control officers will be needed to be further explored in the TMP, but the following seem to be likely areas:

i. Snelling Avenue at Concordia Avenue, Saint Anthony Avenue, Shields Avenue, Spruce Tree Avenue and University Avenue
ii. Pascal Street at Concordia Avenue, Saint Anthony Avenue, two driveways, Shields Avenue extension, Spruce Tree Extension and University Avenue
iii. University Avenue at Fry Street for westbound LRT platform and the crossing to the eastbound LRT platform on the south side of University Avenue at Simpson Street.
iv. Metro Transits Staff at the Snelling Avenue Platforms and manage queues getting onto the platforms. Hamline Avenue Platform to ensure compliance.
v. Additional traffic control will be needed at the Shuttle Bus Loading areas, Charter Bus and Private Shuttle Bus Loading areas to assist with loading and unloading on the site.
vi. Traffic control for taxi, drop-off/pick-up areas.
vii. Internal traffic control to direct pedestrians to transit service and maintain orderly flow and eliminate any modal conflict.

b. Managed Storage Areas for Transit, Shuttle and Charter Bus. Storage areas have been ***estimated*** for the maximum number of patrons per transit mode:
   i. Westbound LRT – 1,500 to 2,100 people (12,000 to 17,000 sq. ft.)
   ii. Eastbound LRT – 1,250 to 1,750 people (10,000 to 14,000 sq. ft.)
   iii. Shuttles to Remote Parking – 3,000 to 3,500 people (24,000 to 28,000 sq. ft.)
   iv. A Line BRT – 200 people (2,000 sq. ft.)
c. Temporary lane or roadway closures. Need to identify these locations in the TMP. Consideration could be given to lane closures on Spruce Tree Avenue, behind remaining businesses on-site and several internal roadways.
d. Permanent or temporary barriers are needed to restrict uncontrolled pedestrian crossings on Snelling Avenue (median) and Pascal Street. Internal roadways and walkways will require barriers to direct pedestrian flow.
e. Event traffic signal timing plan at the following intersections:
   i. University Avenue at Fry Street, Snelling Avenue, Pascal Street, Hamline Avenue and Lexington Avenue.
   ii. Snelling Avenue at Thomas Avenue, University Avenue, Shields Avenue, Saint Anthony Avenue, Concordia Avenue, Marshall Avenue and Selby Avenue
   iii. Pascal Street at University Avenue, Shields Avenue (once built) and Saint Anthony Avenue

11. Parking Plan

On-Site Parking is only expected to accommodate approximately 10 percent of a capacity crowd. There will be more demand for parking near the facility than can be accommodated. To reduce congestion and frustration caused by vehicles trying to find parking, communication must be stated that if you do not have a reserved parking space for the event, then please take transit or shuttle buses from (list where they can park and ride transit/shuttle service). Assigned Parking on-site and immediately (within one mile) near-by should be assigned and purchased with the tickets. Potentially, this should be considered for all locations in order to minimize confusion.

a. LRT/BRT and Shuttle Buses to remote parking will need to identify these locations and communicate their locations to event patrons.

b. Parking spaces for event patrons leaving by LRT – westbound will need about 1,200 to 1,400 parking spaces. These could be located at the University of Minnesota or in Downtown Minneapolis.
c. Parking spaces for event patrons leaving by LRT – eastbound will need about 1,000 to 1,200 parking spaces. These could be located near the capitol or Downtown Saint Paul.
d. Parking spaces for event patrons leaving by Shuttle Bus to remote parking will need about 3,000 parking spaces. These could be located at several locations including the State Fair Grounds, etc., although the destinations are preferably limited to two or three in order to maximize efficiency of shuttle operations.
e. Work with businesses and quasi-government agencies to provide event parking such as the State Fair Grounds, University of Minnesota, Downtown Saint Paul, etc. Consider pre-sale of these facilities.
f. Encourage on-site parking to have high vehicle occupancy. Example – Able to purchase on-site parking pass with the purchase of 4 or more tickets, etc.
g. Private businesses could have available parking supply during events but may not be interested in providing parking for various reasons including already being used, not current practice, insurance, licensing and sales tax. However, the potential for additional use of nearby lots during events should be explored if locations can be accessed without additional traffic passing through the I-94/Snelling interchange.

12. Transit Plan

Metro Transit is currently working with a transit consultant to work through some of the potential issues for transit before and after events. Expectations are that LRT, A-Line BRT and regular bus service are expected to accommodate approximately 35 percent of a capacity event. This analysis made the following assumptions regarding the movement and queueing of transit riders on the site:

The Snelling Ave LRT Station westbound platform departure operation would load from the Fry Street end. LRT passengers alighting at this station would proceed to Snelling Avenue side of the station. The Snelling Avenue LRT Station eastbound platform departure operation would load similar to the westbound, except boarding at the midblock crossing near Simpson Street with alightings directed toward to Snelling Avenue.

These operations are shown on Figure 20. The routes were chosen based on understanding of likely configuration of the portion of the superblock north of the proposed extended Shields Avenue at the time of stadium opening in 2018. However, Metro Transit has looked at alternatives for pedestrian routing and staging that would also be feasible for accommodating transit riders. The alternatives implemented in 2018 will be determined in consultation with Metro Transit based on actual site configuration in 2018, and modified going forward as the remainder of the superblock redevelops.

The project will need to work with Metro Transit in the following areas:

a. Identification of preferred alternatives for movement and queueing of transit riders based on actual site configuration in 2018.
b. Modification of alternatives as the remainder of the superblock redevelops.
c. Request continued LRT frequency of 10 minute headways through event departures

d. Request 3 car LRT trains are available during event arrivals and departures on the weekends
e. Initial understanding is that Metro Transit would not be able to add LRT trains for the event, because no storage areas exist near this station and was never planned for Stadium. Continue to investigate this option with them.
f. "A" Line (Snelling Avenue) BRT service will come on-line in summer of 2016. Request that BRT frequency of 10 minute headways is continued through event departures
g. Ask Metro Transit if the frequency can be increased for the BRT service
h. Ask if regular Metro Transit bus service can be expanded for events
i. Ask if Metro Transit will supplement LRT with additional bus service, especially on University Avenue and Snelling Avenue.
j. The limitation of expanded bus service depends on the availability of buses and operators

13. Shuttle Service to Remote Parking Plan

Expectation is this shuttle service to remote parking would accommodate around 30 percent of a capacity event. This would result in approximately 100 to 120 bus trips with a crush-load of 70 people and require 40 to 50 buses depending on the location of the remote parking. Two key elements of the shuttle service is the amount of space on-site required to stage event patrons waiting for the shuttles and finding remote parking areas within a reasonable distance.

a. Shuttle service area to remote parking could include State Fair, University of Minnesota, large parking areas at private businesses, Capitol Area or downtown Saint Paul. Recommend parking locations within two to three miles to reduce the number of buses. Once locations are determined, then will need to determine location and routing.
b. Temporary shuttle area alighting and boarding areas along either St Anthony or Pascal are contemplated, although event traffic queueing from the Snelling/Saint Anthony intersection might be an issue.
c. Shuttle area's unloading and loading areas should be for one destination each, so event patrons don't become confused. The same location should be for drop-off and pick-up.
d. Temporary fencing may be necessary in order to control how pedestrian queues flow within the shuttle area.

14. Routing and Wayfinding Plan

All event patrons are pedestrians at some point of their trip to or from the Stadium. The team will need to provide direction to Snelling Avenue LRT Station, A-Line BRT Station (University Avenue Station), Charter Bus/Private Shuttle Bus, Shuttle Bus service to remote parking (and perhaps more than one destination) and parking lots. This information is needed on-site, but other off-site signage and wayfinding maybe needed. The intent is provide the most efficient, safe and easy to understand plan to have a great patron experience.

a. Bike rack storage (pre-sale spaces)
b. Event signage (Changeable Message Sign (CMS)) on freeway, local streets and on-site
c. Planning routes and minimizing use of Snelling/I-94 interchange
d. Locations to all of the transportation modes
e. Show these plans on the website, tickets, etc.

15. Communication and Education Plan
    The technical analysis and the other plans need to be communicated to the event patrons, local businesses/residents and those who drive/walk/bike or take transit through the area. The transportation system will need its full capacity to accommodate the arrival and departure of the event. This information can be mailed to ticket holders, websites, on parking vouchers, with any ticket purchase, media outlets, email notifications to anyone, etc.
    a. Not enough on-site parking with be available for the potential demand, and therefore event patrons need to use transit or shuttle bus service to remote parking
    b. Need good information techniques to guide event patrons to remote parking and transit
    c. Information that on-site and adjacent off-site parking is limited and should be pre-sale
    d. Only want so much parking on-site. Desire parking that is east or west of site and does not use the Snelling Avenue interchange to access I-94.
    e. Provide private charter and shuttle bus service providers to event patrons.

16. Incident Management and Safety Plan
    This would be completed by emergency responders. It would cover situations in the case of an incident or issue at the stadium.

17. Other Considerations
    Other items to consider that impact the transportation event include existing usage of the transportation system, how to manage the event by spreading out the peak demand and how the site might develop resulting in adaption of the plan to new conditions.
    a. Form a transportation committee that meets at least twice a year to discuss event scheduling, transportation issues, improvements, etc. Group should include MnUnited Soccer Team, RK Midway, City of Saint Paul Planning and Public Works, Metro Transit, Ramsey County Public Works, MnDOT Area Manager and FWHA
    b. With the amount of retail land use in the area, the existing volumes are high until 6:30 p.m. on both weekdays and weekends. Recommend considering games begin at 7:00 p.m. or later. Matches starting at 2:00 or 4:00 p.m. would have challenges with event arrival and departure traffic.
    c. Avoid over-lapping events at the University of Minnesota (TCF Bank), State Fair (operates for twelve days from late August into early September, ending on Labor Day) and Vikings (US Bank Stadium), as these events will likely consume remote parking, transit capacity and regional roadway capacity.
    d. The team should consider activities/concerts/etc. before and after match events to spread out arrival and departure times. Work with local businesses to participate or lead such events.
    e. Consider pre-sale of parking at all venues including on-site, near-by, and remote parking facilities. This will guarantee a parking space, reduce circulation and patron confusion and frustration.
    f. Consider pre-sale (and open marketing) of bike spaces, and transit and shuttle to remote parking. Limit money transfer to speed up process.
    g. Identify an Event Transportation Manager for the Stadium
    h. TMP needs to adapt as site changes

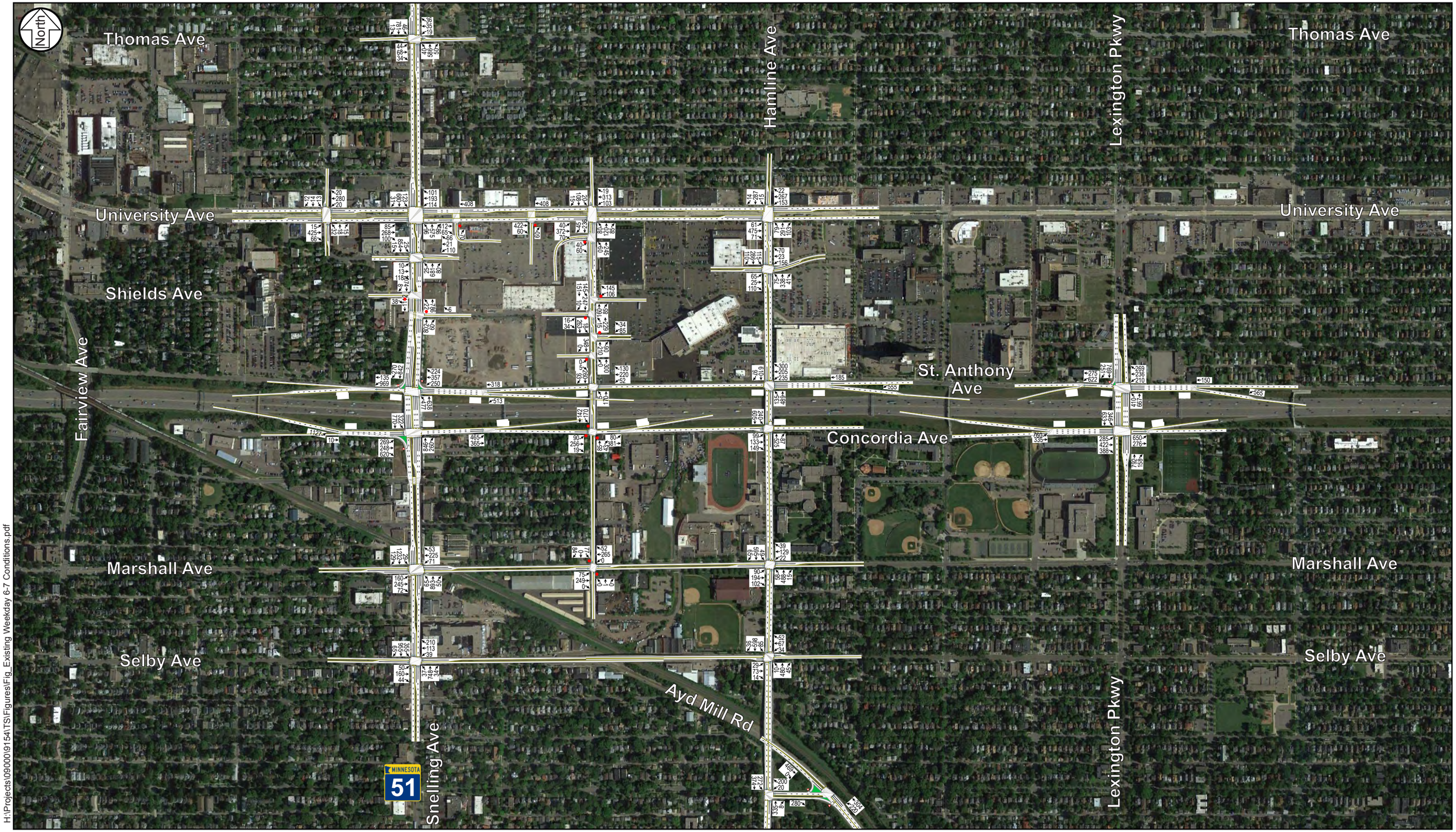
18. Items that need to be incorporated into the Year of Opening Plan Mitigation
    a. Transportation Management Plan that includes event traffic control, parking, transit, shuttle service, routing and wayfinding, and communication and education.
    b. Create a transportation management committee. Stakeholders include MnUnited Soccer Team, RK Midway representative, City of Saint Paul Planning and Public Works, Metro Transit, Ramsey County Public Works, MnDOT and FHWA.
    c. Fencing down the median of Snelling Avenue and allowance for future boulevard fencing on the west side of Pascal Street (permanent or temporary)
    d. Providing shuttle service to remote parking
    e. Site Plan
        i. Identification of transit, charter bus, private shuttle and shuttle bus loading and unloading areas
        ii. Sufficient waiting areas for transit, charter bus, private shuttle and shuttle bus patrons
        iii. Identification of taxi and drop-off/pick-up areas
        iv. Identify bike parking facilities

Mitigation – Event (Future Expansion – Capacity of 25,500)

The mitigation of event would be similar to the year of opening plan. It will also have the benefit of knowing how the transportation is working on the site. Without any increase in Metro Transit's capacity to accommodate event patrons, the additional 5,500 patrons would need to be accommodated by on-site/adjacent parking and shuttle bus service. The proposed parking that would be available is expected to be in the office developments along Snelling Avenue. This will result in adding traffic to the busiest roadway and a key interchange (I-94/Snelling) in the transportation network. Only so many additional cars can be added and this becomes more challenging when the event is scheduled on a Saturday starting at 2:00 to 4:00 p.m. and ending around 4:00 or 6:00 p.m., as the area is very active.

Additional parking for the event might be an additional 1,000 spaces with the full re-development of the site, so 2,750 of the additional 5,500 patrons would be accommodated by on-site parking. This might be challenging to accommodate all of these vehicles onto Snelling Avenue at Shields. It is expected that with new residential and hotels being planned for the site, more internal walking trips will be included in a mode to the stadium. This will likely result in full capacity of the transit system for one hour and similar bus service to remote parking. The one issue is the additional parking is challenging to accommodate at one access at Snelling Avenue and Shields Avenue. This could result in a two hour duration to clear the on-site parked vehicles. If the parking is able to be rearranged so that it is not as one-sided or all accessing through one intersection, the departure time may be able to be reduced.

Appendix A
Existing Volumes



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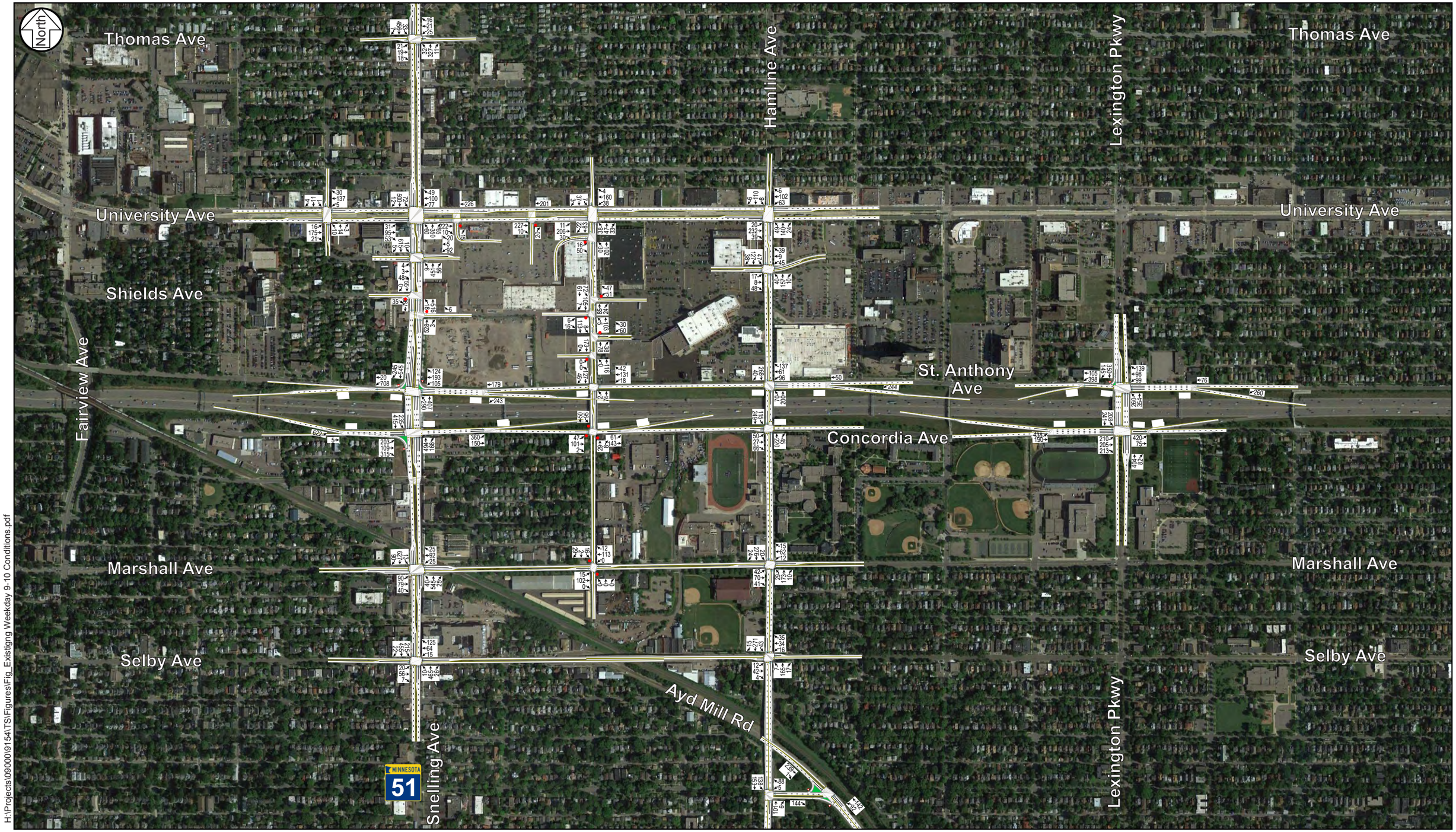
SRF Consulting Group, Inc.

0169154
April 2016

Existing Weekday Conditions (6:00 PM - 7:00 PM)

Snelling Midway Stadium Environmental Review
City of St. Paul

Figure



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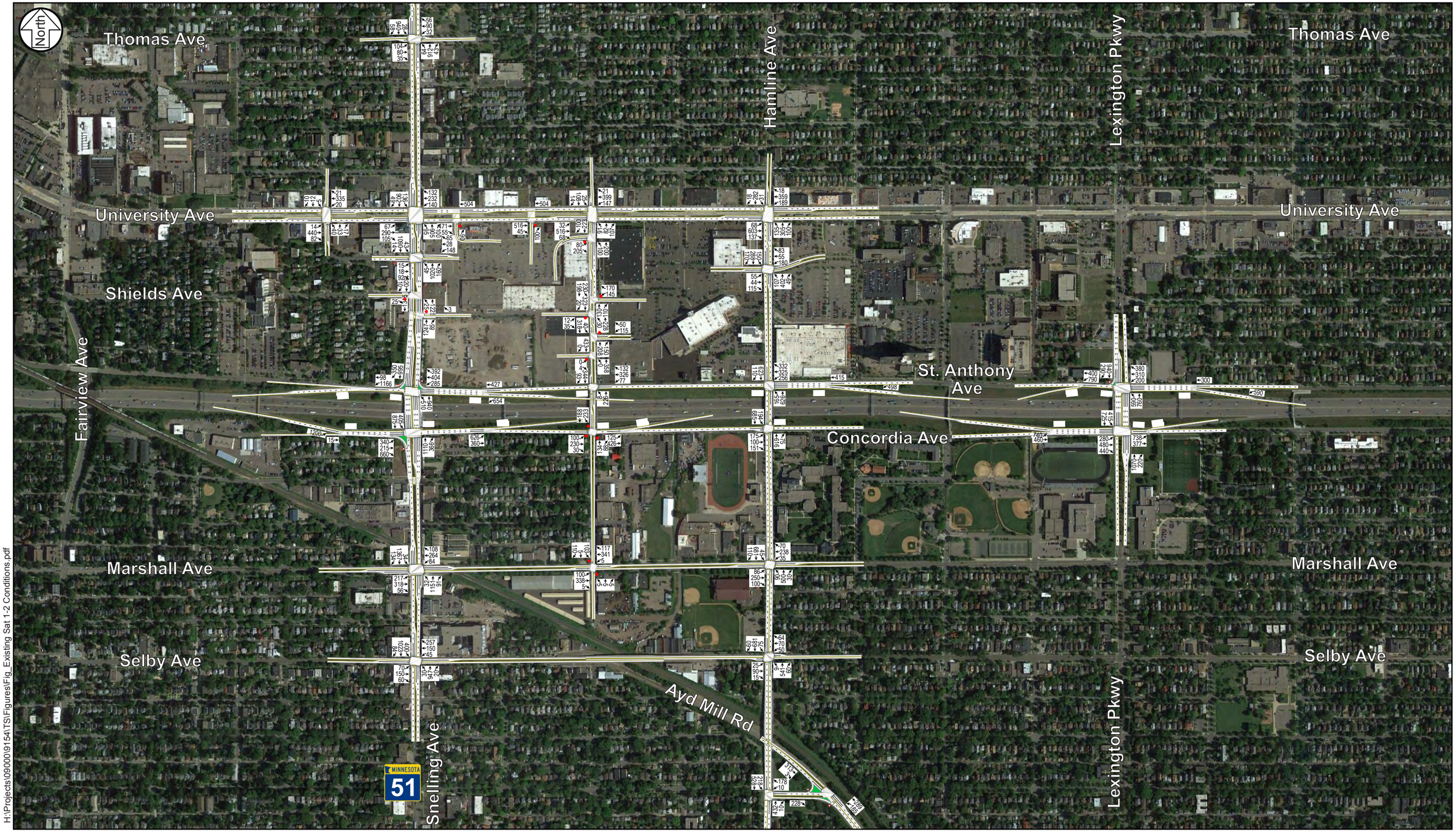
SRF Consulting Group, Inc.

0169154
April 2016

Existing Weekday Conditions (9:00 PM - 10:00 PM)

Snelling Midway Stadium Environmental Review
City of St. Paul

Figure



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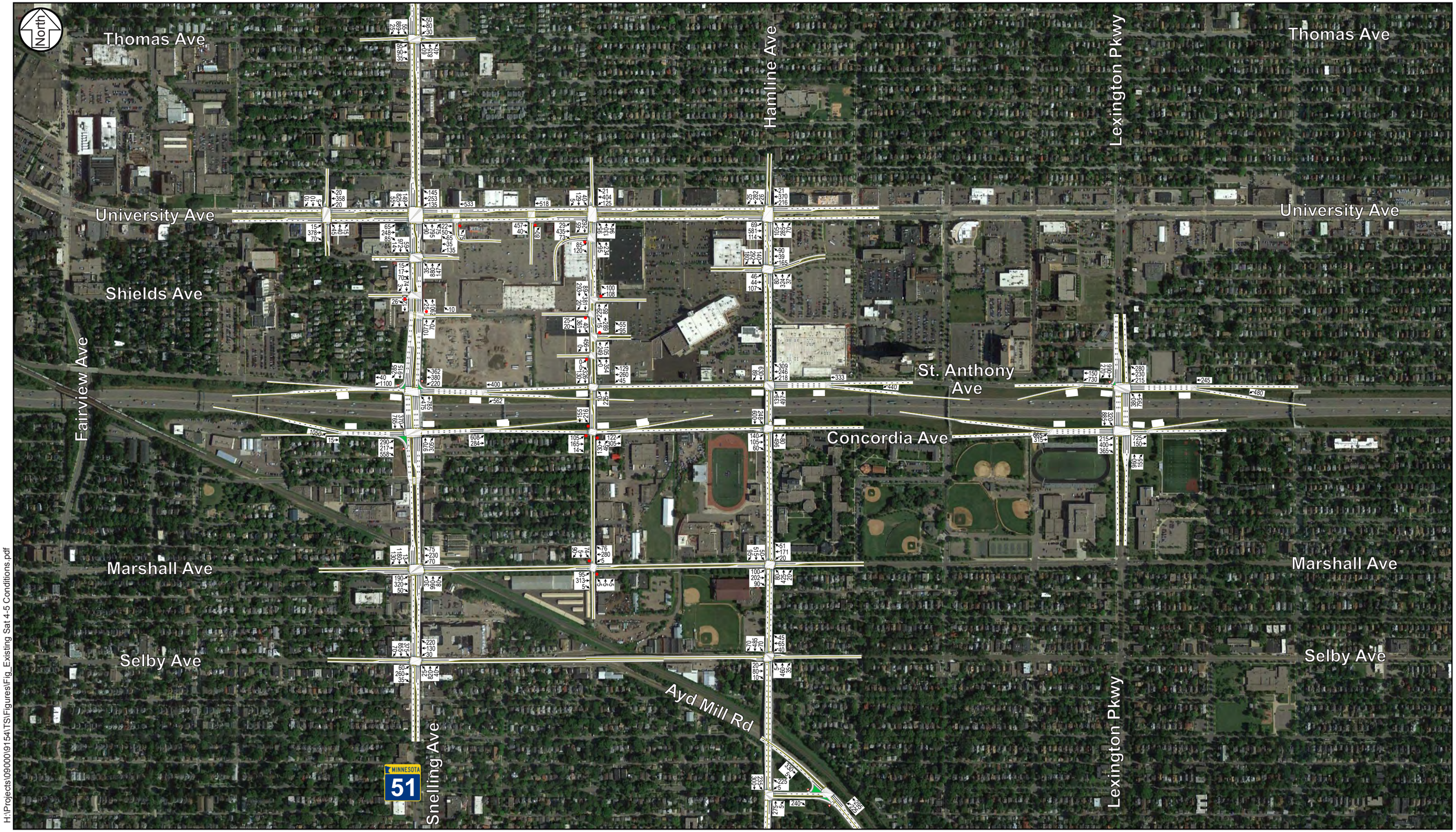
0169154
April 2016

Existing Saturday Conditions (1:00 PM - 2:00 PM)

Snelling Midway Stadium Environmental Review
City of St. Paul

Figure



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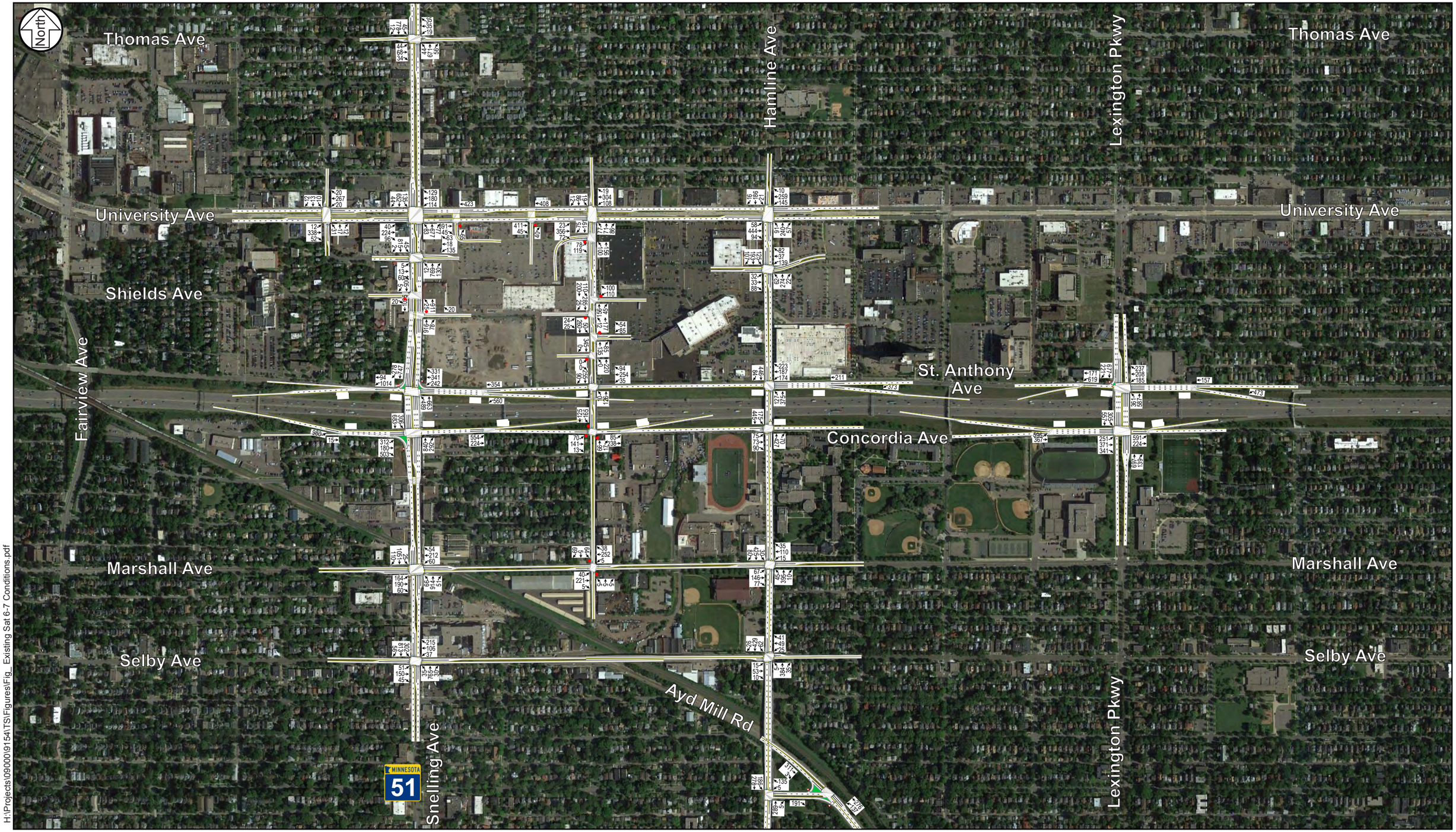
0169154
April 2016

Existing Saturday Conditions (4:00 PM - 5:00 PM)

Snelling Midway Stadium Environmental Review
City of St. Paul

Figure



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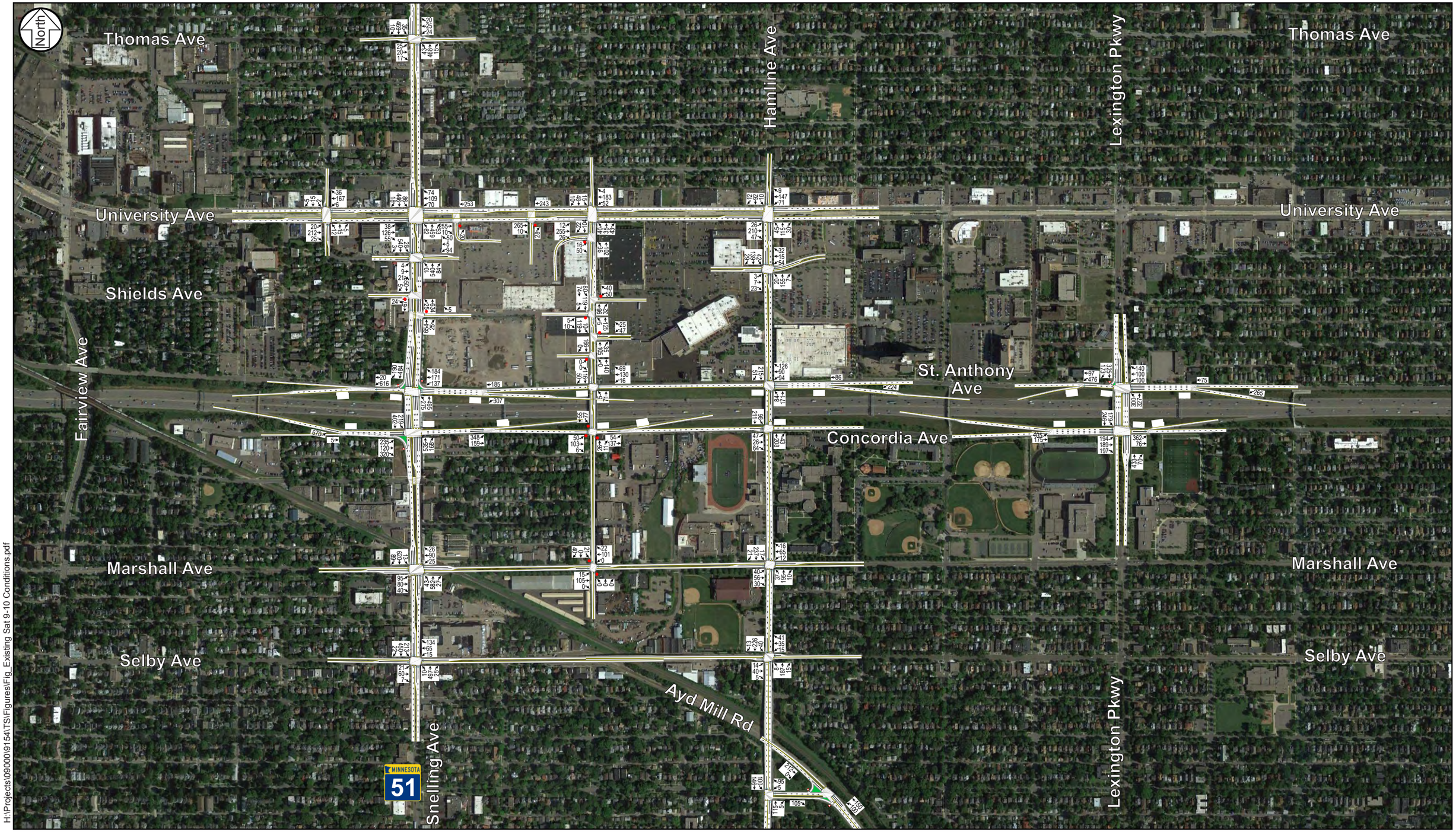
0169154
April 2016

Existing Saturday Conditions (6:00 PM - 7:00 PM)

Snelling Midway Stadium Environmental Review
City of St. Paul

Figure



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0169154
April 2016

Existing Saturday Conditions (9:00 PM - 10:00 PM)

Snelling Midway Stadium Environmental Review
City of St. Paul

Figure

Appendix B
Year 2035 No Build Analysis

110: Fry Street & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.3	0.1	0.2	0.0	0.0	0.0	4.1	0.1	0.3	0.1	0.1	3.9
Total Del/Veh (s)	69.9	4.5	2.0	63.1	2.2	1.9	53.6	46.6	14.1	37.0	51.2	9.1

110: Fry Street & University Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	8.5

200: Snelling Ave & Thomas Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.3	3.9	0.3	0.4	3.9	0.0	0.0	0.0	2.6	0.3	2.9
Total Del/Veh (s)	30.7	28.1	7.7	31.5	30.2	10.5	23.4	9.1	7.8	15.0	7.3	2.7

200: Snelling Ave & Thomas Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.5
Total Del/Veh (s)	10.3

210: Snelling Ave & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.3
Total Del/Veh (s)	58.3	27.4	15.8	40.1	16.8	13.3	44.2	17.9	8.6	50.5	30.3	9.3

210: Snelling Ave & University Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	25.9

220: Snelling Ave & Spruce Tree Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.2	0.3	0.3	4.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	39.1	44.0	10.8	44.2	44.7	13.5	19.6	7.1	1.4	10.9	2.8	2.3

220: Snelling Ave & Spruce Tree Rd Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	7.2

230: Snelling Ave & Shields Ave Performance by movement

Movement	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.8	9.2	0.3	1.0	0.8	0.9

235: Snelling Ave & Snelling Access Performance by movement

Movement	WBR	NBT	NBR	SBT	All
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.7	2.2	2.1	0.3	1.2

239: St Anthony Ave Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.0	0.2	0.1
Total Del/Veh (s)	1.0	1.2	1.1

240: Snelling Ave & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	41.8	40.5	2.3	22.3	6.3	15.1	11.2	18.7

241: St Anthony Ave Performance by movement

Movement	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	5.1	5.3	5.2

249: Concordia Ave Performance by movement

Movement	EBT	SEL	All
Denied Del/Veh (s)	0.1	0.5	0.5
Total Del/Veh (s)	0.1	1.6	1.6

250: Snelling Ave & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	43.3	37.6	2.5	15.1	3.8	27.7	8.7	15.9

251: Concordia Ave Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	6.0	0.9	4.8

260: Snelling Ave & Marshall Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	5.6	2.8	4.8	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
Total Del/Veh (s)	102.1	48.7	25.9	35.4	54.4	31.4	45.9	29.7	15.6	51.8	27.0	14.0

260: Snelling Ave & Marshall Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	37.7

270: Snelling Ave & Selby Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.3	0.4	0.3	1.5	0.6	0.6	2.7	0.6	0.6	0.0	0.0	0.0
Total Del/Veh (s)	174.0	24.8	15.8	172.0	173.4	172.9	113.8	98.2	86.0	73.9	15.9	12.4

270: Snelling Ave & Selby Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	88.6

310: West Midway Shopping Entrance & University Ave Performance by movement

Movement	EBT	EBR	WBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	1.3	1.1	0.5	2.9	0.9

315: East Midway Shopping Entrance & University Ave Performance by movement

Movement	EBT	EBR	WBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	0.5	0.6	1.3	3.0	1.0

410: University Ave & Pascal St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.6	0.0	0.2	0.2	0.5	0.0	0.3	0.2	4.0
Total Del/Veh (s)	42.1	2.9	1.7	53.8	11.1	4.6	48.4	45.3	4.6	46.3	48.2	11.8

410: University Ave & Pascal St Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	17.2

415: Pascal St & North Midway Shopping Entrance Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.3	4.0	0.0	0.0	0.0	0.0	0.7
Total Del/Veh (s)	7.9	3.0	3.0	2.2	2.3	1.4	2.8

420: Pascal St & North Walmart/Cub Entrance Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	6.2	3.6	0.4	0.1	2.9	0.6	2.1

425: Pascal St & South Midway Shopping Entrance Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.4	2.7	2.2	0.6	0.4	0.2	0.8

430: Pascal St & South Cub Entrance Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	4.0	0.2	0.0	0.0	0.0	0.0	0.3
Total Del/Veh (s)	6.3	2.7	0.7	0.2	2.4	0.2	1.1

435: Pascal St & Empty St. Paul Lot Entrance Performance by movement

Movement	NBL	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	2.8	1.5	0.4	1.0

440: Pascal St & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.8	4.3	3.2	34.4	30.0	26.3	6.3	11.3

450: Pascal St & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.4	6.4	3.3	6.1	4.0	7.3	7.9	6.2

451: Concordia Ave Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	1.5	1.5	1.5

460: Pascal St & Marshall Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	7.4	2.9	1.5	4.3	3.5	2.6	9.0	9.8	3.6	12.7	14.8	8.2

460: Pascal St & Marshall Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	4.3

510: Hamline Ave & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	3.5	0.2	0.2	0.1	0.1	0.0	3.5	0.4	0.2
Total Del/Veh (s)	76.7	13.9	10.2	47.2	18.2	10.5	42.7	36.2	5.1	35.8	38.6	31.7

510: Hamline Ave & University Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	28.6

520: Hamline Ave & Midway Market Place Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	4.1	0.2	0.1	4.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	54.0	47.7	7.7	48.5	50.6	11.3	11.9	6.4	1.8	14.3	3.4	2.6

520: Hamline Ave & Midway Market Place Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	7.2

539: St Anthony Ave Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.1	0.2	0.2
Total Del/Veh (s)	0.1	0.5	0.4

540: Hamline Ave & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	28.3	26.3	8.6	15.7	8.7	10.6	7.1	13.3

550: Hamline Ave & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	27.4	25.2	5.7	22.3	13.8	19.6	9.1	17.7

560: Hamline Ave & Marshall Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.0	0.0	3.5	0.4	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	31.6	23.4	22.7	26.3	25.0	24.7	29.6	14.8	9.8	31.8	20.5	23.7

560: Hamline Ave & Marshall Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	20.4

570: Hamline Ave & Selby Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.2	2.8	0.3	0.4	3.8	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	33.4	30.7	5.5	32.9	32.3	10.2	9.4	6.6	4.3	27.1	13.2	8.4

570: Hamline Ave & Selby Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	11.5

580: Hamline Ave & Ashland Ave Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0		0.0	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	19.9		19.1	13.6	5.8	16.4	5.5	15.2

590: Ayd Mill Rd & Ashland Ave Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.6	2.7	0.1	0.2	1.1
Total Del/Veh (s)	0.9	1.6	8.8	12.9	29.0	3.8	13.5

610: Lexington Ave & University Ave Performance by movement

Movement	NBT	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	1.1	1.1

639: St Anthony Ave Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.2	0.3	0.3
Total Del/Veh (s)	0.2	1.1	0.8

640: Lexington Ave & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	3.1	1.8	0.9
Total Del/Veh (s)	44.7	38.1	17.8	37.8	6.3	54.4	4.4	29.9

641: St Anthony Ave Performance by movement

Movement	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	7.4	3.5	6.2

649: Concordia Ave Performance by movement

Movement	EBT	SEL	All
Denied Del/Veh (s)	0.2	0.2	0.2
Total Del/Veh (s)	0.3	1.1	0.8

650: Lexington Ave & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	1.3	2.4	0.0	0.0	0.7
Total Del/Veh (s)	57.8	48.6	9.6	31.0	18.8	40.5	25.3	32.3

651: Concordia Ave Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	3.2	1.1	2.9

Total Network Performance

Denied Del/Veh (s)	1.1
Total Del/Veh (s)	76.1

Intersection: 110: Fry Street & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	LT	R
Maximum Queue (ft)	30	83	96	55	43	59	112	77	76	47
Average Queue (ft)	4	21	22	10	5	11	38	18	22	8
95th Queue (ft)	20	60	63	35	25	38	84	54	61	36
Link Distance (ft)		1035	1035		570	570		259	508	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	250			170			125			25
Storage Blk Time (%)							0	0	25	1
Queuing Penalty (veh)							0	0	3	0

Intersection: 200: Snelling Ave & Thomas Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	R
Maximum Queue (ft)	158	73	148	75	114	242	248	99	223	216	108
Average Queue (ft)	57	25	62	42	29	81	99	22	108	91	18
95th Queue (ft)	119	64	123	84	78	194	211	67	192	172	65
Link Distance (ft)	488		400			1213	1213		585	585	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)		25		25	200			200			125
Storage Blk Time (%)	38	6	43	10		1			0	1	0
Queuing Penalty (veh)	15	5	28	10		0			0	1	0

Intersection: 210: Snelling Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (ft)	69	107	118	172	150	183	100	240	246	125	225	361
Average Queue (ft)	27	37	48	73	54	85	77	160	170	50	128	208
95th Queue (ft)	62	81	99	138	120	159	119	255	264	133	237	324
Link Distance (ft)		570	570	213	213	213		209	209			1213
Upstream Blk Time (%)						0		3	4			
Queuing Penalty (veh)						0		14	16			
Storage Bay Dist (ft)	250						50			75	125	
Storage Blk Time (%)							34	26	26	0	6	24
Queuing Penalty (veh)							123	31	14	1	26	31

Intersection: 210: Snelling Ave & University Ave

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	383	225
Average Queue (ft)	223	60
95th Queue (ft)	341	186
Link Distance (ft)	1213	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		175
Storage Blk Time (%)	17	
Queuing Penalty (veh)	13	

Intersection: 220: Snelling Ave & Spruce Tree Rd

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	
Directions Served	LT	R	LT	R	L	T	T	R	L	T	TR	
Maximum Queue (ft)	56	73	114	65	72	193	214	33	65	50	80	
Average Queue (ft)	16	38	51	18	22	72	87	8	16	9	15	
95th Queue (ft)	46	65	104	48	53	153	168	27	48	34	52	
Link Distance (ft)	550	550	610			212	212	212		209	209	
Upstream Blk Time (%)						0	0					
Queuing Penalty (veh)						0	1					
Storage Bay Dist (ft)				175	150				110			
Storage Blk Time (%)						1			0			
Queuing Penalty (veh)						0			0			

Intersection: 230: Snelling Ave & Shields Ave

Movement	EB	NB	SB
Directions Served	R	L	TR
Maximum Queue (ft)	52	64	21
Average Queue (ft)	15	24	1
95th Queue (ft)	43	54	10
Link Distance (ft)	910	92	212
Upstream Blk Time (%)		0	
Queuing Penalty (veh)		0	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 235: Snelling Ave & Snelling Access

Movement	WB	SB	SB
Directions Served	R	T	T
Maximum Queue (ft)	31	6	11
Average Queue (ft)	8	0	0
95th Queue (ft)	29	4	8
Link Distance (ft)	350	92	92
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 239: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	239	317	325	106	246	246	172	161	115	80	185	169
Average Queue (ft)	96	179	167	5	158	168	67	69	48	27	77	80
95th Queue (ft)	175	273	264	66	234	246	127	125	91	64	143	142
Link Distance (ft)	450	450	450	450	233	233	233	233			507	507
Upstream Blk Time (%)		0	0		1	1						
Queuing Penalty (veh)		0	0		3	5						
Storage Bay Dist (ft)									300	300		
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	332
Average Queue (ft)	73
95th Queue (ft)	245
Link Distance (ft)	507
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 241: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 249: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 250: Snelling Ave & Concordia Ave

Movement	EB	EB	EB	EB	NB	NB	NB	NB	NB	B5	B5	SB
Directions Served	L	LT	T	R	T	T	T	T	R	T	T	L
Maximum Queue (ft)	302	269	201	8	219	244	339	244	130	150	23	248
Average Queue (ft)	163	166	50	0	126	152	108	105	51	8	1	99
95th Queue (ft)	261	250	141	6	227	243	269	199	101	81	17	185
Link Distance (ft)	436	436	436				291	291	291	595	595	233
Upstream Blk Time (%)							1	0				0
Queuing Penalty (veh)							7	0				1
Storage Bay Dist (ft)				100	190	190						
Storage Blk Time (%)			0		1	3	0					
Queuing Penalty (veh)			2		2	11	1					

Intersection: 250: Snelling Ave & Concordia Ave

Movement	SB	SB	SB
Directions Served	L	T	T
Maximum Queue (ft)	221	224	213
Average Queue (ft)	59	74	71
95th Queue (ft)	142	162	170
Link Distance (ft)	233	233	233
Upstream Blk Time (%)	0	0	0
Queuing Penalty (veh)	0	0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 251: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 260: Snelling Ave & Marshall Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	347	616	148	250	458	225	224	488	469	100	122	434
Average Queue (ft)	231	276	22	59	212	105	51	278	245	18	30	194
95th Queue (ft)	381	828	77	171	399	231	156	440	408	74	88	370
Link Distance (ft)		1074			1226			602	602			595
Upstream Blk Time (%)		5						0	0			1
Queuing Penalty (veh)		0						0	0			5
Storage Bay Dist (ft)	300		175	200		175	150			75	125	
Storage Blk Time (%)	20	2	0		19	0		34	40	0		26
Queuing Penalty (veh)	54	6	0		36	0		16	16	0		8

Intersection: 260: Snelling Ave & Marshall Ave

Movement	SB	SB	B5	B5	B5
Directions Served	T	R	T	T	
Maximum Queue (ft)	421	150	113	213	117
Average Queue (ft)	196	84	6	19	4
95th Queue (ft)	380	181	65	122	59
Link Distance (ft)	595		291	291	291
Upstream Blk Time (%)	1			0	0
Queuing Penalty (veh)	6			0	0
Storage Bay Dist (ft)		100			
Storage Blk Time (%)	30	0			
Queuing Penalty (veh)	44	1			

Intersection: 270: Snelling Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	183	235	300	1733	199	776	762	250	509	448
Average Queue (ft)	67	105	89	1080	24	544	509	215	237	168
95th Queue (ft)	162	190	298	1822	115	838	802	286	550	415
Link Distance (ft)		1089		2121		923	923		602	602
Upstream Blk Time (%)						3	1		1	0
Queuing Penalty (veh)						0	0		5	0
Storage Bay Dist (ft)	225		200		125			175		
Storage Blk Time (%)	1	0		64		68		35	1	
Queuing Penalty (veh)	2	0		19		7		126	3	

Intersection: 310: West Midway Shopping Entrance & University Ave

Movement	NB
Directions Served	R
Maximum Queue (ft)	48
Average Queue (ft)	20
95th Queue (ft)	46
Link Distance (ft)	499
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 315: East Midway Shopping Entrance & University Ave

Movement	NB
Directions Served	R
Maximum Queue (ft)	53
Average Queue (ft)	21
95th Queue (ft)	47
Link Distance (ft)	439
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 410: University Ave & Pascal St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	LT	R
Maximum Queue (ft)	48	54	77	106	147	146	79	79	68	161	74
Average Queue (ft)	12	7	27	37	53	60	38	37	17	73	18
95th Queue (ft)	38	33	66	83	115	124	78	78	48	141	61
Link Distance (ft)		386	386		1220	1220	77	77	77	729	
Upstream Blk Time (%)							4	5	0		
Queuing Penalty (veh)							1	2	0		
Storage Bay Dist (ft)	225			250							25
Storage Blk Time (%)										52	2
Queuing Penalty (veh)										10	2

Intersection: 415: Pascal St & North Midway Shopping Entrance

Movement	EB	EB	NB	NB	NB	SB
Directions Served	L	R	LT	T	T	TR
Maximum Queue (ft)	36	55	61	28	6	18
Average Queue (ft)	20	31	13	2	0	1
95th Queue (ft)	44	47	46	19	4	9
Link Distance (ft)	494			404	404	77
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		200	200			
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 420: Pascal St & North Walmart/Cub Entrance

Movement	WB	NB	SB	SB
Directions Served	LR	TR	L	T
Maximum Queue (ft)	82	14	36	4
Average Queue (ft)	39	0	6	0
95th Queue (ft)	66	8	28	3
Link Distance (ft)	778	49		404
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		0		
Storage Bay Dist (ft)			125	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 425: Pascal St & South Midway Shopping Entrance

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	60	31
Average Queue (ft)	21	2
95th Queue (ft)	49	13
Link Distance (ft)	697	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		45
Storage Blk Time (%)		0
Queuing Penalty (veh)		0

Intersection: 430: Pascal St & South Cub Entrance

Movement	WB	WB	NB	SB
Directions Served	L	R	TR	L
Maximum Queue (ft)	47	52	4	35
Average Queue (ft)	18	17	0	6
95th Queue (ft)	44	44	3	27
Link Distance (ft)		798	74	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	75			40
Storage Blk Time (%)	0	0		0
Queuing Penalty (veh)	0	0		0

Intersection: 435: Pascal St & Empty St. Paul Lot Entrance

Movement	NB	SB
Directions Served	LT	TR
Maximum Queue (ft)	25	15
Average Queue (ft)	2	1
95th Queue (ft)	14	13
Link Distance (ft)	179	74
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 440: Pascal St & St Anthony Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	TR	L	T	T	R
Maximum Queue (ft)	118	84	71	147	149	75
Average Queue (ft)	41	30	13	60	72	28
95th Queue (ft)	91	72	46	116	132	73
Link Distance (ft)	1228	1228		276	179	
Upstream Blk Time (%)					0	
Queuing Penalty (veh)					1	
Storage Bay Dist (ft)			100			50
Storage Blk Time (%)				3	22	0
Queuing Penalty (veh)				0	8	0

Intersection: 450: Pascal St & Concordia Ave

Movement	EB	EB	NB	SB	SB
Directions Served	LT	TR	TR	L	T
Maximum Queue (ft)	80	76	67	97	76
Average Queue (ft)	41	36	39	42	30
95th Queue (ft)	65	59	59	78	62
Link Distance (ft)	676	676	947		276
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				100	
Storage Blk Time (%)				0	0
Queuing Penalty (veh)				0	0

Intersection: 451: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 460: Pascal St & Marshall Ave

Movement	EB	WB	WB	NB	SB
Directions Served	L	L	TR	LTR	LTR
Maximum Queue (ft)	61	31	4	40	84
Average Queue (ft)	20	2	0	12	40
95th Queue (ft)	53	15	3	38	69
Link Distance (ft)			1247	350	947
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	100	100			
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 510: Hamline Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	TR
Maximum Queue (ft)	50	117	126	127	172	139	190	329	83	149	365
Average Queue (ft)	15	41	59	64	76	42	92	224	35	31	203
95th Queue (ft)	44	92	110	112	140	101	193	346	66	100	325
Link Distance (ft)		1220	1220		782	782		315	315		606
Upstream Blk Time (%)								5			
Queuing Penalty (veh)								15			
Storage Bay Dist (ft)	275			275			140			100	
Storage Blk Time (%)							3	31			38
Queuing Penalty (veh)							11	32			10

Intersection: 520: Hamline Ave & Midway Market Place

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	55	84	48	56	104	331	157	88	91	126
Average Queue (ft)	15	31	10	18	30	101	27	26	18	22
95th Queue (ft)	45	63	36	48	86	239	94	64	62	73
Link Distance (ft)		380		396		792	792		315	315
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	125		200		75			125		
Storage Blk Time (%)		0			1	11		0	0	
Queuing Penalty (veh)		0			3	6		0	0	

Intersection: 539: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 540: Hamline Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	T	R	LT	T	T	TR
Maximum Queue (ft)	145	148	117	148	266	234	156	156
Average Queue (ft)	62	77	53	65	165	38	61	65
95th Queue (ft)	112	128	98	110	278	138	126	134
Link Distance (ft)	377	377	377	377	249	249	792	792
Upstream Blk Time (%)					1	0		
Queuing Penalty (veh)					5	0		
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 550: Hamline Ave & Concordia Ave

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	LT	T	R	T	TR	LT	T
Maximum Queue (ft)	78	78	76	334	299	198	190
Average Queue (ft)	39	24	41	181	124	94	68
95th Queue (ft)	73	60	71	290	235	163	147
Link Distance (ft)	937	937		942	942	249	249
Upstream Blk Time (%)						0	0
Queuing Penalty (veh)						0	0
Storage Bay Dist (ft)			25				
Storage Blk Time (%)		18	12				
Queuing Penalty (veh)		18	2				

Intersection: 560: Hamline Ave & Marshall Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	TR	LT	TR
Maximum Queue (ft)	86	234	143	248	360	301	200	193
Average Queue (ft)	35	100	28	137	172	129	88	97
95th Queue (ft)	70	183	80	219	304	259	159	163
Link Distance (ft)		1247		659	612	612	942	942
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	200		150					
Storage Blk Time (%)		1	0	6				
Queuing Penalty (veh)		0	0	2				

Intersection: 570: Hamline Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	128	83	159	100	153	179	183	162
Average Queue (ft)	58	16	66	44	80	78	94	67
95th Queue (ft)	104	57	122	91	139	147	165	136
Link Distance (ft)	1319		651		947	947	612	612
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		50		50				
Storage Blk Time (%)	20	0	22	4				
Queuing Penalty (veh)	3	0	16	4				

Intersection: 580: Hamline Ave & Ashland Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LR	R	T	TR	LT	T
Maximum Queue (ft)	222	202	194	159	212	98
Average Queue (ft)	117	106	101	51	92	33
95th Queue (ft)	184	180	169	115	169	81
Link Distance (ft)	343	343	677	677	947	947
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 590: Ayd Mill Rd & Ashland Ave

Movement	NB	NB	NB	SB	SB
Directions Served	L	L	T	T	TR
Maximum Queue (ft)	221	293	150	245	200
Average Queue (ft)	93	78	110	146	86
95th Queue (ft)	171	217	169	214	179
Link Distance (ft)	866	866		600	600
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		0	8		
Queuing Penalty (veh)		1	25		

Intersection: 610: Lexington Ave & University Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 639: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	252	311	258	294	299	256	151	120	215	249	494	408
Average Queue (ft)	137	200	112	132	202	116	49	47	168	134	257	215
95th Queue (ft)	224	287	234	234	304	255	108	103	245	310	498	404
Link Distance (ft)	443	443	443	443	241	241	241	241				
Upstream Blk Time (%)					13	1						
Queuing Penalty (veh)					48	3						
Storage Bay Dist (ft)									180	180		
Storage Blk Time (%)									22	7	14	
Queuing Penalty (veh)									50	16	61	

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	279
Average Queue (ft)	73
95th Queue (ft)	190
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 641: St Anthony Ave

Movement	WB	WB
Directions Served	LT	T
Maximum Queue (ft)	197	56
Average Queue (ft)	16	5
95th Queue (ft)	104	62
Link Distance (ft)	222	222
Upstream Blk Time (%)	0	0
Queuing Penalty (veh)	1	0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 649: Concordia Ave

Movement	EB	SE	SE
Directions Served	T	L	L
Maximum Queue (ft)	15	5	37
Average Queue (ft)	1	0	3
95th Queue (ft)	13	4	41
Link Distance (ft)	711	715	715
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 650: Lexington Ave & Concordia Ave

Movement	EB	EB	EB	EB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	LT	T	R	T	T	T	T	R	L	L	T
Maximum Queue (ft)	344	361	313	148	200	274	435	354	200	275	105	253
Average Queue (ft)	187	220	62	65	146	148	193	184	114	230	30	188
95th Queue (ft)	314	340	221	114	218	272	319	287	213	287	75	308
Link Distance (ft)	443	443	443	443			812	812		241	241	241
Upstream Blk Time (%)	0	1	1							16		7
Queuing Penalty (veh)	0	1	1							44		18
Storage Bay Dist (ft)					125	125			125			
Storage Blk Time (%)					20	9	20	18	4			
Queuing Penalty (veh)					60	27	120	43	11			

Intersection: 650: Lexington Ave & Concordia Ave

Movement	SB
Directions Served	T
Maximum Queue (ft)	253
Average Queue (ft)	186
95th Queue (ft)	310
Link Distance (ft)	241
Upstream Blk Time (%)	6
Queuing Penalty (veh)	18
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 651: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 1423

110: Fry Street & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.7	0.2	0.2	0.0	0.0	0.0	4.0	0.3	0.3	0.2	0.2	4.0
Total Del/Veh (s)	48.9	12.9	12.2	57.0	6.8	6.1	41.2	38.1	15.9	47.1	48.1	5.7

110: Fry Street & University Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	14.9

200: Snelling Ave & Thomas Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.4	0.4	3.7	0.4	0.4	3.9	0.0	0.0	0.0	2.4	0.4	2.6
Total Del/Veh (s)	38.6	39.0	16.3	34.1	30.7	12.0	25.5	6.0	5.8	24.2	11.8	4.2

200: Snelling Ave & Thomas Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.5
Total Del/Veh (s)	13.3

210: Snelling Ave & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.7	1.8
Total Del/Veh (s)	93.2	51.7	91.6	142.0	30.5	28.9	52.5	44.4	20.1	97.9	58.5	29.8

210: Snelling Ave & University Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.5
Total Del/Veh (s)	55.7

220: Snelling Ave & Spruce Tree Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.2	28.2	21.0	27.0	0.0	0.7	0.0	0.0	0.0	0.0
Total Del/Veh (s)	64.5	49.6	30.9	62.2	46.9	131.5	37.0	51.8	2.8	24.9	20.6	16.9

220: Snelling Ave & Spruce Tree Rd Performance by movement

Movement	All
Denied Del/Veh (s)	2.4
Total Del/Veh (s)	39.0

230: Snelling Ave & Shields Ave Performance by movement

Movement	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	35.9	0.0	0.0	0.0	0.0	2.6
Total Del/Veh (s)	258.7	14.0	17.2	14.9	9.6	31.9

235: Snelling Ave & Snelling Access Performance by movement

Movement	WBR	NBT	NBR	SBT	All
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	357.2	28.9	6.5	7.7	19.0

239: St Anthony Ave Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.0	0.3	0.2
Total Del/Veh (s)	1.7	1.3	1.4

240: Snelling Ave & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Total Del/Veh (s)	28.1	24.5	2.7	34.1	21.3	95.0	6.7	41.9

241: St Anthony Ave Performance by movement

Movement	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	4.0	4.0	4.0

249: Concordia Ave Performance by movement

Movement	EBT	SEL	All
Denied Del/Veh (s)	0.1	33.1	32.8
Total Del/Veh (s)	1.7	39.2	38.8

250: Snelling Ave & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	40.9	59.6	55.0	33.1	7.2	41.9	32.8	39.8

251: Concordia Ave Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	5.5	1.2	3.2

260: Snelling Ave & Marshall Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.3	1.1	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.5
Total Del/Veh (s)	50.0	34.1	18.4	43.7	29.9	16.2	45.7	15.7	8.6	89.0	82.8	69.0

260: Snelling Ave & Marshall Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.5
Total Del/Veh (s)	48.4

270: Snelling Ave & Selby Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	24.7	20.3	19.4	3.4	0.5	0.5	2.7	0.3	0.3	0.0	0.0	0.0
Total Del/Veh (s)	222.4	61.1	52.8	111.5	72.8	60.7	86.3	44.0	34.9	37.6	13.3	12.4

270: Snelling Ave & Selby Ave Performance by movement

Movement	All
Denied Del/Veh (s)	2.8
Total Del/Veh (s)	41.9

310: West Midway Shopping Entrance & University Ave Performance by movement

Movement	EBT	EBR	WBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	1.7	1.9	9.6	4.8	5.0

315: East Midway Shopping Entrance & University Ave Performance by movement

Movement	EBT	EBR	WBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	0.8	0.7	1.4	5.1	1.2

410: University Ave & Pascal St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	3.9
Total Del/Veh (s)	58.7	10.6	10.5	53.6	7.1	5.6	40.0	25.8	6.9	37.4	35.4	13.1

410: University Ave & Pascal St Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	18.7

415: Pascal St & North Midway Shopping Entrance Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.6	3.8	0.0	0.0	0.0	0.0	0.6
Total Del/Veh (s)	44.3	5.5	8.1	5.7	1.9	1.2	8.2

420: Pascal St & North Walmart/Cub Entrance Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.3	0.3	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	20.8	13.9	0.6	0.1	4.6	1.1	5.3

425: Pascal St & South Midway Shopping Entrance Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	9.0	4.0	2.8	0.7	0.5	0.3	1.2

430: Pascal St & South Cub Entrance Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	3.8	0.4	0.0	0.0	0.0	0.0	0.4
Total Del/Veh (s)	10.6	4.4	0.9	0.2	3.5	0.3	2.0

435: Pascal St & Empty St. Paul Lot Entrance Performance by movement

Movement	NBL	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	4.0	1.5	0.6	1.1

440: Pascal St & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	12.0	12.2	9.3	23.6	13.1	12.8	5.5	11.9

450: Pascal St & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	9.6	11.1	7.9	10.2	6.8	9.9	10.8	10.1

451: Concordia Ave Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	1.8	1.9	1.9

460: Pascal St & Marshall Ave Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	7.5	4.3	3.5	4.3	3.1	15.9	14.4	7.5	27.4	23.8	19.3	8.7

510: Hamline Ave & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.0	0.0	3.2	0.3	0.3	0.0	0.0	0.0	3.9	1.3	0.7
Total Del/Veh (s)	46.4	29.8	33.8	46.6	24.3	15.1	48.9	25.2	7.1	61.9	52.0	40.0

510: Hamline Ave & University Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.6
Total Del/Veh (s)	33.9

520: Hamline Ave & Midway Market Place Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.8	0.3	0.3	3.7	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	37.6	25.4	9.3	36.4	26.9	11.3	21.6	7.5	5.2	23.4	5.1	3.2

520: Hamline Ave & Midway Market Place Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	11.7

539: St Anthony Ave Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.2	0.2	0.2
Total Del/Veh (s)	0.3	1.0	0.7

540: Hamline Ave & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	33.0	29.6	15.6	28.8	14.7	14.5	12.1	19.9

550: Hamline Ave & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	37.5	36.4	25.1	15.1	10.4	18.5	8.7	17.6

560: Hamline Ave & Marshall Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.3	0.2	3.5	0.4	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	91.1	71.8	70.2	54.5	39.0	37.1	85.6	25.6	16.1	29.7	21.1	17.6

560: Hamline Ave & Marshall Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	37.5

570: Hamline Ave & Selby Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.2	3.0	0.4	0.5	3.7	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	41.4	41.0	10.9	43.8	42.1	11.2	26.3	5.3	3.6	20.2	12.6	7.7

570: Hamline Ave & Selby Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	13.9

580: Hamline Ave & Ashland Ave Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	25.6	21.4	7.3	6.1	22.5	5.5	13.9

590: Ayd Mill Rd & Ashland Ave Performance by movement

Movement	EBR	NBL	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.4	3.0	0.1	0.7
Total Del/Veh (s)	3.3	15.5	19.3	23.8	16.2

610: Lexington Ave & University Ave Performance by movement

Movement	NBT	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	1.3	1.3

639: St Anthony Ave Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.2	0.3	0.3
Total Del/Veh (s)	0.3	1.2	0.9

640: Lexington Ave & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.9	0.4	0.3
Total Del/Veh (s)	32.2	30.6	18.3	36.4	8.4	27.4	4.0	21.9

641: St Anthony Ave Performance by movement

Movement	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	6.6	3.6	5.4

649: Concordia Ave Performance by movement

Movement	EBT	SEL	All
Denied Del/Veh (s)	0.2	0.4	0.3
Total Del/Veh (s)	0.6	2.3	1.7

650: Lexington Ave & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	1.0	2.5	0.0	0.0	0.3
Total Del/Veh (s)	26.8	26.6	30.7	39.8	18.1	27.0	9.7	25.3

651: Concordia Ave Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	3.6	1.5	2.5

Total Network Performance

Denied Del/Veh (s)	4.5
Total Del/Veh (s)	99.1

Intersection: 110: Fry Street & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	LT	R
Maximum Queue (ft)	122	330	318	72	91	119	117	107	78	50
Average Queue (ft)	23	99	93	25	27	48	48	49	30	18
95th Queue (ft)	76	247	246	60	72	101	93	97	66	50
Link Distance (ft)		1035	1035		570	570		259	508	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	250			170			125			25
Storage Blk Time (%)		2					0	1	30	2
Queuing Penalty (veh)		1					0	0	6	1

Intersection: 200: Snelling Ave & Thomas Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	R
Maximum Queue (ft)	273	75	177	75	122	77	116	135	297	272	126
Average Queue (ft)	129	35	81	41	41	14	28	42	172	140	16
95th Queue (ft)	227	87	145	84	86	52	79	91	272	243	72
Link Distance (ft)	488		400			1213	1213		585	585	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)		25		25	200			200			125
Storage Blk Time (%)	64	6	48	12					4	6	0
Queuing Penalty (veh)	26	13	29	16					3	2	0

Intersection: 210: Snelling Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (ft)	298	506	514	279	179	196	100	260	268	125	225	906
Average Queue (ft)	157	193	214	138	95	113	73	237	240	81	170	379
95th Queue (ft)	298	435	444	279	159	179	125	263	268	159	271	848
Link Distance (ft)		570	570	213	213	213		209	209			1213
Upstream Blk Time (%)		2	2	20	0	0		35	45			0
Queuing Penalty (veh)		7	8	33	0	0		220	280			2
Storage Bay Dist (ft)	250						50			75	125	
Storage Blk Time (%)	2	11					25	65	66	1	23	32
Queuing Penalty (veh)	4	15					126	78	83	5	107	60

Intersection: 210: Snelling Ave & University Ave

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	888	225
Average Queue (ft)	361	101
95th Queue (ft)	820	253
Link Distance (ft)	1213	
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	1	
Storage Bay Dist (ft)		175
Storage Blk Time (%)	26	
Queuing Penalty (veh)	29	

Intersection: 220: Snelling Ave & Spruce Tree Rd

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	R	L	T	TR
Maximum Queue (ft)	148	216	304	187	211	312	314	77	160	228	232
Average Queue (ft)	56	88	132	80	60	253	264	22	39	121	126
95th Queue (ft)	115	172	386	189	202	344	336	54	109	251	256
Link Distance (ft)	550	550	610			212	212	212		209	209
Upstream Blk Time (%)			7		0	50	56			15	14
Queuing Penalty (veh)			0		0	209	235			85	83
Storage Bay Dist (ft)				175	150				110		
Storage Blk Time (%)			1	12		57			0	27	
Queuing Penalty (veh)			1	16		17			1	14	

Intersection: 230: Snelling Ave & Shields Ave

Movement	EB	NB	NB	NB	NB	SB	SB
Directions Served	R	L	T	T	T	T	TR
Maximum Queue (ft)	857	78	182	184	11	240	255
Average Queue (ft)	333	28	94	99	0	114	114
95th Queue (ft)	915	63	224	229	8	298	299
Link Distance (ft)	910	92	92	92	92	212	212
Upstream Blk Time (%)	14	0	40	44		15	13
Queuing Penalty (veh)	0	0	129	143		102	87
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 235: Snelling Ave & Snelling Access

Movement	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	R	T	T	T	TR	T	T	T
Maximum Queue (ft)	100	168	520	528	441	127	123	139
Average Queue (ft)	26	43	177	193	115	55	54	33
95th Queue (ft)	94	183	512	543	455	140	138	110
Link Distance (ft)	350		507	507	507	92	92	92
Upstream Blk Time (%)			1	3	1	25	19	3
Queuing Penalty (veh)			3	11	6	125	97	13
Storage Bay Dist (ft)		110						
Storage Blk Time (%)			33					
Queuing Penalty (veh)			107					

Intersection: 239: St Anthony Ave

Movement	WB
Directions Served	T
Maximum Queue (ft)	7
Average Queue (ft)	0
95th Queue (ft)	5
Link Distance (ft)	751
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	206	270	259	17	215	219	240	241	374	450	562	557
Average Queue (ft)	110	130	107	1	125	134	146	152	150	303	384	381
95th Queue (ft)	178	209	195	8	191	197	237	237	353	596	670	658
Link Distance (ft)	450	450	450	450	233	233	233	233			507	507
Upstream Blk Time (%)			0		0	0	1	1			27	27
Queuing Penalty (veh)			0		0	0	3	5			137	134
Storage Bay Dist (ft)									300	300		
Storage Blk Time (%)									0	5	55	
Queuing Penalty (veh)									0	15	333	

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	514
Average Queue (ft)	154
95th Queue (ft)	514
Link Distance (ft)	507
Upstream Blk Time (%)	2
Queuing Penalty (veh)	11
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 241: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 249: Concordia Ave

Movement	EB	SE	SE
Directions Served	T	L	L
Maximum Queue (ft)	12	614	640
Average Queue (ft)	1	272	280
95th Queue (ft)	7	871	872
Link Distance (ft)	1483	785	785
Upstream Blk Time (%)		14	17
Queuing Penalty (veh)		0	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 250: Snelling Ave & Concordia Ave

Movement	EB	EB	EB	EB	NB	NB	NB	NB	NB	B5	B5	SB
Directions Served	L	LT	T	R	T	T	T	T	R	T	T	L
Maximum Queue (ft)	435	496	449	400	200	250	360	366	172	192	196	240
Average Queue (ft)	269	335	305	265	82	133	191	211	52	40	41	145
95th Queue (ft)	502	559	539	532	169	255	363	371	115	243	243	233
Link Distance (ft)	436	436	436				291	291	291	595	595	233
Upstream Blk Time (%)	11	18	11				7	8		0	1	2
Queuing Penalty (veh)	57	97	57				31	38		2	4	6
Storage Bay Dist (ft)				100	190	190						
Storage Blk Time (%)			51	45	0	1	12					
Queuing Penalty (veh)			392	111	1	2	72					

Intersection: 250: Snelling Ave & Concordia Ave

Movement	SB	SB	SB
Directions Served	L	T	T
Maximum Queue (ft)	233	261	260
Average Queue (ft)	155	199	201
95th Queue (ft)	236	316	316
Link Distance (ft)	233	233	233
Upstream Blk Time (%)	2	7	7
Queuing Penalty (veh)	6	25	25
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 251: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 260: Snelling Ave & Marshall Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	284	371	193	159	237	166	90	261	253	98	199	686
Average Queue (ft)	137	190	47	63	130	46	26	112	113	25	51	652
95th Queue (ft)	246	326	150	120	211	114	67	226	230	82	155	735
Link Distance (ft)		664			1226			602	602			595
Upstream Blk Time (%)												54
Queuing Penalty (veh)												488
Storage Bay Dist (ft)	300		175	200		175	150			75	125	
Storage Blk Time (%)	0	13			3			7	23	0		53
Queuing Penalty (veh)	2	37			6			2	21	0		21

Intersection: 260: Snelling Ave & Marshall Ave

Movement	SB	SB	B5	B5	B5
Directions Served	T	R	T	T	
Maximum Queue (ft)	694	150	343	348	401
Average Queue (ft)	653	97	270	275	311
95th Queue (ft)	745	198	408	409	535
Link Distance (ft)	595		291	291	291
Upstream Blk Time (%)	53		4	9	50
Queuing Penalty (veh)	482		25	52	303
Storage Bay Dist (ft)		100			
Storage Blk Time (%)	53	0			
Queuing Penalty (veh)	85	1			

Intersection: 270: Snelling Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	275	537	300	526	200	436	423	250	519	482
Average Queue (ft)	136	287	89	315	54	287	262	188	178	155
95th Queue (ft)	289	555	253	606	163	448	413	286	451	387
Link Distance (ft)		609		930		564	564		602	602
Upstream Blk Time (%)		10				1	0		0	0
Queuing Penalty (veh)		0				0	0		1	1
Storage Bay Dist (ft)	225		200		125			175		
Storage Blk Time (%)	16	15	1	34	0	44		18	0	
Queuing Penalty (veh)	58	10	2	17	0	13		104	1	

Intersection: 310: West Midway Shopping Entrance & University Ave

Movement	EB	WB	WB	WB	NB
Directions Served	TR	T	T	T	R
Maximum Queue (ft)	76	154	126	89	69
Average Queue (ft)	3	24	21	3	29
95th Queue (ft)	50	135	182	62	56
Link Distance (ft)	213		505	505	499
Upstream Blk Time (%)	0		2		
Queuing Penalty (veh)	0		5		
Storage Bay Dist (ft)		200			
Storage Blk Time (%)		6	1		
Queuing Penalty (veh)		9	1		

Intersection: 315: East Midway Shopping Entrance & University Ave

Movement	EB	WB	NB
Directions Served	TR	T	R
Maximum Queue (ft)	7	27	64
Average Queue (ft)	0	2	29
95th Queue (ft)	5	26	54
Link Distance (ft)	505	386	439
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 410: University Ave & Pascal St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	LT	R
Maximum Queue (ft)	79	248	262	166	118	138	86	88	72	227	75
Average Queue (ft)	31	80	110	70	32	36	61	72	40	120	21
95th Queue (ft)	68	176	213	133	87	96	94	95	69	204	68
Link Distance (ft)		386	386		1220	1220	77	77	77	729	
Upstream Blk Time (%)							18	24	1		
Queuing Penalty (veh)							24	31	1		
Storage Bay Dist (ft)	225			250							25
Storage Blk Time (%)		0								58	2
Queuing Penalty (veh)		0								12	4

Intersection: 415: Pascal St & North Midway Shopping Entrance

Movement	EB	EB	NB	NB	NB	SB
Directions Served	L	R	LT	T	T	TR
Maximum Queue (ft)	158	78	148	114	16	37
Average Queue (ft)	63	41	49	31	1	3
95th Queue (ft)	125	67	114	91	10	16
Link Distance (ft)	494			404	404	77
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		200	200			
Storage Blk Time (%)	0		0			
Queuing Penalty (veh)	0		0			

Intersection: 420: Pascal St & North Walmart/Cub Entrance

Movement	WB	NB	SB
Directions Served	LR	TR	L
Maximum Queue (ft)	198	29	82
Average Queue (ft)	80	1	38
95th Queue (ft)	157	13	69
Link Distance (ft)	778	49	
Upstream Blk Time (%)		0	
Queuing Penalty (veh)		0	
Storage Bay Dist (ft)			125
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 425: Pascal St & South Midway Shopping Entrance

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (ft)	62	40	16	6
Average Queue (ft)	31	9	1	0
95th Queue (ft)	54	33	12	4
Link Distance (ft)	697		112	49
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		45		
Storage Blk Time (%)		0		
Queuing Penalty (veh)		1		

Intersection: 430: Pascal St & South Cub Entrance

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	88	76	16	35	6
Average Queue (ft)	38	30	1	9	0
95th Queue (ft)	69	57	8	32	4
Link Distance (ft)		798	74		112
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	75			40	
Storage Blk Time (%)	1	0		0	0
Queuing Penalty (veh)	1	0		1	0

Intersection: 435: Pascal St & Empty St. Paul Lot Entrance

Movement	NB	SB
Directions Served	LT	TR
Maximum Queue (ft)	62	28
Average Queue (ft)	8	2
95th Queue (ft)	38	19
Link Distance (ft)	179	74
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 440: Pascal St & St Anthony Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	TR	L	T	T	R
Maximum Queue (ft)	202	183	44	141	179	76
Average Queue (ft)	87	88	13	72	103	35
95th Queue (ft)	167	165	38	121	169	83
Link Distance (ft)	1228	1228		276	179	
Upstream Blk Time (%)					0	
Queuing Penalty (veh)					1	
Storage Bay Dist (ft)			100			50
Storage Blk Time (%)				2	23	0
Queuing Penalty (veh)				0	15	1

Intersection: 450: Pascal St & Concordia Ave

Movement	EB	EB	NB	SB	SB
Directions Served	LT	TR	TR	L	T
Maximum Queue (ft)	141	144	118	129	117
Average Queue (ft)	73	77	57	61	58
95th Queue (ft)	117	127	92	102	98
Link Distance (ft)	676	676	947		276
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				100	
Storage Blk Time (%)				1	1
Queuing Penalty (veh)				1	1

Intersection: 451: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 460: Pascal St & Marshall Ave

Movement	EB	WB	NB	SB
Directions Served	L	TR	LTR	LTR
Maximum Queue (ft)	64	32	56	214
Average Queue (ft)	26	2	24	100
95th Queue (ft)	56	15	49	176
Link Distance (ft)		1247	350	947
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 510: Hamline Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	TR
Maximum Queue (ft)	188	304	330	227	201	159	190	328	154	149	531
Average Queue (ft)	69	178	198	120	116	70	99	188	46	50	299
95th Queue (ft)	150	289	307	196	182	138	196	331	101	132	538
Link Distance (ft)		1220	1220		782	782		315	315		606
Upstream Blk Time (%)								2	0		3
Queuing Penalty (veh)								9	0		0
Storage Bay Dist (ft)	275			275			140			100	
Storage Blk Time (%)		1		0			3	19		0	50
Queuing Penalty (veh)		1		0			13	25		0	23

Intersection: 520: Hamline Ave & Midway Market Place

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	105	125	194	174	125	354	205	156	101	106
Average Queue (ft)	34	54	98	63	59	126	56	68	28	44
95th Queue (ft)	80	98	164	127	118	262	138	130	78	82
Link Distance (ft)		380		396		792	792		315	315
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	125		200		75			125		
Storage Blk Time (%)	0	0	0	0	4	14		2		
Queuing Penalty (veh)	0	0	0	0	13	16		5		

Intersection: 539: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 540: Hamline Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	T	R	LT	T	T	TR
Maximum Queue (ft)	226	238	235	286	276	263	207	205
Average Queue (ft)	132	155	124	125	165	118	121	122
95th Queue (ft)	195	218	206	228	267	239	189	189
Link Distance (ft)	377	377	377	377	249	249	792	792
Upstream Blk Time (%)					2	1		
Queuing Penalty (veh)					8	2		
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 550: Hamline Ave & Concordia Ave

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	LT	T	R	T	TR	LT	T
Maximum Queue (ft)	277	322	75	262	215	262	246
Average Queue (ft)	157	178	71	110	95	157	130
95th Queue (ft)	238	279	88	199	173	234	223
Link Distance (ft)	937	937		942	942	249	249
Upstream Blk Time (%)						0	0
Queuing Penalty (veh)						2	1
Storage Bay Dist (ft)			25				
Storage Blk Time (%)		52	46				
Queuing Penalty (veh)		169	53				

Intersection: 560: Hamline Ave & Marshall Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	TR	LT	TR
Maximum Queue (ft)	275	786	139	333	332	325	344	360
Average Queue (ft)	151	362	37	174	181	160	189	184
95th Queue (ft)	310	715	102	298	295	274	306	308
Link Distance (ft)		1247		659	612	612	942	942
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	200		150					
Storage Blk Time (%)	3	38		17				
Queuing Penalty (veh)	12	42		7				

Intersection: 570: Hamline Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	179	99	223	100	133	133	298	275
Average Queue (ft)	89	31	92	51	49	40	147	122
95th Queue (ft)	152	88	179	104	104	98	257	236
Link Distance (ft)	1319		651		947	947	612	612
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		50		50				
Storage Blk Time (%)	42	0	40	2				
Queuing Penalty (veh)	8	0	30	3				

Intersection: 580: Hamline Ave & Ashland Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LR	R	T	TR	LT	T
Maximum Queue (ft)	134	131	142	125	391	245
Average Queue (ft)	65	52	61	36	167	59
95th Queue (ft)	109	109	117	86	306	161
Link Distance (ft)	343	343	677	677	947	947
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 590: Ayd Mill Rd & Ashland Ave

Movement	EB	NB	NB	NB	SB	SB
Directions Served	R	L	L	T	T	TR
Maximum Queue (ft)	132	166	314	150	302	263
Average Queue (ft)	11	88	114	122	193	138
95th Queue (ft)	86	149	271	177	272	229
Link Distance (ft)	343	866	866		600	600
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)				100		
Storage Blk Time (%)			1	14		
Queuing Penalty (veh)			3	27		

Intersection: 610: Lexington Ave & University Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 639: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	280	312	268	309	273	268	201	190	166	250	527	386
Average Queue (ft)	149	172	85	157	169	107	93	85	76	138	253	224
95th Queue (ft)	230	258	195	268	283	236	156	153	136	271	429	350
Link Distance (ft)	443	443	443	443	241	241	241	241				
Upstream Blk Time (%)					4	1	0	0				
Queuing Penalty (veh)					13	4	0	0				
Storage Bay Dist (ft)									180	180		
Storage Blk Time (%)									0	0	18	
Queuing Penalty (veh)									0	1	120	

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	185
Average Queue (ft)	53
95th Queue (ft)	148
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 641: St Anthony Ave

Movement	WB	WB
Directions Served	LT	T
Maximum Queue (ft)	144	49
Average Queue (ft)	8	2
95th Queue (ft)	62	24
Link Distance (ft)	222	222
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 649: Concordia Ave

Movement	EB	EB	SE	SE
Directions Served	T	T	L	L
Maximum Queue (ft)	25	17	62	90
Average Queue (ft)	2	1	2	6
95th Queue (ft)	20	10	45	72
Link Distance (ft)	711	711	715	715
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 650: Lexington Ave & Concordia Ave

Movement	EB	EB	EB	EB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	LT	T	R	T	T	T	T	R	L	L	T
Maximum Queue (ft)	285	437	423	430	185	274	509	406	200	236	197	253
Average Queue (ft)	139	234	174	240	104	147	239	207	97	117	96	129
95th Queue (ft)	230	370	340	394	181	295	410	354	217	203	166	228
Link Distance (ft)	443	443	443	443			812	812		241	241	241
Upstream Blk Time (%)		1	0	1						0	0	0
Queuing Penalty (veh)		3	2	3						1	0	1
Storage Bay Dist (ft)					125	125			125			
Storage Blk Time (%)					9	6	35	26	1			
Queuing Penalty (veh)					25	16	185	46	1			

Intersection: 650: Lexington Ave & Concordia Ave

Movement	SB
Directions Served	T
Maximum Queue (ft)	253
Average Queue (ft)	132
95th Queue (ft)	236
Link Distance (ft)	241
Upstream Blk Time (%)	0
Queuing Penalty (veh)	2
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 651: Concordia Ave

Movement	EB
Directions Served	T
Maximum Queue (ft)	11
Average Queue (ft)	0
95th Queue (ft)	8
Link Distance (ft)	104
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 6946

Appendix C
Year 2035 Build Analysis

110: Fry Street & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)		0.1	0.2	0.0	0.0	0.0	4.0	0.2	0.1	0.1	0.1	4.3
Total Del/Veh (s)		5.6	3.0	25.7	7.7	7.0	12.7	6.9	2.4	7.2	10.2	3.9

110: Fry Street & University Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	6.8

200: Snelling Ave & Thomas Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.3	4.0	0.4	0.5	3.8	0.0	0.0	0.0	2.9	0.4	2.7
Total Del/Veh (s)	45.8	43.4	11.0	47.5	44.0	11.5	11.8	4.9	5.1	13.4	7.4	2.6

200: Snelling Ave & Thomas Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.5
Total Del/Veh (s)	9.3

210: Snelling Ave & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.4
Total Del/Veh (s)	58.8	34.4	24.5	53.1	29.5	24.4	43.5	10.6	6.4	42.3	27.4	8.1

210: Snelling Ave & University Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	25.4

220: Snelling Ave & Spruce Tree Rd Performance by movement

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	11.8	8.0	3.4	2.9	3.2	2.4	3.6

230: Snelling Ave & Shields Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	4.1	0.1	0.1	0.2	0.4	3.7	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	65.1	70.6	10.9	47.4	49.0	9.3	54.4	18.7	19.0	27.9	3.5	1.3

230: Snelling Ave & Shields Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	17.0

239: St Anthony Ave Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.0	0.3	0.2
Total Del/Veh (s)	1.5	1.8	1.7

240: Snelling Ave & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.1
Total Del/Veh (s)	34.0	32.9	2.9	31.0	9.5	24.1	11.3	19.8

241: St Anthony Ave Performance by movement

Movement	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	5.6	5.4	5.6

249: Concordia Ave Performance by movement

Movement	EBT	SEL	All
Denied Del/Veh (s)	0.1	0.6	0.5
Total Del/Veh (s)	0.1	2.1	2.0

250: Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.1	0.1	0.3	0.0	0.1
Total Del/Veh (s)	36.3	31.8	3.6	28.7	5.7	52.7	6.2	23.6

251: Concordia Ave Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	6.1	0.8	4.8

260: Snelling Ave & Marshall Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	52.1	51.1	52.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Total Del/Veh (s)	189.3	75.0	56.2	42.1	46.7	26.4	39.9	19.7	10.5	45.6	23.0	12.0

260: Snelling Ave & Marshall Ave Performance by movement

Movement	All
Denied Del/Veh (s)	8.0
Total Del/Veh (s)	40.8

270: Snelling Ave & Selby Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.7	0.4	0.4	104.3	103.5	104.4	12.6	4.2	3.1	0.0	0.0	0.0
Total Del/Veh (s)	32.6	22.7	17.0	125.9	148.1	141.1	132.3	86.8	71.5	95.4	21.5	16.8

270: Snelling Ave & Selby Ave Performance by movement

Movement	All
Denied Del/Veh (s)	26.4
Total Del/Veh (s)	79.1

310: West Midway Shopping Entrance & University Ave Performance by movement

Movement	EBT	EBR	WBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	1.4	1.4	0.5	2.7	0.9

315: East Midway Shopping Entrance & University Ave Performance by movement

Movement	EBT	EBR	WBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	0.5	0.6	0.9	3.1	0.8

410: University Ave & Pascal St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.5	0.0	0.1	0.0	0.0	0.0	0.1	0.2	4.1
Total Del/Veh (s)	42.3	11.6	6.9	41.1	5.9	3.7	34.8	27.8	4.8	29.9	32.5	6.6

410: University Ave & Pascal St Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	17.4

415: Pascal St & North Midway Shopping Entrance Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.9	4.3	2.6	0.3	1.6	1.2	2.4

420: Pascal St & North Walmart/Cub Entrance Performance by movement

Movement	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.5	3.1	6.9	3.7	3.5	0.6	0.3	2.7	2.0	1.1	2.5

430: Pascal St & South Cub Entrance Performance by movement

Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.8	2.9	2.2	1.7	1.3	3.0	0.6	1.7

440: Pascal St & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.9	6.1	4.9	21.2	14.9	13.0	4.3	8.6

450: Pascal St & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.3	6.5	3.3	6.8	4.1	6.9	7.8	6.4

451: Concordia Ave Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	1.5	1.5	1.5

460: Pascal St & Marshall Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.1	0.0	0.0	0.0		0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	7.2	2.3	1.9	4.5	3.6	2.4		10.9	4.5	12.7	11.1	8.4

460: Pascal St & Marshall Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	4.3

510: Hamline Ave & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	3.4	0.2	0.2	0.0	0.0	0.0	3.3	0.4	0.3
Total Del/Veh (s)	56.6	16.8	12.5	38.4	16.3	10.6	22.5	17.9	4.8	23.3	25.0	24.8

510: Hamline Ave & University Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	19.3

520: Hamline Ave & Midway Market Place Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	4.0	0.2	0.1	4.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	39.1	43.9	6.2	36.7	35.6	6.1	8.3	2.9	1.1	9.9	2.2	2.0

520: Hamline Ave & Midway Market Place Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	4.0

539: St Anthony Ave Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.1	0.2	0.2
Total Del/Veh (s)	0.1	0.5	0.4

540: Hamline Ave & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	31.6	30.8	8.5	10.7	7.0	8.0	4.0	12.2

550: Hamline Ave & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	25.6	24.8	5.5	13.6	7.4	22.9	6.5	13.0

560: Hamline Ave & Marshall Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.0	0.0	3.5	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	36.2	25.2	27.5	28.7	28.4	27.2	27.8	14.8	8.6	27.9	16.5	18.4

560: Hamline Ave & Marshall Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	20.2

570: Hamline Ave & Selby Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.1	2.7	0.4	0.5	3.7	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	36.2	31.4	4.9	29.4	34.1	9.8	12.7	8.6	5.9	22.0	10.5	6.5

570: Hamline Ave & Selby Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	11.8

580: Hamline Ave & Ashland Ave Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	30.4	20.7	13.8	6.3	17.5	6.4	16.4

590: Ayd Mill Rd & Ashland Ave Performance by movement

Movement	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.6	2.8	0.1	0.1	1.2
Total Del/Veh (s)	1.7	8.2	12.4	33.9	5.9	14.2

610: Lexington Ave & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBT	NBT	SBR	All
Denied Del/Veh (s)	4.1	0.1	0.1	0.1	0.0	4.1	0.2
Total Del/Veh (s)	30.2	16.1	1.9	19.2	1.2	1.5	3.2

639: St Anthony Ave Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.2	0.3	0.3
Total Del/Veh (s)	0.2	1.0	0.8

640: Lexington Ave & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	1.1	0.4	0.3
Total Del/Veh (s)	34.1	32.1	13.0	44.7	8.5	23.7	3.3	22.3

641: St Anthony Ave Performance by movement

Movement	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	7.2	3.4	6.1

649: Concordia Ave Performance by movement

Movement	EBT	SEL	All
Denied Del/Veh (s)	0.2	0.2	0.2
Total Del/Veh (s)	0.2	0.7	0.5

650: Lexington Ave & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	5.7	7.3	0.0	0.0	2.6
Total Del/Veh (s)	39.9	34.8	8.9	48.6	18.1	39.8	5.3	31.7

651: Concordia Ave Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	3.2	1.1	2.9

Total Network Performance

Denied Del/Veh (s)	7.8
Total Del/Veh (s)	73.8

Intersection: 110: Fry Street & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	LT	R
Maximum Queue (ft)	5	76	111	31	139	146	57	35	39	39
Average Queue (ft)	0	26	39	4	48	60	25	12	15	9
95th Queue (ft)	0	61	81	20	113	131	52	37	40	35
Link Distance (ft)		1035	1035		570	570		259	508	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	250			170			125			25
Storage Blk Time (%)					0				5	1
Queuing Penalty (veh)					0				0	0

Intersection: 200: Snelling Ave & Thomas Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	R
Maximum Queue (ft)	148	75	189	75	52	75	91	64	250	248	147
Average Queue (ft)	55	29	68	38	20	19	38	19	129	104	19
95th Queue (ft)	113	74	143	84	50	58	79	50	219	201	80
Link Distance (ft)	488		400			1213	1213		585	585	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)		25		25	200			200			125
Storage Blk Time (%)	51	6	52	9					1	3	0
Queuing Penalty (veh)	19	5	32	8					0	1	0

Intersection: 210: Snelling Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (ft)	82	109	162	154	158	187	194	226	252	122	224	304
Average Queue (ft)	34	46	82	68	74	105	94	108	130	27	126	182
95th Queue (ft)	70	92	139	128	137	166	166	210	233	94	217	289
Link Distance (ft)		570	570	212	212	212	208	208	208			1213
Upstream Blk Time (%)						0	0	0	1			
Queuing Penalty (veh)						0	1	1	3			
Storage Bay Dist (ft)	250									75	150	
Storage Blk Time (%)									9	0	3	18
Queuing Penalty (veh)									4	0	14	31

Intersection: 210: Snelling Ave & University Ave

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	295	191
Average Queue (ft)	173	35
95th Queue (ft)	270	117
Link Distance (ft)	1213	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		175
Storage Blk Time (%)	12	
Queuing Penalty (veh)	9	

Intersection: 220: Snelling Ave & Spruce Tree Rd

Movement	EB	WB	NB	NB	NB	NB	SB	SB
Directions Served	R	R	T	T	T	R	T	TR
Maximum Queue (ft)	116	26	73	138	143	90	136	171
Average Queue (ft)	43	7	7	17	27	10	26	28
95th Queue (ft)	79	24	39	79	98	49	95	113
Link Distance (ft)	555	604		202	202	202	208	208
Upstream Blk Time (%)					0		0	0
Queuing Penalty (veh)					0		0	0
Storage Bay Dist (ft)			25					
Storage Blk Time (%)			1	1				
Queuing Penalty (veh)			2	4				

Intersection: 230: Snelling Ave & Shields Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	LT	R	L	T	T	TR	L	T	TR
Maximum Queue (ft)	34	50	154	144	85	202	300	618	595	173	245	160
Average Queue (ft)	5	17	76	70	22	73	166	198	228	90	41	39
95th Queue (ft)	22	44	133	127	58	146	258	385	426	155	138	104
Link Distance (ft)		909	766	766			644	644	644		202	202
Upstream Blk Time (%)								0	0		0	0
Queuing Penalty (veh)								1	0		2	1
Storage Bay Dist (ft)	100				100	250				125		
Storage Blk Time (%)				7		0	1			3	0	
Queuing Penalty (veh)				2		0	1			15	1	

Intersection: 239: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	186	255	241	11	265	258	193	229	152	145	206	205
Average Queue (ft)	90	155	141	0	210	214	105	142	79	56	112	114
95th Queue (ft)	157	226	221	8	289	291	168	214	136	116	181	185
Link Distance (ft)	450	450	450	450	233	233	233	233			644	644
Upstream Blk Time (%)					5	6	0	0				
Queuing Penalty (veh)					27	33	0	2				
Storage Bay Dist (ft)									300	300		
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	266
Average Queue (ft)	117
95th Queue (ft)	261
Link Distance (ft)	644
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 241: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 249: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 250:

Movement	EB	EB	EB	NB	NB	NB	NB	NB	B5	B5	SB	SB
Directions Served	L	LT	T	T	T	T	T	R	T	T	L	L
Maximum Queue (ft)	335	334	287	219	250	363	321	129	284	187	248	220
Average Queue (ft)	211	213	66	147	173	181	185	58	49	28	138	99
95th Queue (ft)	299	300	197	248	271	356	303	108	259	187	212	181
Link Distance (ft)	436	436	436			291	291	291	595	595	233	233
Upstream Blk Time (%)						6	2		0	0	1	0
Queuing Penalty (veh)						40	15		1	0	1	0
Storage Bay Dist (ft)				190	190							
Storage Blk Time (%)			0	5	11	2						
Queuing Penalty (veh)			1	21	43	18						

Intersection: 250:

Movement	SB	SB
Directions Served	T	T
Maximum Queue (ft)	101	113
Average Queue (ft)	48	41
95th Queue (ft)	88	89
Link Distance (ft)	233	233
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 251: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 260: Snelling Ave & Marshall Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	350	708	102	154	351	225	198	426	419	100	173	331
Average Queue (ft)	333	530	21	43	159	70	48	212	215	15	32	188
95th Queue (ft)	402	905	70	120	272	167	133	349	357	62	115	308
Link Distance (ft)		664			1226			602	602			595
Upstream Blk Time (%)		45										
Queuing Penalty (veh)		0										
Storage Bay Dist (ft)	300		175	200		175	150			75	125	
Storage Blk Time (%)	72	1			9		0	16	32	0		25
Queuing Penalty (veh)	183	3			16		0	7	13	0		7

Intersection: 260: Snelling Ave & Marshall Ave

Movement	SB	SB	B5	B5
Directions Served	T	R	T	T
Maximum Queue (ft)	341	150	86	142
Average Queue (ft)	189	82	3	7
95th Queue (ft)	305	178	46	71
Link Distance (ft)	595		291	291
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)	30	0		
Queuing Penalty (veh)	47	2		

Intersection: 270: Snelling Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	106	189	300	980	199	589	580	250	552	547
Average Queue (ft)	37	96	77	854	25	489	458	225	305	221
95th Queue (ft)	82	167	274	1181	108	663	647	291	584	473
Link Distance (ft)		609		930		564	564		602	602
Upstream Blk Time (%)				53		18	11		1	0
Queuing Penalty (veh)				0		0	0		5	0
Storage Bay Dist (ft)	225		200		125			175		
Storage Blk Time (%)		0		64		65		48	1	
Queuing Penalty (veh)		0		17		7		175	3	

Intersection: 310: West Midway Shopping Entrance & University Ave

Movement	NB
Directions Served	R
Maximum Queue (ft)	30
Average Queue (ft)	13
95th Queue (ft)	37
Link Distance (ft)	499
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 315: East Midway Shopping Entrance & University Ave

Movement	NB
Directions Served	R
Maximum Queue (ft)	35
Average Queue (ft)	11
95th Queue (ft)	35
Link Distance (ft)	439
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 410: University Ave & Pascal St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	LT	R
Maximum Queue (ft)	36	134	154	193	90	112	116	89	65	99	73
Average Queue (ft)	7	44	57	89	27	35	49	37	18	37	17
95th Queue (ft)	27	100	120	160	73	90	99	74	50	80	55
Link Distance (ft)		387	387		1219	1219		225	225	729	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	225			250			200				25
Storage Blk Time (%)				0						31	2
Queuing Penalty (veh)				0						6	1

Intersection: 415: Pascal St & North Midway Shopping Entrance

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	70	29	4
Average Queue (ft)	37	4	0
95th Queue (ft)	60	20	3
Link Distance (ft)	454		225
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		100	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 420: Pascal St & North Walmart/Cub Entrance

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	L	L	TR
Maximum Queue (ft)	48	82	47	30	13
Average Queue (ft)	25	37	14	3	1
95th Queue (ft)	47	64	41	18	7
Link Distance (ft)	651	779			260
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100	125	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 430: Pascal St & South Cub Entrance

Movement	WB	WB	NB	SB
Directions Served	LT	R	TR	L
Maximum Queue (ft)	34	48	4	43
Average Queue (ft)	16	16	0	5
95th Queue (ft)	41	41	3	25
Link Distance (ft)	798	798	315	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				125
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 440: Pascal St & St Anthony Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	TR	L	T	T	R
Maximum Queue (ft)	114	121	39	87	122	64
Average Queue (ft)	52	49	9	43	56	9
95th Queue (ft)	99	91	32	78	106	37
Link Distance (ft)	1228	1228		276	315	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			100			50
Storage Blk Time (%)				0	11	0
Queuing Penalty (veh)				0	1	0

Intersection: 450: Pascal St & Concordia Ave

Movement	EB	EB	NB	SB	SB
Directions Served	LT	TR	TR	L	T
Maximum Queue (ft)	68	64	74	71	72
Average Queue (ft)	36	37	39	40	34
95th Queue (ft)	56	56	60	65	59
Link Distance (ft)	676	676	947		276
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				100	
Storage Blk Time (%)				0	0
Queuing Penalty (veh)				0	0

Intersection: 451: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 460: Pascal St & Marshall Ave

Movement	EB	WB	NB	SB
Directions Served	L	L	LTR	LTR
Maximum Queue (ft)	58	36	24	92
Average Queue (ft)	20	3	2	42
95th Queue (ft)	49	18	16	73
Link Distance (ft)			350	947
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100	100		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 510: Hamline Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	TR
Maximum Queue (ft)	48	144	152	114	184	155	189	316	63	76	280
Average Queue (ft)	8	48	67	51	90	51	58	147	29	22	141
95th Queue (ft)	30	109	123	96	155	114	132	267	58	68	237
Link Distance (ft)		1219	1219		782	782		315	315		606
Upstream Blk Time (%)								0			
Queuing Penalty (veh)								1			
Storage Bay Dist (ft)	275			275			140			100	
Storage Blk Time (%)								9			20
Queuing Penalty (veh)								9			5

Intersection: 520: Hamline Ave & Midway Market Place

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	47	82	51	53	71	114	43	63	44	52
Average Queue (ft)	11	26	7	14	22	40	8	20	5	9
95th Queue (ft)	37	59	30	41	54	100	32	53	26	37
Link Distance (ft)		380		396		792	792		315	315
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	125		200		75			125		
Storage Blk Time (%)		0			0	2				
Queuing Penalty (veh)		0			0	1				

Intersection: 539: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 540: Hamline Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	T	R	LT	T	T	TR
Maximum Queue (ft)	128	155	138	136	225	181	139	126
Average Queue (ft)	69	81	52	60	97	38	48	45
95th Queue (ft)	116	130	106	104	182	113	101	99
Link Distance (ft)	377	377	377	377	249	249	792	792
Upstream Blk Time (%)					0	0		
Queuing Penalty (veh)					0	0		
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 550: Hamline Ave & Concordia Ave

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	LT	T	R	T	TR	LT	T
Maximum Queue (ft)	120	103	75	222	190	182	161
Average Queue (ft)	52	41	37	116	73	89	60
95th Queue (ft)	98	81	73	197	143	152	124
Link Distance (ft)	937	937		942	942	249	249
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			25				
Storage Blk Time (%)		28	9				
Queuing Penalty (veh)		23	4				

Intersection: 560: Hamline Ave & Marshall Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	TR	LT	TR
Maximum Queue (ft)	81	235	159	258	321	282	162	160
Average Queue (ft)	34	110	31	141	155	115	69	67
95th Queue (ft)	71	192	95	233	268	236	127	121
Link Distance (ft)		1247		659	612	612	942	942
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	200		150					
Storage Blk Time (%)		1		8				
Queuing Penalty (veh)		1		3				

Intersection: 570: Hamline Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	118	58	151	98	195	214	148	115
Average Queue (ft)	50	10	63	47	100	103	67	42
95th Queue (ft)	96	40	119	90	170	181	130	97
Link Distance (ft)	1319		651		947	947	612	612
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		50		50				
Storage Blk Time (%)	17	0	22	5				
Queuing Penalty (veh)	2	0	23	5				

Intersection: 580: Hamline Ave & Ashland Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LR	R	T	TR	LT	T
Maximum Queue (ft)	246	220	172	141	213	102
Average Queue (ft)	117	106	95	47	96	38
95th Queue (ft)	195	189	159	107	167	88
Link Distance (ft)	343	343	677	677	947	947
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 590: Ayd Mill Rd & Ashland Ave

Movement	NB	NB	NB	SB	SB
Directions Served	L	L	T	T	TR
Maximum Queue (ft)	175	255	150	264	212
Average Queue (ft)	86	82	113	151	93
95th Queue (ft)	148	217	172	228	194
Link Distance (ft)	866	866		600	600
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		0	9		
Queuing Penalty (veh)		2	26		

Intersection: 610: Lexington Ave & University Ave

Movement	EB	EB	EB	WB	WB	SB
Directions Served	L	T	TR	T	TR	R
Maximum Queue (ft)	58	56	24	83	33	30
Average Queue (ft)	18	20	3	32	5	13
95th Queue (ft)	47	50	16	63	21	36
Link Distance (ft)		561	561	836	836	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	275					150
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 639: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	226	283	231	208	277	274	169	168	201	195	230	202
Average Queue (ft)	106	174	89	105	221	142	86	84	117	50	132	113
95th Queue (ft)	187	263	205	183	306	297	144	142	194	147	203	185
Link Distance (ft)	443	443	443	443	241	241	241	241				
Upstream Blk Time (%)					15	3		0				
Queuing Penalty (veh)					55	12		0				
Storage Bay Dist (ft)									180	180		
Storage Blk Time (%)									2	1	1	
Queuing Penalty (veh)									5	1	6	

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	159
Average Queue (ft)	48
95th Queue (ft)	125
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 641: St Anthony Ave

Movement	WB	WB
Directions Served	LT	T
Maximum Queue (ft)	210	40
Average Queue (ft)	28	2
95th Queue (ft)	135	21
Link Distance (ft)	222	222
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	1	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 649: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 650: Lexington Ave & Concordia Ave

Movement	EB	EB	EB	EB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	LT	T	R	T	T	T	T	R	L	L	T
Maximum Queue (ft)	259	297	200	134	199	255	507	520	200	252	81	108
Average Queue (ft)	136	183	43	62	155	174	310	276	104	176	26	51
95th Queue (ft)	221	278	135	108	229	306	757	704	211	275	62	94
Link Distance (ft)	443	443	443	443			812	812		241	241	241
Upstream Blk Time (%)							10	3		5		
Queuing Penalty (veh)							0	0		14		
Storage Bay Dist (ft)					125	125			125			
Storage Blk Time (%)					39	21	14	15	2			
Queuing Penalty (veh)					115	63	80	36	7			

Intersection: 650: Lexington Ave & Concordia Ave

Movement	SB
Directions Served	T
Maximum Queue (ft)	116
Average Queue (ft)	49
95th Queue (ft)	99
Link Distance (ft)	241
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 651: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 1354

110: Fry Street & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.9	0.2	0.3	0.0	0.0	0.0	4.0	0.3	0.3	0.2	0.1	4.2
Total Del/Veh (s)	63.9	7.4	5.2	70.1	10.4	8.3	48.3	46.0	17.1	65.6	44.7	8.6

110: Fry Street & University Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	12.9

200: Snelling Ave & Thomas Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.4	0.4	3.7	0.4	0.4	3.8	0.0	0.0	0.0	2.4	0.5	2.5
Total Del/Veh (s)	45.6	44.4	23.2	45.8	37.5	17.8	32.3	7.0	7.2	37.6	14.2	5.8

200: Snelling Ave & Thomas Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	15.9

210: Snelling Ave & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	59.7	58.4	64.8	69.3	32.7	27.6	31.7	27.2	13.6	89.8	60.0	37.1

210: Snelling Ave & University Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	46.6

220: Snelling Ave & Spruce Tree Rd Performance by movement

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Denied Del/Veh (s)	1.2	0.2	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	94.6	31.3	9.1	2.2	7.2	5.2	13.6

230: Snelling Ave & Shields Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.7	0.2	0.3	63.0	31.6	58.8	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	67.3	97.2	33.7	106.2	118.9	76.4	56.7	28.1	14.3	50.3	23.9	18.4

230: Snelling Ave & Shields Ave Performance by movement

Movement	All
Denied Del/Veh (s)	15.4
Total Del/Veh (s)	44.1

239: St Anthony Ave Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.0	0.3	0.2
Total Del/Veh (s)	1.4	2.2	2.0

240: Snelling Ave & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	100.7	42.1	3.1	39.9	10.9	71.0	18.2	40.5

241: St Anthony Ave Performance by movement

Movement	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	5.8	6.1	5.8

249: Concordia Ave Performance by movement

Movement	EBT	SEL	All
Denied Del/Veh (s)	0.1	6.3	6.3
Total Del/Veh (s)	0.4	14.1	14.0

250: Concordia Ave & Snelling Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.2	0.1	0.1	0.2	0.1	0.9	1.3	0.5
Total Del/Veh (s)	55.1	53.4	16.0	36.9	15.0	44.5	31.3	35.9

251: Concordia Ave Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	6.8	1.3	4.3

260: Snelling Ave & Marshall Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	7.8	5.2	8.6	0.0	0.0	0.0	0.0	0.0	0.0	3.7	3.5	4.5
Total Del/Veh (s)	85.1	38.3	30.1	92.4	49.7	18.2	38.1	6.4	4.9	78.4	57.8	47.6

260: Snelling Ave & Marshall Ave Performance by movement

Movement	All
Denied Del/Veh (s)	2.6
Total Del/Veh (s)	41.8

270: Snelling Ave & Selby Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.4	0.4	0.4	3.3	0.5	0.5	2.3	0.3	0.3	0.0	0.0	0.0
Total Del/Veh (s)	49.4	43.2	34.3	105.5	100.6	90.7	277.5	47.5	43.9	37.8	12.9	12.1

270: Snelling Ave & Selby Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	42.0

310: West Midway Shopping Entrance & University Ave Performance by movement

Movement	EBT	EBR	WBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.2	0.0
Total Del/Veh (s)	1.8	1.6	0.6	6.3	1.7

315: East Midway Shopping Entrance & University Ave Performance by movement

Movement	EBT	EBR	WBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	1.3	1.3	0.6	5.2	1.1

410: University Ave & Pascal St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	4.0
Total Del/Veh (s)	50.4	25.0	21.4	23.7	4.4	3.2	56.4	37.5	8.3	47.6	40.2	12.8

410: University Ave & Pascal St Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	24.8

415: Pascal St & North Midway Shopping Entrance Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	15.3	9.2	5.7	0.9	2.0	1.4	3.6

420: Pascal St & North Walmart/Cub Entrance Performance by movement

Movement	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	16.5	8.2	21.0	12.4	3.2	1.3	0.7	4.4	1.9	1.1	6.1

430: Pascal St & South Cub Entrance Performance by movement

Movement	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.0	13.5	4.6	4.2	2.3	1.5	5.5	0.8	3.1

440: Pascal St & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	10.8	11.1	8.2	27.2	19.7	21.3	10.0	15.2

450: Pascal St & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	10.1	11.5	9.5	10.2	7.1	12.5	13.7	11.4

451: Concordia Ave Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	1.9	1.9	1.9

460: Pascal St & Marshall Ave Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	9.8	4.3	3.8	4.9	3.5	15.5	18.6	7.8	49.0	48.2	40.3	13.7

510: Hamline Ave & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.0	0.1	3.2	0.4	0.4	0.0	0.0	0.0	4.3	1.3	0.9
Total Del/Veh (s)	42.1	25.0	27.2	56.3	24.9	15.4	49.7	37.2	8.8	67.5	64.5	52.8

510: Hamline Ave & University Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.5
Total Del/Veh (s)	36.5

520: Hamline Ave & Midway Market Place Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	3.8	0.3	0.3	3.7	0.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	80.8	36.2	13.7	42.8	48.5	23.2	26.1	9.0	5.0	23.3	5.4	3.8

520: Hamline Ave & Midway Market Place Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	15.3

539: St Anthony Ave Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.2	0.3	0.3
Total Del/Veh (s)	0.4	1.5	1.1

540: Hamline Ave & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	34.9	24.7	13.7	30.6	14.9	21.8	17.0	21.5

550: Hamline Ave & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	31.7	31.7	32.6	19.4	12.2	23.1	11.1	20.3

560: Hamline Ave & Marshall Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.0	0.0	3.7	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	54.5	53.4	48.8	43.0	34.0	32.4	128.7	41.7	26.6	102.3	78.6	75.3

560: Hamline Ave & Marshall Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	63.1

570: Hamline Ave & Selby Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.3	0.2	3.0	0.6	0.5	3.8	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	48.7	50.6	11.5	56.0	58.9	15.9	21.6	8.0	5.5	18.5	11.1	6.7

570: Hamline Ave & Selby Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	15.3

580: Hamline Ave & Ashland Ave Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0		0.0	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	24.7		21.7	8.1	4.5	39.8	11.6	21.7

590: Ayd Mill Rd & Ashland Ave Performance by movement

Movement	EBR	NBL	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.4	2.9	0.2	0.7
Total Del/Veh (s)	3.0	13.3	17.3	21.0	14.4

610: Lexington Ave & University Ave Performance by movement

Movement	EBL	EBT	EBR	WBT	NBT	SBR	All
Denied Del/Veh (s)	3.8	0.1	0.2	0.1	0.0	4.1	0.3
Total Del/Veh (s)	55.2	38.8	4.2	47.8	1.3	1.3	8.2

639: St Anthony Ave Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.2	0.3	0.3
Total Del/Veh (s)	0.2	1.2	0.9

640: Lexington Ave & St Anthony Ave Performance by movement

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.9	0.4	0.3
Total Del/Veh (s)	39.1	35.3	23.7	33.0	8.8	27.8	3.3	23.3

641: St Anthony Ave Performance by movement

Movement	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	6.7	3.4	5.4

649: Concordia Ave Performance by movement

Movement	EBT	SEL	All
Denied Del/Veh (s)	0.2	0.4	0.4
Total Del/Veh (s)	0.7	2.7	1.9

650: Lexington Ave & Concordia Ave Performance by movement

Movement	EBL	EBT	EBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	1.1	2.5	0.0	0.0	0.3
Total Del/Veh (s)	28.7	31.4	31.0	40.5	21.4	35.1	8.9	27.2

651: Concordia Ave Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	3.7	1.6	2.5

Total Network Performance

Denied Del/Veh (s)	4.6
Total Del/Veh (s)	96.7

Intersection: 110: Fry Street & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	LT	R
Maximum Queue (ft)	77	191	209	68	224	239	106	128	69	47
Average Queue (ft)	21	76	73	21	77	98	47	54	20	13
95th Queue (ft)	53	161	169	55	166	190	93	102	55	42
Link Distance (ft)		1035	1035		570	570		259	508	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	250			170			125			25
Storage Blk Time (%)		0			1		0	1	20	2
Queuing Penalty (veh)		0			0		0	0	3	1

Intersection: 200: Snelling Ave & Thomas Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	R
Maximum Queue (ft)	301	75	201	75	106	97	111	208	366	336	150
Average Queue (ft)	157	37	94	44	47	19	41	53	214	187	19
95th Queue (ft)	259	90	168	88	93	62	85	148	339	313	83
Link Distance (ft)	488		400			1213	1213		585	585	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)		25		25	200			200			125
Storage Blk Time (%)	68	8	56	15					9	11	0
Queuing Penalty (veh)	28	17	33	19					5	4	0

Intersection: 210: Snelling Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (ft)	250	323	339	198	196	220	241	258	278	125	225	753
Average Queue (ft)	103	192	213	104	104	123	120	172	199	56	202	441
95th Queue (ft)	191	287	314	175	176	192	216	291	314	134	265	915
Link Distance (ft)		570	570	212	212	212	208	208	208			1213
Upstream Blk Time (%)				1	0	1	2	11	19			1
Queuing Penalty (veh)				2	0	1	7	50	89			4
Storage Bay Dist (ft)	250									75	150	
Storage Blk Time (%)		4							50	1	23	29
Queuing Penalty (veh)		4							60	3	104	71

Intersection: 210: Snelling Ave & University Ave

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	732	225
Average Queue (ft)	435	122
95th Queue (ft)	891	274
Link Distance (ft)	1213	
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	2	
Storage Bay Dist (ft)		175
Storage Blk Time (%)	31	0
Queuing Penalty (veh)	33	0

Intersection: 220: Snelling Ave & Spruce Tree Rd

Movement	EB	WB	NB	NB	NB	NB	SB	SB
Directions Served	R	R	T	T	T	R	T	TR
Maximum Queue (ft)	309	146	74	299	306	83	211	212
Average Queue (ft)	151	49	19	111	130	6	70	71
95th Queue (ft)	400	105	69	305	326	42	206	202
Link Distance (ft)	555	604		202	202	202	208	208
Upstream Blk Time (%)	2			4	6	0	1	1
Queuing Penalty (veh)	0			19	27	0	4	5
Storage Bay Dist (ft)			25					
Storage Blk Time (%)			1	8				
Queuing Penalty (veh)			6	35				

Intersection: 230: Snelling Ave & Shields Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	LT	R	L	T	T	TR	L	T	TR
Maximum Queue (ft)	149	258	727	737	150	261	564	637	586	165	253	270
Average Queue (ft)	34	106	449	450	124	77	270	307	207	76	176	191
95th Queue (ft)	105	216	845	852	194	190	437	510	425	160	286	292
Link Distance (ft)		909	782	782			644	644	644		202	202
Upstream Blk Time (%)			15	23			0	0	0		14	17
Queuing Penalty (veh)			0	0			0	1	0		94	115
Storage Bay Dist (ft)	100				100	250				125		
Storage Blk Time (%)	0	21		54	5		9			2	26	
Queuing Penalty (veh)	0	6		106	21		6			11	20	

Intersection: 239: St Anthony Ave

Movement	WB	NW	NW
Directions Served	T	L	L
Maximum Queue (ft)	19	75	79
Average Queue (ft)	1	5	7
95th Queue (ft)	15	60	75
Link Distance (ft)	751	1278	1278
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	359	365	323	71	249	252	203	211	375	450	694	697
Average Queue (ft)	198	200	177	3	162	175	134	139	195	308	460	450
95th Queue (ft)	369	362	333	52	233	250	192	198	365	548	793	771
Link Distance (ft)	450	450	450	450	233	233	233	233			644	644
Upstream Blk Time (%)	1	1	1		1	1	0	0			15	9
Queuing Penalty (veh)	4	2	2		2	6	0	0			113	69
Storage Bay Dist (ft)									300	300		
Storage Blk Time (%)									0	9	40	
Queuing Penalty (veh)									1	35	322	

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	652
Average Queue (ft)	345
95th Queue (ft)	704
Link Distance (ft)	644
Upstream Blk Time (%)	6
Queuing Penalty (veh)	43
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 241: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 249: Concordia Ave

Movement	SE	SE
Directions Served	L	L
Maximum Queue (ft)	713	741
Average Queue (ft)	128	188
95th Queue (ft)	575	678
Link Distance (ft)	785	785
Upstream Blk Time (%)	2	5
Queuing Penalty (veh)	0	0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 250: Concordia Ave & Snelling Ave

Movement	EB	EB	EB	EB	NB	NB	NB	NB	NB	B5	B5	SB
Directions Served	L	LT	T	R	T	T	T	T	R	T	T	L
Maximum Queue (ft)	437	491	444	372	202	250	348	358	184	48	54	260
Average Queue (ft)	264	354	292	133	94	149	227	250	80	3	3	190
95th Queue (ft)	414	499	511	418	160	251	325	334	149	29	35	272
Link Distance (ft)	436	436	436				291	291	291	595	595	233
Upstream Blk Time (%)	1	4	2				3	5				6
Queuing Penalty (veh)	5	23	10				15	23				27
Storage Bay Dist (ft)				100	190	190						
Storage Blk Time (%)			15	16	0	1	18					
Queuing Penalty (veh)			116	40	0	4	108					

Intersection: 250: Concordia Ave & Snelling Ave

Movement	SB	SB	SB
Directions Served	L	T	T
Maximum Queue (ft)	258	268	271
Average Queue (ft)	185	185	185
95th Queue (ft)	271	325	331
Link Distance (ft)	233	233	233
Upstream Blk Time (%)	5	15	19
Queuing Penalty (veh)	22	71	88
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 251: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 260: Snelling Ave & Marshall Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	330	542	225	250	442	225	80	135	164	88	199	699
Average Queue (ft)	185	254	48	101	229	86	23	51	62	11	58	595
95th Queue (ft)	330	493	160	213	396	229	59	107	127	49	165	853
Link Distance (ft)		664			1226			602	602			595
Upstream Blk Time (%)		3										30
Queuing Penalty (veh)		0										301
Storage Bay Dist (ft)	300		175	200		175	150			75	125	
Storage Blk Time (%)	8	14		3	17	0		0	4	0	0	45
Queuing Penalty (veh)	36	41		12	32	0		0	3	0	2	18

Intersection: 260: Snelling Ave & Marshall Ave

Movement	SB	SB	B5	B5	B5
Directions Served	T	R	T	T	
Maximum Queue (ft)	700	150	376	350	396
Average Queue (ft)	598	100	268	268	278
95th Queue (ft)	855	200	458	442	520
Link Distance (ft)	595		291	291	291
Upstream Blk Time (%)	31		11	18	26
Queuing Penalty (veh)	309		75	118	173
Storage Bay Dist (ft)		100			
Storage Blk Time (%)	44	0			
Queuing Penalty (veh)	97	1			

Intersection: 270: Snelling Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	199	378	300	808	199	435	420	250	572	583
Average Queue (ft)	61	230	114	457	88	288	283	215	223	193
95th Queue (ft)	143	352	311	835	199	400	398	293	553	503
Link Distance (ft)		977		1142		1196	1196		602	602
Upstream Blk Time (%)				0					0	0
Queuing Penalty (veh)				0					2	2
Storage Bay Dist (ft)	225		200		125			175		
Storage Blk Time (%)		10		54	7	45		22	0	
Queuing Penalty (veh)		7		26	31	14		133	1	

Intersection: 310: West Midway Shopping Entrance & University Ave

Movement	EB	NB
Directions Served	TR	R
Maximum Queue (ft)	22	75
Average Queue (ft)	0	39
95th Queue (ft)	8	66
Link Distance (ft)	212	499
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 315: East Midway Shopping Entrance & University Ave

Movement	EB	EB	NB
Directions Served	T	TR	R
Maximum Queue (ft)	12	115	53
Average Queue (ft)	0	4	19
95th Queue (ft)	5	84	46
Link Distance (ft)	505	505	439
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 410: University Ave & Pascal St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	LT	R
Maximum Queue (ft)	135	309	334	238	42	44	219	233	102	215	75
Average Queue (ft)	31	192	216	121	8	6	136	104	46	109	15
95th Queue (ft)	87	296	307	207	31	25	206	202	82	191	57
Link Distance (ft)		387	387		1219	1219		225	225	729	
Upstream Blk Time (%)							0	1			
Queuing Penalty (veh)							0	3			
Storage Bay Dist (ft)	225			250			200				25
Storage Blk Time (%)		5		0			2	2		60	1
Queuing Penalty (veh)		1		0			2	3		10	2

Intersection: 415: Pascal St & North Midway Shopping Entrance

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (ft)	121	69	56	31
Average Queue (ft)	60	24	4	1
95th Queue (ft)	103	55	30	11
Link Distance (ft)	454		260	225
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)			0	
Queuing Penalty (veh)			0	

Intersection: 420: Pascal St & North Walmart/Cub Entrance

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	108	186	55	19	107	42
Average Queue (ft)	56	72	14	1	39	1
95th Queue (ft)	96	139	41	9	81	26
Link Distance (ft)	651	779		214		260
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			100		125	
Storage Blk Time (%)			0		0	
Queuing Penalty (veh)			0		0	

Intersection: 430: Pascal St & South Cub Entrance

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	TR	L	T
Maximum Queue (ft)	39	95	62	31	22	42	9
Average Queue (ft)	15	42	28	6	1	9	0
95th Queue (ft)	40	73	52	26	9	31	7
Link Distance (ft)	638	798	798		315		214
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)				100		125	
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 440: Pascal St & St Anthony Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	TR	L	T	T	R
Maximum Queue (ft)	138	200	87	188	293	74
Average Queue (ft)	56	70	15	85	168	19
95th Queue (ft)	114	137	53	155	266	63
Link Distance (ft)	1228	1228		276	315	
Upstream Blk Time (%)					0	
Queuing Penalty (veh)					0	
Storage Bay Dist (ft)			100			50
Storage Blk Time (%)				6	38	0
Queuing Penalty (veh)				1	12	0

Intersection: 450: Pascal St & Concordia Ave

Movement	EB	EB	NB	SB	SB
Directions Served	LT	TR	TR	L	T
Maximum Queue (ft)	127	146	117	149	209
Average Queue (ft)	69	80	60	81	85
95th Queue (ft)	107	120	95	137	154
Link Distance (ft)	676	676	947		276
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				100	
Storage Blk Time (%)				3	3
Queuing Penalty (veh)				6	8

Intersection: 451: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 460: Pascal St & Marshall Ave

Movement	EB	WB	NB	SB
Directions Served	L	TR	LTR	LTR
Maximum Queue (ft)	88	33	48	346
Average Queue (ft)	32	3	15	160
95th Queue (ft)	67	18	42	292
Link Distance (ft)		1247	350	947
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100			
Storage Blk Time (%)	0			
Queuing Penalty (veh)	1			

Intersection: 510: Hamline Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	TR
Maximum Queue (ft)	126	262	280	255	258	245	190	335	157	149	569
Average Queue (ft)	58	114	135	136	147	111	115	242	46	51	357
95th Queue (ft)	108	213	226	231	225	204	211	365	101	137	598
Link Distance (ft)		1219	1219		782	782		315	315		606
Upstream Blk Time (%)								8	0		4
Queuing Penalty (veh)								29	0		0
Storage Bay Dist (ft)	275			275			140			100	
Storage Blk Time (%)		0		0	0		2	37		0	55
Queuing Penalty (veh)		0		0	0		12	44		0	25

Intersection: 520: Hamline Ave & Midway Market Place

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	125	170	197	202	125	391	240	160	128	107
Average Queue (ft)	53	67	106	83	72	158	47	72	22	44
95th Queue (ft)	117	131	177	164	135	318	163	134	67	88
Link Distance (ft)		380		396		792	792		315	315
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	125		200		75			125		
Storage Blk Time (%)	1	1	1	1	7	19		3	0	
Queuing Penalty (veh)	2	1	1	1	19	21		6	0	

Intersection: 539: St Anthony Ave

Movement	WB	NW
Directions Served	T	L
Maximum Queue (ft)	19	19
Average Queue (ft)	1	2
95th Queue (ft)	15	25
Link Distance (ft)	611	922
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 540: Hamline Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	T	R	LT	T	T	TR
Maximum Queue (ft)	235	276	265	263	282	251	288	293
Average Queue (ft)	129	159	134	123	167	98	141	144
95th Queue (ft)	237	272	254	228	285	221	252	263
Link Distance (ft)	377	377	377	377	249	249	792	792
Upstream Blk Time (%)	0	1	0	0	3	0		
Queuing Penalty (veh)	0	2	1	0	13	1		
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 550: Hamline Ave & Concordia Ave

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	LT	T	R	T	TR	LT	T
Maximum Queue (ft)	299	356	75	292	230	255	261
Average Queue (ft)	153	185	72	146	123	153	132
95th Queue (ft)	247	328	85	248	213	258	248
Link Distance (ft)	937	937		942	942	249	249
Upstream Blk Time (%)						3	3
Queuing Penalty (veh)						19	16
Storage Bay Dist (ft)			25				
Storage Blk Time (%)		51	48				
Queuing Penalty (veh)		151	73				

Intersection: 560: Hamline Ave & Marshall Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	TR	LT	TR
Maximum Queue (ft)	275	626	137	332	529	514	880	884
Average Queue (ft)	115	292	33	173	327	269	489	490
95th Queue (ft)	269	532	89	288	500	474	884	894
Link Distance (ft)		1247		659	612	612	942	942
Upstream Blk Time (%)					0	0	1	3
Queuing Penalty (veh)					1	1	8	15
Storage Bay Dist (ft)	200		150					
Storage Blk Time (%)		28		14				
Queuing Penalty (veh)		30		5				

Intersection: 570: Hamline Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	210	72	279	100	181	178	318	322
Average Queue (ft)	95	16	122	68	86	78	119	91
95th Queue (ft)	173	58	240	122	160	156	236	218
Link Distance (ft)	1319		651		947	947	612	612
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		50		50				
Storage Blk Time (%)	44	0	51	3				
Queuing Penalty (veh)	7	0	50	4				

Intersection: 580: Hamline Ave & Ashland Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LR	R	T	TR	LT	T
Maximum Queue (ft)	204	184	145	94	628	544
Average Queue (ft)	76	69	65	31	298	162
95th Queue (ft)	156	151	122	73	569	400
Link Distance (ft)	343	343	677	677	947	947
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 590: Ayd Mill Rd & Ashland Ave

Movement	EB	NB	NB	NB	SB	SB
Directions Served	R	L	L	T	T	TR
Maximum Queue (ft)	142	154	251	150	298	259
Average Queue (ft)	5	80	79	112	189	133
95th Queue (ft)	62	131	203	167	270	231
Link Distance (ft)	343	866	866		600	600
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)				100		
Storage Blk Time (%)			1	11		
Queuing Penalty (veh)			3	23		

Intersection: 610: Lexington Ave & University Ave

Movement	EB	EB	EB	WB	WB	SB
Directions Served	L	T	TR	T	TR	R
Maximum Queue (ft)	142	158	108	103	41	49
Average Queue (ft)	53	67	24	49	6	12
95th Queue (ft)	110	123	70	95	23	37
Link Distance (ft)		561	561	836	836	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	275					150
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 639: St Anthony Ave

Movement	NW
Directions Served	L
Maximum Queue (ft)	6
Average Queue (ft)	0
95th Queue (ft)	5
Link Distance (ft)	742
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	301	352	349	365	279	242	184	199	183	250	525	374
Average Queue (ft)	165	198	120	181	181	126	89	81	82	149	271	235
95th Queue (ft)	252	297	254	317	265	219	153	149	148	285	426	342
Link Distance (ft)	443	443	443	443	241	241	241	241			1203	1203
Upstream Blk Time (%)		0	0	0	2	0	0	0				
Queuing Penalty (veh)		0	0	0	6	0	0	0				
Storage Bay Dist (ft)									180	180		
Storage Blk Time (%)									0	0	20	
Queuing Penalty (veh)									0	1	136	

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	157
Average Queue (ft)	44
95th Queue (ft)	121
Link Distance (ft)	1203
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 641: St Anthony Ave

Movement	WB	WB
Directions Served	LT	T
Maximum Queue (ft)	156	36
Average Queue (ft)	10	1
95th Queue (ft)	72	14
Link Distance (ft)	222	222
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 649: Concordia Ave

Movement	EB	EB	SE
Directions Served	T	T	L
Maximum Queue (ft)	19	6	103
Average Queue (ft)	2	0	6
95th Queue (ft)	18	7	60
Link Distance (ft)	711	711	715
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 650: Lexington Ave & Concordia Ave

Movement	EB	EB	EB	EB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	LT	T	R	T	T	T	T	R	L	L	T
Maximum Queue (ft)	350	449	423	433	181	275	533	433	200	250	234	249
Average Queue (ft)	171	280	226	269	98	138	242	223	117	135	121	124
95th Queue (ft)	285	414	388	418	162	276	416	357	235	226	208	216
Link Distance (ft)	443	443	443	443			812	812		241	241	241
Upstream Blk Time (%)		1	1	0			0			1	0	0
Queuing Penalty (veh)		3	3	2			0			3	1	1
Storage Bay Dist (ft)					125	125			125			
Storage Blk Time (%)					5	5	36	30	1			
Queuing Penalty (veh)					13	12	190	51	4			

Intersection: 650: Lexington Ave & Concordia Ave

Movement	SB
Directions Served	T
Maximum Queue (ft)	248
Average Queue (ft)	122
95th Queue (ft)	223
Link Distance (ft)	241
Upstream Blk Time (%)	0
Queuing Penalty (veh)	1
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 651: Concordia Ave

Movement	EB
Directions Served	T
Maximum Queue (ft)	11
Average Queue (ft)	1
95th Queue (ft)	11
Link Distance (ft)	104
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 4667

Appendix D
Event Mode Share

DRAFT - For Discussion Purposes Only!

2018 - 20,000 Capacity Event Trip Generation and Modal Split

24-May-16

			Weekday 6-7PM	Weekday 9-10PM		Saturday 1-2PM	Saturday 4-5PM
	Stadium Capacity		20,000	20,000		20,000	20,000
Notes	**Modes**						
A	Walk (Home or Work to Event)	3.0%	600	600	5.0%	1,000	1,000
	- Surrounding neighborhood	*3.0%*	*600*	*600*	*5.0%*	*1,000*	*1,000*
	- On-Site Apartments	*0.0%*	-	-	*0.0%*	-	-
	- Hotel	*0.0%*	-	-	*0.0%*	-	-
B	Bike	2.0%	400	400	2.0%	400	400
C	Express Bus	0.0%	-	-	0.0%	-	-
D	Charter Bus (Destination - Rochester to Event)	1.0%	200	200	3.0%	600	600
E	Shuttle Bus (Circulator to business)	2.0%	400	400	3.0%	600	600
G	Metro Transit - Regular Service	1.5%	300	300	1.5%	300	300
I	Taxi / Limo	0.5%	100	100	0.5%	100	100
	Total (Not from Auto or LRT/BRT)		2,000	2,000		3,000	3,000
	% (Not from Auto or LRT/BRT)	**10%**	10%	10%	**15%**	15%	15%
	Parking Spaces Available		400	400		400	400
	-Dedicated Event Spaces		*400*	*400*		*400*	*400*
J	Average Auto Occupancy		2.75	2.75		2.75	2.75
	Arrive by Auto to Site	**5.5%**	1,100	1,100	**5.5%**	1,100	1,100
K	Auto Arrival/Departure in Peak Hour		85%	95%		75%	95%
	Autos in Peak Hour		340	380		300	380
	Patrons using Transit (A-Line/LRT)	**34.8%**	6,960	6,960	**34.8%**	6,960	6,960
	NB	*1.8%*	*360*	*360*		*360*	*360*
	SB	*1.8%*	*360*	*360*		*360*	*360*
	EB	*14.4%*	*2,880*	*2,880*		*2,880*	*2,880*
	WB	*16.8%*	*3,360*	*3,360*		*3,360*	*3,360*
G	"A" Line Snelling BRT						
	NB Capacity Available (per hour)		*360*	*360*		*360*	*360*
	- Capacity of Vehicle		70	70		70	70
	- Existing use		10	10		10	10
	- Frequency of Service		6	6		6	6
	Hours Needed NB		***1.0***	***1.0***		***1.0***	***1.0***
	SB Capacity Available (per hour)		*360*	*360*		*360*	*360*
	- Capacity of Vehicle		*70*	*70*		*70*	*70*
	- Existing use		*10*	*10*		*10*	*10*
	- Frequency of Service		*6*	*6*		*6*	*6*
	Hours Needed SB		***1.0***	***1.0***		***1.0***	***1.0***
H	LRT						
	EB Capacity Available (per hour)		*2,880*	*2,880*		*2,880*	*2,880*
	- Capacity of Vehicle		*540*	*540*		*540*	*540*
	- Existing use		*60*	*60*		*60*	*60*
	- Frequency of Service		*6*	*6*		*6*	*6*
	Hours Needed EB		***1.0***	***1.0***		***1.0***	***1.0***
	WB Capacity Available (per hour)		*3,360*	*3,360*		*3,360*	*3,360*
	- Capacity of Vehicle		*540*	*540*		*540*	*540*
	- Existing use		*60*	*60*		*60*	*60*
	- Frequency of Service		*7*	*7*		*7*	*7*
	Hours Needed WB		***1.0***	***1.0***		***1.0***	***1.0***
	Remaining	**49.7%**	**9,940**	**9,940**	**44.7%**	**8,940**	**8,940**
	Shuttle Service to remote PnR	*44.9%*	8,978	-	*39.9%*	7,978	-
	Adjacent Parking	*4.8%*	963	963	*4.8%*	963	963

NOTES:

A	Walk	Event patrons within 1 mile walking radius (1% of population) - Three times as likely to attend match on weekday and 5 times as likely on weekend.
B	Bike	Estimated from Twins
C	Express Bus	No express bus service has been identified - MVTA or SW or Metro Transit
D	Charter Bus	Conservative Estimate
E	Local Shuttle Bus	Conservative Estimate
F	"A" Line Snelling BRT	DRAFT - Weekdays are six times an hour, but after 9pm twice per hour; Saturdays are six times an hour, but between 7:30 to 9:30 3 to 4 times an hour and after 9:30 twice an hour (Crush Capacity 70 passengers)
G	Metro Transit	DRAFT - Route 84 (Snelling) - 3 times an hour; Route 16 (University) - 2 times an hour; Route 21 - 3 time pr hour - Assumption 20 patrons per bus per direction
H	LRT	LRT has 6 LRT trains in each direction with capacity for 540 people in each direction. One additional WB assumed due to attendance imbalance
I	Taxi/Limo	Small number of event patrons
J	Auto Occupancy	Auto occupancy can range from 2.5 to 3.0. 2.75 has been the typical range used on the other stadium studies. Can be influenced by TMP Strategies.
K	Arrival/Departure	Twins Ballpark Data and other local sporting events

DRAFT - For Discussion Purposes Only!

2035 - 25,500 Capacity Event Trip Generation and Modal Split

24-May-16

			Weekday 6-7PM	Weekday 9-10PM		Saturday 1-2PM	Saturday 4-5PM
	Stadium Capacity		25,500	25,500		25,500	25,500
Notes	**Modes**						
A	Walk (Home or Work to Event)	6.9%	1,770	1,770	9.2%	2,345	2,345
	- Surrounding neighborhood	*4.0%*	*1,020*	*1,020*	*6.0%*	*1,530*	*1,530*
	- On-Site Work	*1.0%*	*250*	*250*	*0.2%*	*50*	*50*
	- On-Site Apartments	*0.5%*	*125*	*125*	*0.5%*	*125*	*125*
	- Hotel	*1.5%*	*375*	*375*	*2.5%*	*640*	*640*
B	Bike	2.0%	500	500	2.0%	500	500
C	Express Bus	0.0%	-	-	0.0%	-	-
D	Charter Bus (Destination - Rochester to Event)	1.0%	250	250	3.0%	765	765
E	Shuttle Bus (Circulator to business)	2.0%	500	500	2.0%	500	500
G	Metro Transit - Regular Service	1.5%	375	375	1.5%	375	375
I	Taxi / Limo	0.5%	120	120	0.5%	120	120
	Total (Not from Auto or LRT/BRT)		3,515	3,515		4,605	4,605
	% (Not from Auto or LRT/BRT)	**14%**	14%	14%	**18%**	18%	18%
	Parking Spaces Available		2,050	2,050		2,050	2,050
	-Dedicated Event Spaces		*190*	*190*		*190*	*190*
	- Available on-site Block A (755 Office Spaces - 0% for events)		*-*	*-*		*-*	*-*
	- Available on-site Block B (665 Office Spaces - 0% for events)		*-*	*-*		*-*	*-*
	- Available on-site Block C (735 Office Spaces - 100% for events)		*1,860*	*1,860*		*1,860*	*1,860*
J	Average Auto Occupancy		2.75	2.75		2.75	2.75
	Arrive by Auto to Site	**22.1%**	5,638	5,638	**22.1%**	5,638	5,638
K	Auto Arrival/Departure in Peak Hour		70%	95%		65%	90%
	Autos in Peak Hour		1,435	1,948		1,333	1,845
	Patrons using Transit (A-Line/LRT)	**27.3%**	6,960	6,960	**27.3%**	6,960	6,960
	NB	*1.4%*	*360*	*360*		*360*	*360*
	SB	*1.4%*	*360*	*360*		*360*	*360*
	EB	*11.3%*	*2,880*	*2,880*		*2,880*	*2,880*
	WB	*13.2%*	*3,360*	*3,360*		*3,360*	*3,360*
G	"A" Line Snelling BRT						
	NB Capacity Available (per hour)		*360*	*360*		*360*	*360*
	- Capacity of Vehicle		70	70		70	70
	- Existing use		10	10		10	10
	- Frequency of Service		6	6		6	6
	Hours Needed NB		***1.0***	***1.0***		***1.0***	***1.0***
	SB Capacity Available (per hour)		*360*	*360*		*360*	*360*
	- Capacity of Vehicle		*70*	*70*		*70*	*70*
	- Existing use		*10*	*10*		*10*	*10*
	- Frequency of Service		*6*	*6*		*6*	*6*
	Hours Needed SB		***1.0***	***1.0***		***1.0***	***1.0***
H	LRT						
	EB Capacity Available (per hour)		*2,880*	*2,880*		*2,880*	*2,880*
	- Capacity of Vehicle		*540*	*540*		*540*	*540*
	- Existing use		*60*	*60*		*60*	*60*
	- Frequency of Service		*6*	*6*		*6*	*6*
	Hours Needed EB		***1.0***	***1.0***		***1.0***	***1.0***
	WB Capacity Available (per hour)		*3,360*	*3,360*		*3,360*	*3,360*
	- Capacity of Vehicle		*540*	*540*		*540*	*540*
	- Existing use		*60*	*60*		*60*	*60*
	- Frequency of Service		*7*	*7*		*7*	*7*
	Hours Needed WB		***1.0***	***1.0***		***1.0***	***1.0***
	Remaining	**36.8%**	**9,388**	**9,388**	**32.5%**	**8,298**	**8,298**
	Shuttle Service to remote PnR	*32.3%*	8,233	-	*28.0%*	7,143	-
	Adjacent Parking	*4.5%*	1,155	1,155	*4.5%*	1,155	1,155

NOTES:

A	Walk	Event patrons within 1 mile walking radius (1% of population) - Three times as likely to attend match on weekday and 5 times as likely on weekend.
B	Bike	Estimated from Twins
C	Express Bus	No express bus service has been identified - MVTA or SW or Metro Transit
D	Charter Bus	Conservative Estimate
E	Local Shuttle Bus	Conservative Estimate
F	"A" Line Snelling BRT	DRAFT - Weekdays are six times an hour, but after 9pm twice per hour; Saturdays are six times an hour, but between 7:30 to 9:30 3 to 4 times an hour and after 9:30 twice an hour (Crush Capacity 70 passengers)
G	Metro Transit	DRAFT - Route 84 (Snelling) - 3 times an hour; Route 16 (University) - 2 times an hour; Route 21 - 3 time pr hour Assumption 20 patrons per bus per direction
H	LRT	LRT has 6 LRT trains in each direction with capacity for 540 people in each direction. One additional WB assumed due to attendance imbalance
I	Taxi/Limo	Small number of event patrons
J	Auto Occupancy	Auto occupancy can range from 2.5 to 3.0. 2.75 has been the typical range used on the other stadium studies. Can be influenced by TMP Strategies.
K	Arrival/Departure	Twins Ballpark Data and other local sporting events

Appendix E
Year of Opening Event Analysis

110: Fry Street & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.2	0.0	2.0	2.0	0.4
Total Del/Veh (s)	7.0	7.1	36.7	25.8	10.2

200: Snelling Ave & Thomas Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.8	1.5	0.0	0.4	0.4
Total Del/Veh (s)	29.3	21.2	11.8	8.6	12.6

210: Snelling Ave & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	27.0	30.6	27.6	31.0	29.2

220: Snelling Ave & Spruce Tree Rd Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	16.4	12.1	9.7	13.7	11.9

230: Snelling Ave & Shields Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.1	0.6	0.0	0.0	0.0
Total Del/Veh (s)	32.1	39.9	18.2	23.8	21.3

239: St Anthony Ave Performance by approach

Approach	WB	NW	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	1.3	0.7	0.9

240: Snelling Ave & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	12.6	29.1	21.9	22.6

241: St Anthony Ave Performance by approach

Approach	WB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	3.8	3.8

249: Concordia Ave Performance by approach

Approach	EB	SE	All
Denied Del/Veh (s)	0.1	0.0	0.0
Total Del/Veh (s)	0.3	7.7	7.7

250: Snelling Ave & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	32.6	31.5	22.8	29.7

251: Concordia Ave Performance by approach

Approach	EB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	3.4	3.4

260: Snelling Ave & Marshall Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	2.0	0.0	0.0	0.0	0.3
Total Del/Veh (s)	24.5	22.1	13.0	20.5	18.8

270: Snelling Ave & Selby Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.3	0.7	0.3	0.0	0.3
Total Del/Veh (s)	29.1	25.9	27.8	9.0	18.9

310: West Midway Shopping Entrance & University Ave Performance by approach

Approach	EB	WB	NB	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0
Total Del/Veh (s)	1.4	0.4	3.6	1.1

315: East Midway Shopping Entrance & University Ave Performance by approach

Approach	EB	WB	NB	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0
Total Del/Veh (s)	0.5	0.8	4.2	0.8

410: University Ave & Pascal St Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.1	0.0	0.7	0.1
Total Del/Veh (s)	11.5	13.3	23.6	32.0	15.7

415: Pascal St & North Midway Shopping Entrance Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	2.9	0.0	0.0	0.7
Total Del/Veh (s)	5.8	2.9	1.2	2.9

420: Pascal St & North Walmart/Cub Entrance Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.2	0.0	0.0	0.1
Total Del/Veh (s)	9.7	0.6	2.6	4.4

425: Pascal St & South Midway Shopping Entrance Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.3	0.0	0.0	0.0
Total Del/Veh (s)	10.3	5.2	1.6	4.2

430: Pascal St & South Cub Entrance Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	2.7	0.0	0.0	0.4
Total Del/Veh (s)	20.1	2.3	2.7	4.7

435: Pascal St & Empty St. Paul Lot Entrance Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.1	0.0	0.0	0.0
Total Del/Veh (s)	2.8	2.9	1.2	2.4

440: Pascal St & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	13.8	35.4	23.4	23.3

450: Pascal St & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	13.2	10.1	10.5	11.9

451: Concordia Ave Performance by approach

Approach	EB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	1.6	1.6

460: Pascal St & Marshall Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0	0.0
Total Del/Veh (s)	4.2	3.1	8.9	11.2	4.9

510: Hamline Ave & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.1	1.3	0.0	0.7	0.5
Total Del/Veh (s)	20.8	25.9	25.2	30.1	24.6

520: Hamline Ave & Midway Market Place Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.2	2.4	0.0	0.0	0.5
Total Del/Veh (s)	18.3	26.2	6.2	7.4	11.0

539: St Anthony Ave Performance by approach

Approach	WB	NW	All
Denied Del/Veh (s)	0.2	0.2	0.2
Total Del/Veh (s)	0.2	0.8	0.5

540: Hamline Ave & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	18.5	10.1	13.4	14.5

550: Hamline Ave & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	15.9	12.8	6.6	10.6

560: Hamline Ave & Marshall Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.7	0.0	0.0	0.1
Total Del/Veh (s)	23.2	23.3	17.3	13.7	18.0

570: Hamline Ave & Selby Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.5	1.5	0.0	0.0	0.2
Total Del/Veh (s)	27.8	23.1	3.7	4.5	8.4

580: Hamline Ave & Ashland Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.1	0.0	0.0
Total Del/Veh (s)	27.6	4.5	8.4	10.8

590: Ayd Mill Rd & Ashland Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	2.1	0.1	1.1
Total Del/Veh (s)	1.2	9.5	18.7	10.3

610: Lexington Ave & University Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.4	0.0	3.4	0.1
Total Del/Veh (s)	37.7	1.0	1.6	2.0

639: St Anthony Ave Performance by approach

Approach	WB	NW	All
Denied Del/Veh (s)	0.1	0.2	0.2
Total Del/Veh (s)	0.2	0.7	0.5

640: Lexington Ave & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	1.0	0.3
Total Del/Veh (s)	25.3	9.5	11.1	14.1

641: St Anthony Ave Performance by approach

Approach	WB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	4.5	4.5

649: Concordia Ave Performance by approach

Approach	EB	SE	All
Denied Del/Veh (s)	0.2	0.3	0.2
Total Del/Veh (s)	0.2	1.0	0.7

650: Lexington Ave & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	1.4	0.0	0.5
Total Del/Veh (s)	23.1	18.3	12.5	18.3

651: Concordia Ave Performance by approach

Approach	EB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	2.7	2.7

Total Network Performance

Denied Del/Veh (s)	1.8
Total Del/Veh (s)	60.0

Intersection: 110: Fry Street & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	LT	R
Maximum Queue (ft)	46	114	132	51	47	72	92	82	52	50
Average Queue (ft)	10	37	41	13	11	20	31	29	13	13
95th Queue (ft)	33	90	97	37	36	56	73	64	42	44
Link Distance (ft)		1035	1035		569	569		467	508	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	250			170			125			25
Storage Blk Time (%)							0		14	1
Queuing Penalty (veh)							0		1	0

Intersection: 200: Snelling Ave & Thomas Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	R
Maximum Queue (ft)	166	75	123	74	109	248	263	42	244	192	89
Average Queue (ft)	88	23	53	30	32	74	93	12	124	81	15
95th Queue (ft)	148	70	103	69	82	197	213	38	213	161	56
Link Distance (ft)	488		400			1213	1213		585	585	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)		25		25	200			200			125
Storage Blk Time (%)	54	3	38	6		1			1	1	0
Queuing Penalty (veh)	15	4	17	5		0			0	0	0

Intersection: 210: Snelling Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (ft)	91	160	175	216	106	170	114	261	258	125	224	362
Average Queue (ft)	41	59	85	94	44	72	51	167	185	66	98	190
95th Queue (ft)	82	119	146	174	90	132	92	278	295	148	201	311
Link Distance (ft)		569	569	212	212	212	208	208	208			1213
Upstream Blk Time (%)				1				6	12			
Queuing Penalty (veh)				2				16	31			
Storage Bay Dist (ft)	250									75	125	
Storage Blk Time (%)		0							37	0	1	23
Queuing Penalty (veh)		0							25	1	4	33

Intersection: 210: Snelling Ave & University Ave

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	339	190
Average Queue (ft)	190	23
95th Queue (ft)	305	86
Link Distance (ft)	1213	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		175
Storage Blk Time (%)	13	
Queuing Penalty (veh)	5	

Intersection: 220: Snelling Ave & Spruce Tree Rd

Movement	EB	WB	NB	NB	NB	NB	SB	SB
Directions Served	R	R	T	T	T	R	T	TR
Maximum Queue (ft)	85	57	97	248	264	57	234	226
Average Queue (ft)	36	17	14	72	86	11	119	120
95th Queue (ft)	72	42	64	203	233	40	256	259
Link Distance (ft)	553	602		215	215	215	208	208
Upstream Blk Time (%)				1	2		4	4
Queuing Penalty (veh)				4	6		18	21
Storage Bay Dist (ft)			50					
Storage Blk Time (%)			2	13				
Queuing Penalty (veh)			4	33				

Intersection: 230: Snelling Ave & Shields Ave

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	LTR	L	T	T	TR	L	T	TR
Maximum Queue (ft)	77	72	110	274	583	662	358	174	250	265
Average Queue (ft)	30	23	47	155	123	166	89	71	172	180
95th Queue (ft)	62	55	86	249	353	461	228	156	278	284
Link Distance (ft)	909		1792		644	644	644		215	215
Upstream Blk Time (%)					0	0			10	11
Queuing Penalty (veh)					0	1			47	54
Storage Bay Dist (ft)		300		200				100		
Storage Blk Time (%)				5	1			3	24	
Queuing Penalty (veh)				15	4			13	16	

Intersection: 239: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	156	179	145	11	224	221	268	272	179	237	287	281
Average Queue (ft)	74	108	47	0	144	105	223	229	66	74	125	134
95th Queue (ft)	135	162	108	8	203	193	302	295	139	160	245	246
Link Distance (ft)	450	450	450	450	233	233	233	233			644	644
Upstream Blk Time (%)					0	0	13	13				
Queuing Penalty (veh)					1	1	48	49				
Storage Bay Dist (ft)									300	300		
Storage Blk Time (%)											0	
Queuing Penalty (veh)											1	

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	111
Average Queue (ft)	5
95th Queue (ft)	48
Link Distance (ft)	644
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 241: St Anthony Ave

Movement	WB
Directions Served	L
Maximum Queue (ft)	46
Average Queue (ft)	2
95th Queue (ft)	28
Link Distance (ft)	202
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 249: Concordia Ave

Movement	SE	SE
Directions Served	L	L
Maximum Queue (ft)	322	396
Average Queue (ft)	40	60
95th Queue (ft)	257	316
Link Distance (ft)	781	781
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 250: Snelling Ave & Concordia Ave

Movement	EB	EB	EB	EB	NB	NB	NB	NB	NB	B5	SB	SB
Directions Served	L	LT	T	R	T	T	T	T	R	T	L	L
Maximum Queue (ft)	461	481	403	160	209	243	289	289	177	15	190	189
Average Queue (ft)	247	274	188	6	99	120	163	176	76	1	95	97
95th Queue (ft)	477	486	438	84	169	222	251	261	138	8	164	169
Link Distance (ft)	436	436	436				291	291	291	595	233	233
Upstream Blk Time (%)	8	7	2				0	0			0	0
Queuing Penalty (veh)	41	35	9				1	1			0	0
Storage Bay Dist (ft)				100	190	190						
Storage Blk Time (%)			2		0	1	5					
Queuing Penalty (veh)			11		0	3	23					

Intersection: 250: Snelling Ave & Concordia Ave

Movement	SB	SB
Directions Served	T	T
Maximum Queue (ft)	262	254
Average Queue (ft)	161	170
95th Queue (ft)	268	267
Link Distance (ft)	233	233
Upstream Blk Time (%)	2	1
Queuing Penalty (veh)	4	3
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 251: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 260: Snelling Ave & Marshall Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	170	198	86	78	204	145	49	210	205	100	199	359
Average Queue (ft)	75	113	16	32	93	29	15	90	107	27	28	200
95th Queue (ft)	135	188	52	65	168	79	40	165	188	86	107	337
Link Distance (ft)		664			1226			602	602			595
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	300		175	200		175	150			75	125	
Storage Blk Time (%)		1			1			2	19	0		20
Queuing Penalty (veh)		3			1			1	16	0		5

Intersection: 260: Snelling Ave & Marshall Ave

Movement	SB	SB	B5	B5	B5
Directions Served	T	R	T	T	
Maximum Queue (ft)	366	150	259	267	65
Average Queue (ft)	212	67	22	27	3
95th Queue (ft)	351	172	138	158	48
Link Distance (ft)	595		291	291	291
Upstream Blk Time (%)			0	0	0
Queuing Penalty (veh)			0	0	0
Storage Bay Dist (ft)		100			
Storage Blk Time (%)	26				
Queuing Penalty (veh)	26				

Intersection: 270: Snelling Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	130	152	119	310	174	303	284	232	164	115
Average Queue (ft)	46	76	27	163	34	174	167	118	32	41
95th Queue (ft)	106	134	80	276	100	255	251	202	96	89
Link Distance (ft)		609		930		564	564		602	602
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		200		125			175		
Storage Blk Time (%)		0		6	1	20		1		
Queuing Penalty (veh)		0		2	2	5		5		

Intersection: 310: West Midway Shopping Entrance & University Ave

Movement	NB
Directions Served	R
Maximum Queue (ft)	51
Average Queue (ft)	25
95th Queue (ft)	49
Link Distance (ft)	499
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 315: East Midway Shopping Entrance & University Ave

Movement	NB
Directions Served	R
Maximum Queue (ft)	54
Average Queue (ft)	26
95th Queue (ft)	50
Link Distance (ft)	439
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 410: University Ave & Pascal St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	LT	R
Maximum Queue (ft)	65	111	138	153	70	75	79	80	59	144	74
Average Queue (ft)	19	51	73	67	24	22	46	39	29	61	15
95th Queue (ft)	51	93	125	132	56	56	84	77	52	120	52
Link Distance (ft)		386	386		1220	1220	77	77	77	729	
Upstream Blk Time (%)							7	4	0		
Queuing Penalty (veh)							4	2	0		
Storage Bay Dist (ft)	225			250							25
Storage Blk Time (%)										44	1
Queuing Penalty (veh)										5	1

Intersection: 415: Pascal St & North Midway Shopping Entrance

Movement	EB	EB	NB	NB	SB
Directions Served	L	R	LT	T	TR
Maximum Queue (ft)	52	85	74	46	18
Average Queue (ft)	25	36	19	3	1
95th Queue (ft)	49	61	56	22	9
Link Distance (ft)	494			404	77
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		200	200		
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 420: Pascal St & North Walmart/Cub Entrance

Movement	WB	NB	SB	SB
Directions Served	LR	TR	L	T
Maximum Queue (ft)	159	22	84	42
Average Queue (ft)	61	1	28	2
95th Queue (ft)	122	8	65	19
Link Distance (ft)	778	49		404
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		0		
Storage Bay Dist (ft)			125	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 425: Pascal St & South Midway Shopping Entrance

Movement	EB	EB	NB	NB	SB
Directions Served	L	R	L	T	TR
Maximum Queue (ft)	35	40	72	151	60
Average Queue (ft)	7	13	58	55	27
95th Queue (ft)	28	37	81	148	58
Link Distance (ft)		2305		100	49
Upstream Blk Time (%)				3	1
Queuing Penalty (veh)				18	3
Storage Bay Dist (ft)	300		45		
Storage Blk Time (%)			13	0	
Queuing Penalty (veh)			20	2	

Intersection: 430: Pascal St & South Cub Entrance

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	92	127	79	49	18
Average Queue (ft)	45	30	16	15	1
95th Queue (ft)	80	75	65	44	9
Link Distance (ft)		798	74		100
Upstream Blk Time (%)			2		
Queuing Penalty (veh)			10		
Storage Bay Dist (ft)	75			40	
Storage Blk Time (%)	4	0		2	0
Queuing Penalty (veh)	2	0		3	0

Intersection: 435: Pascal St & Empty St. Paul Lot Entrance

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	31	144	66
Average Queue (ft)	4	14	9
95th Queue (ft)	19	78	43
Link Distance (ft)	734	179	74
Upstream Blk Time (%)		0	0
Queuing Penalty (veh)		0	1
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 440: Pascal St & St Anthony Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	TR	L	T	T	R
Maximum Queue (ft)	184	256	130	291	184	75
Average Queue (ft)	77	98	15	230	117	32
95th Queue (ft)	157	198	73	328	194	83
Link Distance (ft)	1228	1228		276	179	
Upstream Blk Time (%)				8	3	
Queuing Penalty (veh)				35	9	
Storage Bay Dist (ft)			100			50
Storage Blk Time (%)				39	35	0
Queuing Penalty (veh)				3	20	1

Intersection: 450: Pascal St & Concordia Ave

Movement	EB	EB	NB	SB	SB
Directions Served	LT	TR	TR	L	T
Maximum Queue (ft)	279	166	128	122	100
Average Queue (ft)	106	43	56	60	48
95th Queue (ft)	200	111	98	105	82
Link Distance (ft)	676	676	947		276
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				100	
Storage Blk Time (%)				1	0
Queuing Penalty (veh)				1	0

Intersection: 451: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 460: Pascal St & Marshall Ave

Movement	EB	WB	WB	NB	SB
Directions Served	L	L	TR	LTR	LTR
Maximum Queue (ft)	76	6	20	31	114
Average Queue (ft)	24	0	1	9	50
95th Queue (ft)	58	4	9	32	90
Link Distance (ft)			1247	350	947
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	100	100			
Storage Blk Time (%)	0				
Queuing Penalty (veh)	0				

Intersection: 510: Hamline Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	TR
Maximum Queue (ft)	91	173	182	178	151	111	173	264	94	149	259
Average Queue (ft)	38	80	97	101	73	41	68	122	31	29	127
95th Queue (ft)	80	150	164	168	137	95	138	226	71	97	222
Link Distance (ft)		1220	1220		782	782		315	315		606
Upstream Blk Time (%)								0			
Queuing Penalty (veh)								0			
Storage Bay Dist (ft)	275			275			140			100	
Storage Blk Time (%)							1	8			16
Queuing Penalty (veh)							2	8			4

Intersection: 520: Hamline Ave & Midway Market Place

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	107	128	162	121	107	171	95	127	97	124
Average Queue (ft)	34	52	86	49	41	63	28	48	24	46
95th Queue (ft)	82	104	144	101	87	135	70	98	68	95
Link Distance (ft)		380		396		792	792		315	315
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	125		200		75			125		
Storage Blk Time (%)	0	1	0		1	6		0		
Queuing Penalty (veh)	0	0	0		2	5		0		

Intersection: 539: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 540: Hamline Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	T	R	LT	T	T	TR
Maximum Queue (ft)	141	166	152	107	192	132	163	187
Average Queue (ft)	77	103	87	59	91	46	84	91
95th Queue (ft)	127	155	143	94	160	99	146	159
Link Distance (ft)	377	377	377	377	249	249	792	792
Upstream Blk Time (%)					0	0		
Queuing Penalty (veh)					0	0		
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 550: Hamline Ave & Concordia Ave

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	LT	T	R	T	TR	LT	T
Maximum Queue (ft)	164	99	72	182	138	132	125
Average Queue (ft)	76	35	41	75	56	78	64
95th Queue (ft)	132	70	73	136	111	123	115
Link Distance (ft)	937	937		942	942	249	249
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			25				
Storage Blk Time (%)		21	12				
Queuing Penalty (veh)		22	4				

Intersection: 560: Hamline Ave & Marshall Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	TR	LT	TR
Maximum Queue (ft)	95	241	76	213	212	214	143	157
Average Queue (ft)	39	116	22	105	110	101	64	75
95th Queue (ft)	81	206	55	174	178	175	113	129
Link Distance (ft)		1247		659	612	612	942	942
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	200		150					
Storage Blk Time (%)		1		2				
Queuing Penalty (veh)		1		1				

Intersection: 570: Hamline Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	144	59	140	98	88	83	110	80
Average Queue (ft)	63	12	66	30	32	19	37	21
95th Queue (ft)	120	45	120	69	69	51	82	56
Link Distance (ft)	1319		651		947	947	612	612
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		50		50				
Storage Blk Time (%)	22	0	25	1				
Queuing Penalty (veh)	3	0	13	1				

Intersection: 580: Hamline Ave & Ashland Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LR	R	T	TR	LT	T
Maximum Queue (ft)	115	106	120	81	146	130
Average Queue (ft)	55	42	46	19	67	55
95th Queue (ft)	95	87	93	55	118	110
Link Distance (ft)	343	343	677	677	947	947
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 590: Ayd Mill Rd & Ashland Ave

Movement	NB	NB	NB	SB	SB
Directions Served	L	L	T	T	TR
Maximum Queue (ft)	94	60	140	142	101
Average Queue (ft)	36	10	58	76	18
95th Queue (ft)	73	36	115	127	57
Link Distance (ft)	866	866		600	600
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)			1		
Queuing Penalty (veh)			1		

Intersection: 610: Lexington Ave & University Ave

Movement	WB	WB	WB	SB	SB	SB
Directions Served	L	T	TR	T	T	R
Maximum Queue (ft)	23	55	24	16	11	38
Average Queue (ft)	2	18	2	1	0	5
95th Queue (ft)	12	46	14	7	4	23
Link Distance (ft)		836	836	617	617	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	275					150
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 639: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	166	218	150	207	242	181	154	134	118	123	176	149
Average Queue (ft)	84	124	47	94	122	64	56	49	55	35	88	70
95th Queue (ft)	143	191	117	157	197	125	126	113	103	81	152	132
Link Distance (ft)	443	443	443	443	241	241	241	241			1203	1203
Upstream Blk Time (%)					0	0						
Queuing Penalty (veh)					0	0						
Storage Bay Dist (ft)									180	180		
Storage Blk Time (%)									0	0	0	
Queuing Penalty (veh)									0	0	0	

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	85
Average Queue (ft)	10
95th Queue (ft)	50
Link Distance (ft)	1203
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 641: St Anthony Ave

Movement	WB	WB
Directions Served	LT	T
Maximum Queue (ft)	45	11
Average Queue (ft)	2	0
95th Queue (ft)	17	8
Link Distance (ft)	222	222
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 649: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 650: Lexington Ave & Concordia Ave

Movement	EB	EB	EB	EB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	LT	T	R	T	T	T	T	R	L	L	T
Maximum Queue (ft)	239	277	199	180	150	154	219	193	138	192	124	121
Average Queue (ft)	154	179	79	82	73	59	119	98	48	98	54	43
95th Queue (ft)	222	255	172	143	129	114	200	175	99	164	102	93
Link Distance (ft)	443	443	443	443			812	812		241	241	241
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)					125	125			125			
Storage Blk Time (%)					1	0	8	3	0			
Queuing Penalty (veh)					3	1	34	6	1			

Intersection: 650: Lexington Ave & Concordia Ave

Movement	SB
Directions Served	T
Maximum Queue (ft)	105
Average Queue (ft)	31
95th Queue (ft)	82
Link Distance (ft)	241
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 651: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 950

110: Fry Street & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.3	0.0	1.9	3.8	0.5
Total Del/Veh (s)	5.5	4.9	34.3	7.0	8.1

200: Snelling Ave & Thomas Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.8	1.5	0.0	0.5	0.4
Total Del/Veh (s)	28.7	24.4	12.0	7.0	12.4

210: Snelling Ave & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Del/Veh (s)	23.9	24.8	26.7	31.6	27.6

220: Snelling Ave & Spruce Tree Rd Performance by approach

Approach	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	5.8	16.7	11.4

230: Snelling Ave & Shields Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.9	1.3	0.0	0.0	0.4
Total Del/Veh (s)	28.0	20.7	38.5	34.8	32.4

239: St Anthony Ave Performance by approach

Approach	WB	NW	All
Denied Del/Veh (s)	0.0	0.2	0.1
Total Del/Veh (s)	11.9	19.1	15.2

240: Snelling Ave & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.2	0.1
Total Del/Veh (s)	69.9	22.6	22.2	35.3

241: St Anthony Ave Performance by approach

Approach	WB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	8.4	8.4

249: Concordia Ave Performance by approach

Approach	EB	SE	All
Denied Del/Veh (s)	0.1	0.4	0.4
Total Del/Veh (s)	0.0	1.2	1.1

250: Snelling Ave & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	15.3	15.0	11.1	13.7

251: Concordia Ave Performance by approach

Approach	EB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	4.2	4.2

260: Snelling Ave & Marshall Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.9	0.0	0.0	0.0	0.3
Total Del/Veh (s)	23.9	22.6	7.8	19.5	16.8

270: Snelling Ave & Selby Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.0	0.6	0.3	0.0	0.3
Total Del/Veh (s)	31.4	24.9	25.9	9.1	18.6

310: West Midway Shopping Entrance & University Ave Performance by approach

Approach	EB	WB	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	1.2	0.4	0.8

315: East Midway Shopping Entrance & University Ave Performance by approach

Approach	EB	WB	NB	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0
Total Del/Veh (s)	0.6	0.7	3.4	0.9

410: University Ave & Pascal St Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.1	0.0	0.3	0.1
Total Del/Veh (s)	12.0	11.9	25.7	36.2	17.5

415: Pascal St & North Midway Shopping Entrance Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	2.6	0.0	0.0	0.5
Total Del/Veh (s)	7.4	3.3	1.4	3.3

420: Pascal St & North Walmart/Cub Entrance Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.2	0.0	0.0	0.0
Total Del/Veh (s)	14.4	1.1	3.5	5.3

425: Pascal St & South Midway Shopping Entrance Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.5	0.0	0.0	0.2
Total Del/Veh (s)	9.9	5.6	5.4	7.1

430: Pascal St & South Cub Entrance Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	2.6	0.0	0.0	0.4
Total Del/Veh (s)	12.3	1.1	2.9	3.7

435: Pascal St & Empty St. Paul Lot Entrance Performance by approach

Approach	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	1.6	3.4	2.8

440: Pascal St & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	14.2	31.0	20.0	19.6

450: Pascal St & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	6.4	6.1	9.1	7.7

451: Concordia Ave Performance by approach

Approach	EB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	1.3	1.3

460: Pascal St & Marshall Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0	0.0
Total Del/Veh (s)	3.7	2.5	6.4	9.8	4.4

510: Hamline Ave & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.1	1.4	0.0	0.6	0.5
Total Del/Veh (s)	19.3	25.9	24.5	28.1	23.6

520: Hamline Ave & Midway Market Place Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.1	2.3	0.0	0.0	0.5
Total Del/Veh (s)	20.0	25.7	5.3	6.1	10.3

539: St Anthony Ave Performance by approach

Approach	WB	NW	All
Denied Del/Veh (s)	0.2	0.2	0.2
Total Del/Veh (s)	0.1	0.5	0.3

540: Hamline Ave & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	17.9	7.2	10.2	12.2

550: Hamline Ave & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	17.0	13.9	7.5	11.6

560: Hamline Ave & Marshall Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.6	0.0	0.0	0.1
Total Del/Veh (s)	23.6	20.8	17.5	13.2	17.7

570: Hamline Ave & Selby Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.4	1.3	0.0	0.0	0.2
Total Del/Veh (s)	26.9	25.1	2.9	4.3	8.3

580: Hamline Ave & Ashland Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.1	0.0	0.0
Total Del/Veh (s)	27.6	4.0	7.3	10.7

590: Ayd Mill Rd & Ashland Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	2.0	0.1	0.9
Total Del/Veh (s)	1.2	10.7	16.1	10.3

610: Lexington Ave & University Ave Performance by approach

Approach	EB	NB	All
Denied Del/Veh (s)	2.0	0.0	0.1
Total Del/Veh (s)	41.3	0.8	2.4

639: St Anthony Ave Performance by approach

Approach	WB	NW	All
Denied Del/Veh (s)	0.1	0.2	0.2
Total Del/Veh (s)	0.1	0.6	0.4

640: Lexington Ave & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.7	0.3
Total Del/Veh (s)	25.4	8.2	8.2	12.1

641: St Anthony Ave Performance by approach

Approach	WB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	4.6	4.6

649: Concordia Ave Performance by approach

Approach	EB	SE	All
Denied Del/Veh (s)	0.2	0.2	0.2
Total Del/Veh (s)	0.2	0.8	0.6

650: Lexington Ave & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	1.3	0.0	0.4
Total Del/Veh (s)	22.9	15.6	9.5	15.7

651: Concordia Ave Performance by approach

Approach	EB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	3.1	3.1

Total Network Performance

Denied Del/Veh (s)	0.8
Total Del/Veh (s)	59.3

Intersection: 110: Fry Street & University Ave

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	T	TR	L	TR	LT	R
Maximum Queue (ft)	43	69	84	86	72	68	70	48	53
Average Queue (ft)	11	20	22	18	23	28	31	5	22
95th Queue (ft)	34	55	61	57	61	63	63	26	54
Link Distance (ft)		1035	1035	570	570		259	508	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	250					125			25
Storage Blk Time (%)								3	3
Queuing Penalty (veh)								1	0

Intersection: 200: Snelling Ave & Thomas Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	R
Maximum Queue (ft)	163	75	107	73	76	284	315	60	212	160	52
Average Queue (ft)	79	24	48	25	24	81	99	20	91	52	7
95th Queue (ft)	138	71	90	67	56	205	224	48	164	119	34
Link Distance (ft)	488		400			1213	1213		585	585	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)		25		25	200			200			125
Storage Blk Time (%)	54	3	41	4		1			0	0	0
Queuing Penalty (veh)	13	4	16	3		1			0	0	0

Intersection: 210: Snelling Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	T	R	L	T
Maximum Queue (ft)	87	131	168	152	129	160	134	257	267	125	224	317
Average Queue (ft)	31	50	77	72	51	82	55	156	170	57	68	158
95th Queue (ft)	70	99	141	131	102	146	110	283	295	139	153	276
Link Distance (ft)		570	570	212	212	212	220	220	220			1213
Upstream Blk Time (%)						0		8	10			
Queuing Penalty (veh)						0		21	27			
Storage Bay Dist (ft)	250									75	125	
Storage Blk Time (%)									30	1	0	17
Queuing Penalty (veh)									21	2	1	17

Intersection: 210: Snelling Ave & University Ave

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	321	126
Average Queue (ft)	162	30
95th Queue (ft)	278	98
Link Distance (ft)	1213	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		175
Storage Blk Time (%)	9	
Queuing Penalty (veh)	4	

Intersection: 220: Snelling Ave & Spruce Tree Rd

Movement	NB	NB	NB	SB	SB
Directions Served	T	T	T	T	TR
Maximum Queue (ft)	52	162	194	231	238
Average Queue (ft)	4	26	43	136	147
95th Queue (ft)	27	96	128	264	275
Link Distance (ft)		203	203	220	220
Upstream Blk Time (%)		0	0	4	5
Queuing Penalty (veh)		0	0	15	21
Storage Bay Dist (ft)	50				
Storage Blk Time (%)	0	5			
Queuing Penalty (veh)	0	14			

Intersection: 230: Snelling Ave & Shields Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	LT	R	L	T	T	TR	L	T	TR
Maximum Queue (ft)	124	247	354	393	150	180	300	376	83	174	241	230
Average Queue (ft)	21	71	90	111	55	42	180	195	34	37	166	176
95th Queue (ft)	65	170	237	274	144	108	268	301	62	121	269	270
Link Distance (ft)		909		1792			644	644	644		203	203
Upstream Blk Time (%)											13	17
Queuing Penalty (veh)											53	72
Storage Bay Dist (ft)	100		300		100	200				100		
Storage Blk Time (%)	0	10	1	14	0		9			0	28	
Queuing Penalty (veh)	0	4	3	67	1		4			0	9	

Intersection: 239: St Anthony Ave

Movement	WB	WB	NW	NW
Directions Served	T	T	L	L
Maximum Queue (ft)	236	178	122	267
Average Queue (ft)	56	21	17	68
95th Queue (ft)	237	130	130	280
Link Distance (ft)	751	751	1278	1278
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	439	491	496	361	264	249	166	188	134	106	246	513
Average Queue (ft)	187	299	272	80	162	106	75	88	42	27	62	121
95th Queue (ft)	430	543	565	349	261	228	140	165	107	76	176	364
Link Distance (ft)	450	450	450	450	233	233	233	233			644	644
Upstream Blk Time (%)	1	17	16	0	5	1		0				0
Queuing Penalty (veh)	2	40	36	0	12	2		0				0
Storage Bay Dist (ft)									300	300		
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	628
Average Queue (ft)	243
95th Queue (ft)	667
Link Distance (ft)	644
Upstream Blk Time (%)	2
Queuing Penalty (veh)	9
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 241: St Anthony Ave

Movement	WB	WB
Directions Served	L	LT
Maximum Queue (ft)	209	275
Average Queue (ft)	56	44
95th Queue (ft)	177	199
Link Distance (ft)	202	202
Upstream Blk Time (%)	0	2
Queuing Penalty (veh)	3	17
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 249: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 250: Snelling Ave & Concordia Ave

Movement	EB	EB	EB	NB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	T	T	T	T	R	L	L	T	T
Maximum Queue (ft)	165	183	118	184	196	235	190	116	205	185	182	185
Average Queue (ft)	96	100	20	88	58	74	85	54	89	60	76	79
95th Queue (ft)	156	164	75	164	148	155	162	102	160	125	154	162
Link Distance (ft)	436	436	436			291	291	291	233	233	233	233
Upstream Blk Time (%)						1			0	0	0	0
Queuing Penalty (veh)						2			1	0	0	0
Storage Bay Dist (ft)				190	190							
Storage Blk Time (%)			0	0	1	0						
Queuing Penalty (veh)			0	1	1	1						

Intersection: 251: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 260: Snelling Ave & Marshall Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	174	208	86	85	167	87	44	153	160	82	63	405
Average Queue (ft)	69	109	18	34	84	21	15	57	56	10	10	194
95th Queue (ft)	126	181	56	69	153	58	39	124	120	45	44	340
Link Distance (ft)		664			1226			602	602			595
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	300		175	200		175	150			75	125	
Storage Blk Time (%)		1			1			0	4	0		18
Queuing Penalty (veh)		2			1			0	2	0		1

Intersection: 260: Snelling Ave & Marshall Ave

Movement	SB	SB	B5	B5	B5
Directions Served	T	R	T	T	
Maximum Queue (ft)	384	150	110	115	93
Average Queue (ft)	186	67	6	6	3
95th Queue (ft)	325	166	70	72	49
Link Distance (ft)	595		291	291	291
Upstream Blk Time (%)			0	0	
Queuing Penalty (veh)			0	0	
Storage Bay Dist (ft)		100			
Storage Blk Time (%)	22				
Queuing Penalty (veh)	22				

Intersection: 270: Snelling Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	86	220	69	234	141	280	281	237	251	87
Average Queue (ft)	35	115	20	114	23	163	142	111	35	33
95th Queue (ft)	74	192	55	200	91	265	248	200	136	77
Link Distance (ft)		609		930		564	564		602	602
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		200		125			175		
Storage Blk Time (%)		0		1		17		1	0	
Queuing Penalty (veh)		0		0		3		5	0	

Intersection: 310: West Midway Shopping Entrance & University Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 315: East Midway Shopping Entrance & University Ave

Movement	NB
Directions Served	R
Maximum Queue (ft)	62
Average Queue (ft)	32
95th Queue (ft)	53
Link Distance (ft)	439
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 410: University Ave & Pascal St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	LT	R
Maximum Queue (ft)	57	96	120	159	84	80	83	83	65	160	65
Average Queue (ft)	16	40	58	55	19	22	57	57	28	82	7
95th Queue (ft)	47	84	110	115	52	58	95	95	54	143	36
Link Distance (ft)		386	386		1220	1220	77	77	77	729	
Upstream Blk Time (%)							12	9	0		
Queuing Penalty (veh)							10	8	0		
Storage Bay Dist (ft)	225			250							25
Storage Blk Time (%)				0						53	1
Queuing Penalty (veh)				0						2	1

Intersection: 415: Pascal St & North Midway Shopping Entrance

Movement	EB	EB	NB	NB
Directions Served	L	R	LT	T
Maximum Queue (ft)	70	57	106	53
Average Queue (ft)	27	30	22	6
95th Queue (ft)	56	49	67	30
Link Distance (ft)	494			404
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		200	200	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 420: Pascal St & North Walmart/Cub Entrance

Movement	WB	NB	SB	SB
Directions Served	LR	TR	L	T
Maximum Queue (ft)	176	15	49	100
Average Queue (ft)	52	1	15	18
95th Queue (ft)	106	6	43	65
Link Distance (ft)	778	49		404
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			125	
Storage Blk Time (%)				0
Queuing Penalty (veh)				0

Intersection: 425: Pascal St & South Midway Shopping Entrance

Movement	EB	EB	NB	NB	SB
Directions Served	L	R	L	T	TR
Maximum Queue (ft)	74	182	43	100	63
Average Queue (ft)	23	60	4	41	41
95th Queue (ft)	57	136	23	93	70
Link Distance (ft)		2305		100	49
Upstream Blk Time (%)				1	11
Queuing Penalty (veh)				2	28
Storage Bay Dist (ft)	300		45		
Storage Blk Time (%)			0	6	
Queuing Penalty (veh)			0	0	

Intersection: 430: Pascal St & South Cub Entrance

Movement	WB	WB	NB	SB	SB
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	83	105	62	48	110
Average Queue (ft)	35	28	4	8	36
95th Queue (ft)	64	67	26	31	111
Link Distance (ft)		798	74		100
Upstream Blk Time (%)			0		4
Queuing Penalty (veh)			0		22
Storage Bay Dist (ft)	75			40	
Storage Blk Time (%)	3	0		0	6
Queuing Penalty (veh)	1	0		2	2

Intersection: 435: Pascal St & Empty St. Paul Lot Entrance

Movement	NB	SB
Directions Served	LT	TR
Maximum Queue (ft)	26	80
Average Queue (ft)	1	39
95th Queue (ft)	14	97
Link Distance (ft)	179	74
Upstream Blk Time (%)		8
Queuing Penalty (veh)		49
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 440: Pascal St & St Anthony Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	TR	L	T	T	R
Maximum Queue (ft)	157	133	102	213	186	75
Average Queue (ft)	69	60	11	85	155	51
95th Queue (ft)	144	122	58	176	225	96
Link Distance (ft)	1228	1228		276	179	
Upstream Blk Time (%)				0	13	
Queuing Penalty (veh)				0	72	
Storage Bay Dist (ft)			100			50
Storage Blk Time (%)				10	42	3
Queuing Penalty (veh)				1	84	9

Intersection: 450: Pascal St & Concordia Ave

Movement	EB	EB	NB	SB	SB
Directions Served	LT	TR	TR	L	T
Maximum Queue (ft)	80	55	77	127	99
Average Queue (ft)	44	32	40	65	42
95th Queue (ft)	70	52	65	107	73
Link Distance (ft)	676	676	947		276
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				100	
Storage Blk Time (%)				1	0
Queuing Penalty (veh)				2	0

Intersection: 451: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 460: Pascal St & Marshall Ave

Movement	EB	WB	WB	NB	SB
Directions Served	L	L	TR	LTR	LTR
Maximum Queue (ft)	51	11	17	35	103
Average Queue (ft)	13	1	1	10	48
95th Queue (ft)	39	7	6	33	85
Link Distance (ft)			1247	350	947
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	100	100			
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 510: Hamline Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	TR
Maximum Queue (ft)	116	139	167	215	140	122	146	245	69	110	214
Average Queue (ft)	38	74	83	104	64	39	56	110	25	20	115
95th Queue (ft)	85	127	144	182	122	91	114	191	55	70	192
Link Distance (ft)		1220	1220		782	782		315	315		606
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	275			275			140			100	
Storage Blk Time (%)				0			0	5			14
Queuing Penalty (veh)				0			0	4			3

Intersection: 520: Hamline Ave & Midway Market Place

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	89	155	155	113	93	131	74	95	87	106
Average Queue (ft)	26	50	81	46	31	53	20	36	20	40
95th Queue (ft)	64	106	138	93	72	110	56	79	62	90
Link Distance (ft)		380		396		792	792		315	315
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	125		200		75			125		
Storage Blk Time (%)		1			2	4		0	0	
Queuing Penalty (veh)		0			2	2		0	0	

Intersection: 539: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 540: Hamline Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	T	R	LT	T	T	TR
Maximum Queue (ft)	117	153	124	131	156	82	175	158
Average Queue (ft)	59	81	65	58	64	31	76	63
95th Queue (ft)	103	133	110	101	121	69	141	125
Link Distance (ft)	377	377	377	377	249	249	792	792
Upstream Blk Time (%)					0			
Queuing Penalty (veh)					0			
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 550: Hamline Ave & Concordia Ave

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	LT	T	R	T	TR	LT	T
Maximum Queue (ft)	150	116	75	146	133	143	128
Average Queue (ft)	72	49	29	64	54	80	58
95th Queue (ft)	123	102	70	123	110	131	105
Link Distance (ft)	937	937		942	942	249	249
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			25				
Storage Blk Time (%)		29	5				
Queuing Penalty (veh)		17	3				

Intersection: 560: Hamline Ave & Marshall Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	TR	LT	TR
Maximum Queue (ft)	126	233	56	154	184	170	129	124
Average Queue (ft)	43	102	16	74	92	87	56	59
95th Queue (ft)	95	185	46	136	151	143	102	111
Link Distance (ft)		1247		659	612	612	942	942
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	200		150					
Storage Blk Time (%)		1		1				
Queuing Penalty (veh)		1		0				

Intersection: 570: Hamline Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	135	58	157	90	62	59	93	64
Average Queue (ft)	57	7	60	25	21	12	32	13
95th Queue (ft)	105	33	116	67	51	38	73	41
Link Distance (ft)	1319		651		947	947	612	612
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		50		50				
Storage Blk Time (%)	18	0	21	0				
Queuing Penalty (veh)	1	0	7	0				

Intersection: 580: Hamline Ave & Ashland Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LR	R	T	TR	LT	T
Maximum Queue (ft)	105	98	86	57	134	79
Average Queue (ft)	49	36	32	13	58	25
95th Queue (ft)	88	81	75	43	113	68
Link Distance (ft)	343	343	677	677	947	947
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 590: Ayd Mill Rd & Ashland Ave

Movement	NB	NB	NB	SB	SB
Directions Served	L	L	T	T	TR
Maximum Queue (ft)	86	47	111	169	115
Average Queue (ft)	35	11	54	80	22
95th Queue (ft)	72	34	103	139	71
Link Distance (ft)	866	866		600	600
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)			1		
Queuing Penalty (veh)			0		

Intersection: 610: Lexington Ave & University Ave

Movement	EB	EB	EB	NB
Directions Served	L	T	TR	T
Maximum Queue (ft)	62	57	18	6
Average Queue (ft)	15	13	1	0
95th Queue (ft)	47	44	10	4
Link Distance (ft)		561	561	1203
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	275			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 639: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	200	263	205	163	184	102	120	107	118	76	189	153
Average Queue (ft)	79	119	31	54	97	38	30	26	39	21	89	64
95th Queue (ft)	139	197	101	88	163	81	83	73	87	57	160	127
Link Distance (ft)	443	443	443	443	241	241	241	241				
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)									180	180		
Storage Blk Time (%)											0	
Queuing Penalty (veh)											1	

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	80
Average Queue (ft)	9
95th Queue (ft)	46
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 641: St Anthony Ave

Movement	WB	WB
Directions Served	LT	T
Maximum Queue (ft)	26	9
Average Queue (ft)	1	0
95th Queue (ft)	11	0
Link Distance (ft)	222	222
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 649: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 650: Lexington Ave & Concordia Ave

Movement	EB	EB	EB	EB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	LT	T	R	T	T	T	T	R	L	L	T
Maximum Queue (ft)	274	296	204	140	123	134	200	194	112	162	84	142
Average Queue (ft)	92	166	65	69	57	42	106	78	30	72	31	56
95th Queue (ft)	175	249	167	118	108	96	179	155	76	133	68	113
Link Distance (ft)	443	443	443	443			812	812		241	241	241
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)					125	125			125			
Storage Blk Time (%)					0	0	5	2	0			
Queuing Penalty (veh)					1	0	18	2	0			

Intersection: 650: Lexington Ave & Concordia Ave

Movement	SB
Directions Served	T
Maximum Queue (ft)	132
Average Queue (ft)	50
95th Queue (ft)	110
Link Distance (ft)	241
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

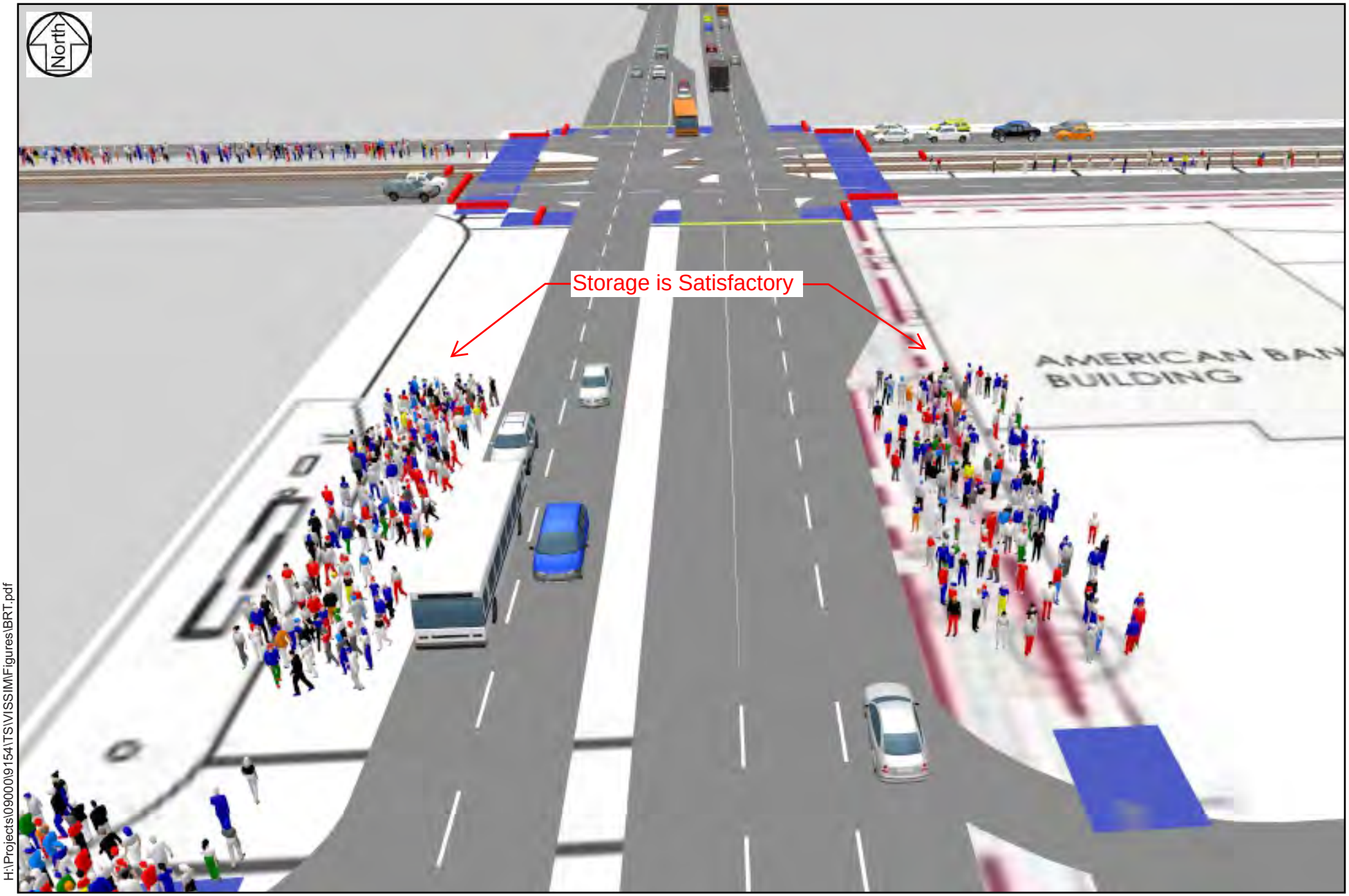
Intersection: 651: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 919

Appendix F
VISSIM Screen Captures



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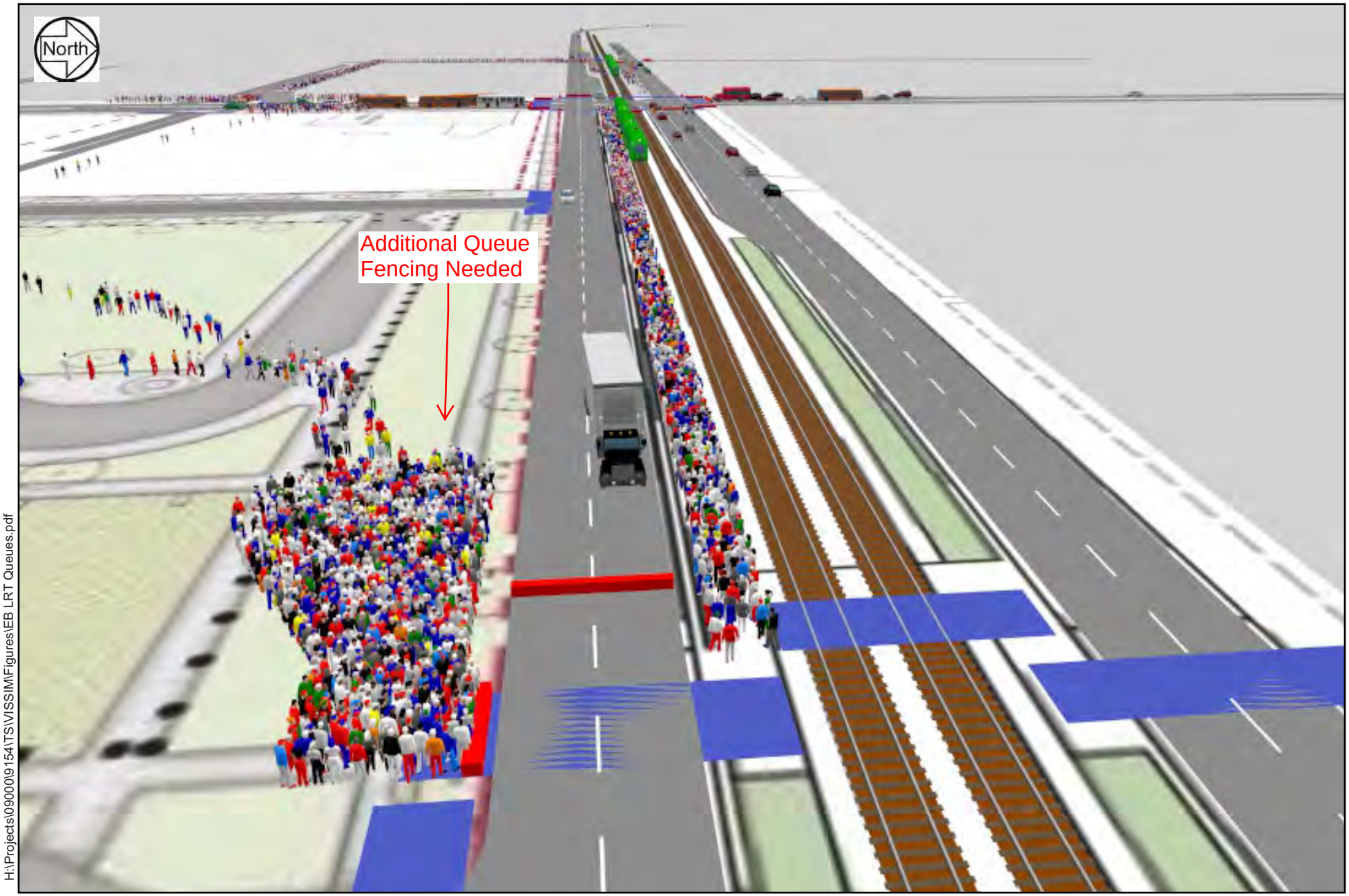
SRF Consulting Group, Inc.

Pedestrian Modeling - Bus Rapid Transit Max Queues (35 min After Event)

Snelling Midway Stadium Environmental Review

City of St. Paul

0169154
April 2016



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SRF Consulting Group, Inc.

Pedestrian Modeling - Eastbound Light Rail Train Max **Queues** (35 min After Event)

Snelling Midway Stadium Environmental Review

City of St. Paul

0169154
April 2016

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Pedestrian Modeling - Eastbound Light Rail Train Max **Queues** (35 min After Event)

Snelling Midway Stadium Environmental Review

City of St. Paul

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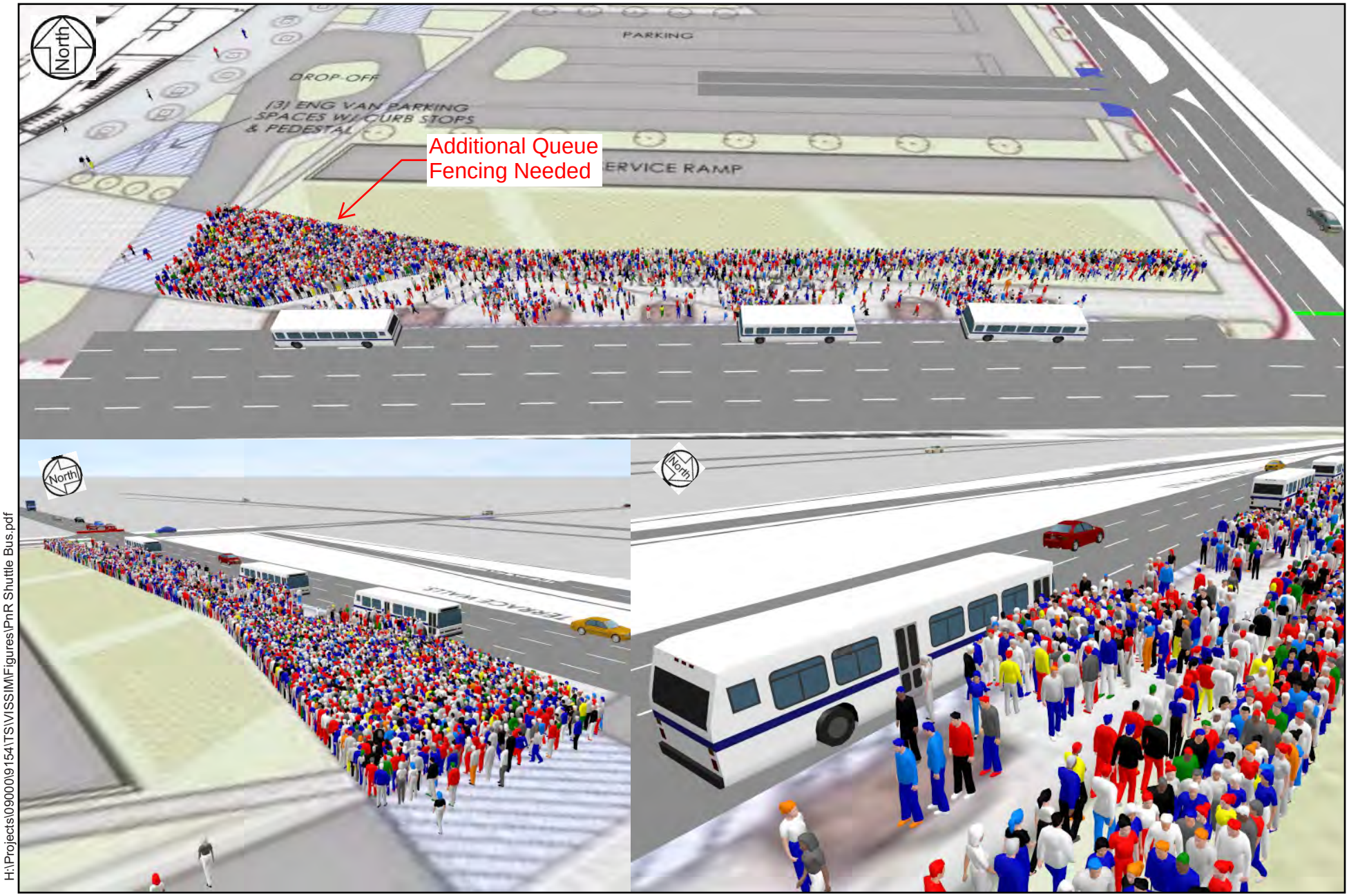

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SRF Consulting Group, Inc.

Pedestrian Modeling - Park and Ride Shuttle Bus Max **Queues** (35 min After Event)

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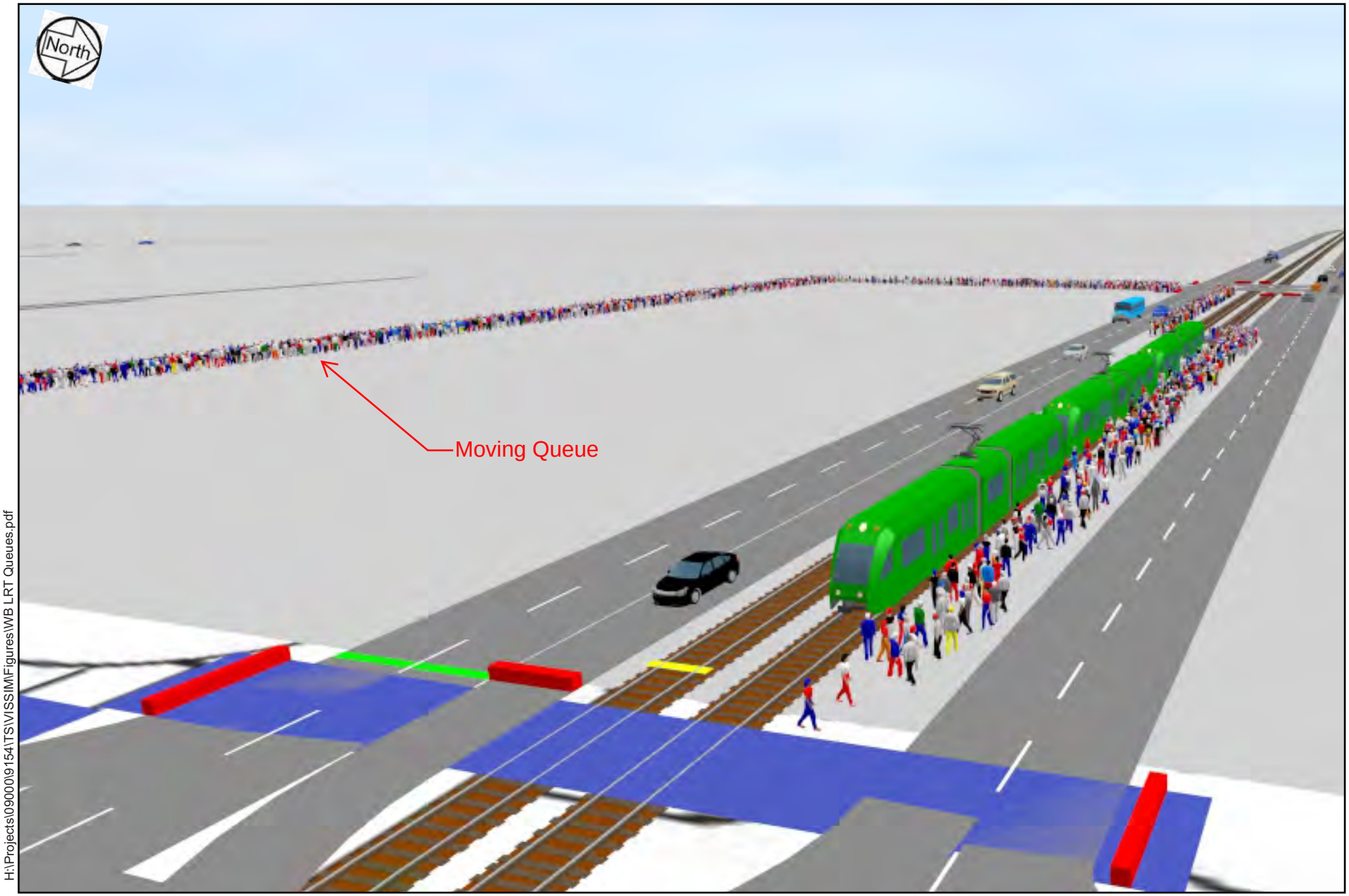

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Pedestrian Modeling - Westbound Light Rail Train Max **Queues** (35 min After Event)

Snelling Midway Stadium Environmental Review

City of St. Paul

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SRF Consulting Group, Inc.

Pedestrian Modeling - Westbound Light Rail Train Max **Queues** (35 min After Event)

Snelling Midway Stadium Environmental Review

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April 2016

Appendix G
Saturday Trip Generation

DRAFT

Saturday 1-2 PM

Master Plan Development Scenario
Trip Generation and Modal Split

Land Use Code	Land Use	Day of Data	Time Period	Size	In	Out
220	Apartment (Dwelling Units)	Weekday	1-2 PM	620	90	110
710	General Office Building (1000 Sq. Ft. Gross Floor Area)	Weekday	1-2 PM	1000	69	62
820	Shopping Center (1000 Sq. Ft. Gross Leasable Area)	Weekday	1-2 PM	294.1	737	680
310	Hotel (Rooms)	Weekday	1-2 PM	400	49	48
445	Multiplex Movie Theater (Seats)	Weekday	1-2 PM	800	52	20
492	Health/Fitness Club (1000 Sq. Ft. Gross Floor Area)	Weekday	1-2 PM	50	51	63
850	Supermarket (1000 Sq. Ft. Gross Floor Area)	Saturday	1-2 PM	42	212	204

Total Trips	1260	1187
Internal Multi-Use Trip Reduction (15%)	189	178
Subtotal of External Trips	1071	1009

Mode of External Trips

3%	Walk	32	30
2%	Bike	21	20
10%	LRT	107	101
5%	Bus	54	50
80%	Vehicle	857	807

DRAFT

Saturday 4-5 PM

Master Plan Development Scenario
Trip Generation and Modal Split

Land Use Code	Land Use	Day of Data	Time Period	Size	In	Out
220	Apartment (Dwelling Units)	Weekday	1-2 PM	620	117	106
710	General Office Building (1000 Sq. Ft. Gross Floor Area)	Weekday	1-2 PM	1000	69	62
820	Shopping Center (1000 Sq. Ft. Gross Leasable Area)	Weekday	1-2 PM	294.1	463	599
310	Hotel (Rooms)	Weekday	1-2 PM	400	88	59
445	Multiplex Movie Theater (Seats)	Weekday	1-2 PM	800	124	114
492	Health/Fitness Club (1000 Sq. Ft. Gross Floor Area)	Weekday	1-2 PM	50	48	59
850	Supermarket (1000 Sq. Ft. Gross Floor Area)	Saturday	1-2 PM	42	212	204

	Total Trips	1120	1203
	Internal Multi-Use Trip Reduction (15%)	168	180
	Subtotal of External Trips	952	1022

Mode of External Trips

3%	Walk	29	31
2%	Bike	19	20
10%	LRT	95	102
5%	Bus	48	51
80%	Vehicle	762	818

Appendix H
Year 2035 Event Analysis

110: Fry Street & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.1	0.0	1.9	1.9	0.3
Total Del/Veh (s)	7.6	8.0	13.0	10.1	8.2

200: Snelling Ave & Thomas Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.7	1.4	0.0	0.3	0.3
Total Del/Veh (s)	40.2	28.8	5.9	10.3	12.2

210: Snelling Ave & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.2	0.1
Total Del/Veh (s)	42.0	33.9	30.0	46.8	38.7

220: Snelling Ave & Spruce Tree Rd Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.2	0.0	0.0	0.0
Total Del/Veh (s)	10.5	2.2	8.0	5.9

230: Snelling Ave & Shields Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.6	1.2	0.0	0.0	0.1
Total Del/Veh (s)	19.9	30.7	33.6	26.0	30.3

239: St Anthony Ave Performance by approach

Approach	WB	NW	All
Denied Del/Veh (s)	0.0	0.3	0.2
Total Del/Veh (s)	1.5	1.6	1.6

240: Snelling Ave & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.3	0.0	0.1
Total Del/Veh (s)	12.3	25.8	18.1	19.6

241: St Anthony Ave Performance by approach

Approach	WB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	3.4	3.4

250: Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	9.6	0.0	3.0
Total Del/Veh (s)	94.3	88.8	17.5	71.7

251: Concordia Ave Performance by approach

Approach	EB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	3.3	3.3

260: Snelling Ave & Marshall Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.2	0.0	0.0	0.0	0.2
Total Del/Veh (s)	30.5	22.9	115.8	12.1	50.2

270: Snelling Ave & Selby Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.4	22.5	25.8	0.0	12.1
Total Del/Veh (s)	21.8	113.4	347.7	13.7	129.8

310: West Midway Shopping Entrance & University Ave Performance by approach

Approach	EB	WB	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	1.3	1.0	1.1

315: East Midway Shopping Entrance & University Ave Performance by approach

Approach	EB	WB	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.5	1.3	0.9

410: University Ave & Pascal St Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.1	0.0	0.6	0.1
Total Del/Veh (s)	17.4	17.9	25.6	25.6	19.8

415: Pascal St & North Midway Shopping Entrance Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.2	0.0	0.0	0.1
Total Del/Veh (s)	9.5	1.9	1.7	3.9

420: Pascal St & North Walmart/Cub Entrance Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.1	0.2	0.0	0.0	0.1
Total Del/Veh (s)	6.3	10.3	1.5	2.1	4.7

430: Pascal St & South Cub Entrance Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	4.8	10.0	2.6	1.0	3.3

440: Pascal St & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	11.0	13.8	9.6	11.2

450: Pascal St & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	7.6	7.3	8.6	7.9

451: Concordia Ave Performance by approach

Approach	EB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	1.6	1.6

460: Pascal St & Marshall Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0	0.0
Total Del/Veh (s)	4.0	3.6	8.1	11.6	5.1

510: Hamline Ave & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.1	1.1	0.0	0.6	0.5
Total Del/Veh (s)	20.4	25.9	17.4	27.1	22.3

520: Hamline Ave & Midway Market Place Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.2	2.3	0.0	0.0	0.5
Total Del/Veh (s)	17.6	23.9	4.8	6.4	9.5

539: St Anthony Ave Performance by approach

Approach	WB	NW	All
Denied Del/Veh (s)	0.2	0.2	0.2
Total Del/Veh (s)	0.2	0.9	0.6

540: Hamline Ave & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	21.1	9.4	10.4	14.6

550: Hamline Ave & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	22.2	9.9	7.8	12.1

560: Hamline Ave & Marshall Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.7	0.0	0.0	0.1
Total Del/Veh (s)	33.3	29.9	12.9	12.9	19.5

570: Hamline Ave & Selby Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.5	1.5	0.0	0.0	0.3
Total Del/Veh (s)	28.6	25.9	8.4	10.6	13.3

580: Hamline Ave & Ashland Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.1	0.0	0.0
Total Del/Veh (s)	41.4	5.7	4.9	11.9

590: Ayd Mill Rd & Ashland Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	2.1	0.1	1.2
Total Del/Veh (s)	1.1	9.0	24.6	11.3

610: Lexington Ave & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.0	0.2	0.0	3.7	0.3
Total Del/Veh (s)	15.0	20.4	1.2	2.1	3.6

639: St Anthony Ave Performance by approach

Approach	WB	NW	All
Denied Del/Veh (s)	0.1	0.3	0.2
Total Del/Veh (s)	0.2	0.8	0.6

640: Lexington Ave & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	1.0	0.3
Total Del/Veh (s)	23.6	12.2	13.0	15.4

641: St Anthony Ave Performance by approach

Approach	WB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	4.9	4.9

649: Concordia Ave Performance by approach

Approach	EB	SE	All
Denied Del/Veh (s)	0.3	0.2	0.3
Total Del/Veh (s)	0.5	1.1	0.8

650: Lexington Ave & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	1.4	0.0	0.5
Total Del/Veh (s)	22.1	22.1	11.2	18.9

651: Concordia Ave Performance by approach

Approach	EB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	2.7	2.7

Total Network Performance

Denied Del/Veh (s)	69.0
Total Del/Veh (s)	103.3

Intersection: 110: Fry Street & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	LT	R
Maximum Queue (ft)	31	122	151	39	116	112	60	65	52	42
Average Queue (ft)	7	37	58	12	36	42	22	23	10	10
95th Queue (ft)	27	87	119	34	88	95	53	54	35	36
Link Distance (ft)		2798	2798		569	569		882	508	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	250			170			125			25
Storage Blk Time (%)									5	1
Queuing Penalty (veh)									0	0

Intersection: 200: Snelling Ave & Thomas Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	R
Maximum Queue (ft)	221	76	189	75	81	83	110	54	262	252	150
Average Queue (ft)	107	26	71	31	24	26	42	13	134	121	21
95th Queue (ft)	188	75	143	80	56	71	93	40	220	217	87
Link Distance (ft)	1352		884			1213	1213		1771	1771	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)		25		25	200			200			125
Storage Blk Time (%)	62	4	48	5					1	5	0
Queuing Penalty (veh)	16	6	23	5					0	3	0

Intersection: 210: Snelling Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	UL	T	T	R	L	T
Maximum Queue (ft)	120	168	232	278	172	208	141	246	277	125	224	621
Average Queue (ft)	50	87	127	161	63	103	61	164	197	98	132	256
95th Queue (ft)	100	154	214	267	130	177	116	248	291	163	242	587
Link Distance (ft)		569	569	212	212	212	208	208	208			1213
Upstream Blk Time (%)				5	0	0	0	3	11			
Queuing Penalty (veh)				11	0	1	0	10	37			
Storage Bay Dist (ft)	250									75	150	
Storage Blk Time (%)									43	2	3	29
Queuing Penalty (veh)									80	6	15	47

Intersection: 210: Snelling Ave & University Ave

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	588	225
Average Queue (ft)	242	40
95th Queue (ft)	552	152
Link Distance (ft)	1213	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		175
Storage Blk Time (%)	18	
Queuing Penalty (veh)	8	

Intersection: 220: Snelling Ave & Spruce Tree Rd

Movement	WB	NB	NB	NB	NB	SB	SB
Directions Served	R	T	T	T	R	T	TR
Maximum Queue (ft)	104	38	95	123	39	222	226
Average Queue (ft)	41	2	14	23	3	98	87
95th Queue (ft)	80	17	55	77	21	233	210
Link Distance (ft)	604		202	202	202	208	208
Upstream Blk Time (%)						3	1
Queuing Penalty (veh)						17	7
Storage Bay Dist (ft)		25					
Storage Blk Time (%)		0	2				
Queuing Penalty (veh)		0	5				

Intersection: 230: Snelling Ave & Shields Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	LT	R	L	T	T	TR	UL	T	TR
Maximum Queue (ft)	48	111	89	64	54	246	664	700	723	175	268	226
Average Queue (ft)	10	45	39	21	19	131	108	472	498	149	181	162
95th Queue (ft)	35	86	75	54	47	210	430	908	776	206	299	258
Link Distance (ft)		909	766	766			644	644	644		202	202
Upstream Blk Time (%)							0	4	3		18	5
Queuing Penalty (veh)							1	34	27		111	32
Storage Bay Dist (ft)	100				100	250				125		
Storage Blk Time (%)		1				0				39	11	
Queuing Penalty (veh)		0				1				180	26	

Intersection: 239: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	158	160	150	147	158	168	294	276	126	156	250	236
Average Queue (ft)	80	103	87	5	74	79	234	248	58	60	133	141
95th Queue (ft)	137	152	137	66	132	140	295	266	110	115	222	224
Link Distance (ft)	450	450	450	450	232	232	232	232			644	644
Upstream Blk Time (%)							16	34				
Queuing Penalty (veh)							87	182				
Storage Bay Dist (ft)									300	300		
Storage Blk Time (%)											0	
Queuing Penalty (veh)											0	

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	185
Average Queue (ft)	18
95th Queue (ft)	99
Link Distance (ft)	644
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 241: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 250:

Movement	EB	EB	EB	EB	B7	NB	NB	NB	NB	NB	B5	B5
Directions Served	L	LT	T	R	T	T	T	T	T	R	T	T
Maximum Queue (ft)	872	924	700	330	2500	141	250	394	394	341	617	626
Average Queue (ft)	617	721	511	27	910	47	228	364	362	133	513	543
95th Queue (ft)	941	1057	921	225	2718	106	324	386	378	280	772	763
Link Distance (ft)	835	835			2454			293	293	293	595	595
Upstream Blk Time (%)	1	18			14			69	81	0	7	13
Queuing Penalty (veh)	0	0			0			312	368	0	47	91
Storage Bay Dist (ft)			400	400		190	190					
Storage Blk Time (%)		75	2				0	64				
Queuing Penalty (veh)		623	18				0	343				

Intersection: 250:

Movement	SB	SB	SB	SB
Directions Served	L	L	T	T
Maximum Queue (ft)	153	150	169	150
Average Queue (ft)	81	87	68	62
95th Queue (ft)	134	140	123	117
Link Distance (ft)	232	232	232	232
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 251: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 260: Snelling Ave & Marshall Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	316	267	85	101	176	93	225	646	645	100	114	215
Average Queue (ft)	133	98	15	41	83	35	42	493	507	72	21	99
95th Queue (ft)	262	205	54	83	148	77	165	812	804	142	66	200
Link Distance (ft)		1898			1226			602	602			595
Upstream Blk Time (%)								11	20			
Queuing Penalty (veh)								66	117			
Storage Bay Dist (ft)	300		175	200		175	150			75	125	
Storage Blk Time (%)	1	1			0			62	79	0		5
Queuing Penalty (veh)	4	2			0			16	63	2		1

Intersection: 260: Snelling Ave & Marshall Ave

Movement	SB	SB	B5	B5	B5
Directions Served	T	R	T	T	
Maximum Queue (ft)	242	149	134	152	10
Average Queue (ft)	109	34	8	8	0
95th Queue (ft)	213	109	72	74	7
Link Distance (ft)	595		293	293	293
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		100			
Storage Blk Time (%)	10	0			
Queuing Penalty (veh)	13	0			

Intersection: 270: Snelling Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	98	169	300	934	200	2080	2056	213	160	153
Average Queue (ft)	46	77	91	525	59	949	961	106	66	78
95th Queue (ft)	86	141	292	1027	192	2387	2365	189	135	135
Link Distance (ft)		609		930		2488	2488		602	602
Upstream Blk Time (%)				17		10	10			
Queuing Penalty (veh)				0		0	0			
Storage Bay Dist (ft)	225		200		125			175		
Storage Blk Time (%)				55		62		2		
Queuing Penalty (veh)				20		16		7		

Intersection: 310: West Midway Shopping Entrance & University Ave

Movement	WB
Directions Served	T
Maximum Queue (ft)	38
Average Queue (ft)	5
95th Queue (ft)	46
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	200
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 315: East Midway Shopping Entrance & University Ave

Movement											
Directions Served											
Maximum Queue (ft)											
Average Queue (ft)											
95th Queue (ft)											
Link Distance (ft)											
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)											
Storage Blk Time (%)											
Queuing Penalty (veh)											

Intersection: 410: University Ave & Pascal St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	LT	R
Maximum Queue (ft)	66	214	266	165	147	141	176	118	78	95	55
Average Queue (ft)	20	89	122	72	58	60	104	36	34	47	9
95th Queue (ft)	54	186	230	128	123	122	167	82	63	82	36
Link Distance (ft)		387	387		1219	1219		225	225	729	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	225			250			200				25
Storage Blk Time (%)		0					0			37	2
Queuing Penalty (veh)		0					0			4	1

Intersection: 415: Pascal St & North Midway Shopping Entrance

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	145	62	22
Average Queue (ft)	62	28	1
95th Queue (ft)	106	57	9
Link Distance (ft)	454		225
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		100	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 420: Pascal St & North Walmart/Cub Entrance

Movement	EB	WB	NB	NB	SB
Directions Served	LTR	LTR	L	TR	L
Maximum Queue (ft)	78	157	44	18	83
Average Queue (ft)	40	67	11	1	26
95th Queue (ft)	66	118	38	7	63
Link Distance (ft)	651	779		214	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		125
Storage Blk Time (%)					0
Queuing Penalty (veh)					0

Intersection: 430: Pascal St & South Cub Entrance

Movement	EB	WB	WB	NB	NB	SB
Directions Served	LTR	LT	R	L	TR	L
Maximum Queue (ft)	70	90	60	70	4	51
Average Queue (ft)	28	40	25	20	0	7
95th Queue (ft)	55	72	52	52	4	30
Link Distance (ft)	638	798	798		315	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)				100		125
Storage Blk Time (%)				0		
Queuing Penalty (veh)				0		

Intersection: 440: Pascal St & St Anthony Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	TR	L	T	T	R
Maximum Queue (ft)	168	184	30	162	161	75
Average Queue (ft)	76	92	4	91	84	48
95th Queue (ft)	145	166	21	142	147	89
Link Distance (ft)	1228	1228		276	315	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			100			50
Storage Blk Time (%)				5	17	1
Queuing Penalty (veh)				0	21	3

Intersection: 450: Pascal St & Concordia Ave

Movement	EB	EB	NB	SB	SB
Directions Served	LT	TR	TR	L	T
Maximum Queue (ft)	121	75	98	108	92
Average Queue (ft)	61	43	48	55	44
95th Queue (ft)	97	66	76	90	75
Link Distance (ft)	676	676	947		276
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				100	
Storage Blk Time (%)				0	0
Queuing Penalty (veh)				0	0

Intersection: 451: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 460: Pascal St & Marshall Ave

Movement	EB	WB	WB	NB	SB
Directions Served	L	L	TR	LTR	LTR
Maximum Queue (ft)	83	24	26	36	111
Average Queue (ft)	27	1	2	11	51
95th Queue (ft)	62	12	12	35	88
Link Distance (ft)			1247	350	947
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	100	100			
Storage Blk Time (%)	0				
Queuing Penalty (veh)	0				

Intersection: 510: Hamline Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	TR
Maximum Queue (ft)	91	222	240	198	209	160	170	205	63	98	262
Average Queue (ft)	35	100	120	105	102	55	62	98	33	25	118
95th Queue (ft)	74	183	210	178	171	119	123	170	57	68	204
Link Distance (ft)		1219	1219		782	782		315	315		606
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	275			275			140			100	
Storage Blk Time (%)		0					0	2			14
Queuing Penalty (veh)		0					1	2			4

Intersection: 520: Hamline Ave & Midway Market Place

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	94	122	177	125	98	117	66	96	61	75
Average Queue (ft)	31	51	83	53	36	48	23	43	17	29
95th Queue (ft)	66	95	144	103	74	101	57	77	48	67
Link Distance (ft)		380		396		792	792		315	315
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	125		200		75			125		
Storage Blk Time (%)		1	0		1	3		0		
Queuing Penalty (veh)		0	0		2	3		0		

Intersection: 539: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 540: Hamline Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	T	R	LT	T	T	TR
Maximum Queue (ft)	181	195	193	147	174	114	143	163
Average Queue (ft)	90	119	101	71	89	47	75	77
95th Queue (ft)	146	174	160	117	148	102	130	141
Link Distance (ft)	377	377	377	377	249	249	792	792
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 550: Hamline Ave & Concordia Ave

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	LT	T	R	T	TR	LT	T
Maximum Queue (ft)	182	171	75	148	120	157	145
Average Queue (ft)	97	86	41	64	47	90	76
95th Queue (ft)	153	143	86	122	94	136	135
Link Distance (ft)	937	937		942	942	249	249
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			25				
Storage Blk Time (%)		48	8				
Queuing Penalty (veh)		39	11				

Intersection: 560: Hamline Ave & Marshall Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	TR	LT	TR
Maximum Queue (ft)	138	289	95	252	267	136	145	155
Average Queue (ft)	52	164	22	135	85	57	63	70
95th Queue (ft)	107	256	66	224	147	114	122	124
Link Distance (ft)		1247		659	612	612	942	942
Upstream Blk Time (%)					0			
Queuing Penalty (veh)					0			
Storage Bay Dist (ft)	200		150					
Storage Blk Time (%)		5		8				
Queuing Penalty (veh)		3		2				

Intersection: 570: Hamline Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	124	82	245	100	142	144	191	154
Average Queue (ft)	57	11	92	46	62	57	83	72
95th Queue (ft)	104	44	173	103	113	115	154	131
Link Distance (ft)	1319		651		947	947	612	612
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		50		50				
Storage Blk Time (%)	20	0	35	1				
Queuing Penalty (veh)	2	0	24	1				

Intersection: 580: Hamline Ave & Ashland Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LR	R	T	TR	LT	T
Maximum Queue (ft)	169	145	113	84	134	93
Average Queue (ft)	83	67	48	25	56	20
95th Queue (ft)	136	123	98	66	113	68
Link Distance (ft)	343	343	677	677	947	947
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 590: Ayd Mill Rd & Ashland Ave

Movement	NB	NB	NB	SB	SB
Directions Served	L	L	T	T	TR
Maximum Queue (ft)	83	87	133	179	140
Average Queue (ft)	34	13	72	91	31
95th Queue (ft)	72	49	128	155	92
Link Distance (ft)	866	866		600	600
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)			2		
Queuing Penalty (veh)			2		

Intersection: 610: Lexington Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	T	R
Maximum Queue (ft)	76	75	62	18	85	30	23	12	52
Average Queue (ft)	23	26	24	2	31	3	1	0	21
95th Queue (ft)	58	62	51	11	64	16	9	6	49
Link Distance (ft)		561	561		836	836	617	617	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	275			275					150
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 639: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	151	253	204	227	260	241	138	128	141	140	179	158
Average Queue (ft)	81	130	58	106	138	72	74	71	68	54	96	85
95th Queue (ft)	138	210	149	188	237	156	126	120	124	110	161	149
Link Distance (ft)	443	443	443	443	241	241	241	241			1203	1203
Upstream Blk Time (%)					1	0						
Queuing Penalty (veh)					3	1						
Storage Bay Dist (ft)									180	180		
Storage Blk Time (%)										0	0	
Queuing Penalty (veh)										0	1	

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	81
Average Queue (ft)	17
95th Queue (ft)	63
Link Distance (ft)	1203
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 641: St Anthony Ave

Movement	WB
Directions Served	LT
Maximum Queue (ft)	57
Average Queue (ft)	3
95th Queue (ft)	47
Link Distance (ft)	222
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 649: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 650: Lexington Ave & Concordia Ave

Movement	EB	EB	EB	EB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	LT	T	R	T	T	T	T	R	L	L	T
Maximum Queue (ft)	288	324	248	197	162	190	241	217	164	196	141	77
Average Queue (ft)	148	206	103	88	89	75	134	115	54	98	65	38
95th Queue (ft)	242	292	197	158	147	150	214	194	115	168	117	72
Link Distance (ft)	443	443	443	443			812	812		241	241	241
Upstream Blk Time (%)										0		
Queuing Penalty (veh)										0		
Storage Bay Dist (ft)					125	125			125			
Storage Blk Time (%)					2	1	10	5	0			
Queuing Penalty (veh)					6	2	48	9	1			

Intersection: 650: Lexington Ave & Concordia Ave

Movement	SB
Directions Served	T
Maximum Queue (ft)	85
Average Queue (ft)	35
95th Queue (ft)	78
Link Distance (ft)	241
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 651: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 3307

110: Fry Street & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.8	0.0	4.8	1.5	1.9
Total Del/Veh (s)	82.4	18.1	26.4	16.2	41.6

200: Snelling Ave & Thomas Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.7	1.4	0.0	138.3	56.1
Total Del/Veh (s)	56.3	47.2	7.9	115.6	52.9

210: Snelling Ave & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.6	0.0	0.0	39.5	10.3
Total Del/Veh (s)	152.3	68.6	28.9	309.8	126.2

220: Snelling Ave & Spruce Tree Rd Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.5	0.0	0.0	0.1
Total Del/Veh (s)	42.2	6.0	51.9	26.5

230: Snelling Ave & Shields Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.1	817.2	0.0	0.0	439.0
Total Del/Veh (s)	39.0	382.6	46.9	66.8	189.1

239: St Anthony Ave Performance by approach

Approach	WB	NW	All
Denied Del/Veh (s)	0.0	0.2	0.1
Total Del/Veh (s)	220.5	142.8	182.7

240: Snelling Ave & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	1.5	0.6
Total Del/Veh (s)	130.2	12.5	49.1	58.6

250: Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.7	0.1	0.1	0.3
Total Del/Veh (s)	33.3	16.9	12.0	21.0

251: Concordia Ave Performance by approach

Approach	EB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	4.6	4.6

260: Snelling Ave & Marshall Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.9	0.0	0.0	0.0	0.3
Total Del/Veh (s)	27.9	34.0	5.6	16.1	16.2

270: Snelling Ave & Selby Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.9	0.7	0.4	0.0	0.4
Total Del/Veh (s)	40.7	39.1	39.5	9.3	27.4

310: West Midway Shopping Entrance & University Ave Performance by approach

Approach	EB	WB	All
Denied Del/Veh (s)	0.0	0.4	0.2
Total Del/Veh (s)	1.1	61.7	33.3

315: East Midway Shopping Entrance & University Ave Performance by approach

Approach	EB	WB	All
Denied Del/Veh (s)	0.0	0.6	0.3
Total Del/Veh (s)	0.4	35.0	18.9

410: University Ave & Pascal St Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.1	0.0	0.3	0.1
Total Del/Veh (s)	20.8	35.3	38.3	26.4	30.5

415: Pascal St & North Midway Shopping Entrance Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	152.0	0.0	0.0	42.7
Total Del/Veh (s)	130.3	7.3	5.0	40.9

420: Pascal St & North Walmart/Cub Entrance Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	7.9	11.0	0.0	0.0	3.1
Total Del/Veh (s)	201.0	166.3	3.2	17.0	65.5

430: Pascal St & South Cub Entrance Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	599.6	5.6	0.0	0.3	103.3
Total Del/Veh (s)	602.0	289.4	2.8	30.2	113.2

440: Pascal St & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.5	0.2
Total Del/Veh (s)	268.9	14.9	56.6	144.6

450: Pascal St & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	7.2	7.3	9.5	8.2

451: Concordia Ave Performance by approach

Approach	EB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	1.3	1.3

460: Pascal St & Marshall Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0	0.0
Total Del/Veh (s)	3.6	2.7	7.4	11.3	4.5

510: Hamline Ave & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.1	1.1	0.0	0.6	0.5
Total Del/Veh (s)	21.0	27.4	17.0	26.2	23.0

520: Hamline Ave & Midway Market Place Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.2	2.3	0.0	0.0	0.5
Total Del/Veh (s)	17.0	23.2	4.3	6.2	9.3

539: St Anthony Ave Performance by approach

Approach	WB	NW	All
Denied Del/Veh (s)	3.2	0.5	1.8
Total Del/Veh (s)	24.0	35.6	29.9

540: Hamline Ave & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	52.7	22.6	16.0	34.2

550: Hamline Ave & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	22.1	12.8	7.5	12.2

560: Hamline Ave & Marshall Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	1.0	0.0	0.0	0.2
Total Del/Veh (s)	29.1	25.6	11.4	12.4	17.5

570: Hamline Ave & Selby Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.3	1.7	0.0	0.0	0.2
Total Del/Veh (s)	29.2	23.8	9.0	10.8	13.7

580: Hamline Ave & Ashland Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.1	0.0	0.0
Total Del/Veh (s)	38.7	5.8	7.0	14.2

590: Ayd Mill Rd & Ashland Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	1.9	0.1	0.8
Total Del/Veh (s)	1.4	13.1	19.3	12.6

610: Lexington Ave & University Ave Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	1.2	0.1	0.0	4.2	0.3
Total Del/Veh (s)	20.0	23.2	1.1	2.0	5.5

639: St Anthony Ave Performance by approach

Approach	WB	NW	All
Denied Del/Veh (s)	0.2	0.2	0.2
Total Del/Veh (s)	0.1	0.5	0.4

640: Lexington Ave & St Anthony Ave Performance by approach

Approach	WB	NB	SB	All
Denied Del/Veh (s)	0.0	0.0	0.8	0.4
Total Del/Veh (s)	23.4	8.5	10.2	12.3

641: St Anthony Ave Performance by approach

Approach	WB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	5.5	5.5

649: Concordia Ave Performance by approach

Approach	EB	SE	All
Denied Del/Veh (s)	0.2	0.3	0.3
Total Del/Veh (s)	0.5	1.1	0.8

650: Lexington Ave & Concordia Ave Performance by approach

Approach	EB	NB	SB	All
Denied Del/Veh (s)	0.0	1.3	0.0	0.4
Total Del/Veh (s)	23.4	19.5	8.7	16.7

651: Concordia Ave Performance by approach

Approach	EB	All
Denied Del/Veh (s)	0.0	0.0
Total Del/Veh (s)	2.8	2.8

Total Network Performance

Denied Del/Veh (s)	104.3
Total Del/Veh (s)	158.6

Intersection: 12: Bend

Movement	SW	SW
Directions Served	T	
Maximum Queue (ft)	928	1028
Average Queue (ft)	562	569
95th Queue (ft)	1196	1248
Link Distance (ft)	938	938
Upstream Blk Time (%)	0	6
Queuing Penalty (veh)	1	75
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 110: Fry Street & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	LT	R
Maximum Queue (ft)	93	582	607	49	206	201	174	269	48	42
Average Queue (ft)	9	144	166	11	64	72	109	114	7	6
95th Queue (ft)	54	516	537	35	164	172	213	287	31	28
Link Distance (ft)		1035	1035		570	570		259	508	
Upstream Blk Time (%)		1	1					6		
Queuing Penalty (veh)		0	0					0		
Storage Bay Dist (ft)	250			170			125			25
Storage Blk Time (%)		13			2		10	9	6	1
Queuing Penalty (veh)		2			0		11	12	0	0

Intersection: 200: Snelling Ave & Thomas Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	TR	L	T	T	R
Maximum Queue (ft)	357	75	246	75	58	156	176	234	621	621	126
Average Queue (ft)	140	36	86	32	18	53	72	47	324	289	12
95th Queue (ft)	313	88	185	80	47	121	140	186	712	707	73
Link Distance (ft)	488		400			1213	1213		585	585	
Upstream Blk Time (%)	1								37	31	
Queuing Penalty (veh)	0								0	0	
Storage Bay Dist (ft)		25		25	200			200			125
Storage Blk Time (%)	56	26	56	6					42	40	0
Queuing Penalty (veh)	16	40	23	5					19	8	0

Intersection: 210: Snelling Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	UL	T	T	R	L	T
Maximum Queue (ft)	324	577	580	290	205	276	232	264	276	125	225	1246
Average Queue (ft)	45	241	314	204	76	135	88	172	202	91	124	717
95th Queue (ft)	143	588	658	353	169	249	179	283	315	167	266	1568
Link Distance (ft)		570	570	212	212	212	207	207	207			1213
Upstream Blk Time (%)		4	21	55	0	3	1	10	16			31
Queuing Penalty (veh)		7	38	117	0	6	7	41	68			122
Storage Bay Dist (ft)	250									75	150	
Storage Blk Time (%)		9							41	5	4	58
Queuing Penalty (veh)		5							111	24	12	92

Intersection: 210: Snelling Ave & University Ave

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	1234	225
Average Queue (ft)	710	47
95th Queue (ft)	1560	185
Link Distance (ft)	1213	
Upstream Blk Time (%)	30	
Queuing Penalty (veh)	119	
Storage Bay Dist (ft)		175
Storage Blk Time (%)	57	
Queuing Penalty (veh)	25	

Intersection: 220: Snelling Ave & Spruce Tree Rd

Movement	WB	NB	NB	NB	NB	SB	SB
Directions Served	R	T	T	T	R	T	TR
Maximum Queue (ft)	365	74	207	241	110	242	230
Average Queue (ft)	96	6	38	62	6	146	154
95th Queue (ft)	299	38	135	183	45	302	303
Link Distance (ft)	604		203	203	203	207	207
Upstream Blk Time (%)	1		0	1		28	41
Queuing Penalty (veh)	0		1	6		141	204
Storage Bay Dist (ft)		25					
Storage Blk Time (%)		0	7				
Queuing Penalty (veh)		0	25				

Intersection: 230: Snelling Ave & Shields Ave

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	LT	R	L	T	T	TR	UL	T	TR
Maximum Queue (ft)	40	66	2323	2319	150	185	459	538	456	175	258	234
Average Queue (ft)	8	19	1657	1666	107	52	179	208	111	72	182	182
95th Queue (ft)	30	50	3205	3206	209	131	372	422	335	181	303	289
Link Distance (ft)		1442	2265	2265			644	644	644		203	203
Upstream Blk Time (%)			60	62			0	0	0		42	52
Queuing Penalty (veh)			0	0			0	0	0		210	260
Storage Bay Dist (ft)	100				100	250				125		
Storage Blk Time (%)		0		65	0		7			5	38	
Queuing Penalty (veh)		0		168	4		3			22	36	

Intersection: 239: St Anthony Ave

Movement	WB	WB	NW	NW
Directions Served	T	T	L	L
Maximum Queue (ft)	788	793	842	846
Average Queue (ft)	441	434	321	350
95th Queue (ft)	1035	1038	870	898
Link Distance (ft)	751	751	1278	1278
Upstream Blk Time (%)	34	35		
Queuing Penalty (veh)	110	114		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	499	522	519	502	221	224	149	166	165	196	542	644
Average Queue (ft)	328	385	386	311	103	96	66	78	64	50	168	359
95th Queue (ft)	598	632	639	664	178	184	125	145	137	132	434	633
Link Distance (ft)	450	450	450	450	233	233	233	233			644	644
Upstream Blk Time (%)	20	50	53	29	0	0	0	0			0	0
Queuing Penalty (veh)	61	149	159	87	1	1	0	0			4	0
Storage Bay Dist (ft)									300	300		
Storage Blk Time (%)											0	
Queuing Penalty (veh)											1	

Intersection: 240: Snelling Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	660
Average Queue (ft)	480
95th Queue (ft)	908
Link Distance (ft)	644
Upstream Blk Time (%)	24
Queuing Penalty (veh)	219
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 250:

Movement	EB	EB	EB	NB	NB	NB	NB	NB	B5	B5	SB	SB
Directions Served	L	LT	T	T	T	T	T	R	T	T	L	L
Maximum Queue (ft)	278	422	242	179	233	301	304	200	44	52	218	221
Average Queue (ft)	149	215	54	61	87	94	109	56	1	1	99	73
95th Queue (ft)	239	350	146	151	185	220	242	120	20	17	189	160
Link Distance (ft)	4065	4065				290	290	290	595	595	233	233
Upstream Blk Time (%)						1	1				1	0
Queuing Penalty (veh)						4	5				3	1
Storage Bay Dist (ft)			400	190	190							
Storage Blk Time (%)		1		0	1	4						
Queuing Penalty (veh)		4		0	2	19						

Intersection: 250:

Movement	SB	SB
Directions Served	T	T
Maximum Queue (ft)	187	174
Average Queue (ft)	57	46
95th Queue (ft)	140	127
Link Distance (ft)	233	233
Upstream Blk Time (%)	0	0
Queuing Penalty (veh)	1	1
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 251: Concordia Ave

Movement	EB
Directions Served	L
Maximum Queue (ft)	4
Average Queue (ft)	0
95th Queue (ft)	0
Link Distance (ft)	454
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 260: Snelling Ave & Marshall Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	198	228	48	99	202	47	58	126	126	84	67	439
Average Queue (ft)	88	121	13	40	93	19	18	41	50	14	7	171
95th Queue (ft)	159	199	37	84	166	42	47	91	98	50	41	317
Link Distance (ft)		664			1226			602	602			595
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	300		175	200		175	150			75	125	
Storage Blk Time (%)		3			1			0	2	0		14
Queuing Penalty (veh)		5			1			0	1	0		2

Intersection: 260: Snelling Ave & Marshall Ave

Movement	SB	SB	B5	B5	B5
Directions Served	T	R	T	T	
Maximum Queue (ft)	407	150	104	160	45
Average Queue (ft)	160	55	5	8	2
95th Queue (ft)	304	147	66	82	33
Link Distance (ft)	595		290	290	290
Upstream Blk Time (%)				0	
Queuing Penalty (veh)				0	
Storage Bay Dist (ft)		100			
Storage Blk Time (%)	16				
Queuing Penalty (veh)	23				

Intersection: 270: Snelling Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	183	290	210	352	174	434	407	249	383	68
Average Queue (ft)	47	153	33	175	29	236	221	154	46	23
95th Queue (ft)	115	251	108	321	109	384	362	266	206	58
Link Distance (ft)		609		930		564	564		602	602
Upstream Blk Time (%)						0	0			
Queuing Penalty (veh)						0	0			
Storage Bay Dist (ft)	225		200		125			175		
Storage Blk Time (%)		3		10		33		4		
Queuing Penalty (veh)		1		4		8		17		

Intersection: 310: West Midway Shopping Entrance & University Ave

Movement	WB	WB	WB
Directions Served	T	T	T
Maximum Queue (ft)	275	519	470
Average Queue (ft)	138	221	51
95th Queue (ft)	352	629	288
Link Distance (ft)		505	505
Upstream Blk Time (%)		33	3
Queuing Penalty (veh)		89	7
Storage Bay Dist (ft)	200		
Storage Blk Time (%)	46	0	
Queuing Penalty (veh)	91	0	

Intersection: 315: East Midway Shopping Entrance & University Ave

Movement	WB	WB
Directions Served	T	T
Maximum Queue (ft)	406	414
Average Queue (ft)	126	82
95th Queue (ft)	410	332
Link Distance (ft)	387	387
Upstream Blk Time (%)	14	6
Queuing Penalty (veh)	31	12
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 410: University Ave & Pascal St

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	LT	R
Maximum Queue (ft)	52	245	307	240	419	412	219	243	78	148	51
Average Queue (ft)	13	90	126	86	94	93	128	57	37	65	4
95th Queue (ft)	40	197	255	187	262	242	228	164	66	123	25
Link Distance (ft)		387	387		1219	1219		225	225	729	
Upstream Blk Time (%)							6	6			
Queuing Penalty (veh)							0	7			
Storage Bay Dist (ft)	225			250			200				25
Storage Blk Time (%)		1		0	5		10	2		41	2
Queuing Penalty (veh)		0		0	4		7	2		2	2

Intersection: 415: Pascal St & North Midway Shopping Entrance

Movement	EB	NB	NB	NB	SB
Directions Served	LR	L	T	T	TR
Maximum Queue (ft)	506	126	143	35	206
Average Queue (ft)	281	29	11	1	21
95th Queue (ft)	624	84	88	26	111
Link Distance (ft)	454		260	260	225
Upstream Blk Time (%)	41		2		1
Queuing Penalty (veh)	0		2		5
Storage Bay Dist (ft)		100			
Storage Blk Time (%)		0	4		
Queuing Penalty (veh)		0	1		

Intersection: 420: Pascal St & North Walmart/Cub Entrance

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	618	744	93	60	155	269
Average Queue (ft)	226	232	20	3	23	68
95th Queue (ft)	617	666	61	38	97	235
Link Distance (ft)	651	779		214		260
Upstream Blk Time (%)	10	7		1		5
Queuing Penalty (veh)	0	0		1		16
Storage Bay Dist (ft)			100		125	
Storage Blk Time (%)			0	1		12
Queuing Penalty (veh)			1	0		9

Intersection: 430: Pascal St & South Cub Entrance

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	L	TR	L	T
Maximum Queue (ft)	657	806	385	56	37	149	224
Average Queue (ft)	417	255	53	13	1	26	103
95th Queue (ft)	873	706	282	43	7	108	272
Link Distance (ft)	638	798	798		315		214
Upstream Blk Time (%)	55	6	2				20
Queuing Penalty (veh)	0	0	0				81
Storage Bay Dist (ft)				100		125	
Storage Blk Time (%)					0	0	31
Queuing Penalty (veh)					0	0	10

Intersection: 440: Pascal St & St Anthony Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	TR	L	T	T	R
Maximum Queue (ft)	1249	1261	39	182	333	75
Average Queue (ft)	590	604	8	79	241	66
95th Queue (ft)	1469	1479	31	151	417	94
Link Distance (ft)	1228	1228		276	315	
Upstream Blk Time (%)	16	20			32	
Queuing Penalty (veh)	40	50			198	
Storage Bay Dist (ft)			100			50
Storage Blk Time (%)				4	25	42
Queuing Penalty (veh)				0	76	168

Intersection: 450: Pascal St & Concordia Ave

Movement	EB	EB	NB	SB	SB
Directions Served	LT	TR	TR	L	T
Maximum Queue (ft)	101	80	95	131	88
Average Queue (ft)	51	33	44	62	43
95th Queue (ft)	85	59	76	108	77
Link Distance (ft)	676	676	947		276
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				100	
Storage Blk Time (%)				1	0
Queuing Penalty (veh)				2	0

Intersection: 451: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 460: Pascal St & Marshall Ave

Movement	EB	WB	WB	NB	SB
Directions Served	L	L	TR	LTR	LTR
Maximum Queue (ft)	60	18	18	36	115
Average Queue (ft)	17	1	1	8	46
95th Queue (ft)	47	8	7	31	91
Link Distance (ft)			1247	350	947
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	100	100			
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 510: Hamline Ave & University Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	TR
Maximum Queue (ft)	73	224	240	223	237	167	126	192	78	109	248
Average Queue (ft)	31	97	114	119	104	62	49	94	27	20	117
95th Queue (ft)	61	184	210	202	182	138	100	166	58	70	200
Link Distance (ft)		1219	1219		782	782		315	315		606
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	275			275			140			100	
Storage Blk Time (%)		0		0	0			2			14
Queuing Penalty (veh)		0		0	0			1			3

Intersection: 520: Hamline Ave & Midway Market Place

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	73	127	172	130	91	145	66	96	61	77
Average Queue (ft)	25	52	79	44	31	37	16	34	18	30
95th Queue (ft)	57	102	143	88	67	95	48	76	50	68
Link Distance (ft)		380		396		792	792		315	315
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	125		200		75			125		
Storage Blk Time (%)		0	0	0	0	2		0		
Queuing Penalty (veh)		0	0	0	0	1		0		

Intersection: 539: St Anthony Ave

Movement	WB	WB	NW	NW
Directions Served	T	T	L	L
Maximum Queue (ft)	273	259	393	436
Average Queue (ft)	66	46	80	95
95th Queue (ft)	335	289	414	462
Link Distance (ft)	611	611	922	922
Upstream Blk Time (%)	4	3	0	1
Queuing Penalty (veh)	0	0	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 540: Hamline Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	T	R	LT	T	T	TR
Maximum Queue (ft)	330	377	371	320	238	201	213	211
Average Queue (ft)	126	202	202	100	111	67	91	86
95th Queue (ft)	298	390	397	274	225	167	177	178
Link Distance (ft)	377	377	377	377	249	249	792	792
Upstream Blk Time (%)	1	16	16	1	5	1		
Queuing Penalty (veh)	2	30	30	2	12	3		
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 550: Hamline Ave & Concordia Ave

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	LT	T	R	T	TR	LT	T
Maximum Queue (ft)	160	150	76	148	175	156	135
Average Queue (ft)	76	56	24	56	52	82	51
95th Queue (ft)	139	110	70	123	122	134	107
Link Distance (ft)	937	937		942	942	249	249
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			25				
Storage Blk Time (%)		38	3				
Queuing Penalty (veh)		17	3				

Intersection: 560: Hamline Ave & Marshall Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	TR	LT	TR
Maximum Queue (ft)	145	298	108	180	188	106	135	129
Average Queue (ft)	51	127	31	84	73	44	63	69
95th Queue (ft)	107	223	77	149	147	91	114	121
Link Distance (ft)		1247		659	612	612	942	942
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	200		150					
Storage Blk Time (%)		2		1				
Queuing Penalty (veh)		2		0				

Intersection: 570: Hamline Ave & Selby Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	170	83	160	99	156	156	196	146
Average Queue (ft)	76	7	66	38	63	52	80	54
95th Queue (ft)	138	37	124	84	126	118	155	114
Link Distance (ft)	1319		651		947	947	612	612
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		50		50				
Storage Blk Time (%)	27	0	26	1				
Queuing Penalty (veh)	2	0	15	1				

Intersection: 580: Hamline Ave & Ashland Ave

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LR	R	T	TR	LT	T
Maximum Queue (ft)	137	133	121	91	176	78
Average Queue (ft)	77	66	39	19	60	10
95th Queue (ft)	125	127	91	60	133	42
Link Distance (ft)	343	343	677	677	947	947
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 590: Ayd Mill Rd & Ashland Ave

Movement	NB	NB	NB	SB	SB
Directions Served	L	L	T	T	TR
Maximum Queue (ft)	109	122	138	227	194
Average Queue (ft)	46	17	68	111	54
95th Queue (ft)	95	63	125	183	137
Link Distance (ft)	866	866		600	600
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			100		
Storage Blk Time (%)		0	2		
Queuing Penalty (veh)		0	3		

Intersection: 610: Lexington Ave & University Ave

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	TR	T	TR	T	T	R	R
Maximum Queue (ft)	146	115	87	82	34	24	35	29	38
Average Queue (ft)	47	37	28	23	3	1	3	2	9
95th Queue (ft)	116	90	71	61	17	10	17	14	31
Link Distance (ft)		561	561	836	836	1203	1203		
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	275							175	150
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 639: St Anthony Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	T	R	L	L	T	T	T	T	T	T
Maximum Queue (ft)	143	218	170	130	211	112	110	91	133	133	206	193
Average Queue (ft)	82	112	38	62	91	46	47	36	60	46	112	99
95th Queue (ft)	132	176	104	105	165	92	84	80	112	108	178	169
Link Distance (ft)	443	443	443	443	241	241	241	241			1203	1203
Upstream Blk Time (%)					0							
Queuing Penalty (veh)					0							
Storage Bay Dist (ft)									180	180		
Storage Blk Time (%)											0	
Queuing Penalty (veh)											3	

Intersection: 640: Lexington Ave & St Anthony Ave

Movement	SB
Directions Served	R
Maximum Queue (ft)	198
Average Queue (ft)	51
95th Queue (ft)	150
Link Distance (ft)	1203
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 641: St Anthony Ave

Movement	WB	WB
Directions Served	LT	T
Maximum Queue (ft)	66	11
Average Queue (ft)	4	0
95th Queue (ft)	48	8
Link Distance (ft)	222	222
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 649: Concordia Ave

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 650: Lexington Ave & Concordia Ave

Movement	EB	EB	EB	EB	NB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	LT	T	R	T	T	T	T	R	L	L	T
Maximum Queue (ft)	247	338	295	179	140	144	217	191	119	175	158	98
Average Queue (ft)	104	203	98	81	59	52	127	98	40	81	52	46
95th Queue (ft)	203	314	237	143	115	112	201	182	91	138	112	85
Link Distance (ft)	443	443	443	443			812	812		241	241	241
Upstream Blk Time (%)										0	0	
Queuing Penalty (veh)										0	0	
Storage Bay Dist (ft)					125	125			125			
Storage Blk Time (%)					0	0	9	3	0			
Queuing Penalty (veh)					1	0	37	4	0			

Intersection: 650: Lexington Ave & Concordia Ave

Movement	SB
Directions Served	T
Maximum Queue (ft)	105
Average Queue (ft)	44
95th Queue (ft)	90
Link Distance (ft)	241
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 651: Concordia Ave

Movement	EB
Directions Served	T
Maximum Queue (ft)	6
Average Queue (ft)	0
95th Queue (ft)	5
Link Distance (ft)	104
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 4183