

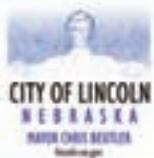


WEST HAYMARKET ARENA

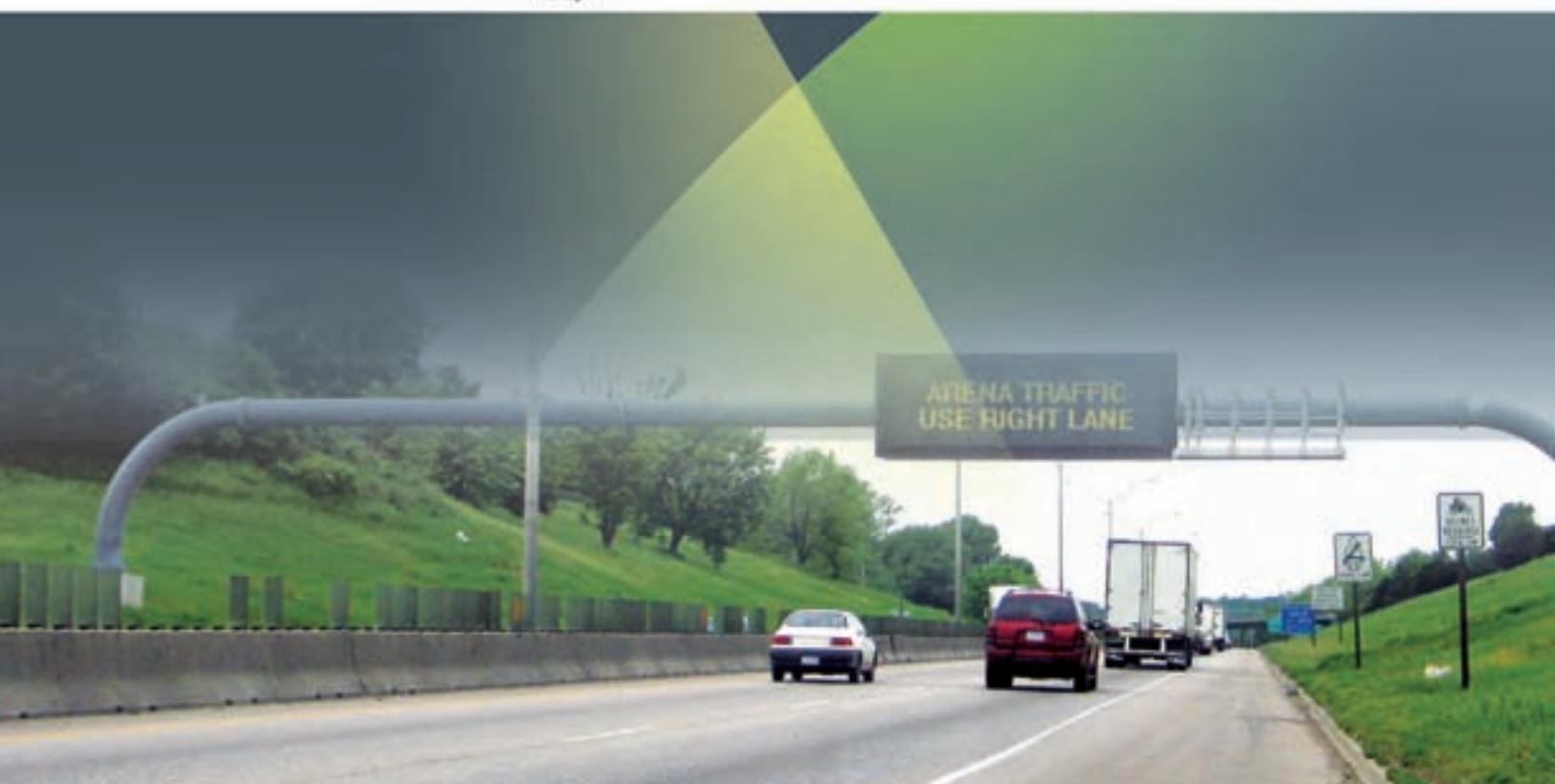
Event Traffic Study | Lincoln, Nebraska

DRAFT REPORT

prepared for:



prepared by:

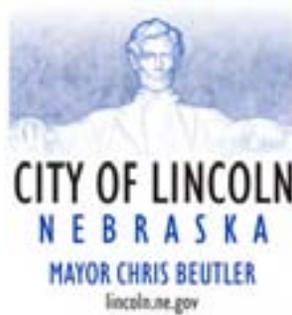


**WEST HAYMARKET ARENA
EVENT TRAFFIC STUDY
Lincoln, Nebraska**

DRAFT REPORT

FEBRUARY 6, 2009

PREPARED FOR:



OA PROJECT No. 008-0645

**1111 Lincoln Mall, Suite 111 | Lincoln, Nebraska 68508
www.oaconsulting.com | TEL 402.474.6311 | FAX 402.474.5160**

TABLE OF CONTENTS

1.0 INTRODUCTION AND OBJECTIVE	1
2.0 DATA COLLECTION.....	1
3.0 BASE TRAFFIC VOLUMES.....	1
4.0 ARENA EVENT / ADJACENT LAND-USE CHARACTERISTICS	5
4.1 TRIP GENERATION - ARENA.....	5
4.2 TRIP GENERATION - OTHER.....	9
4.3 TRIP DISTRIBUTION.....	9
4.4 PARKING STALL PROVISION.....	11
5.0 2013 COMBINED CONDITIONS.....	15
5.1 2013 COMBINED VOLUMES	15
5.2 CAPACITY ANALYSIS & NETWORK IMPROVEMENTS	15
6.0 TRAILS & PEDESTRIAN ACTIVITY	22
7.0 DESIGN EVENT OBSERVATIONS	23
8.0 CAPACITY EVENT CONDITIONS	24
9.0 YEAR 2013 ARENA CONCLUSIONS.....	25
10.0 YEAR 2030 ANALYSIS.....	25
10.1 2030 COMBINED VOLUMES	25
10.2 CAPACITY ANALYSIS & NETWORK IMPROVEMENTS	25
11.0 EXISTING HAYMARKET ANALYSIS	28
12.0 STUDY SUMMARY	28

LIST OF FIGURES

FIGURE 1:	VICINITY MAP	2
FIGURE 2A:	INTERSECTION LANE CONFIGURATIONS & TRAFFIC CONTROL	3
FIGURE 2B:	INTERSECTION LANE CONFIGURATIONS & TRAFFIC CONTROL	4
FIGURE 3A:	2013 BASE VOLUMES	6
FIGURE 3B:	2013 BASE VOLUMES	7
FIGURE 4:	SITE PLAN	8
FIGURE 5:	TRIP DISTRIBUTION	10
FIGURE 6A:	DESIGN EVENT + HOTEL + ICE TRAFFIC VOLUMES	12
FIGURE 6B:	DESIGN EVENT + HOTEL + ICE TRAFFIC VOLUMES	13
FIGURE 7:	STUDY PARKING FACILITIES	14
FIGURE 8A:	2013 COMBINED VOLUMES	16
FIGURE 8B:	2013 COMBINED VOLUMES	17
FIGURE 9A:	2013 CAPACITY ANALYSIS SUMMARY	18
FIGURE 9B:	2013 CAPACITY ANALYSIS SUMMARY	19
FIGURE 10A:	2030 COMBINED VOLUMES	26
FIGURE 10B:	2030 COMBINED VOLUMES	27
FIGURE 11A:	2030 CAPACITY ANALYSIS SUMMARY	29
FIGURE 11B:	2030 CAPACITY ANALYSIS SUMMARY	30

LIST OF APPENDICIES

APPENDIX A	ITE TRIP GENERATION
APPENDIX B	PARKING DEMAND TABLE
APPENDIX C	TRANSPORTATION NETWORK IMPROVEMENTS
APPENDIX D	EXISTING HAYMARKET ANALYSIS

1.0 INTRODUCTION AND OBJECTIVE

This report documents the results of traffic analysis conducted for the proposed West Haymarket Arena, as well as the redevelopment plans for adjacent blocks near the existing Haymarket area in Lincoln, Nebraska. The proposed arena will be located in the area northwest and west of the 7th Street & R Street intersection. A vicinity map showing the study area and project site is illustrated in **Figure 1**.

The primary objective of this study is to show traffic operations during the hour prior to and the hour following a design event at the arena. This analysis will yield necessary network improvements to handle the design event traffic. In addition to the design event, capacity event and future-year analyses are also documented in this report. All analysis scenarios consider additional trips being made due to adjacent land uses.

2.0 DATA COLLECTION

The data collection effort for this study primarily consisted of obtaining existing traffic volume information from the City of Lincoln and Nebraska Department of Roads (NDOR). Peak hour turning movement count dates for the study intersections ranged from 1999 to 2007. An hourly breakdown of ADT volumes throughout the study area was provided by the City to aid in developing off-peak volumes during the pre-event and post-event hours.

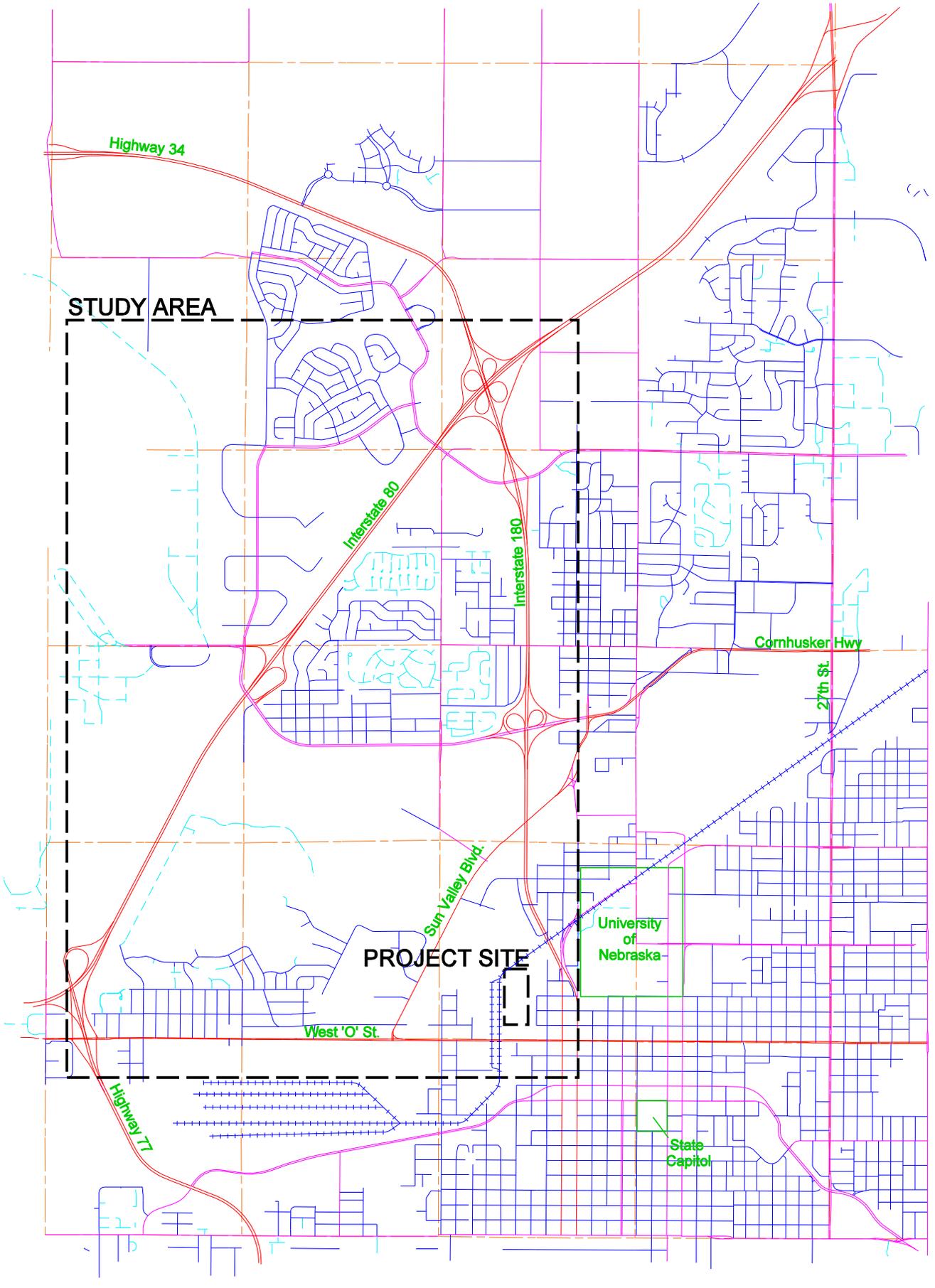
An aerial and field review was conducted of the study area to determine lane configurations and traffic control measures. For the purposes of this study, it was assumed that all lanes along 9th / 10th Streets would be available for traffic (prohibit on-street parking) during the pre-event and post-event hours. The base street network (and modifications) used for the study is illustrated in **Figure 2A & 2B**.

Information (data) contained in this report coincides with the *Comprehensive Downtown Parking Study (10-13-08)* conducted by *Carl Walker Inc.* for the City of Lincoln.

3.0 BASE TRAFFIC VOLUMES

The base traffic volumes for this study corresponded to the non-site related volumes occurring during the expected arena pre-event and post-event hours. These timeframes are assumed to be 6:00 PM - 7:00 PM and 9:00 PM - 10:00 PM respectively. The process to determine these 2013 base volumes is outlined below. (2013 has been selected as an assumed opening date for the arena).

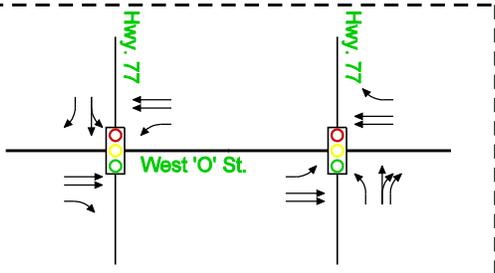
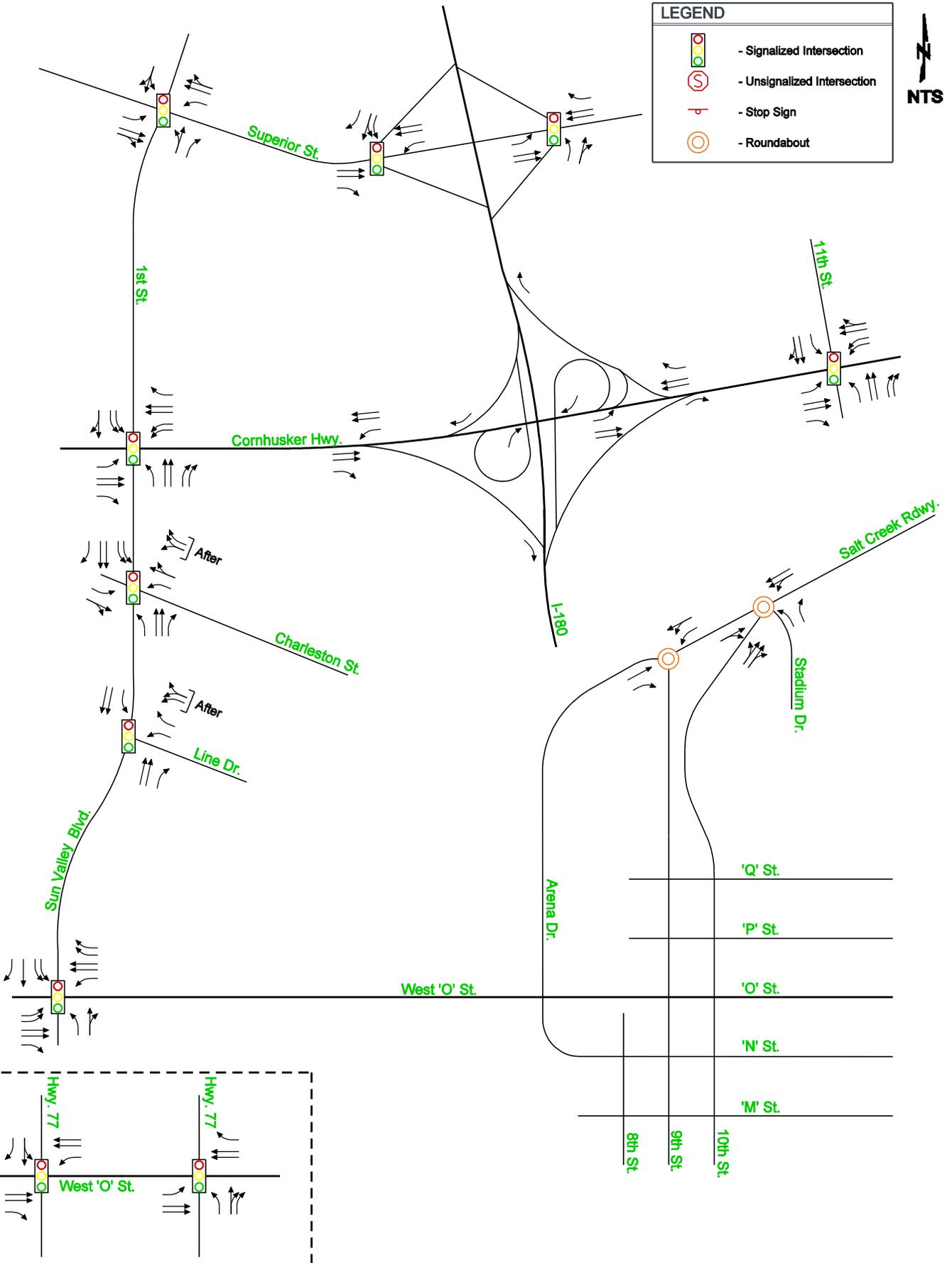
As previously stated, the peak hour intersection volumes provided were conducted over a span of eight years. To bring these volumes into a similar timeframe, all counts prior to 2007 were adjusted to match the most recent count year (2007) using an annual growth rate of 1.5 percent based on the average annual rate to attain the City's Long Range Transportation Plan (LRTP) volumes from 2007 volumes. The adjusted 2007 volumes were then placed on the study network and balanced. Manual balancing was required to provide consistency between volumes at adjacent downtown intersections, interchange ramps, and other locations where balanced volumes would be expected. Attention was given to mid-block generators and / or parking facilities.



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LEGEND	
	- Signalized Intersection
	- Unsignalized Intersection
	- Stop Sign
	- Roundabout



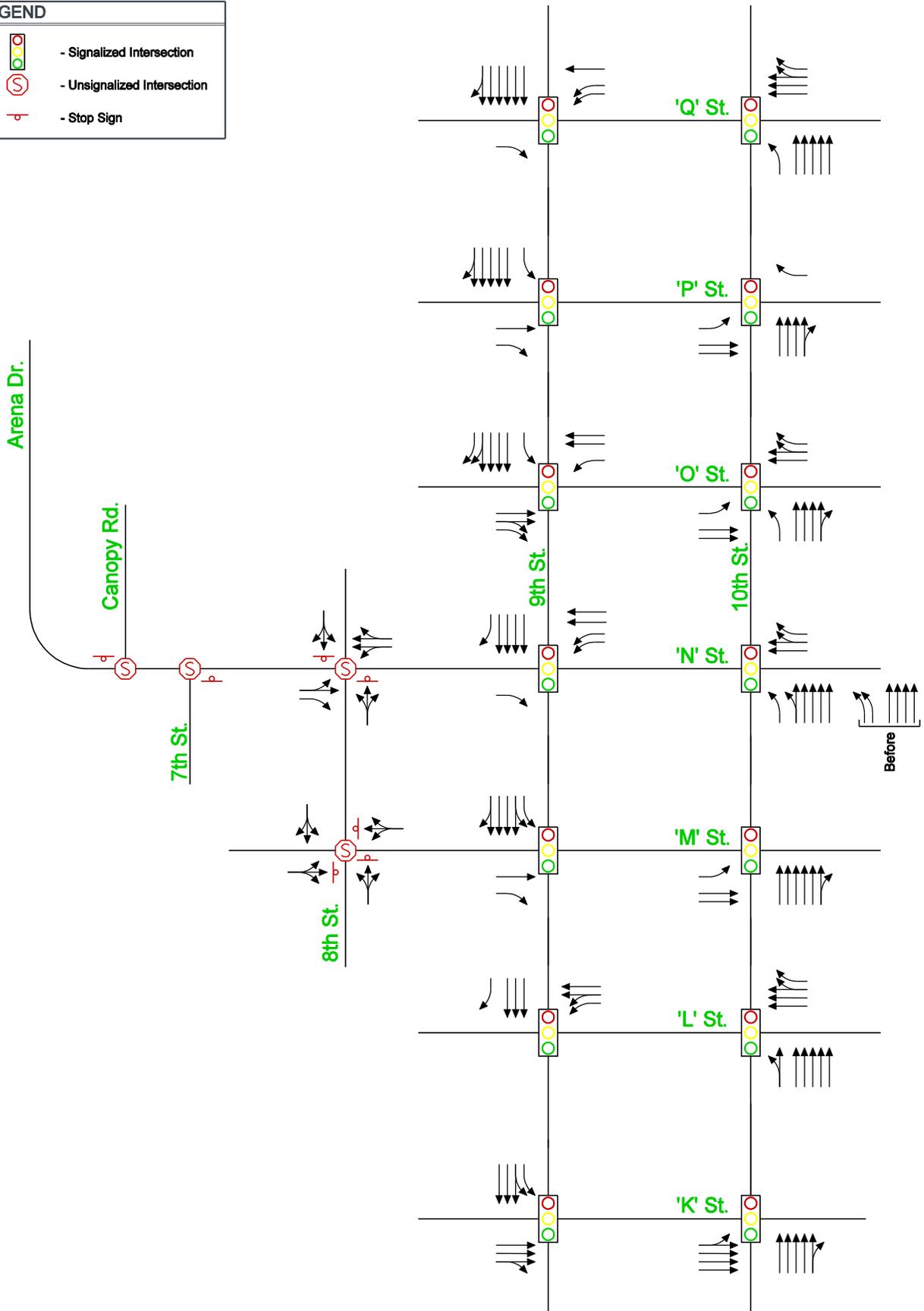
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Intersection Lane Configurations
& Traffic Control

FIGURE
2A

LEGEND	
	- Signalized Intersection
	- Unsignalized Intersection
	- Stop Sign



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Intersection Lane Configurations
& Traffic Control

FIGURE
2B

Further, the study network assumes a realignment of Sun Valley Boulevard disconnecting it from the south leg of 11th Street & Cornhusker Highway. This is currently a Nebraska Department of Roads (NDOR) project. This project is in the preliminary design and environmental documentation phase, with construction planned for 2014 or later. The Sun Valley Boulevard disconnect with 11th Street resulted in increased volumes through the 1st Street & Cornhusker Highway intersection.

Once the network volumes were balanced, 2007 volumes were grown at an annual growth rate of 1.5 percent to the analysis year of 2013. This step provided a representation of expected PM peak hour volumes in 2013. However, the primary intent of this study is to address the pre-event and post-event hours. To reduce the PM peak hour volumes into these time periods, hourly breakdowns of ADT volumes were utilized.

Approximately 20 area ADT counts were evaluated to determine the PM peak hour and the percentage of peak hour volumes occurring between 6-7 PM and 9-10 PM. The evaluation showed that the 6-7 PM volumes average 71 percent of the PM peak and the 9-10 PM volumes average 38 percent of the PM peak. These two reductions were then applied to the 2013 PM peak hour volumes to determine background volumes for the study analysis periods.

Background volumes were developed for Arena Drive based primarily on mixed-use developments expected near the arena (see section 4.2), and a portion of 9th / 10th Street traffic that is expected to use Arena Drive as an alternate route. The 2013 base volumes are illustrated in **Figures 3A & 3B**.

4.0 ARENA EVENT / ADJACENT LAND-USE CHARACTERISTICS

To determine street network operations and development impacts, trips expected to be associated with the West Haymarket development area were generated and applied to the study network. The site plan and layout used for this study is provided in **Figure 4**.

4.1 Trip Generation - Arena

The trip generation for the arena relied heavily on the parking study being conducted for the City. OA was instructed to follow similar assumptions in that study to develop expected traffic volumes.

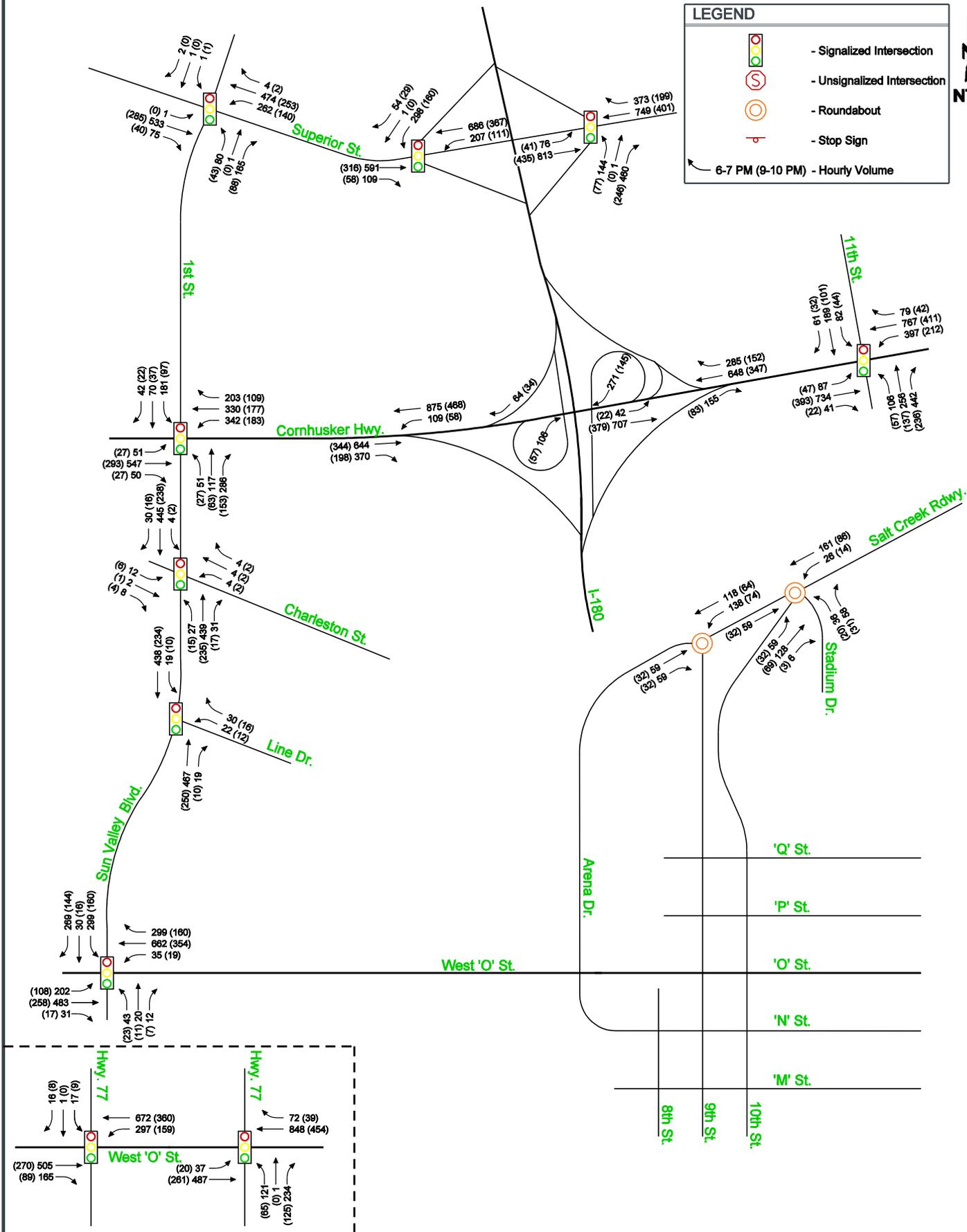
It is assumed that the arena will include 16,000 seats. For the design event, an 80 percent attendance rate is expected (12,800 people). For the purposes of this study, the attendees are expected to arrive solely via personal vehicle with a 2.5 person/vehicle occupancy rate (5,120 vehicles). A further reduction was applied to the trips used in this study which assumes that 90 percent will arrive at the arena during the pre-event hour and 90 percent will leave the arena during the post-event hour. Therefore, 4,608 arena trips are expected to enter and exit the study area during the time periods evaluated for the design event. Assuming all trips by personal vehicles is a conservative step, utilizing other modes of transportation is strongly encouraged.



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- Roundabout
- Stop Sign

↔ 6-7 PM (9-10 PM) - Hourly Volume



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2013 Base Volumes

FIGURE 3A



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- Stop Sign
- 6-7 PM (9-10 PM) - Hourly Volume

Arena Dr.

Canopy Rd.

7th St.

8th St.

9th St.

N St.

10th St.

M St.

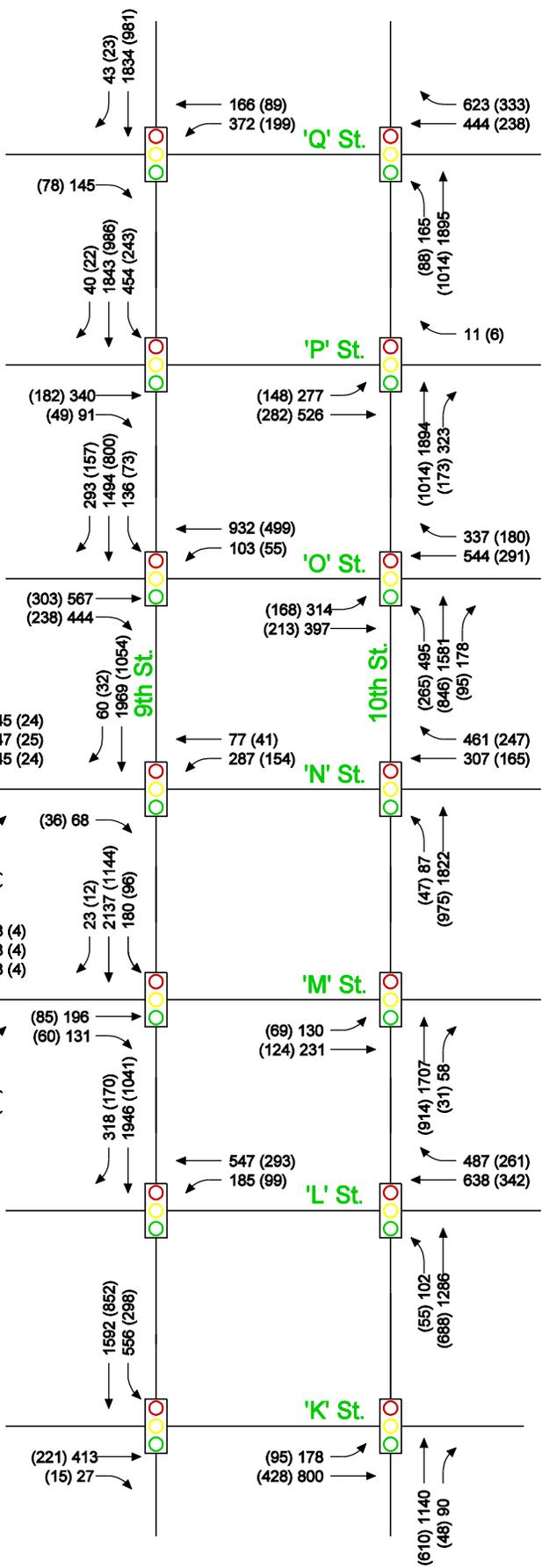
L St.

K St.

Q St.

P St.

O St.

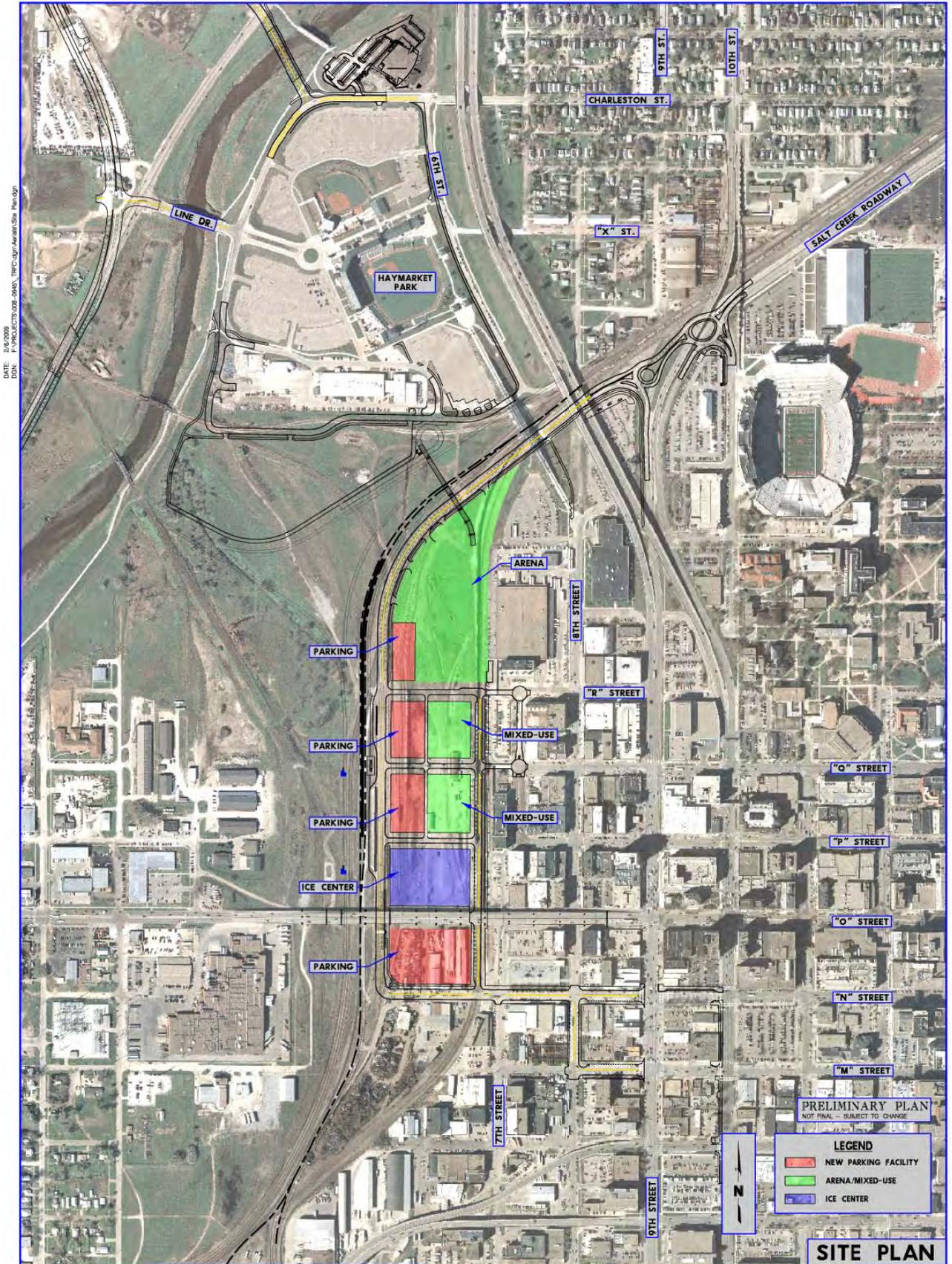


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2013 Base Volumes

FIGURE
3B



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4.2 Trip Generation - Other

The West Haymarket area is expected to encompass other land-uses in addition to the arena. Specifically, this study considers traffic generated from a 250-room hotel, 100,000 ft² of retail space, 100,000 ft² of office space, 100 residential units, and a proposed ice rink. **Appendix A** contains a table showing expected daily trips associated with these uses based on the *ITE Trip Generation Manual* (2008 edition). An ice rink is included in the *ITE Trip Generation Manual*, but has been omitted from the trip generation table because little data is available (direction was provided by the City to assume 135 enter / exit during study hours). In all, the mixed-use areas (hotel, retail, office, and residential) are expected to yield approximately 7,500 daily trips. For the 2013 scenario, build-out of the mixed-use areas is not expected. Therefore, about 60 percent of the trips were included in the initial analysis and are reflected with the background volumes. This assumption is again conservative as many of the trips during the study hours that are associated with the retail and hotel land-uses will likely be tied to the arena trips.

4.3 Trip Distribution

The trip distribution for this study is based on two primary pieces of information. First; direction was given by the City to utilize the provided distribution that was applied to a 2005 study of the Harris Overpass. Second; the locations and size of potential parking facilities were determined from the most recent site layout concepts and ongoing discussions with the design team (see section 4.4).

The distribution provided by the City did not provide detail north of the downtown area; only that 30 percent would enter from I-180 and 6 percent on Sun Valley Boulevard. To include all of the study intersections, these percentages were routed out external nodes on Cornhusker Highway, Superior Street, and north of Superior Street along I-180.

To the southwest, 19 percent was routed into downtown via Rosa Parks Way in the 2005 Harris Overpass study. For the purpose of routing the hotel and ice rink trips, this distribution seems reasonable. However, based on the parking study and ability to provide parking at certain locations, this allotment of arena trips to Rosa Parks Way seems high. There are very few access points on Rosa Parks Way between US-77 and downtown; it is likely that most of the trips could be traced back to US-77. Based on the locations of anticipated parking facilities and the availability of downtown parking, it seems more reasonable that a portion of this “19 percent” would use West O Street from US-77 as opposed to entering downtown only to drive out West O to get to Sun Valley Boulevard (Haymarket Park parking). This distribution assumes that minimal traffic is required to cross Harris Overpass from either direction.

Figure 5 illustrates the external node trip distribution for this study.

From the labeled external nodes, trips were routed internally to the parking facilities based on a number of assumptions pertaining to: ease of path, direction of travel, and parking availability. Many of the assumptions are described in detail below:

- All arena VIP trips enter & exit via the north Arena Drive connection.
- All 10th, K, and L Street arena trips enter & exit via M / N Streets at 9th Street
- 75 percent of East Cornhusker Highway arena trips are routed onto Salt Creek Roadway (remaining 25 percent proceed to Haymarket Park)
- All Salt Creek Roadway (including 75 percent of East Cornhusker Highway) arena trips utilize UNL Garage and NE parking area (north of the Post Office / INS buildings)
- 75 percent of I-180, Superior Street, West Cornhusker Highway, and West O Street arena trips utilize Haymarket Park
- Approximately 40 percent of East O Street arena trips utilize miscellaneous downtown parking east of 10th Street

It should be noted that the traffic volume scenarios resulting from this distribution rely heavily on a well-implemented plan of communicating with drivers through pre-event parking instructions, dynamic message signs, event staff parking control, and driver obedience. It is also worth noting that the parking study recommends minimum parking stall provisions. The recommended stall quantities have been incorporated into the distribution.

Figures 6A & 6B illustrate the trips associated with the arena design event, hotel, and ice rink.

4.4 Parking Stall Provision

A key land-use for the arena development will be parking facilities. The West Haymarket parking study should be obtained for a detailed discussion of the process used to arrive at the total parking demand. Based on design assumptions, the parking study indicates the following total demand by land-use to be:

- 5,120 arena stalls
- 975 mixed-use stalls
- 300 ice rink stalls

Two key factors lead to a reduction in planned stall provision for the development. First, the arena patrons will utilize available existing parking stalls. Second, it is assumed that the arena and mixed-use development will share 350 stalls. The study does not assume utilization of the new stalls by existing Haymarket patrons due to displaced Haymarket stalls (due to festival space between R Street and Q Street west of 7th Street. It is assumed that displaced Haymarket stalls will be provided elsewhere in the Haymarket via future projects.

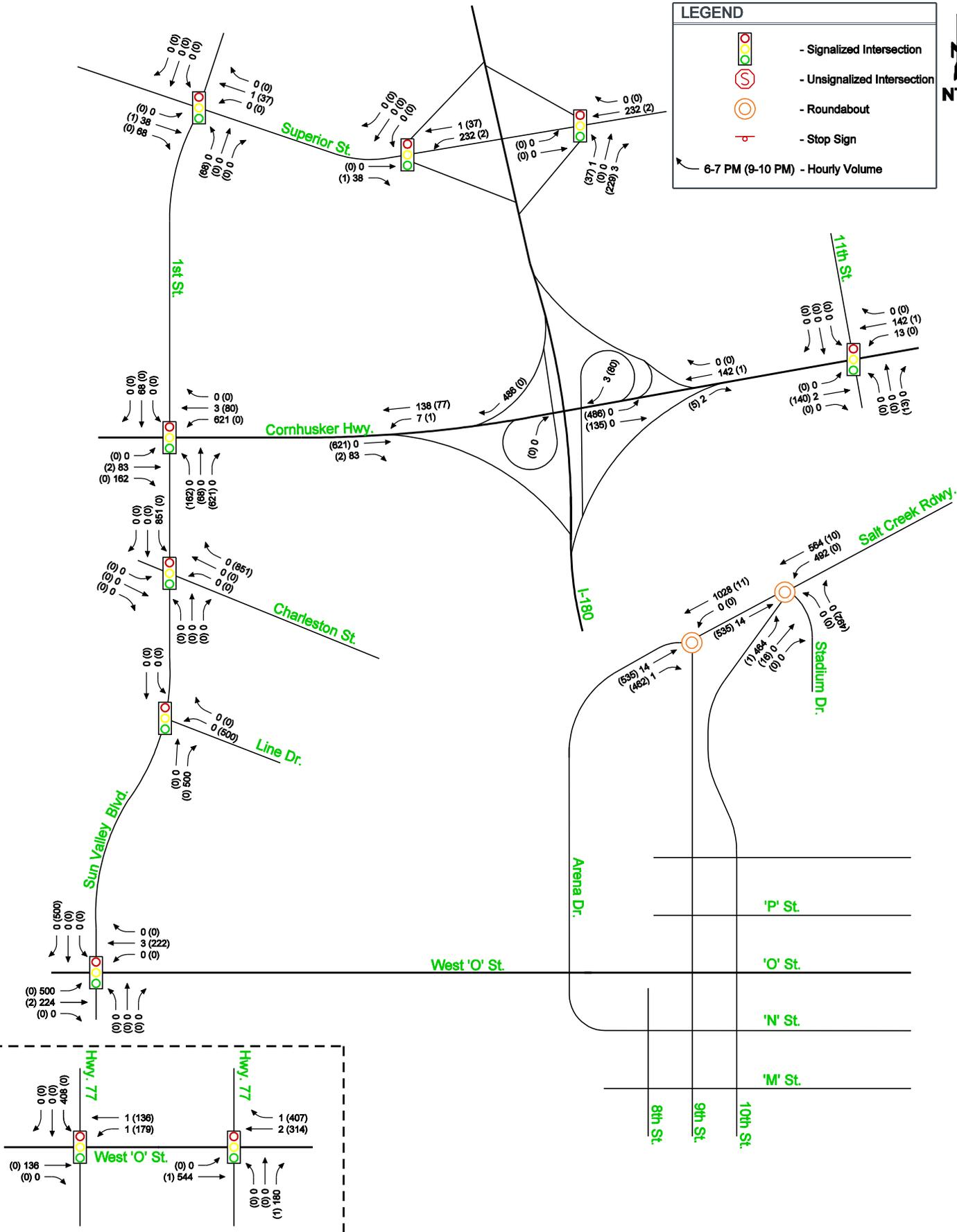
As the West Haymarket site plan has evolved, an ongoing iterative process has been used that considers the total parking demand, expected vehicular distribution, and the site plan's desired parking provision to determine parking demand by location. Based on the demand by location, the quantity of stalls at existing and potential parking facilities was subtracted off to identify the size of the proposed parking garages and potential deck parking just south of the arena site. A detailed parking demand table is included in **Appendix B** which shows parking stall demand by land-use and location. **Figure 7** illustrates the proposed parking facility map corresponding to this study.



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- Roundabout
- Stop Sign

↖ 6-7 PM (9-10 PM) - Hourly Volume



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Design Event + Hotel + Ice
Traffic Volumes

FIGURE
6A



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- Stop Sign
- ↔ - 6-7 PM (9-10 PM) - Hourly Volume

Arena Dr.

Canopy Rd.

7th St.

8th St.

9th St.

N St.

10th St.

M St.

L St.

K St.

Q St.

P St.

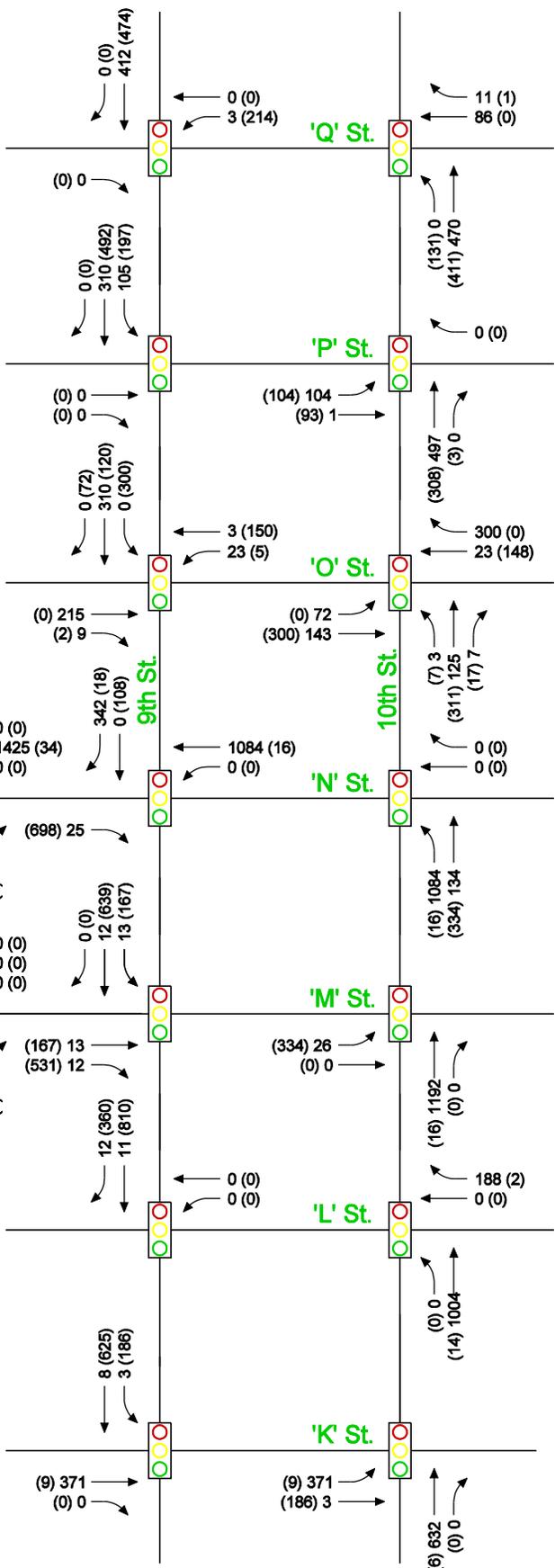
O St.

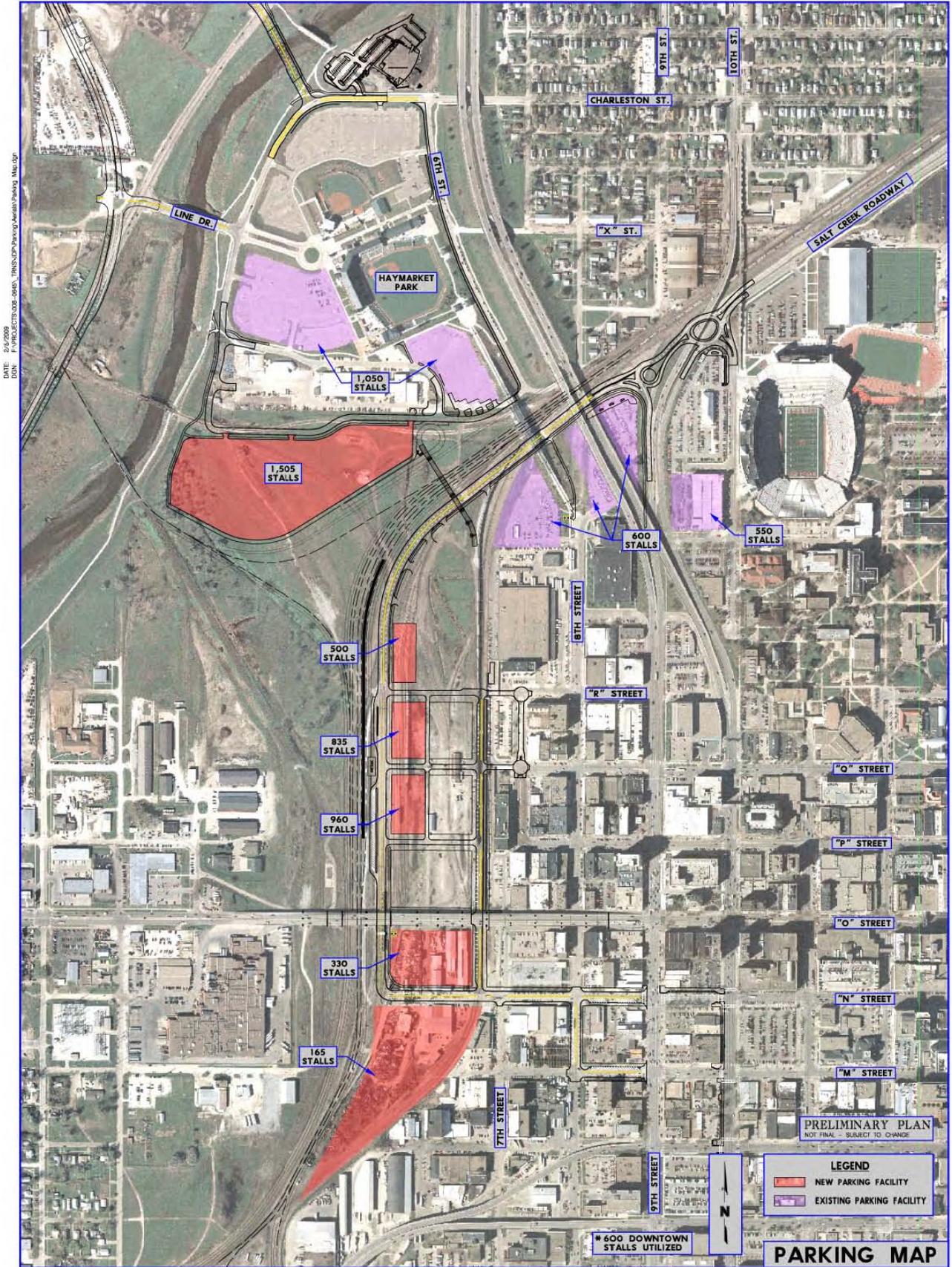
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Design Event + Hotel + Ice
Traffic Volumes

FIGURE
6B





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The parking map is not intended to be all-inclusive in identifying potential parking locations. Rather, it identifies locations and the quantity of stalls corresponding to the arena and other land-use demands. Additional existing parking stalls not labeled on the map may be available, but they should not be relied upon (per the West Haymarket parking study).

Worth noting is the large amount of “South” parking demand. A large demand arises south of the arena due to the expected trip distribution and locations of the mixed-use and ice rink land uses. The current demand allotted to two parking garages and potential deck parking south of O Street is approximately 1,965 stalls. Placing this demand primarily on two garage structures may present operational challenges. Patrons will experience increased delays due to the sheer volume of vehicles that desire to enter and exit the facilities at approximately the same time. Multiple accesses to these structures are assumed with access drives onto Arena Drive, Q Street, and P Street.

Garage management will need to be addressed to determine the most efficient method of charging users. As the project and study have evolved, surface parking farther south of O Street has been removed from the site plan. The addition of more surface parking would reduce the size of the parking garages, and would spread out the demand for parking in this area. If parking stalls can be less centralized, it will allow for more staggered exiting flow patterns and less congestion.

5.0 2013 COMBINED CONDITIONS

A future year, 2013 combined scenario was analyzed to identify expected operations and potential network improvements due to the addition of West Haymarket traffic.

5.1 2013 Combined Volumes

Following the development of 2013 base and West Haymarket development volumes, the two sets of numbers were added to the street network. **Figures 8A & 8B** illustrate the 2013 combined volumes.

5.2 Capacity Analysis & Network Improvements

Intersection operations and traffic circulation were evaluated using traffic capacity analysis software. A summary of the findings are illustrated in **Figures 9A & 9B**.

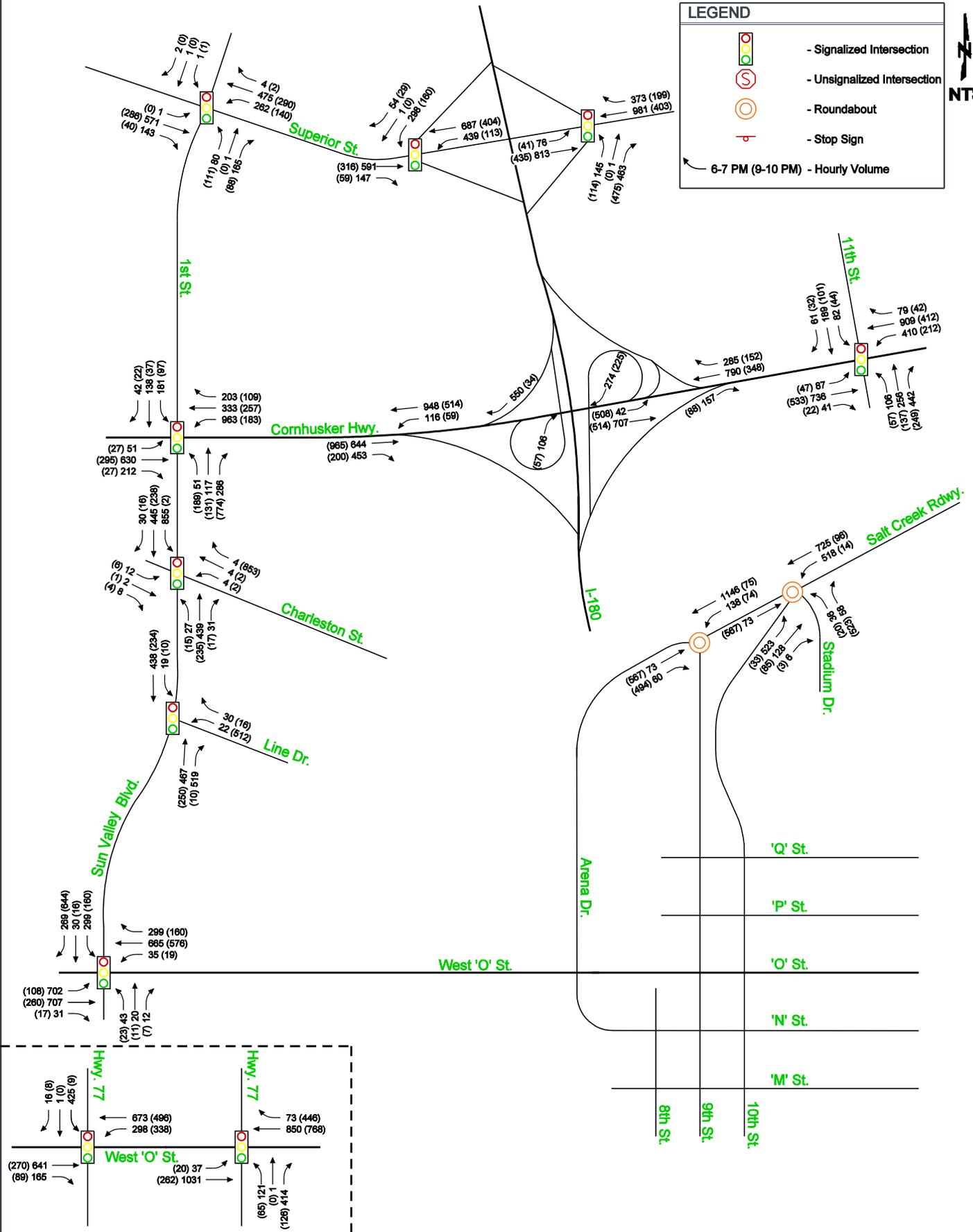
To conduct this analysis; it was necessary to assume some initial large scale modifications to the existing street network. A discussion of these assumptions as well as other recommended improvements is provided in the following paragraphs.



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- Roundabout
- Stop Sign

← 6-7 PM (9-10 PM) - Hourly Volume



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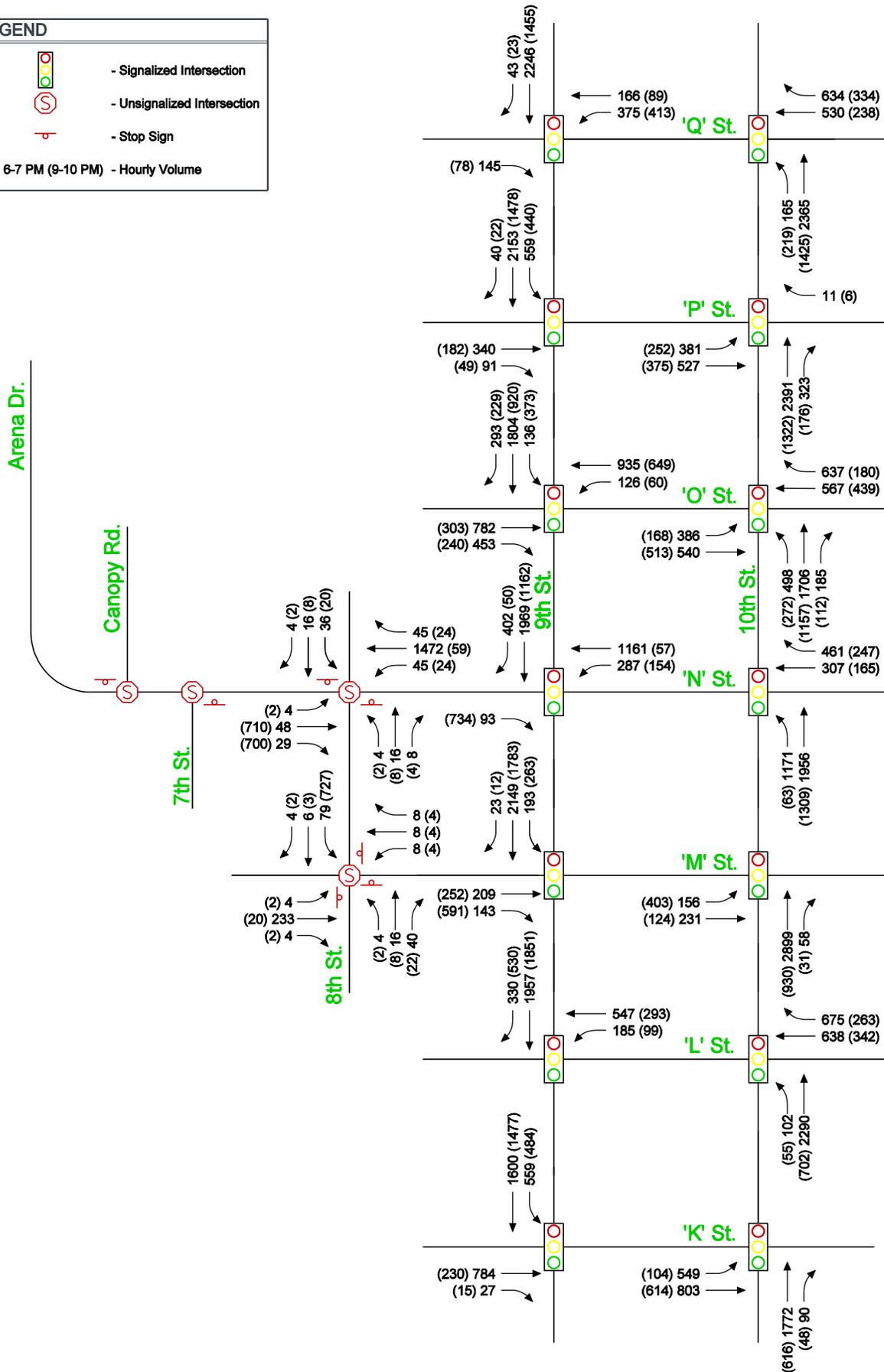
2013 Combined
Volumes

FIGURE
8A

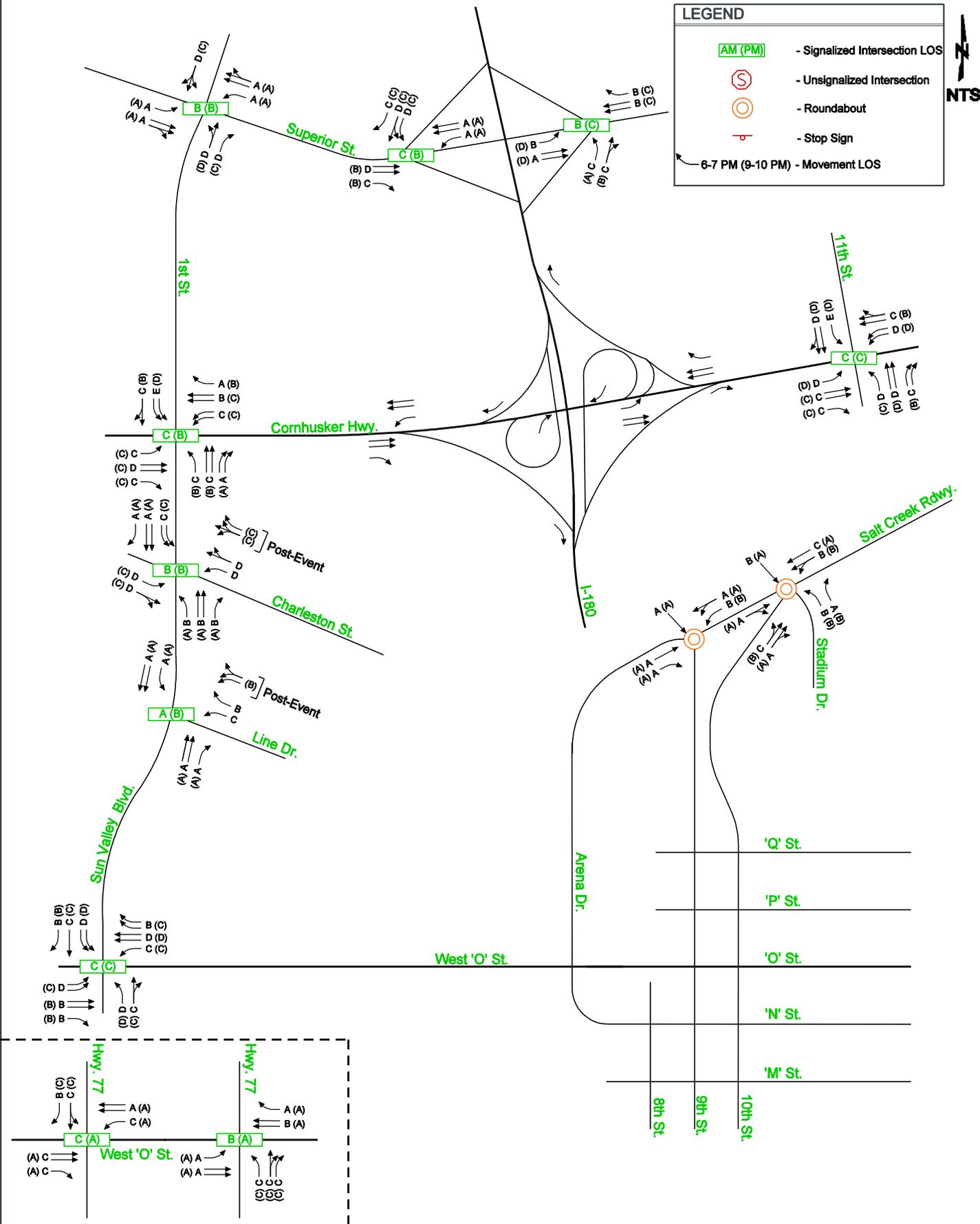


LEGEND

- Signalized Intersection
- Unsignalized Intersection
- Stop Sign
- ↔ - 6-7 PM (9-10 PM) - Hourly Volume



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An assumed network improvement is the reconstruction of Sun Valley Boulevard / 1st Street between West O Street and Cornhusker Highway. This is currently a Nebraska Department of Roads (NDOR) project. This project is in the preliminary design and environmental documentation phase, with construction planned for 2014 or later. Design plans for this section of roadway are not final. However, a preferred concept has been utilized for the West Haymarket study and further development of roadway concepts. The base NDOR concept for the Sun Valley Boulevard project includes a four-lane divided section, with major intersection reconstruction at Cornhusker Highway and West O Street. To fully accommodate vehicular volumes expected for an arena event, turn lane extensions may be required at the Cornhusker Highway and West O Street intersections as well as intersections providing access to Haymarket Park. Since roadway design is being based on design event arena attendance, it is possible that a capacity event would cause queues into through lanes until vehicles can be served.

Also affecting the Sun Valley Boulevard improvements are the access points to Haymarket Park. Currently, a single access is provided via Line Drive. The trip generation estimates and distribution indicate a need for a second access point to provide acceptable service for arena patrons using the Haymarket Park surface lots. The direction given for this study is to provide a second access via Charleston Street where dual entering southbound left-turn lanes will be required. The connection should also allow for two exiting lanes. For the proposed access, existing Charleston Street is shown to be improved to a four-lane undivided section between Sun Valley Boulevard and Haymarket Park. This will include a new four-lane bridge across Salt Creek, as well as improvements to 6th Street along the east side of Haymarket Park in order to provide a three-lane roadway section. The three-lane section will facilitate the use of a reversible center lane during events in order to provide two lanes of either entering or exiting traffic.

Multiple concepts were developed for the “North Entry” area to the West Haymarket. This includes the intersection of Salt Creek Roadway & Stadium Drive, as well as the proposed intersection with Arena Drive. Concepts included traffic signals, stop signs, and roundabouts for control, and a number of full-movement and restricted-movement options. Based on an iterative process that considered design constraints, access needs, operations, and feasibility, a two-roundabout option was selected as the preferred concept to be carried through the study and conceptual plan development. The preferred concept can be implemented without impacting the existing 10th Street bridge, and it will provide full movements between Arena Drive & Salt Creek Roadway for pre- and post-event traffic. In addition, existing movements at Salt Creek Roadway & Stadium Drive will also be maintained.

Arena Drive has been designated as the primary means of entering and exiting the West Haymarket area. Again, following the development of several concepts adhering to design constraints and stakeholder input, a three-lane undivided section is proposed. The center lane will be reversible to allow for multiple entering and exiting lanes in both directions during an arena event. The outside lane in each direction will be designed for shared-use with bicyclists.

The “South” entry / exit point will be provided via M Street and N Street. Again, volumes indicate a need for two entering lanes on N Street, and two exiting lanes along M / N Streets. Modifications to these two corridors may result in a loss or reduction of on-street parking, particularly during periods before and after an event. The initial improvements will utilize both streets for exiting movements. However, the preliminary design will allow for the future extension of M Street to Arena Drive, as well as an extension of M / N Streets as a one-way pair from 9th Street west to Arena Drive.

The extension of internal West Haymarket streets will allow for day-to-day circulation, as well as corridors for vehicular and pedestrian movements related to an arena event. Internal streets to be constructed include P Street, Q Street, R Street, and Canopy Road.

Other network improvements include additional lanes on 10th Street and N Street. An additional lane on the west side of 10th Street between L Street and N Street will allow for dual northbound left-turns at N Street to enter the West Haymarket area. The dual-lane configuration is only expected to be necessary during the hour before an event at the arena. Should volumes warrant, this movement could become permanent without reducing the current capacity on 10th Street. The lane addition on 10th Street would remove on-street parking from the west side of the street, which currently exists during off-peak periods. The additional lane on N Street will reduce the quantity of on-street parking stalls. The existing diagonal stalls will be eliminated and replaced with parallel parking stalls.

Many of the improvements listed above will require traffic signal modifications in addition to the roadway improvements. This may include (but is not limited to) pole / mast arm relocation or reconstruction, changing signal heads, phasing and timing plans, and vehicle detection.

A variety of ITS message boards and signs would need to accompany many of the network modifications discussed. Initial estimates include approximately 12 dynamic message signs spread out through the study area. These will be necessary to direct drivers to appropriate parking facilities based on their network entry point and parking availability. The location of available parking and possible network congestion will be dynamic factors that will require the ability to communicate with drivers and redirect them if necessary. The communication and management plan details will be further developed as the project moves forward into the preliminary and final design phases.

For analysis purposes, signal timings were optimized throughout the study area. Some variation between the optimized timing plans and those actually implemented is likely. It is also likely that eventual timing plans will be required to give preference to movements entering/exiting the area during high demand hours. These movements may or may not be the same movements given preference during typical daily peak hours.

It should be noted that the discussion of improvements in this section is not exhaustive. Other modifications will likely arise as other West Haymarket characteristics are studied, as well as during the transportation design phase. **Appendix C** contains a set of conceptual drawings to illustrate the proposed transportation network improvements. The drawings feature an overall plan that shows the proposed new / reconstructed roadways included as part of the arena project, as well as adjacent roadway improvements that are being completed under other public projects. The plans also include larger-scale views of key areas of the transportation network in order to identify the geometric configuration at intersections and other features.

6.0 TRAILS & PEDESTRIAN ACTIVITY

The entire West Haymarket development is intended to be a pedestrian- and bicycle-friendly area at all times, not just during an event. This project presents a unique opportunity to expand the City's trail network and promote alternative modes of transportation.

The Jamaica Trail is the nearest trail south of the West Haymarket. It currently ends at the intersection of 4th Street & J Street. An extension of this trail north to the south end of West Haymarket is proposed. As part of this connection, a trailhead is planned beneath Harris Overpass in the vicinity of Arena Drive. This trailhead would provide users the opportunity to walk into the West Haymarket. It would serve as a junction between the Jamaica Trail to the south, Arena Drive to the north, and N Street to the east. The designated trail path north of this trailhead will be the shared use outside lanes on Arena Drive. To better serve bicyclists, the outside lanes in each direction will be 15 feet wide. This width will be carried north to the vicinity of the existing Haymarket Pedestrian Bridge, where an off-street trail will be reintroduced. A trailhead would be provided near the south end of the bridge to function as a north pedestrian entry point to West Haymarket. It would serve as a junction for trails on the UNL campus and west across the railroad tracks to Haymarket Park.

An improved pedestrian connection to the UNL campus is also recommended. The current at-grade crossing near T Street is heavily utilized during UNL home football games, and it may gain extensive use by UNL students for UNL events at the arena. This crossing is also critical for large-scale events that may require utilization of UNL parking facilities east of 10th Street. Pedestrians seeking a protected movement may cross 9th / 10th Streets via the traffic signals at Q Street. Extensive modifications to this at-grade crossing are not anticipated in the near future, and traffic control may need to be provided for large-scale events. However, a grade-separated crossing should be pursued as a long-term solution.

In addition to the Haymarket Pedestrian Bridge, a second bridge is proposed to connect the arena to a new surface parking lot south of Haymarket Park. This bridge would make parking at Haymarket Park more attractive since it is expected to tie in to the arena on the concourse level.

Every attempt has been made to separate pedestrian and vehicular traffic during the entry and exit time intervals of an arena event. (Referring to a site plan for this discussion may be beneficial). The separation will be primarily accomplished by closing Canopy Road north of O Street. Access to the West Haymarket will be gained from the existing Haymarket area at Q Street and R Street during the pre- and post-event hours. All vehicular traffic bound for the parking facilities south of the arena will be routed in from the west side (Arena Drive), while pedestrians will be channeled out of these facilities to the east and may proceed to the arena via Canopy Road. Also, due to the restriction of Haymarket to West Haymarket vehicular traffic, Haymarket patrons will be able to walk from the original Haymarket area to the arena without major vehicular interaction or conflicts.

A map showing trail improvements and connections can be found in **Appendix C**.

7.0 DESIGN EVENT OBSERVATIONS

Generally speaking, most movements (or at least overall intersections) in the study area are expected to operate acceptably during the pre- and post-event analysis periods. It is worth noting again that these volumes correspond to an event, and are not daily occurrences. Drivers should anticipate and expect a certain amount of vehicular delay when attending an arena event. Also, a driver's perception of delay will allow him to make a decision concerning his route to and from his destination. It is expected that as delays increase at certain locations, and / or a driver gains experience attending multiple events, he will alter his travel patterns in an attempt to reduce overall travel time.

Most of the downtown intersections along the 9th / 10th Street corridors have the ability to handle expected volumes from a capacity analysis standpoint. Again, this assumes the removal of on-street parking during analysis time periods. However, queues are expected to form much like they do during the current (2008) PM peak hour. Traffic is often backed up for more than a block, causing traffic to stand still even when receiving a green signal indication.

Handling turning volumes (particularly left-turns) at 9th / 10th Street & O Street are key components to an acceptably performing downtown network. Turning vehicles on O Street must be cleared out during each cycle to avoid blocking the through lanes. Whenever possible, drivers should be directed to parking facilities that do not require left-turn movements at these two intersections.

Turn bays at 1st Street & Cornhusker Highway, 1st Street & Charleston Street, Sun Valley Boulevard & Line Drive, and Sun Valley Boulevard & West O Street must be significantly longer than normal. These intersections all fall in the vicinity of Haymarket Park. It is worth noting that the design event analysis does NOT consider traffic volumes that may be associated with a game(s) at Haymarket Park if there were simultaneous events.

Also, exact locations of access points to parking facilities and the methodologies of filling these facilities have not yet been determined; the study is based on design assumptions. The current site plan yields high parking demands south of the arena. The most efficient methods possible must be utilized when directing users to enter and exit the parking garages.

Event management staff and Lincoln Police Department (LPD) officers will be required to be present at various locations during the entry and exiting hours of an event. These staff people will be needed to enforce restrictions, provide directions, and help to maximize utilization of the available facilities (both parking and streets). This study did not evaluate the full extent of the manpower needed and what entities would be responsible for providing traffic control services. Specific locations likely to be included (but are not limited to):

- North entry roundabouts
- South entry at N Street
- R Street and Q Street closures
- Pedestrian crossing at 9th / 10th Streets
- Charleston Street & Sun Valley Boulevard
- Line Drive & Sun Valley Boulevard
- Arena Drive lane utilization
- Parking facilities

8.0 CAPACITY EVENT CONDITIONS

Thus far, this report has documented findings of design event analysis. Periodically, an event will draw more than the design crowd. For this reason, an analysis scenario was prepared to evaluate the sensitivity of the improved study network to a capacity event (16,000 arena attendees).

The first study variable to be identified for this scenario is finding available parking stalls for the increased demand associated with a capacity event. The demand for parking east of the railroad tracks in the immediate vicinity of the West Haymarket is expected to be full during a design event. Additional downtown and Haymarket stalls would likely be utilized as available. However, for this scenario, all vehicles assumed for the design event were routed exactly as previously assigned and ALL additional trips stemming from a capacity event were routed to Haymarket Park. This would result in a demand for additional parking not identified in the design event analysis. Arena patrons should expect to park greater distances from the arena, thus increasing their “walk time.” A capacity event does present additional traffic challenges that must be addressed.

The WBL volume at 1st Street & Cornhusker Highway is expected to be approximately 1,300 vph yielding a 600' queue during the pre-event hour. This queue places vehicles very close to the end of the WB merge ramp from I-180 and creates a potential weave hazard. A solution to this concern would be to train/educate/direct I-180 traffic that came from I-80 to instead exit at the Airport and approach 1st Street & Cornhusker Highway from the west. This will not reduce the expected volume through the intersection but will trade WBL movements for EBR movements. Due to overlap phases, more right-turning than left-turning vehicles can be served when given the same amount of green time.

The WBR movement at Sun Valley Boulevard & West O Street may fill the entire available storage due to the additional volume bound for Haymarket Park under capacity conditions. This is due in part to the right-turn lane storage constraint stemming from the Salt Creek Bridge. Additional signing to “use caution” will be beneficial to motorists as well as an event timing plan that may increase delay to movements not directly associated with inbound event traffic.

Analysis shows a large amount of congestion and queuing in the downtown area due to a Capacity event. A major source of the congestion is the NBL movement at 10th Street & O Street. Pumping more NBL and WBT traffic bound for Haymarket Park steals from the ability to give enough green time to the other movements. Providing a dual lane movement does not clear up the congestion (and may not be feasible due to turning radii). A number of solutions may need to be considered;

- Train / educate drivers from the south to use the West Bypass
- Assume greater utilization of parking east of 10th Street
- Promote carpooling
- Provide shuttles from remote locations (as is done for UNL football games)
- Promote arrivals more than one hour prior to the event

In summary, a capacity event will force attendees to experience greater amounts of delay and congestion. It is not expected that every event will experience a sell-out crowd, but planners should be aware of the potential implications and public perception.

9.0 YEAR 2013 ARENA CONCLUSIONS

Based on the results of this study, it is anticipated that network modifications can be implemented which will accommodate expected traffic volumes associated with the design event. A summary of the network improvements is provided in Section 5.2.

Careful attention should be given to the use of the information in this report as it pertains exclusively to the conditions assumed and discussed in previous sections. Again, the section pertaining to traffic distribution requires proper management and parking provision. It is likely that the actual external distribution will differ from what is assumed for this study. Therefore, actual operations once an arena is constructed will differ from those presented in this report. This report documents conditions stemming from the best available information provided.

10.0 YEAR 2030 ANALYSIS

A study horizon year of 2030 was selected to align with the City's current Long-Range Transportation Plan (LRTP), and is expected to encompass the build-out of the West Haymarket area considered in this study (approximately 60 percent build-out was included with the 2013 analysis). Also included are street improvements expected to be incorporated by year 2030.

10.1 2030 Combined Volumes

To obtain the necessary hourly volumes for analyses, a network-wide comparison was made between 2006 and projected 2030 ADT's from the LRTP. This comparison yielded an average annual growth rate of 1.3 percent. To be conservative, a 1.4 percent growth rate was then applied to the balanced 2013 base peak hour volumes used in the previous analysis scenario. The projected peak hour volumes were then reviewed to verify consistency with the future transportation network.

The largest 2030 network variation includes a Rosa Parks Way connection to West O Street via Sun Valley Boulevard. Certain movements at this intersection are expected to experience a growth rate much larger than 1.4 percent when compared to 2013 volumes. As described in section 3.0, reduction factors were applied to the peak hour volumes yielding anticipated pre-event and post-event background volumes. Site trips were then added to this volume set resulting in a 2030 combined data set as illustrated in **Figures 10A & 10B**.

10.2 Capacity Analysis & Network Improvements

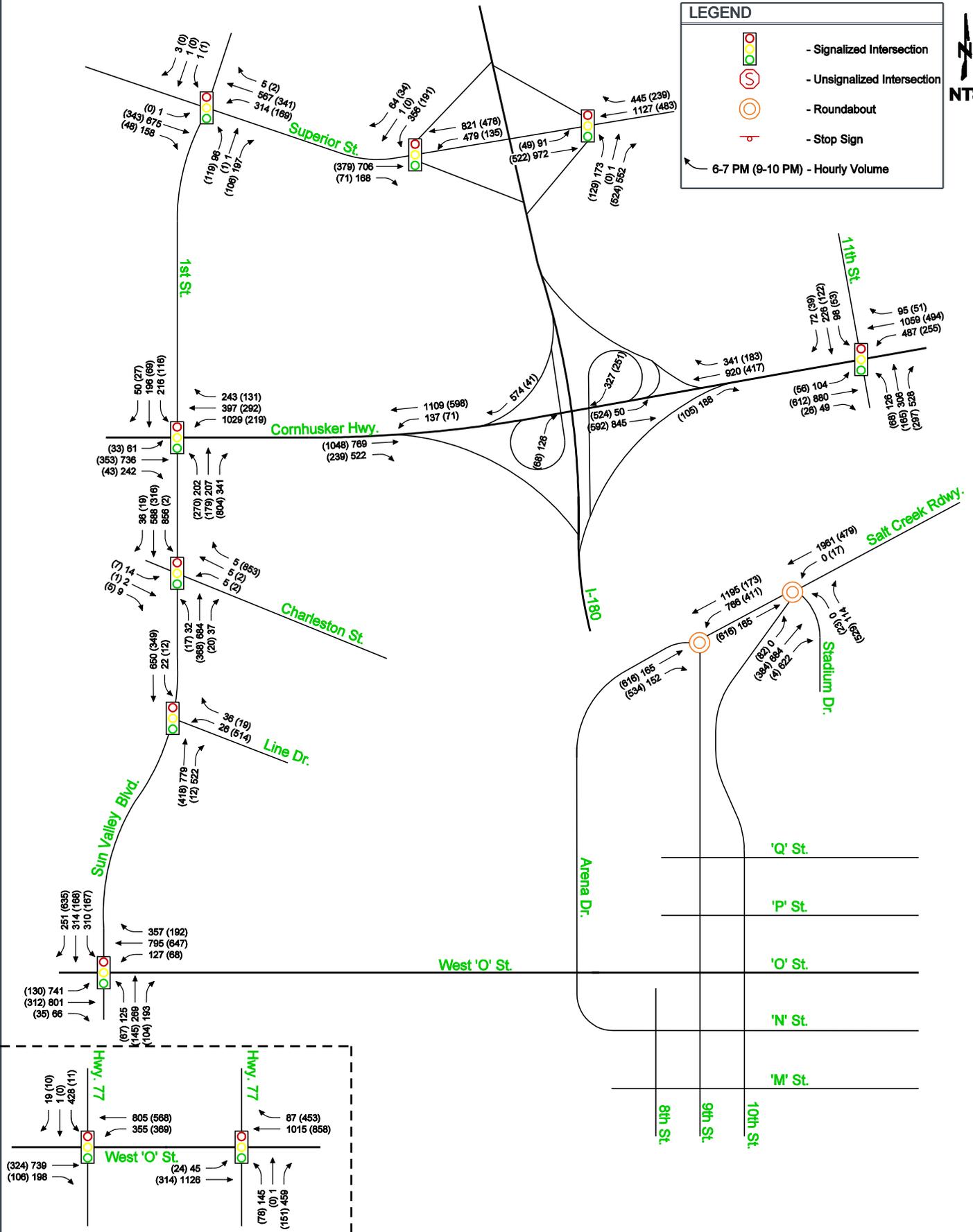
Prior to evaluating the 2030 combined conditions, a special evaluation of the two roundabouts near the north entry of West Haymarket was conducted with 2030 peak hour volumes. It should be noted that the intent of this study is not to look at the network-wide operations for the 2030 peak hour, therefore, only the major intersection modification of the two roundabouts near the north entry were evaluated. Acceptable operation of these two roundabouts in the future under base conditions must be expected prior to implementation. Capacity analysis resulted in expected LOS C or better for both roundabouts. The peak hour volumes are less than the off-peak plus arena event volumes.



LEGEND

- Signalized Intersection
- Unsignalized Intersection
- Roundabout
- Stop Sign

↔ 6-7 PM (9-10 PM) - Hourly Volume



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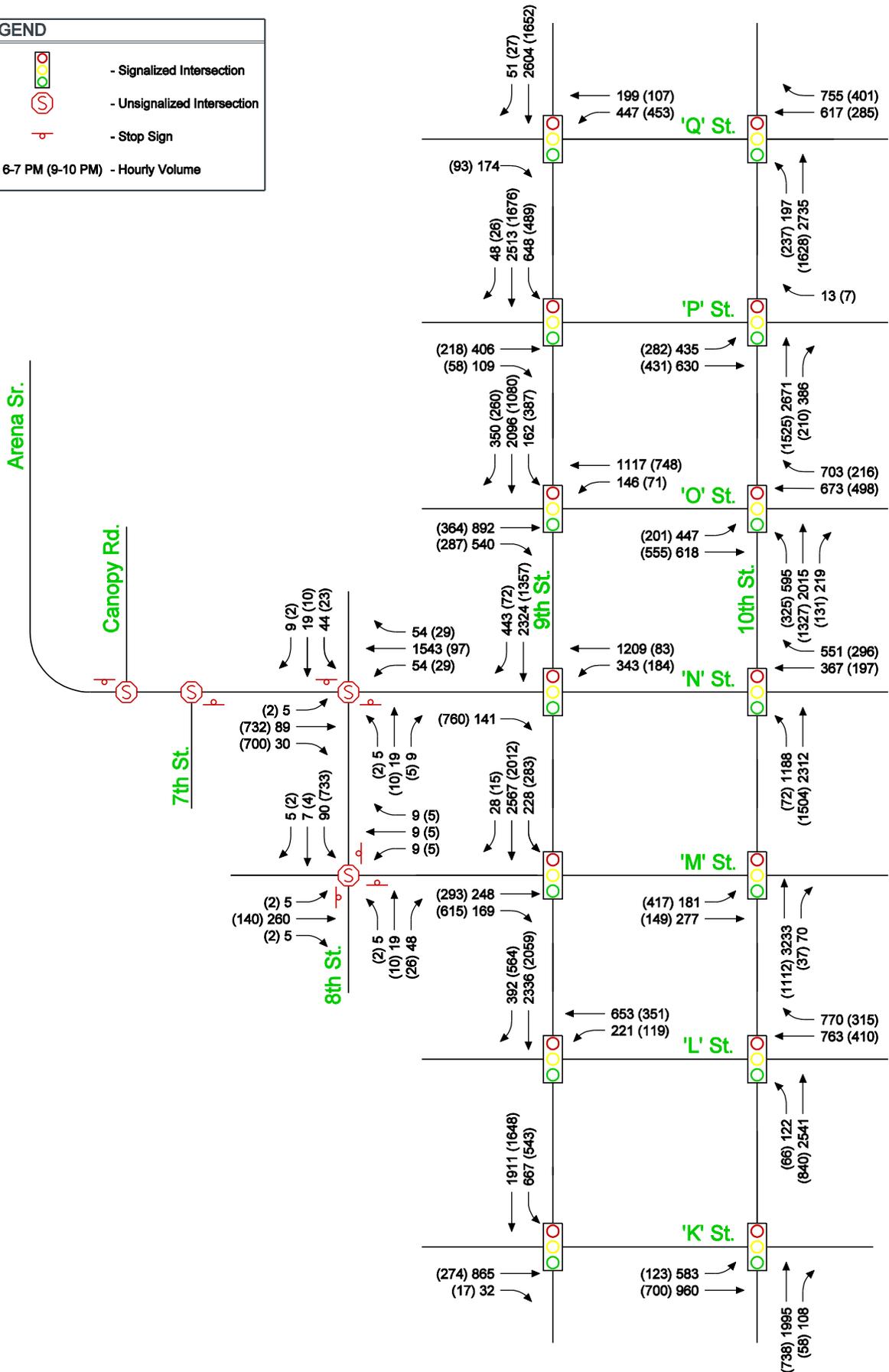


2030 Combined Volumes

FIGURE 10A

LEGEND

-  - Signalized Intersection
-  - Unsignalized Intersection
-  - Stop Sign
-  - 6-7 PM (9-10 PM) - Hourly Volume



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As anticipated, additional congestion is expected throughout the downtown corridors in comparison to the 2013 event conditions. This is due to increased background traffic with no additional downtown network improvements beyond those previously mentioned in this report. The provision of Arena Drive is expected to provide some relief to the 9th / 10th Street corridors particularly during peak periods. As motorists settle in to typical patterns, they will select the route with the least delay serving their destination.

For analysis purposes, signal timings were optimized throughout the study area. Some variations between the optimized timing plans and those actually implemented are probable. A detailed timing plan for future conditions was not generated. It is likely that eventual timing plans will be required to give preference to movements entering / exiting the area during high demand hours. These movements may or may not be the same movements given preference during typical daily peak hours.

It should be noted that additional network improvements other than the West O Street to Rosa Parks Way connection may arise prior to year 2030.

An anticipated management issue will be to restrict some movements at the two roundabouts during the 2030 pre-event hour. During that scenario, left-turning volumes will cause too great of a conflict with the through vehicles. To remedy this operational concern, northbound 10th Street should be restricted to through or right-turn only into Stadium Drive and southbound Salt Creek Roadway will be restricted to through movement only and will not be allowed to make a left-turn into Stadium Drive. These restrictions will be achieved by dynamic message signs, and event staff or LPD placing cones blocking off the two circulating movements through the roundabout.

Intersection operations and traffic circulation were evaluated using traffic capacity analysis software. A summary of the findings is illustrated in **Figures 11A & 11B**.

11.0 EXISTING HAYMARKET ANALYSIS

To determine the impacts of the West Haymarket development on the existing Haymarket streets, additional analysis was conducted for the daily AM and PM peak hours. Access between Haymarket and West Haymarket is assumed on a day-to-day basis via Q Street and R Street. **Appendix D** contains a memorandum documenting this analysis.

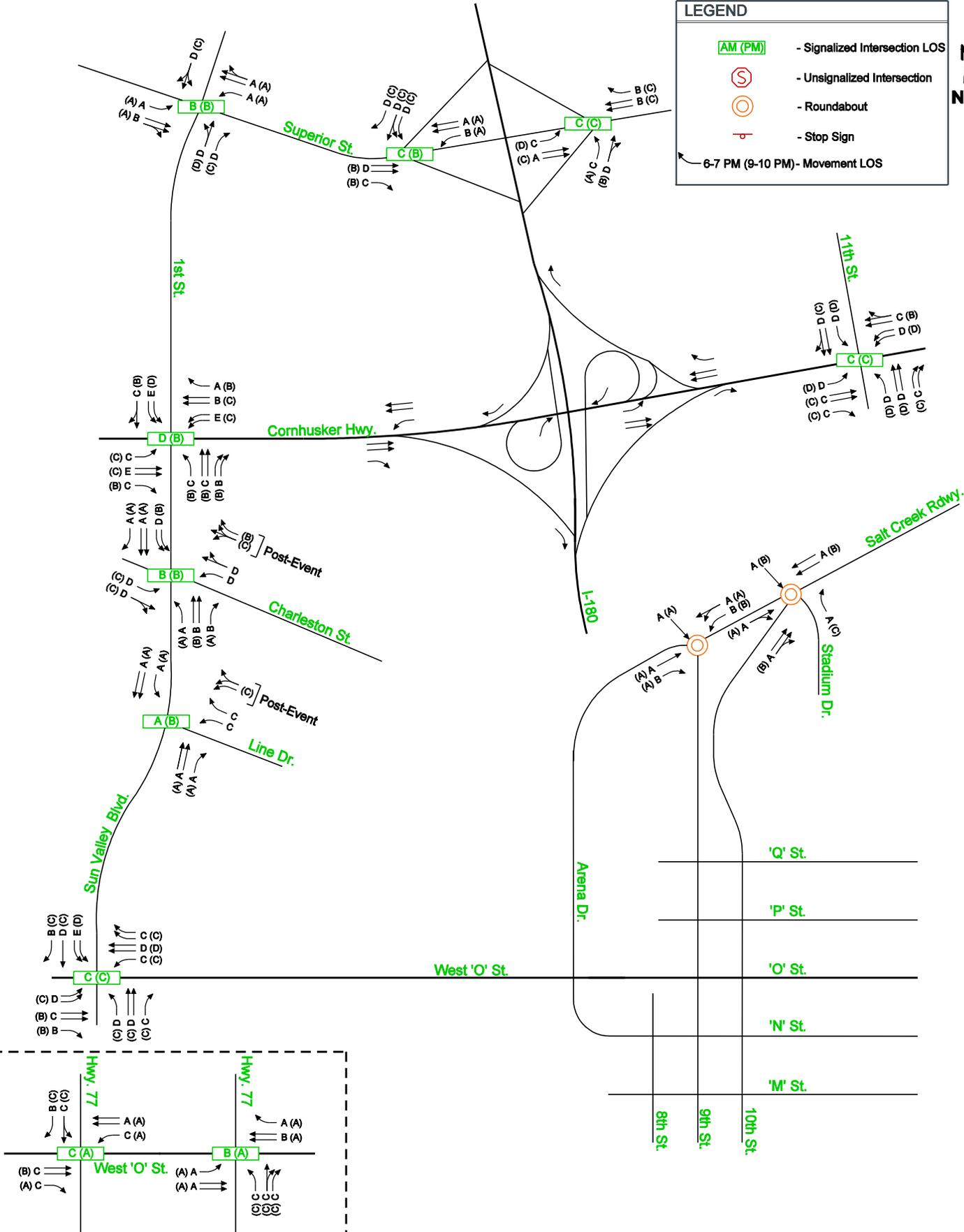
12.0 STUDY SUMMARY

Based on the results of this study, it is anticipated that network modifications can be implemented that will accommodate expected traffic volumes associated with the design event. A summary of the network improvements is provided in Section 5.2 and are illustrated in Appendix C. These recommendations stem from information coinciding with other area studies and from the assumptions outlined in this report.

LEGEND

- AM (PM) - Signalized Intersection LOS
- S - Unsignalized Intersection
- O - Roundabout
- Stop Sign

← 6-7 PM (9-10 PM) - Movement LOS



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APPENDIX A

ITE Trip Generation

Table 1

**TRAFFIC IMPACT STUDY
West Haymarket Arena
ITE TRIP GENERATION**

Daily Trip Generation											
ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	Daily Trips	Mixed-Use Reduction	Total Trips	Trip Distribution		Total Daily Trips	
								Enter	Exit	Enter	Exit
814/1387	Specialty Retail Center	100,000	SF	44.32	4,432	10%	3,989	50%	50%	1,994	1,994
710/1203	General Office Building	100,000	SF	$T = e^{(0.77 \cdot \ln(X) + 3.65)}$	1,334	10%	1,201	50%	50%	600	600
220/327	Apartments	100	Units	$T = 6.06(X) + 123.56$	730	10%	657	50%	50%	328	328
310/580	Hotel	250	Rooms	$T = 8.95(X) - 373.16$	1,864	10%	1,678	50%	50%	839	839
Total					8,360		7,524			3,762	3,762

AM Peak Hour Trips											
ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	AM Trips	Mixed-Use Reduction	Total Trips	Trip Distribution		Total AM Trips	
								Enter	Exit	Enter	Exit
814/	Specialty Retail Center	100,000	SF	0.00	0	10%	0	50%	50%	0	0
710/1204	General Office Building	100,000	SF	$T = e^{(0.80 \cdot \ln(X) + 1.55)}$	188	10%	169	88%	12%	149	20
220/328	Apartments	100	Units	$T = 0.49(X) + 3.73$	53	10%	47	20%	80%	9	38
310/581	Hotel	250	Rooms	$T = e^{(1.24 \cdot \ln(X) - 2)}$	127	10%	115	61%	39%	70	45
Total					368		331			228	103

PM Peak Hour Trips											
ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	PM Trips	Mixed-Use Reduction	Total Trips	Trip Distribution		Total PM Trips	
								Enter	Exit	Enter	Exit
814/1388	Specialty Retail Center	100,000	SF	$T = 2.40(X) + 21.48$	261	10%	235	44%	56%	104	132
710/1205	General Office Building	100,000	SF	$T = 1.12(X) + 78.81$	191	10%	172	17%	83%	29	143
220/329	Apartments	100	Units	$T = 0.55(X) + 17.65$	73	10%	65	65%	35%	43	23
310/582	Hotel	250	Rooms	0.59	148	10%	133	53%	47%	70	62
Total					672		605			246	360

APPENDIX B

Parking Demand Table

PARKING STALL DEMAND

Arena (5,120 minus 350 shared with Mixed-Use)	4,770
Mixed-Use	975
Ice Center	300
	<u>6,045</u>

ARENA BREAKDOWN (By Location)

Existing Haymarket Park	1,050
Existing Post Office / INS *	600
Existing Misc. Downtown	360
Existing 10th & Q Garage	240
Existing UNL Garage	550
New VIP	500
New Haymarket Park **	450
New Garage / South Surface	1,020
	<u>4,770</u>

* An additional 220 stalls were utilized at 6pm.

** More to be constructed for capacity events.

MIXED-USE BREAKDOWN (By Location)

New Garage / South Surface	975
	<u>975</u>

ICE CENTER BREAKDOWN (By Location)

New Garage / South Surface	300
	<u>300</u>

NEW GARAGE / SOUTH SURFACE DEMAND (By Use)

Arena	1,020
Mixed-Use	975
Ice Center	300
	<u>2,295</u>

NEW GARAGE / DECK DEMAND

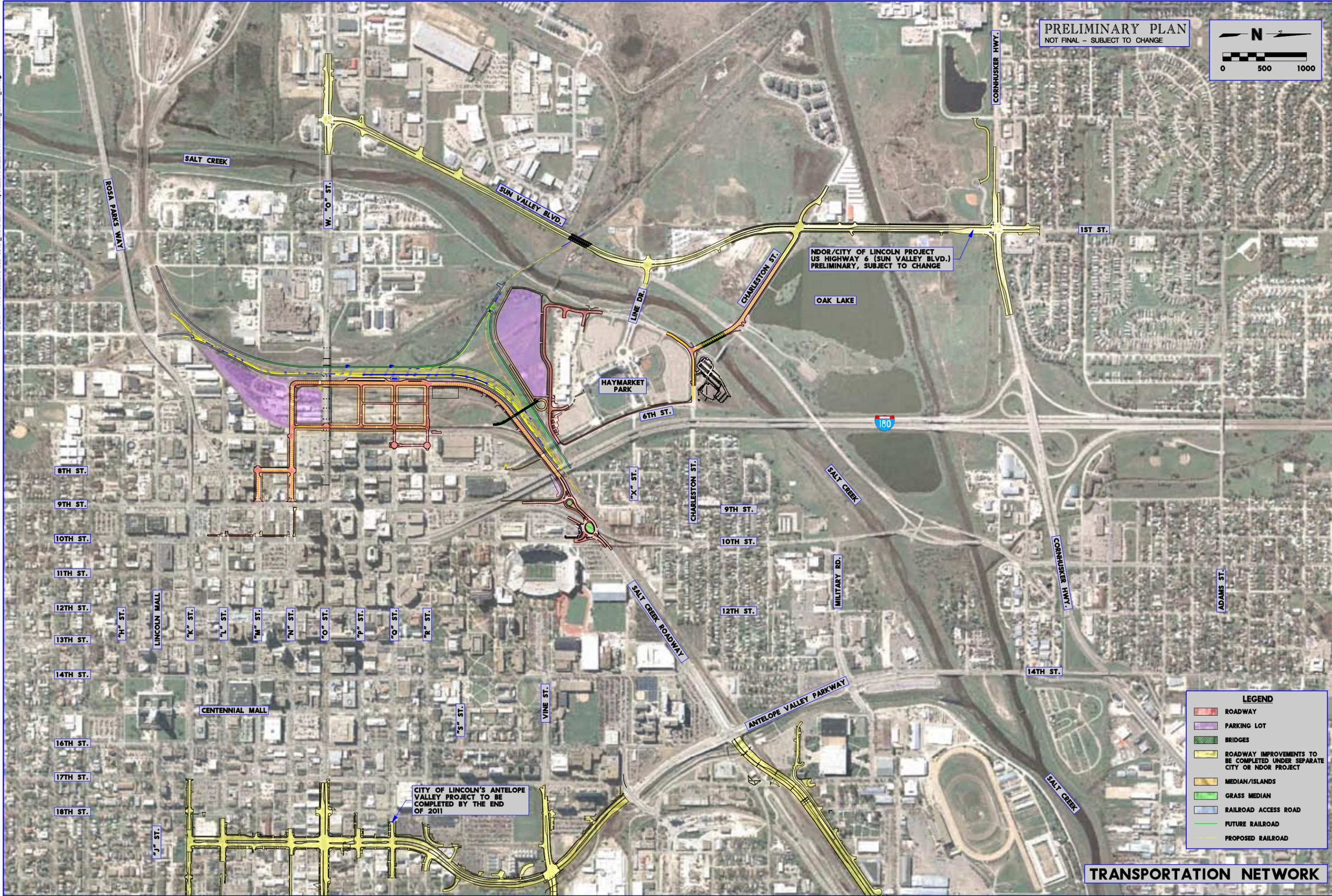
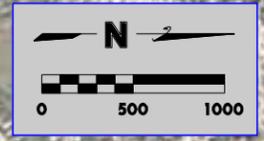
Garage / South Surface Total Demand	2,295
South Surface Available	-330
	<u>1,965</u>

APPENDIX C

Transportation Network Improvements

DATE: 2/6/2009
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PRELIMINARY PLAN
NOT FINAL - SUBJECT TO CHANGE



NDOR/CITY OF LINCOLN PROJECT
US HIGHWAY 6 (SUN VALLEY BLVD.)
PRELIMINARY, SUBJECT TO CHANGE

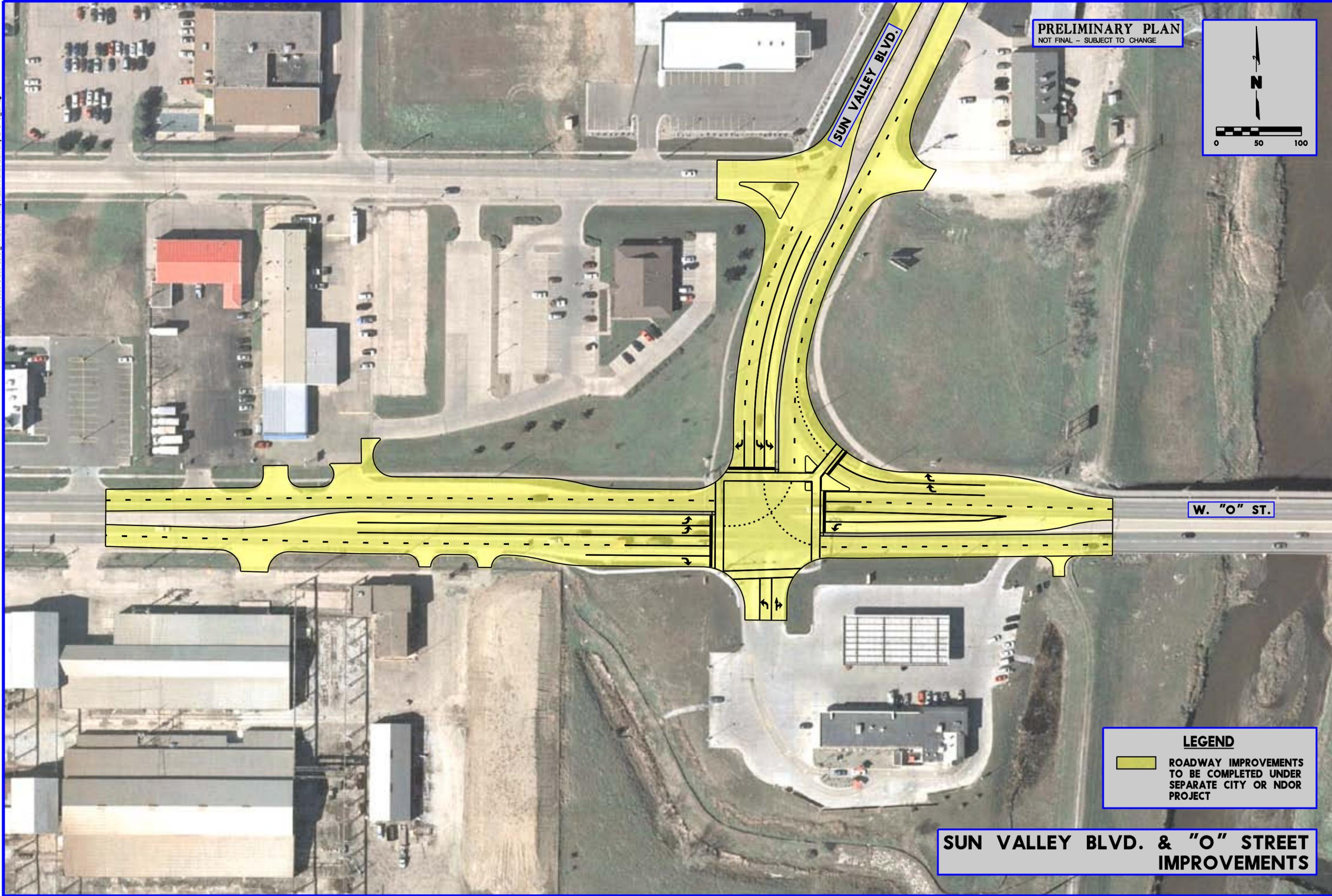
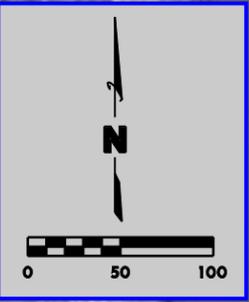
CITY OF LINCOLN'S ANTELOPE
VALLEY PROJECT TO BE
COMPLETED BY THE END
OF 2011

LEGEND	
	ROADWAY
	PARKING LOT
	BRIDGES
	ROADWAY IMPROVEMENTS TO BE COMPLETED UNDER SEPARATE CITY OR NDOR PROJECT
	MEDIAN/ISLANDS
	GRASS MEDIAN
	RAILROAD ACCESS ROAD
	FUTURE RAILROAD
	PROPOSED RAILROAD

TRANSPORTATION NETWORK

DATE: 2/5/2009
DGN: F:\PROJECTS\008-0646\TRNS\DP\Transportation\Aerials\SunValley & O St_DP.dgn

PRELIMINARY PLAN
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W. "O" ST.

SUN VALLEY BLVD.

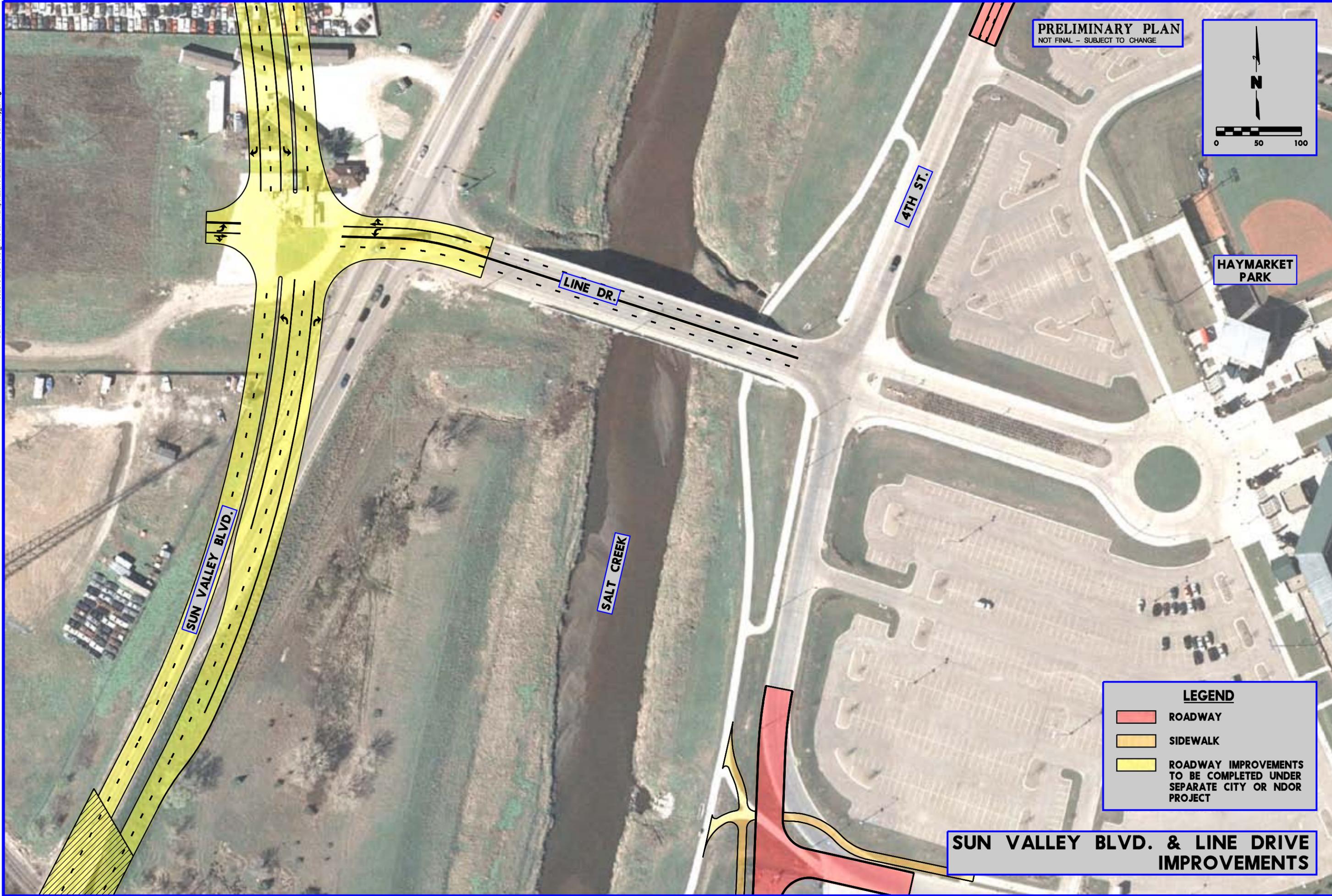
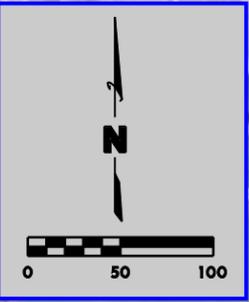
LEGEND

 ROADWAY IMPROVEMENTS TO BE COMPLETED UNDER SEPARATE CITY OR NDOR PROJECT

SUN VALLEY BLVD. & "O" STREET IMPROVEMENTS

DATE: 2/5/2009
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PRELIMINARY PLAN
NOT FINAL - SUBJECT TO CHANGE



SUN VALLEY BLVD.

LINE DR.

4TH ST.

SALT CREEK

HAYMARKET PARK

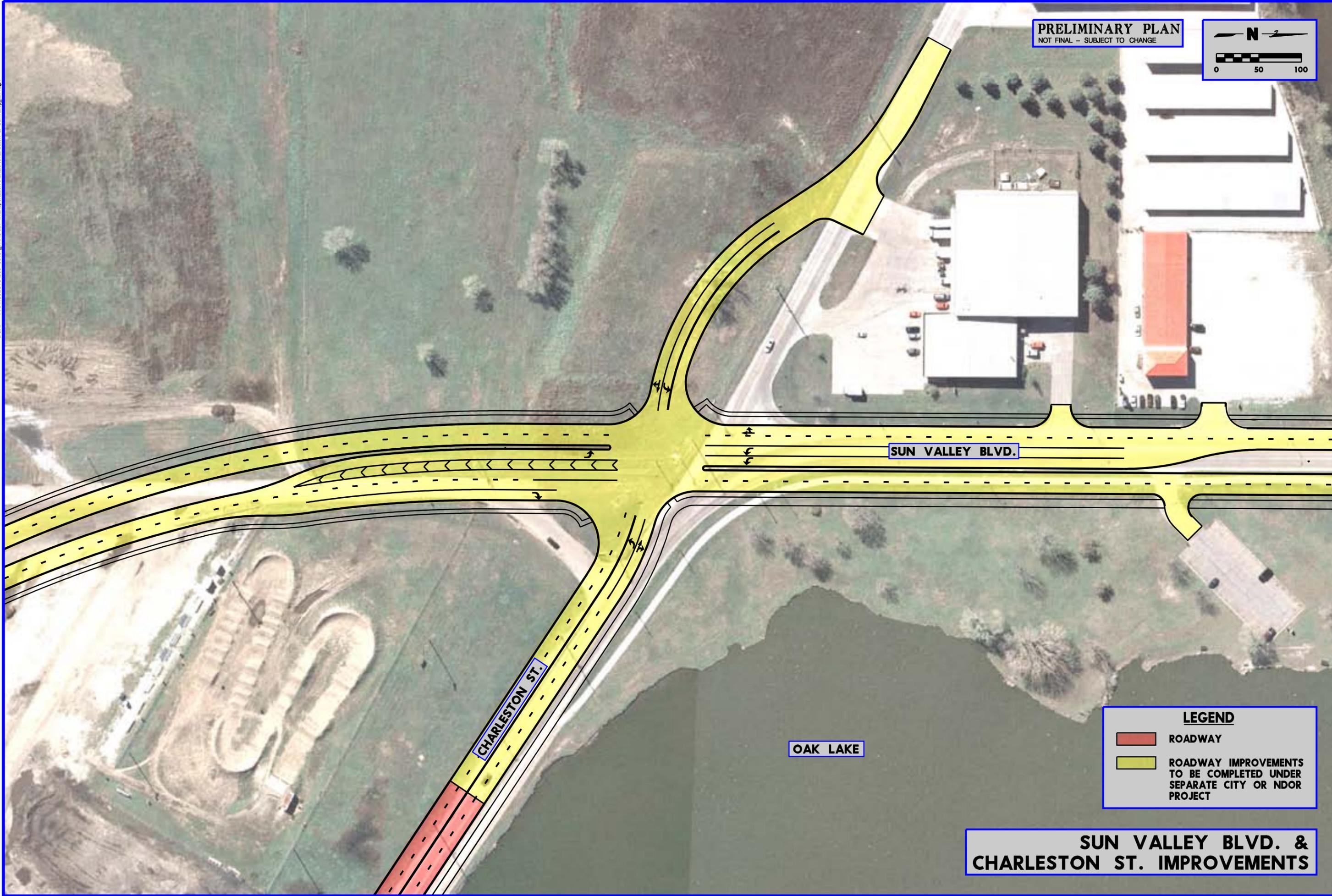
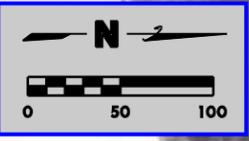
LEGEND

-  ROADWAY
-  SIDEWALK
-  ROADWAY IMPROVEMENTS TO BE COMPLETED UNDER SEPARATE CITY OR NDOR PROJECT

SUN VALLEY BLVD. & LINE DRIVE IMPROVEMENTS

DATE: 2/5/2009
DGN: F:\PROJECTS\008-0645_TRANSPORTATION\Aerials\Charleston & SunValley_DP.dgn

PRELIMINARY PLAN
NOT FINAL - SUBJECT TO CHANGE



SUN VALLEY BLVD.

CHARLESTON ST.

OAK LAKE

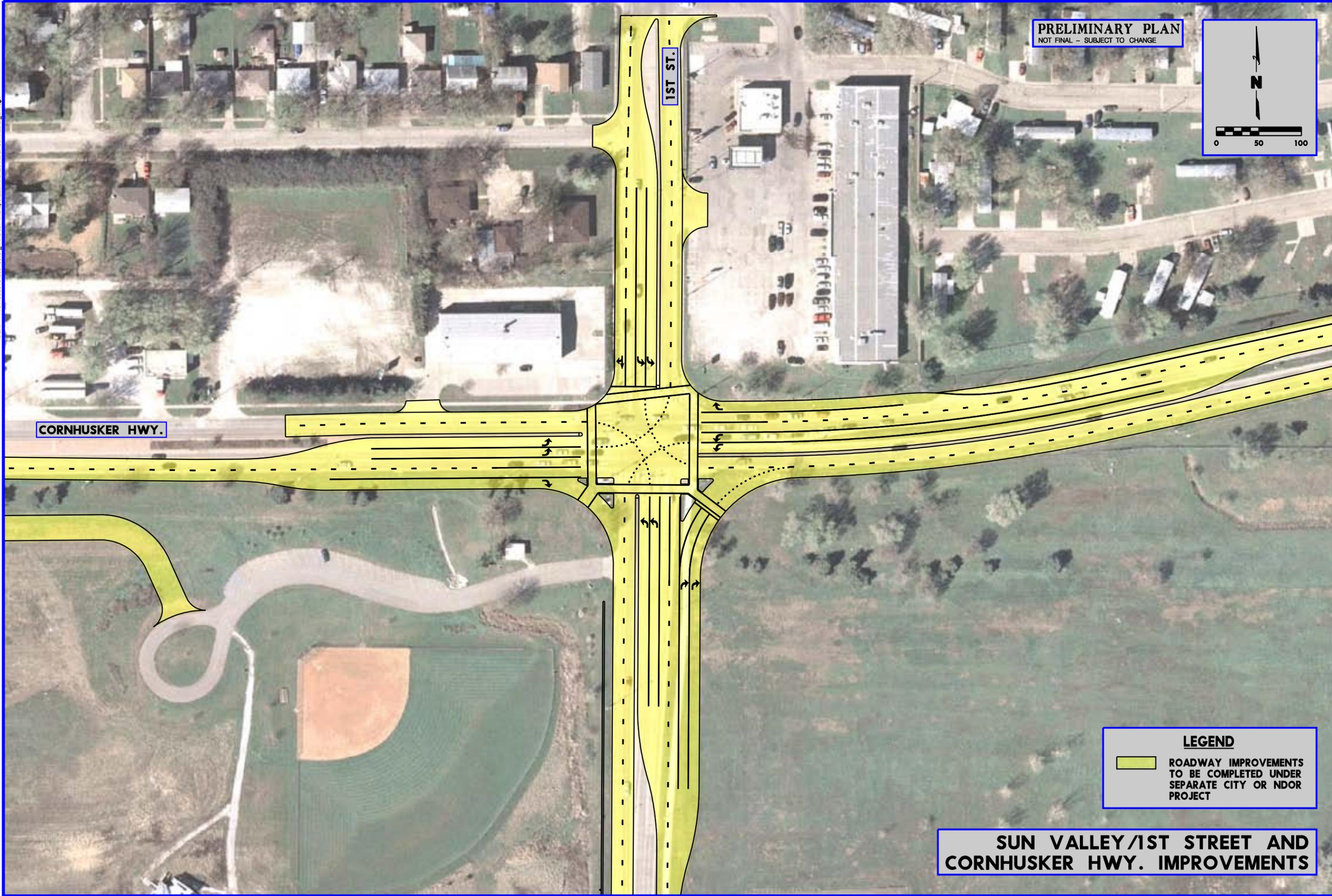
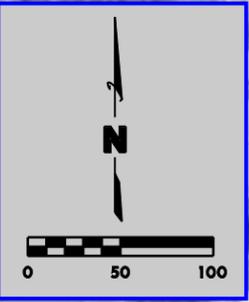
LEGEND

-  ROADWAY
-  ROADWAY IMPROVEMENTS TO BE COMPLETED UNDER SEPARATE CITY OR NDOR PROJECT

SUN VALLEY BLVD. & CHARLESTON ST. IMPROVEMENTS

DATE: 2/5/2009
DGN: F:\PROJECTS\008-0646\TRNS\DP\Transportation\Aerials\1st & Cornhusker_IDP.dgn

PRELIMINARY PLAN
NOT FINAL - SUBJECT TO CHANGE



CORNHUSKER HWY.

1ST ST.

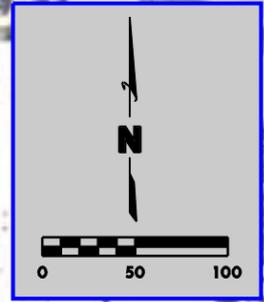
LEGEND

 ROADWAY IMPROVEMENTS TO BE COMPLETED UNDER SEPARATE CITY OR NDOR PROJECT

**SUN VALLEY/1ST STREET AND
CORNHUSKER HWY. IMPROVEMENTS**

DATE: 2/5/2009
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PRELIMINARY PLAN
NOT FINAL - SUBJECT TO CHANGE



**PUBLIC WORKS
MAINTENANCE AND
WATERSHED MANAGEMENT**

N. 4TH ST.

**NEW ACCESS ROAD
FOR PARKING**

**PROPOSED
HAYMARKET
PARKING**

AT GRADE

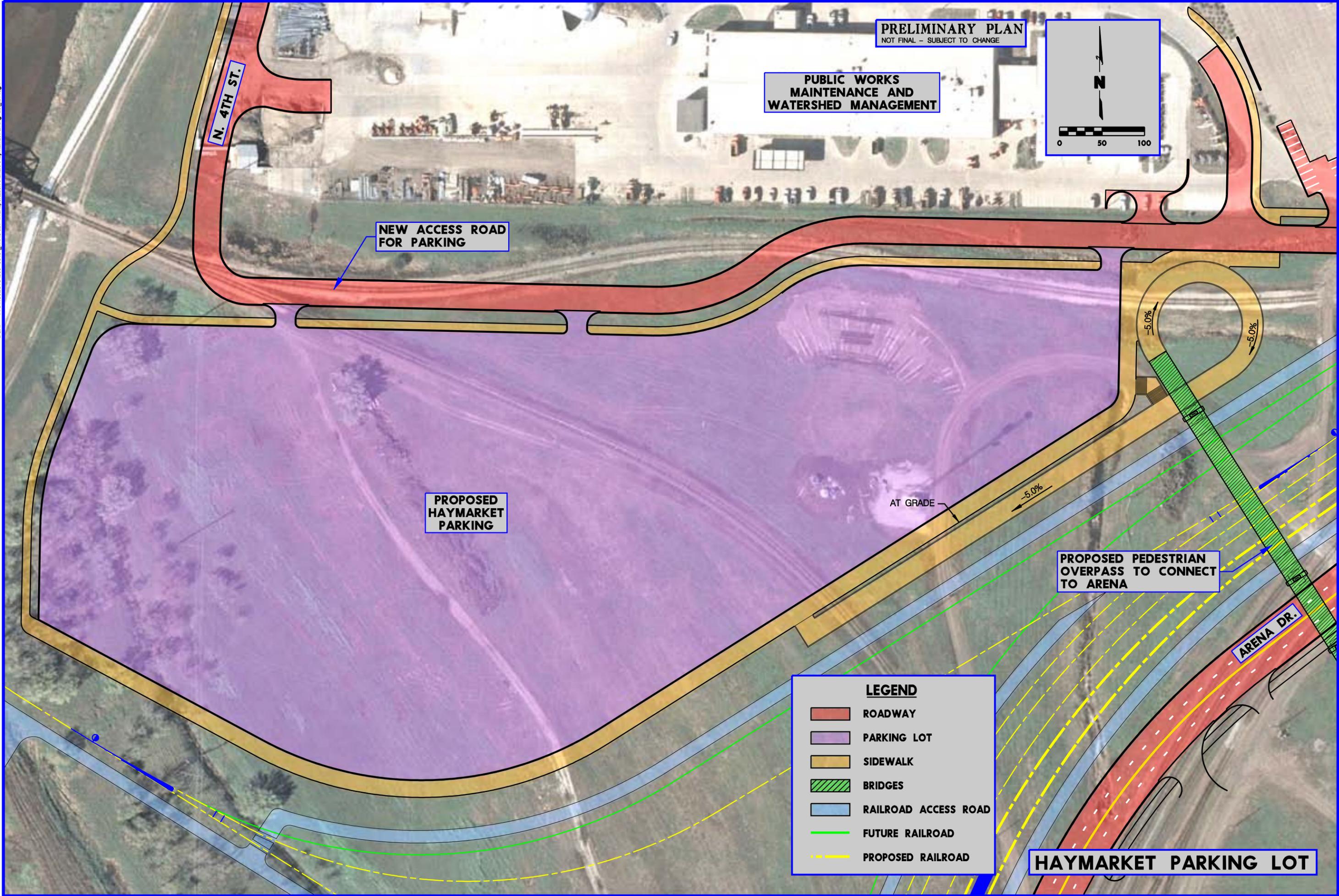
**PROPOSED PEDESTRIAN
OVERPASS TO CONNECT
TO ARENA**

ARENA DR.

LEGEND

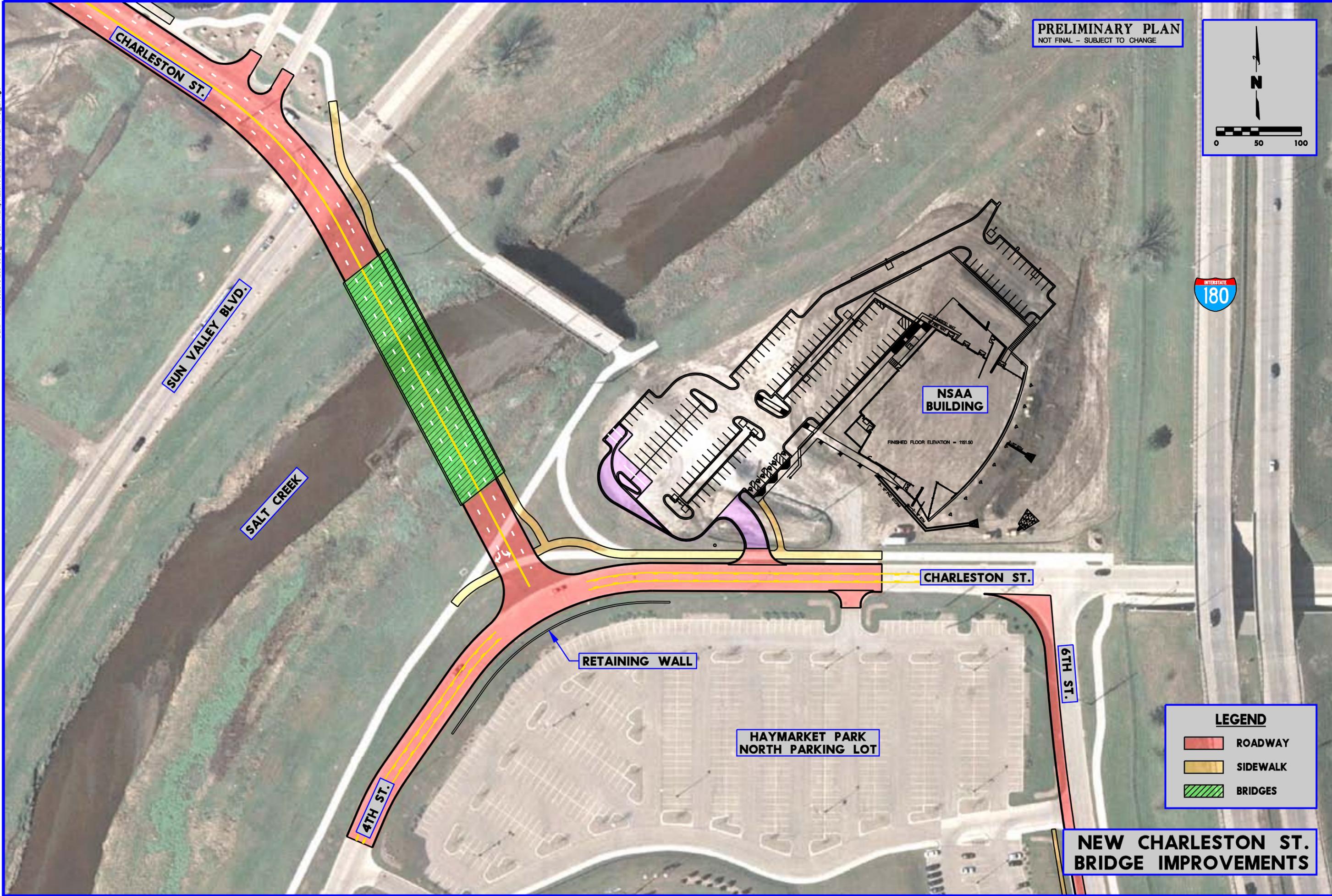
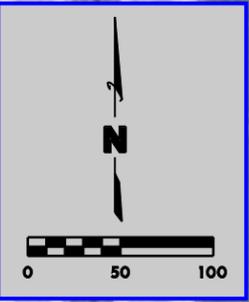
- ROADWAY
- PARKING LOT
- SIDEWALK
- BRIDGES
- RAILROAD ACCESS ROAD
- FUTURE RAILROAD
- PROPOSED RAILROAD

HAYMARKET PARKING LOT



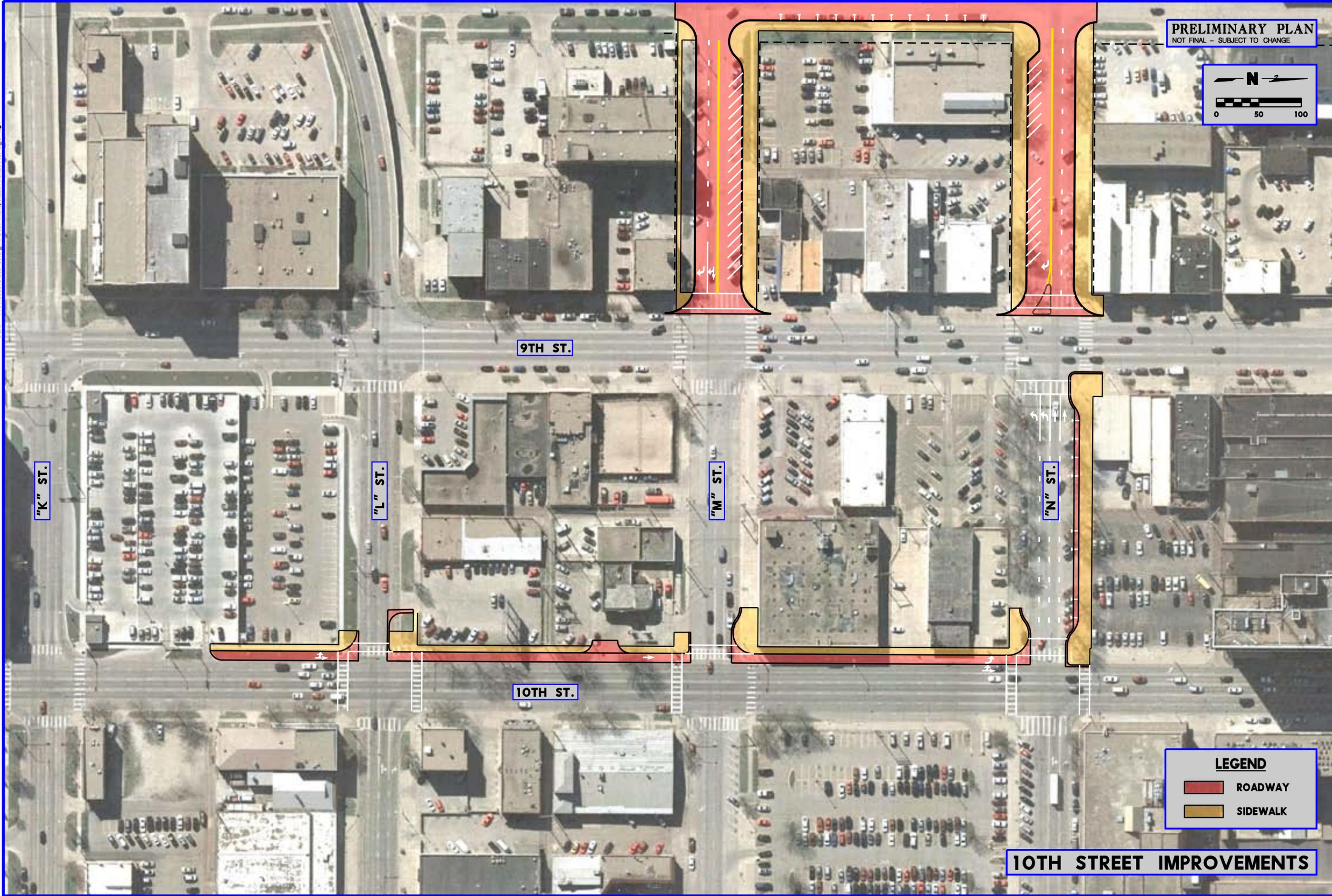
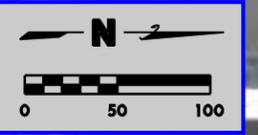
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PRELIMINARY PLAN
NOT FINAL - SUBJECT TO CHANGE



LEGEND	
	ROADWAY
	SIDEWALK
	BRIDGES

**NEW CHARLESTON ST.
BRIDGE IMPROVEMENTS**



"K" ST.

"L" ST.

"M" ST.

"N" ST.

9TH ST.

10TH ST.

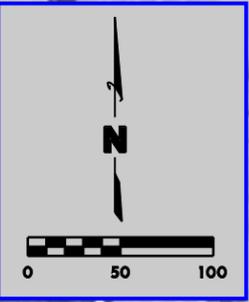
LEGEND

-  ROADWAY
-  SIDEWALK

10TH STREET IMPROVEMENTS

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PRELIMINARY PLAN
NOT FINAL - SUBJECT TO CHANGE



ARENA DR.

CANOPY RD.

8TH ST.

"N" ST.

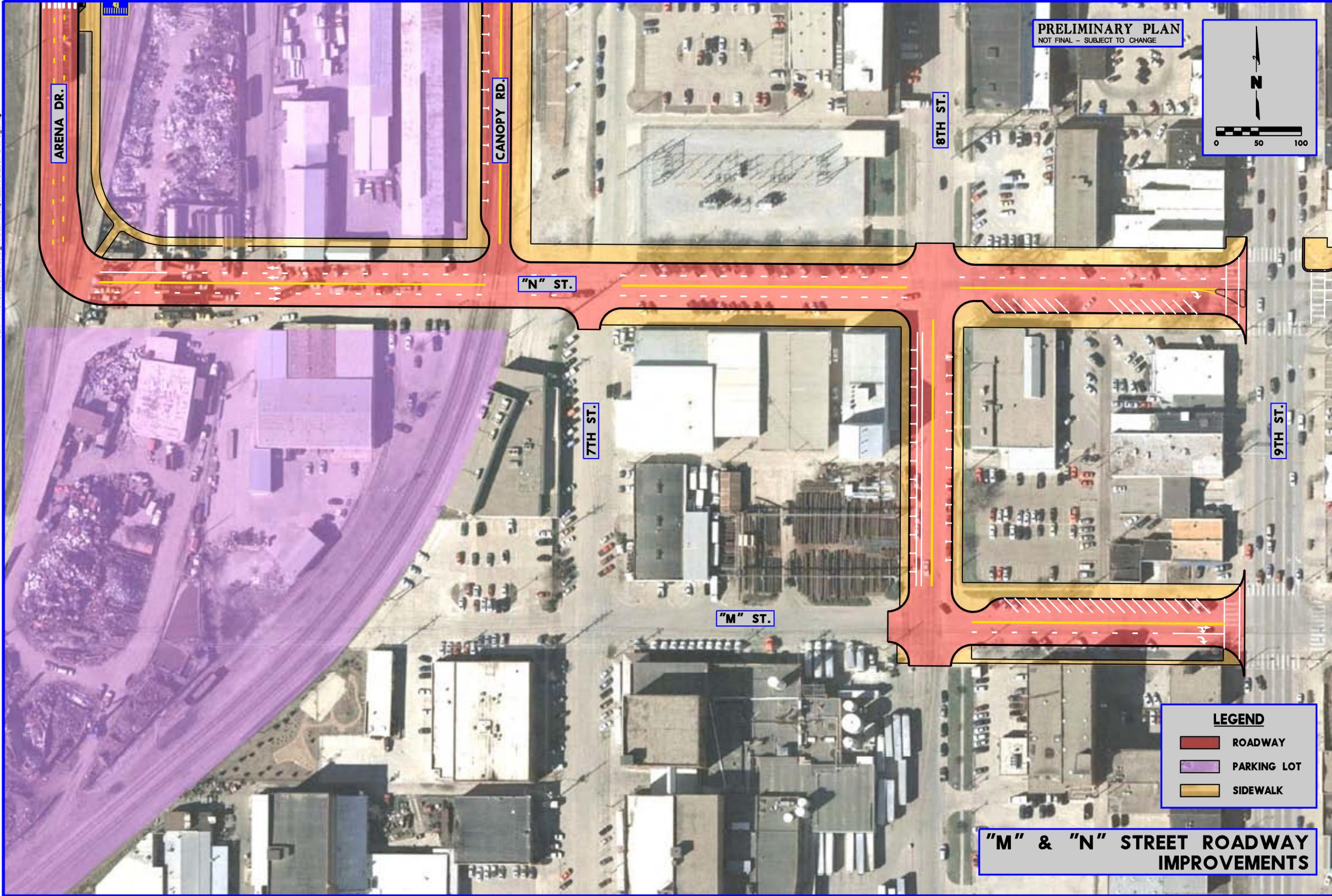
7TH ST.

"M" ST.

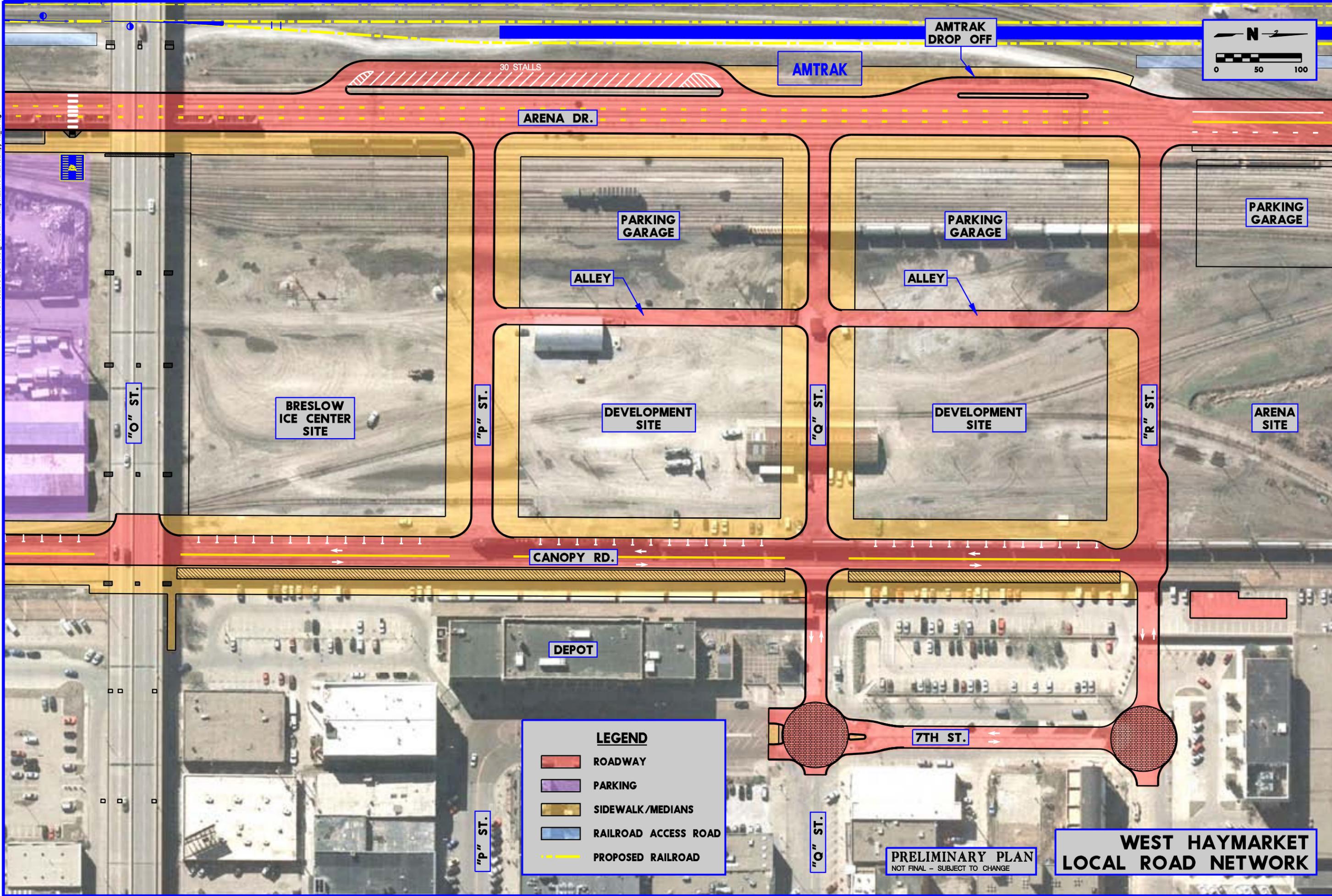
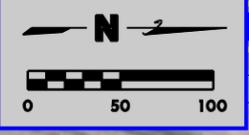
9TH ST.

LEGEND	
	ROADWAY
	PARKING LOT
	SIDEWALK

"M" & "N" STREET ROADWAY IMPROVEMENTS



DATE: 2/6/2009
DGN: F:\PROJECTS\008-0646\TRNS\DP\Transportation\Aerials\Canopy_Rd_IDP.dgn



30 STALLS

AMTRAK
DROP OFF

AMTRAK

ARENA DR.

PARKING GARAGE

ALLEY

PARKING GARAGE

ALLEY

PARKING GARAGE

"O" ST.

BRESLOW
ICE CENTER
SITE

"P" ST.

DEVELOPMENT
SITE

"Q" ST.

DEVELOPMENT
SITE

"R" ST.

ARENA
SITE

CANOPY RD.

DEPOT

7TH ST.

"P" ST.

"Q" ST.

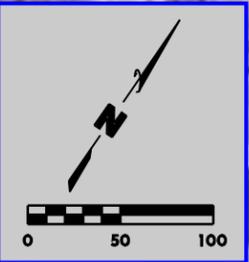
LEGEND

- ROADWAY
- PARKING
- SIDEWALK/MEDIANS
- RAILROAD ACCESS ROAD
- PROPOSED RAILROAD

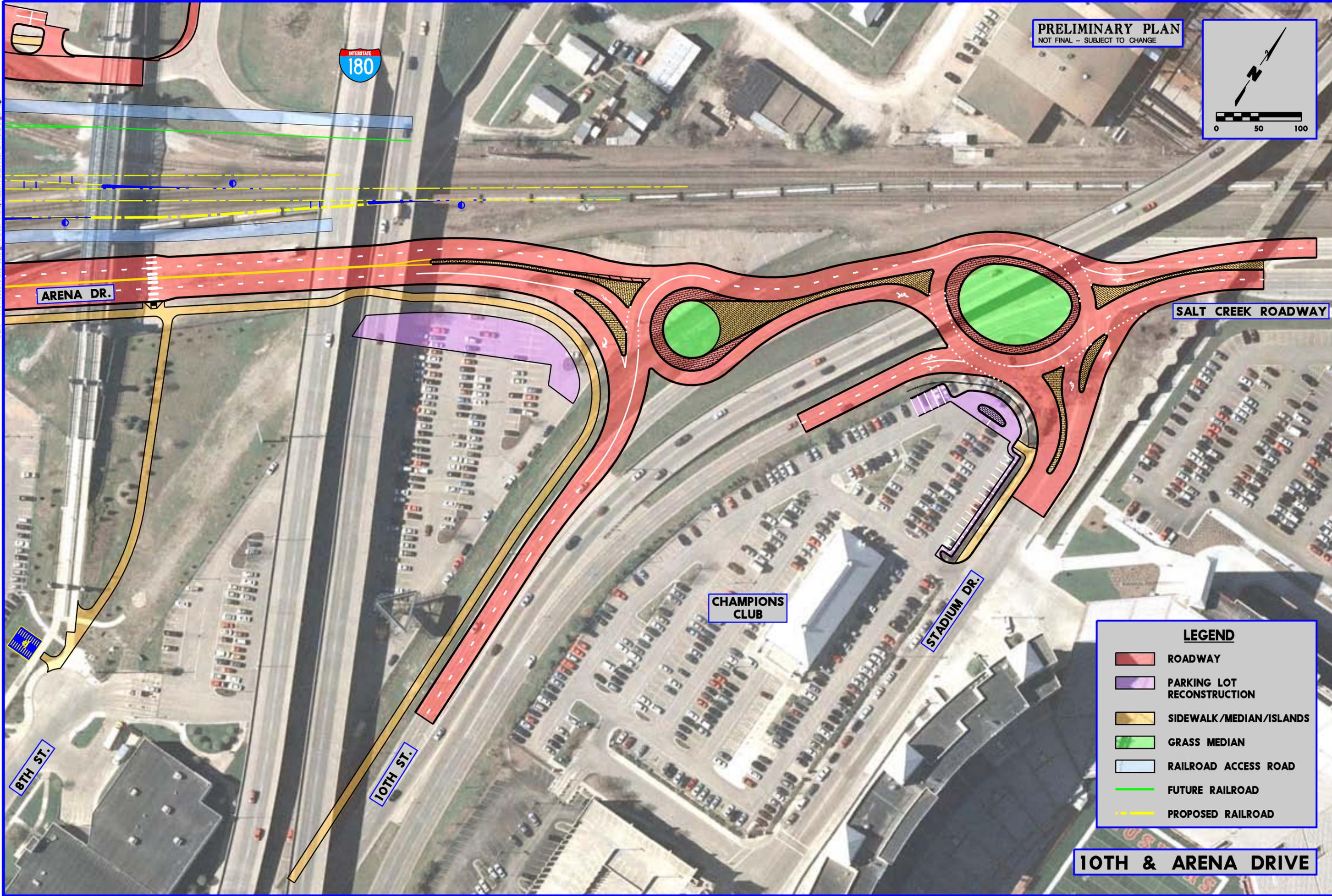
PRELIMINARY PLAN
NOT FINAL - SUBJECT TO CHANGE

**WEST HAYMARKET
LOCAL ROAD NETWORK**

PRELIMINARY PLAN
NOT FINAL - SUBJECT TO CHANGE



DATE: 2/6/2009
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LEGEND	
	ROADWAY
	PARKING LOT RECONSTRUCTION
	SIDEWALK/MEDIAN/ISLANDS
	GRASS MEDIAN
	RAILROAD ACCESS ROAD
	FUTURE RAILROAD
	PROPOSED RAILROAD

10TH & ARENA DRIVE

APPENDIX D

Existing Haymarket Analysis

MEMO

	Overnight
	Regular Mail
	Hand Delivery
X	Other: Appendix in West Haymarket Arena Traffic Report

TO:	West Haymarket Arena Traffic Impact Study
FROM:	Shane King, PE
RE:	Haymarket / West Haymarket Traffic Analysis
DATE:	December 10, 2008
PROJECT #:	008-0645

INTRODUCTION & OBJECTIVE

This technical memorandum is intended to evaluate the impacts of the proposed West Haymarket development on the existing Haymarket intersections. Specific consideration has been given to intersection control and overall circulation.

BASE CONDITIONS

Figure 1 illustrates the existing Haymarket street network. It should be noted that some of the Haymarket intersections have wide approaches that allow for a single vehicle to make a right-turn while a through vehicle is stopped at the approach. For analysis purposes, this “slip-right” movement was omitted. Figure 2 illustrates the existing peak hour volumes. The intersection volumes were obtained via turning movement counts conducted by OA in November 2008 and recent counts provided by the City of Lincoln. Figure 3 shows the results of capacity analysis performed for the existing conditions. All movements are expected to operate at LOS C or better during both peak periods.

SITE CHARACTERISTICS

To determine the site trips entering/exiting West Haymarket during peak periods, expected trips were generated utilizing rates contained in the *Institute of Transportation Engineers (ITE) Trip Generation Manual*. Table 1 shows the expected trips associated directly with the West Haymarket development.

TRAFFIC VOLUMES

To determine analysis volume scenarios, the trip generation volumes were routed through the street network based on the distribution shown in Figure 4. All trips were routed to the West Haymarket parking garages west of Canopy Road. Trips will enter the West Haymarket via Arena Drive, Q Street, and R Street. Based on the distribution, site trips are illustrated in Figure 5. The combines existing plus site volumes are illustrated in Figure 6.

CAPACITY / OPERATIONAL ANALYSIS

Prior to conducting capacity analysis, traffic signal warrants were evaluated at the highest volume intersection; 8th Street & Q Street. Due to limited available data, only Warrant 3, Peak Hour. Tables showing the signal warrant analysis are included at the end of this document. Neither the AM nor PM peak hour is expected to be close to the signalization threshold even with West Haymarket volumes. Therefore, analysis was conducted using the existing intersection control. To provide drivers a common expectation, the intersection control at 7th Street & R Street was changed from Yield to Stop.

Based on the existing plus mixed-use volume scenario, capacity analysis was conducted using Synchro, version 6.0, which is based on the Highway Capacity Manual (HCM) delay methodology. For simplicity, the amount of control delay is equated to a grade or Level of Service (LOS) based on thresholds of driver acceptance. The amount of delay is assigned a letter grade A through F, LOS A representing little or no delay and LOS F representing very high delay. The capacity analysis results are summarized in Figure 7. LOS C or better is expected for all movements during both peak hours.

In addition to the capacity analysis, Haymarket circulation was considered to identify West Haymarket impacts. Of the two access points to West Haymarket (Q Street and R Street), Q Street is expected to be the primary corridor. R Street is appealing only as an entrance for I-180 SB traffic. Q Street provides easy entry access from 9th Street as well as WB traffic on Q Street. Since the West Haymarket parking garages are not expected to have an access on to R Street and because the only Haymarket exit direction is SB on 9th Street, it becomes less attractive as an exit route. The bulk of exiting traffic through the Haymarket is expected to use Q Street and P Street if necessary to continue east. Even with this circulation pattern, 8th Street & Q Street is not expected to satisfy signal warrants as previously discussed.

It is worth noting that any increase in vehicular traffic through the Haymarket increases the vehicle – pedestrian interaction and potential conflicts. However, capacity is available for both modes of transportation.

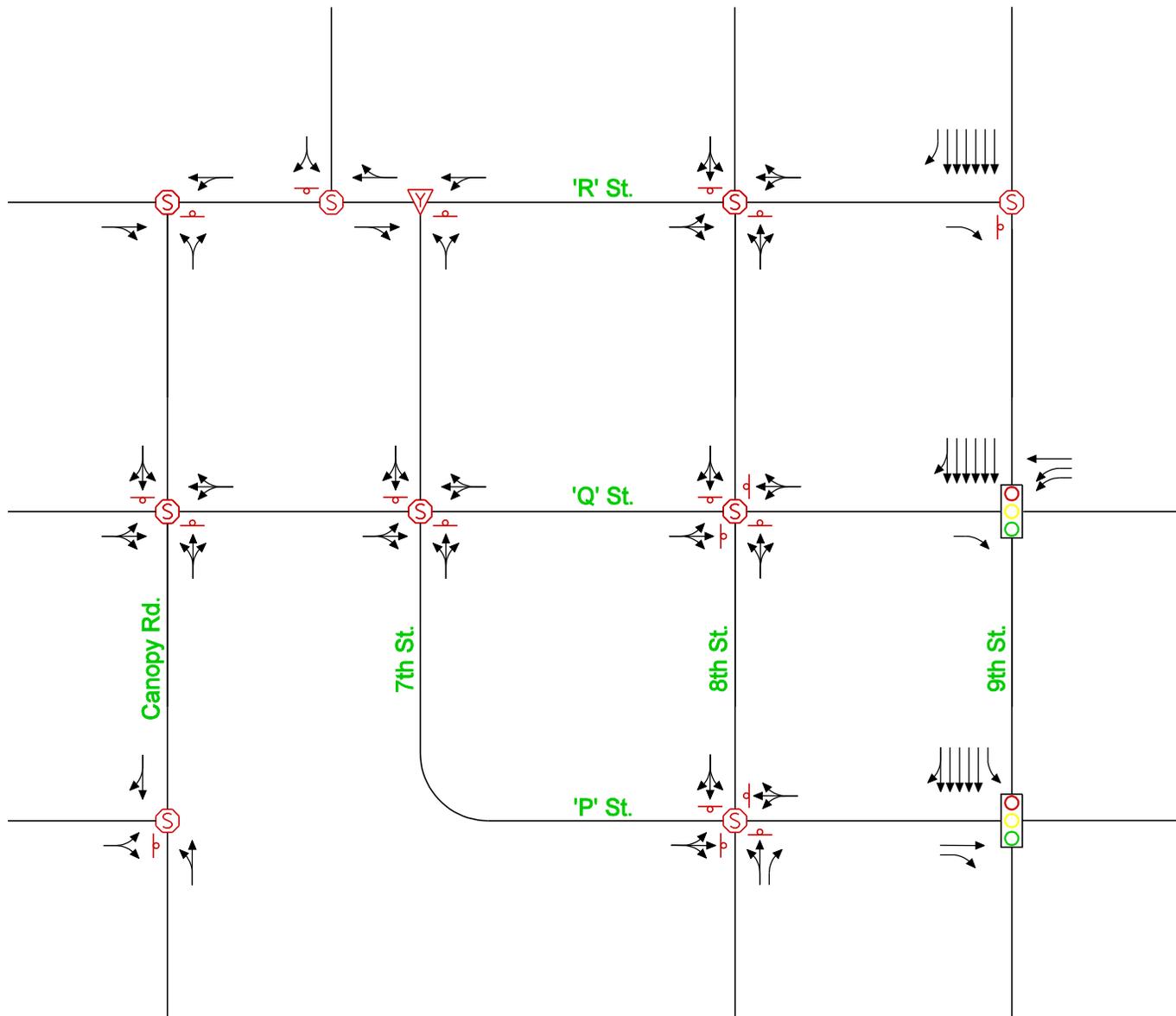
CONCLUSIONS

The findings of this study are documented in this memorandum. Results include the number of expected peak hour trips associated with the mixed-use development in the West Haymarket. It is likely that some trips may be associated with the Arena during the peak hours. However, any peak hour Arena trips are expected to be minimal and were omitted from this analysis.

None of the existing Haymarket intersections are expected to satisfy signal warrants based on the anticipated land-uses and trip distribution. The expected volumes are well below the threshold for even single lane approaches on both the major and minor streets.



LEGEND	
	- Signalized Intersection
	- Stop Control Intersection
	- Yield Control Intersection
	- Sign

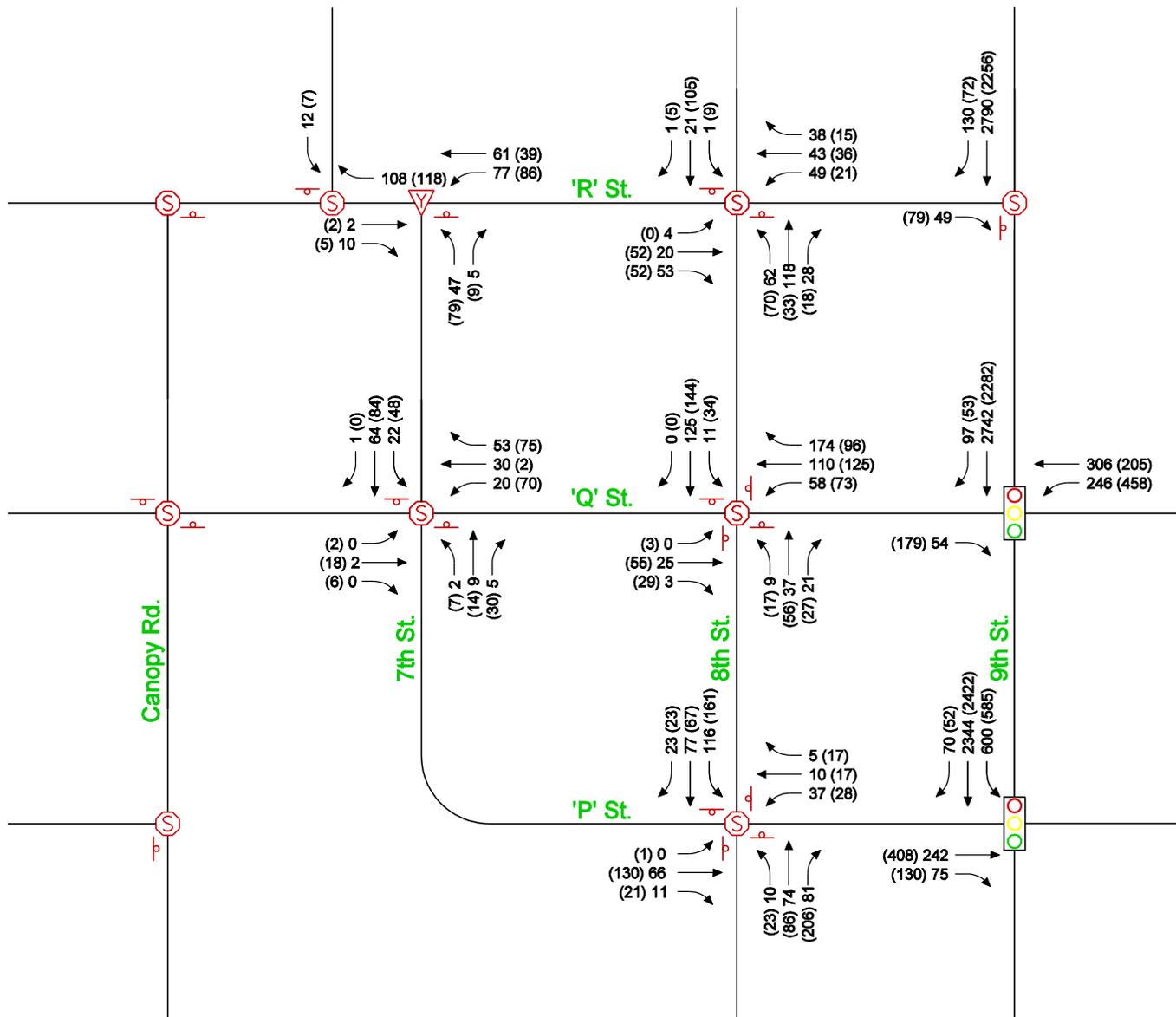


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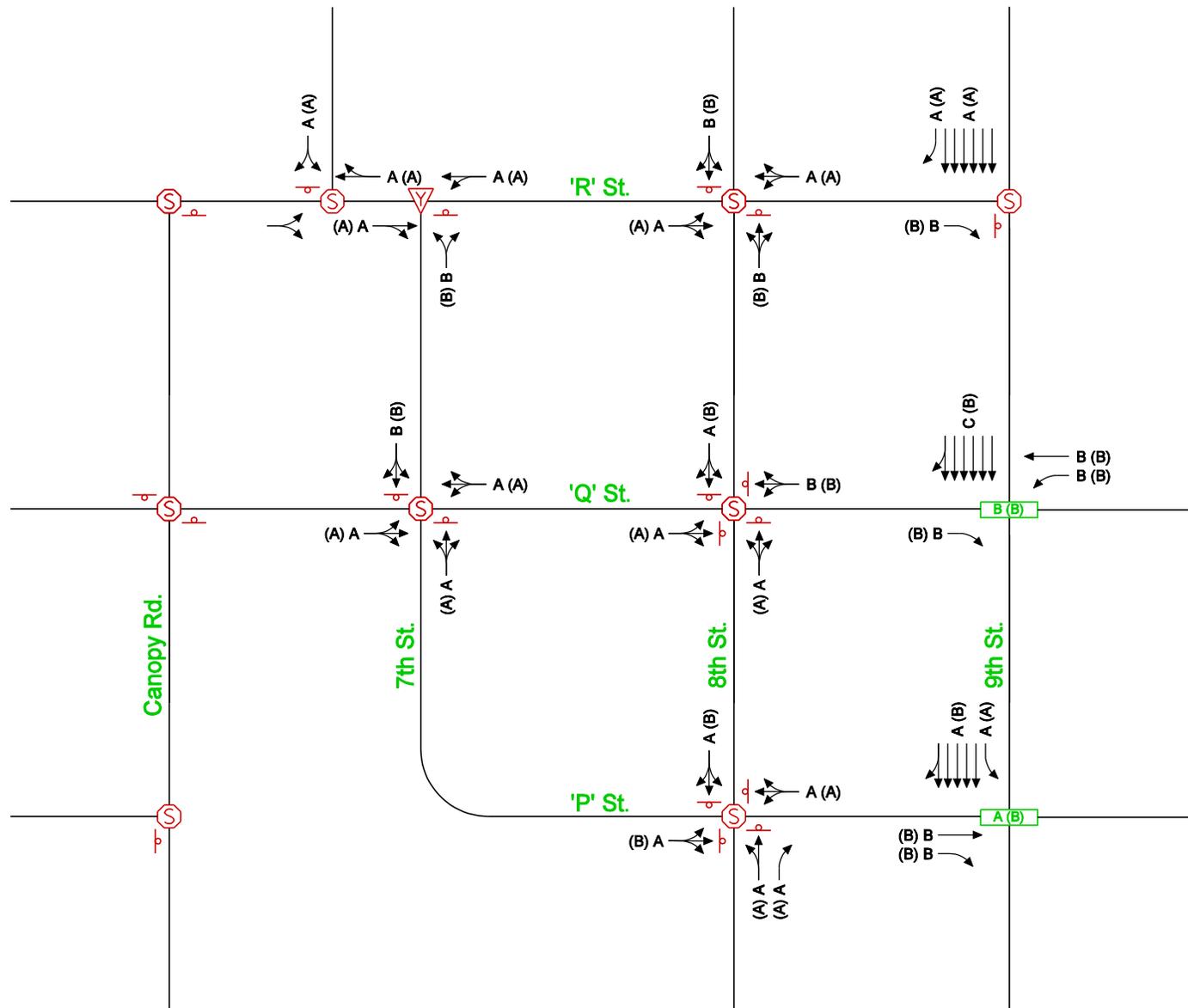
- Signalized Intersection
- Stop Control Intersection
- Yield Control Intersection
- Sign
- AM (PM) - Hourly Volume



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LEGEND	
AM (PM)	- Signalized Intersection LOS
S	- Stop Control Intersection
▽	- Yield Control Intersection
▾	- Sign
↔	AM (PM) - Movement LOS

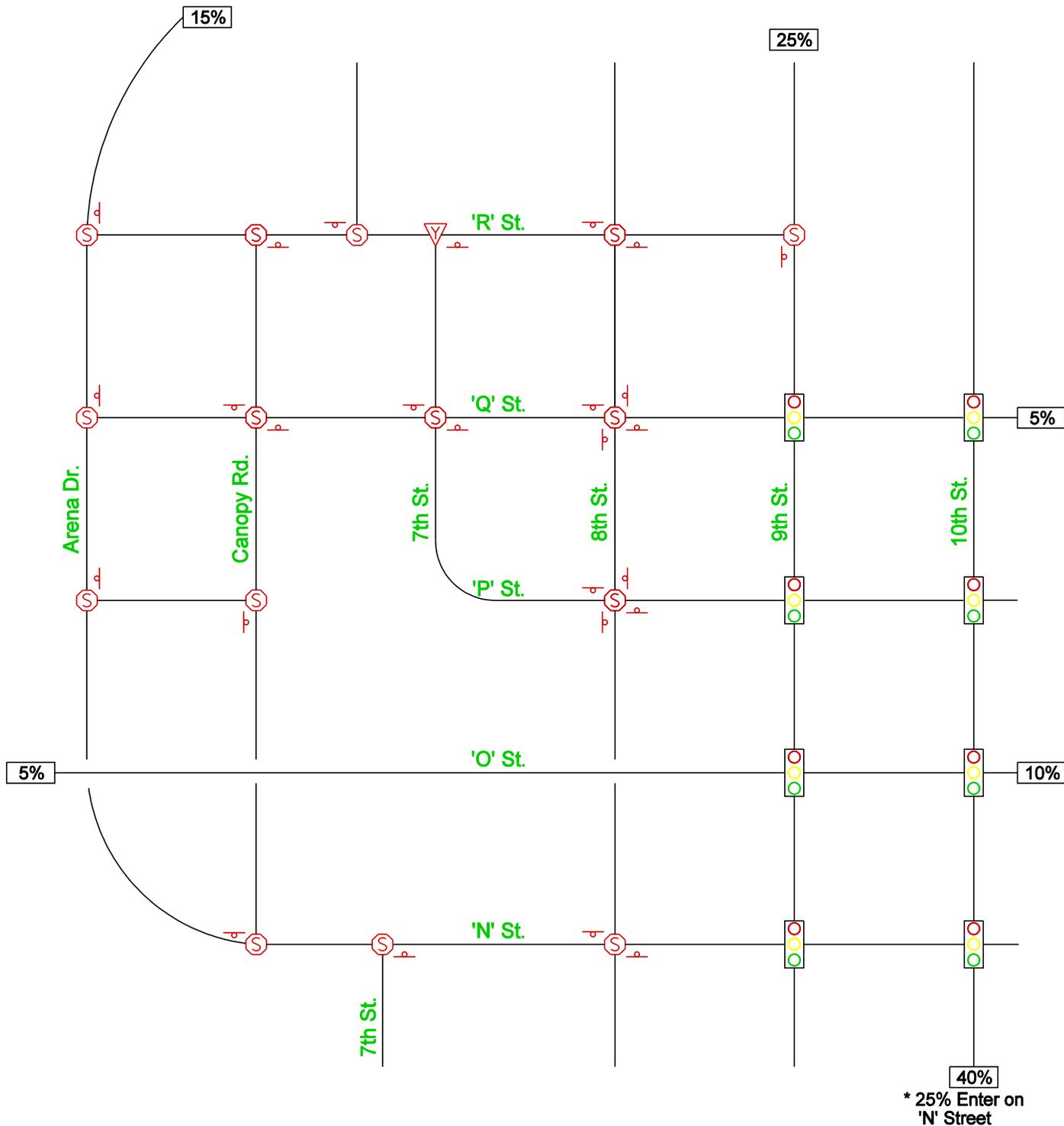


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LEGEND

- Signalized Intersection
- Stop Control Intersection
- Yield Control Intersection
- Sign
- X% - Trip Distribution

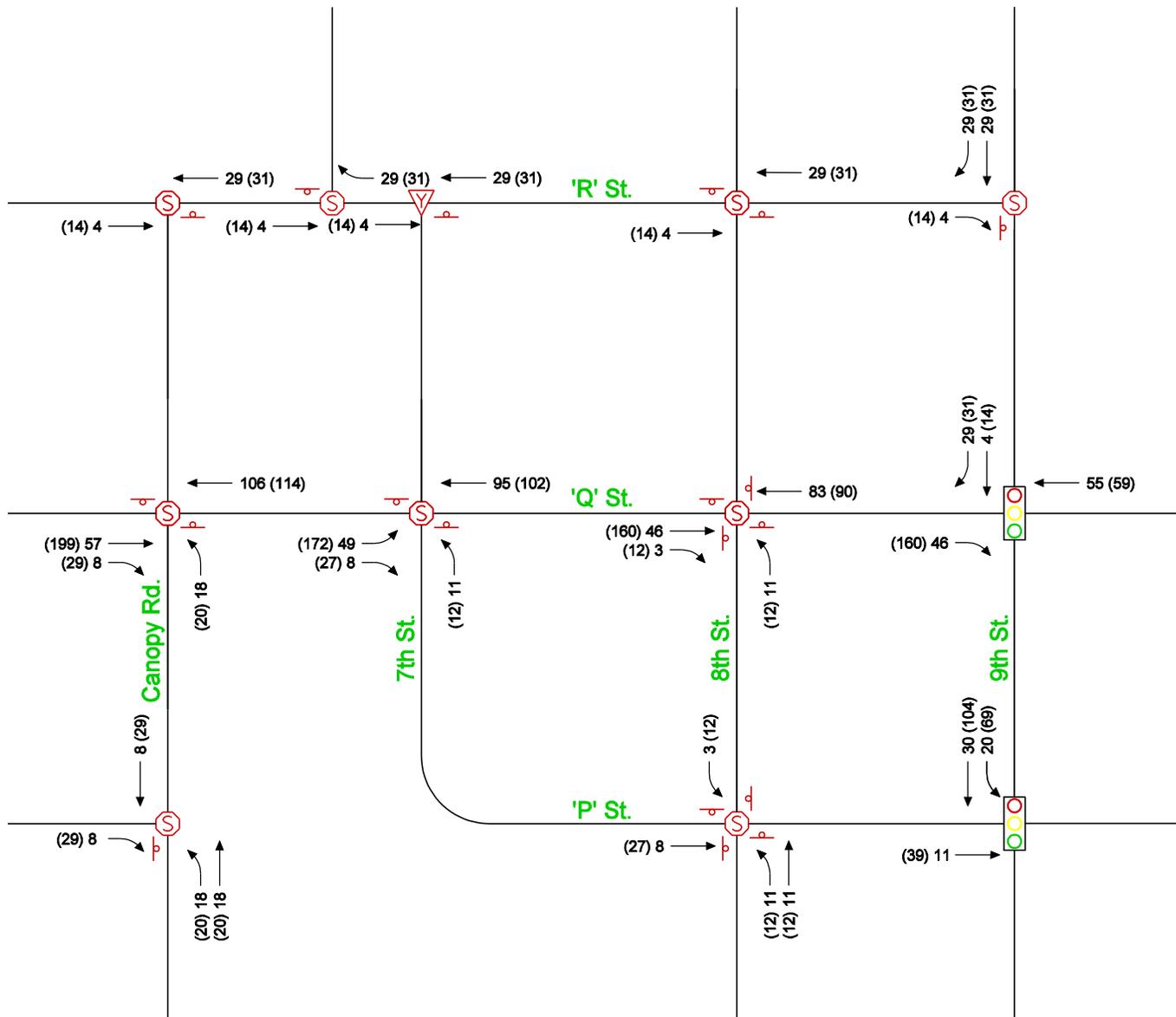


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LEGEND

- Signalized Intersection
- Stop Control Intersection
- Yield Control Intersection
- Sign
- AM (PM) - Hourly Volume

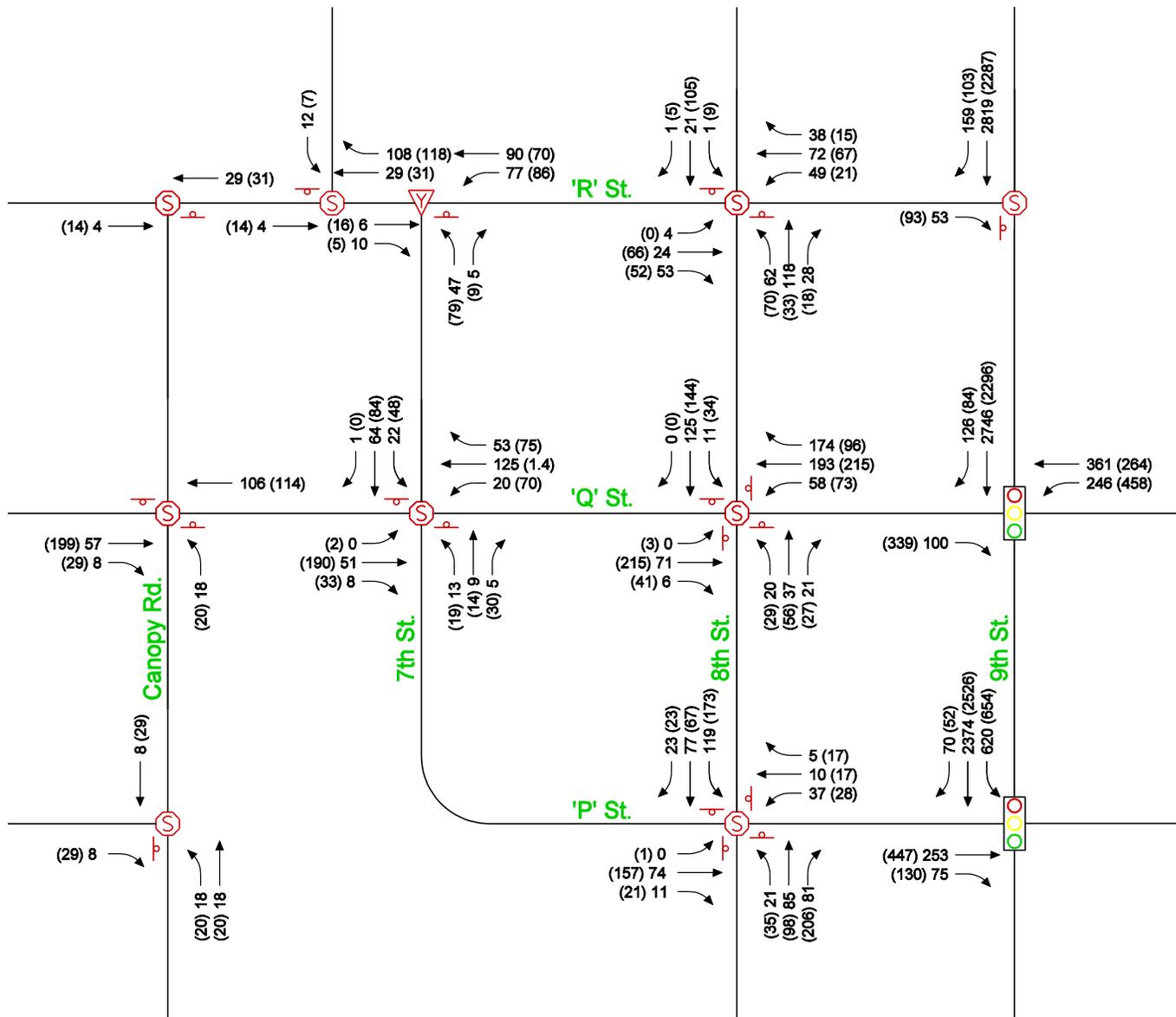


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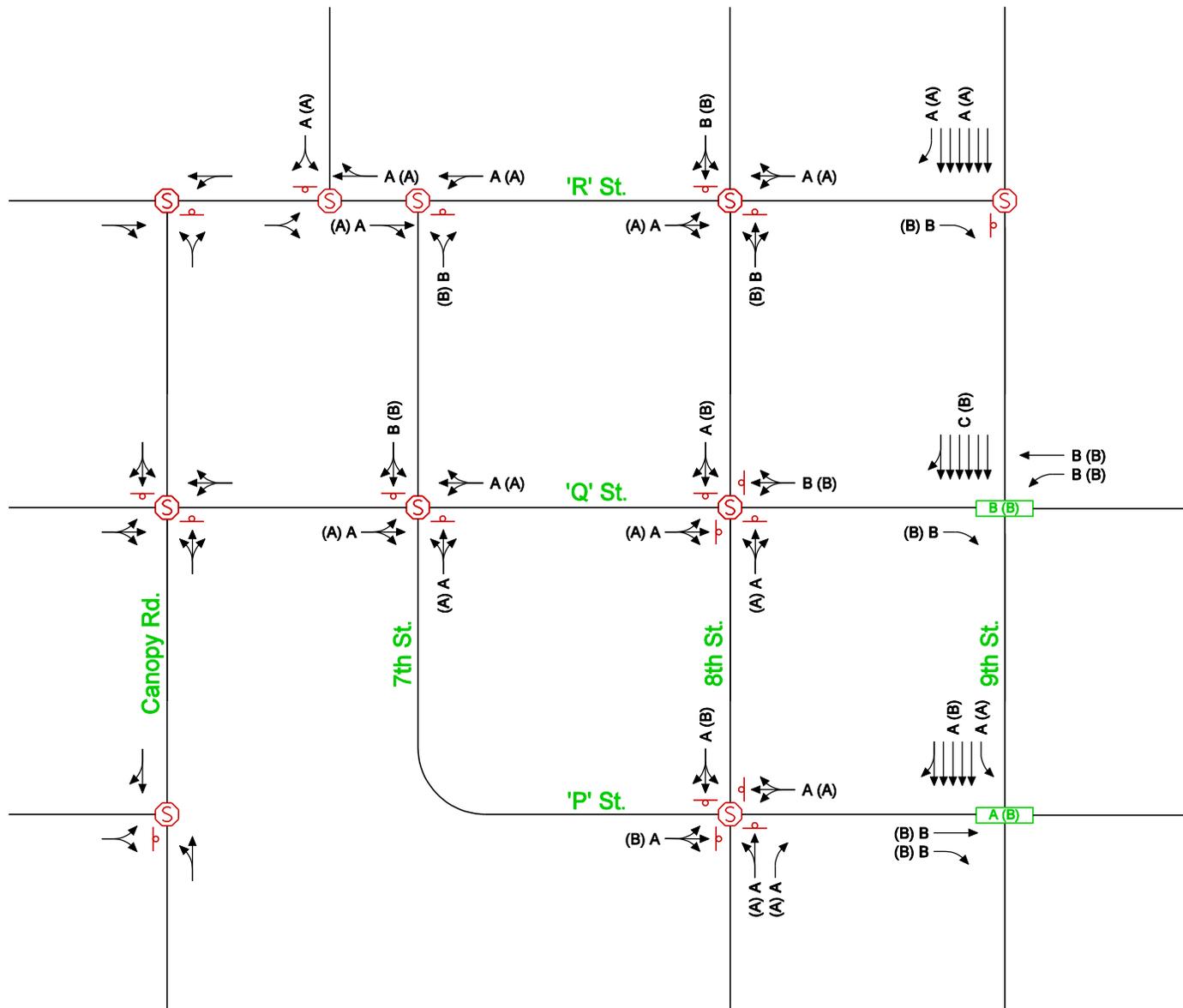
- Signalized Intersection
- Stop Control Intersection
- Yield Control Intersection
- Sign
- AM (PM) - Hourly Volume



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LEGEND	
AM (PM)	- Signalized Intersection LOS
S	- Stop Control Intersection
⏏	- Sign
↔	AM (PM) - Movement LOS



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Table 1

**TRAFFIC IMPACT STUDY
West Haymarket Arena
ITE TRIP GENERATION**

Daily Trip Generation											
ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	Daily Trips	Mixed-Use Reduction	Total Trips	Trip Distribution		Total Daily Trips	
								Enter	Exit	Enter	Exit
814/1387	Specialty Retail Center	100,000	SF	44.32	4,432	10%	3,989	50%	50%	1,994	1,994
710/1203	General Office Building	100,000	SF	$T = e^{(0.77 \cdot \ln(X) + 3.65)}$	1,334	10%	1,201	50%	50%	600	600
220/327	Apartments	100	Units	$T = 6.06(X) + 123.56$	730	10%	657	50%	50%	328	328
310/580	Hotel	250	Rooms	$T = 8.95(X) - 373.16$	1,864	10%	1,678	50%	50%	839	839
Total					8,360		7,524			3,762	3,762

AM Peak Hour Trips											
ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	AM Trips	Mixed-Use Reduction	Total Trips	Trip Distribution		Total AM Trips	
								Enter	Exit	Enter	Exit
814/	Specialty Retail Center	100,000	SF	0.00	0	10%	0	50%	50%	0	0
710/1204	General Office Building	100,000	SF	$T = e^{(0.80 \cdot \ln(X) + 1.55)}$	188	10%	169	88%	12%	149	20
220/328	Apartments	100	Units	$T = 0.49(X) + 3.73$	53	10%	47	20%	80%	9	38
310/581	Hotel	250	Rooms	$T = e^{(1.24 \cdot \ln(X) - 2)}$	127	10%	115	61%	39%	70	45
Total					368		331			228	103

PM Peak Hour Trips											
ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	PM Trips	Mixed-Use Reduction	Total Trips	Trip Distribution		Total PM Trips	
								Enter	Exit	Enter	Exit
814/1388	Specialty Retail Center	100,000	SF	$T = 2.40(X) + 21.48$	261	10%	235	44%	56%	104	132
710/1205	General Office Building	100,000	SF	$T = 1.12(X) + 78.81$	191	10%	172	17%	83%	29	143
220/329	Apartments	100	Units	$T = 0.55(X) + 17.65$	73	10%	65	65%	35%	43	23
310/582	Hotel	250	Rooms	0.59	148	10%	133	53%	47%	70	62
Total					672		605			246	360

major volume (total of both approaches)

502

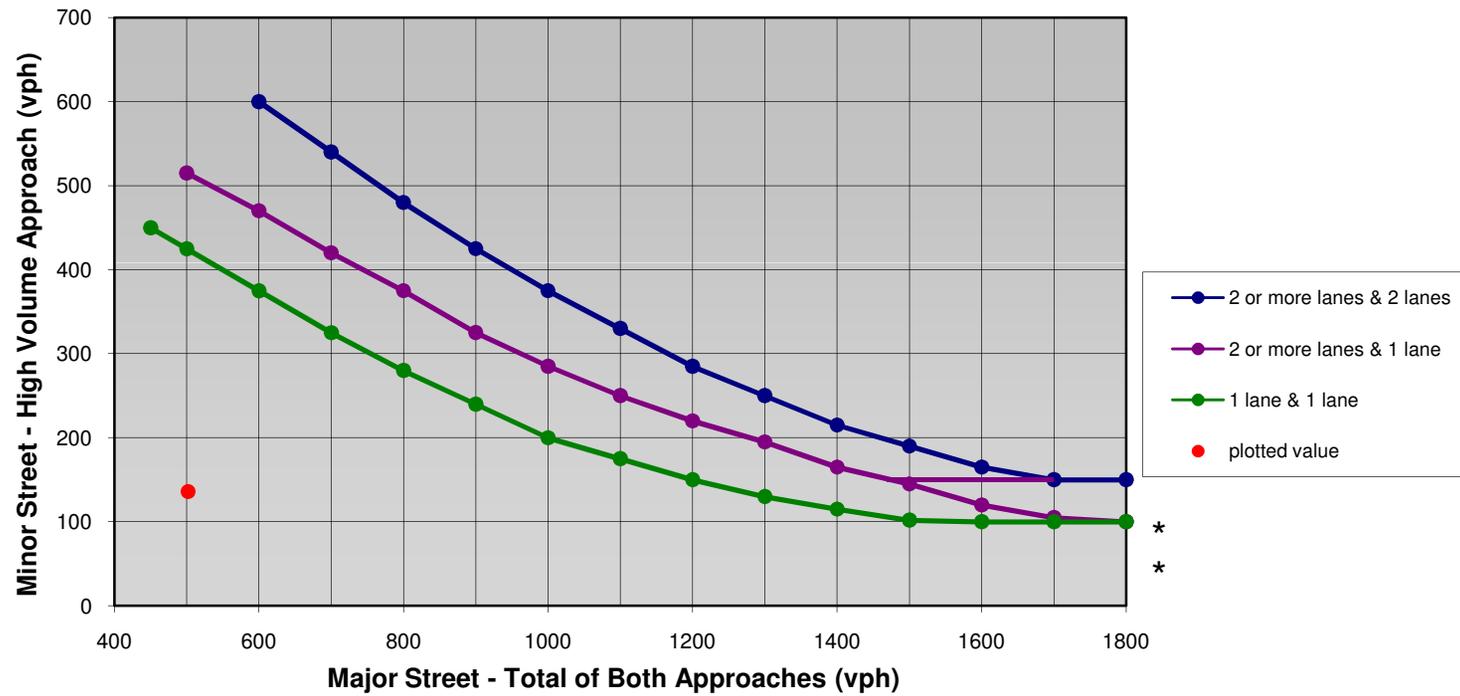
Q St

minor volume (high volume approach)

136

8th St

**2008 Existing + Site AM
8th Street & Q Street**



*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes

major volume (total of both approaches)

643

Q St

minor volume (high volume approach)

178

8th St

