MEMORANDUM

TO: John Judd, Senior Planner - City of Duluth

FROM: Matt Bolf, PE
Heather Kienitz, PE

DATE: September 18, 2013

RE: Park Point Alignment and Traffic Study
SEH No. DULUT 124932 14.00

Short Elliott Hendrickson, Inc. (SEH) has conducted a preliminary analysis of two realignment alternatives for Lake Avenue located on Park Point in the City of Duluth. The Park Point Small Area Plan includes an option of relocating the main traffic pattern between the Lift Bridge and 13th Street South from Lake Avenue to Minnesota Avenue. The two main objectives in doing this would be to provide better access to Franklin Park and move traffic to the more commercially developed Minnesota Avenue and away from the residential area along Lake Avenue.

Two alternatives to accomplish this were evaluated. The first alternative closes the motor vehicle connection for Lake Avenue to Minnesota Avenue on both the north and south ends with access to Lake Avenue occurring on 9th to 12th Streets. This alternative provides an opportunity for Lake Avenue to be redesigned as a local street with treatments more typical of those found on residential streets. The second alternative creates one-way pairs on Lake Avenue and Minnesota Avenue from 8th to 13th Streets with Minnesota serving as a southbound one-way and Lake Avenue a northbound one-way.

Design Alternatives

SEH obtained base mapping from the City's GIS department along with zoning and potential build out information of the vacant lands between 8th and 19th Streets. This information was used as the base of both design alternatives and the traffic forecasts.

Design Alternative 1

This alternative relocates the "S" curve from Lake Avenue to Minnesota Avenue from 12th Street to 8th Street allowing the main traffic pattern to move onto Minnesota from 8th to 13th Streets. The motor vehicle connections between Lake Avenue and Minnesota Avenue would remain from 9th to 12th Streets. Lake Avenue would be reconfigured to allow for pedestrian access and movements as discussed below. A new pedestrian corridor would be constructed from the end of Lake Avenue near the proposed parking lot to the southwest through Franklin Park ultimately providing a crossing of Minnesota Avenue at 13th Street. A pedestrian connection would also be maintained between Lake and Minnesota Avenues on the north end of Lake Avenue. This alternative is shown as Alternative 1 in the attached Figures 1-7.

<u>Minnesota Avenue</u>

The existing roadway consists of two 12-foot travel lanes with no parking. The existing horizontal curves connecting Lake Avenue to Minnesota Avenue have a radius of 160 feet, which does not meet current design standards for a 30 mph roadway. There is currently no sidewalk on Minnesota Avenue between the bridge and 13th Street.

The horizontal alignment selected for Minnesota Avenue utilizes two curves each with a 220 foot radius which meet the State Aid 30 mph urban horizontal curve standards. The typical section used for this study includes two 11- foot through lanes, a 2- foot reaction shoulder on the north side of the road, an 8- foot parking lane and a 6- foot sidewalk on the south side of the roadway. This results in a total pavement width of 32 feet plus a 6- foot sidewalk. This design would also include a curb extension on the west side of Minnesota Avenue at the 13th Street intersection. The curb extension would provide shorter pedestrian crossings and place pedestrians in a position to better view motorists and vice-versa improving sight distance. Under this scenario the utility poles on the south side of the road would encroach approximately 2 feet into the proposed sidewalk. This would need to be addressed by either moving the utility poles, or eliminating the parking or sidewalk.

This alignment also avoids impact to the Duluth Harbor by maintaining a horizontal separation from the water's edge. An improved sidewalk connection would also be made to the existing South Pier walkway.

This alignment would require right-of-way to be purchased from at least four private homeowners (and as many as six) along with the relocation of the City's sanitary sewer lift station at 8th Street. If variances were granted for smaller horizontal curves and the parking and sidewalk were eliminated, it may be possible to reduce the amount of right-of-way to be acquired and avoid any conflicts with the utility poles.

Lake Avenue

The existing roadway consists of two 11 foot travel lanes, two 9 foot parking lanes, two 3 foot boulevards, and two 4 foot sidewalks.

Under this scenario Lake Avenue would no longer be considered the Municipal State Aid (MSA) street, thus allowing for a reduced cross-section more congruous with the adjacent residential context and Complete Streets design principals. Due to the existing on-street bicycle facility and the potential to significantly reduce the motor vehicle volume along the corridor under Alternative 1, we propose a Bicycle Boulevard design for Lake Avenue. The design provides a narrowed travel way to be shared by bicyclists and motorists. It also includes on-street parallel parking within bays. This results in a total pavement width of 36 feet along with 5- foot sidewalks. The attached cross-sections show a midblock location including two 10 -foot through lanes, two 8- foot parking lanes, two 4 -foot boulevards, and two 5 -foot sidewalks.

Attributes of the Bicycle Boulevard design for Lake Avenue are:

- Bicycle boulevards are low volume; low speed residential streets where improvements have been made to give bicyclists some priority for travel.
- Bicycle boulevards generally appeal to all types of bicyclists.
- Bicycle boulevards are sometimes used as an alternate or to supplement routes on higher volume and higher speed streets.
- Bicycle boulevard pavement marking placement encourages bicyclists to travel in the correct direction reducing conflicts with opening car doors.
- Bicycle access at the north and south ends can be accomplished with curb cuts and trail connections.
- The trail crossing of Minnesota Avenue at 13th Street could include a pedestrian activated rectangular rapid flashing beacon which has a documented high rate of motorist compliance (>80%).
- The overall design enhances the aesthetic character of the adjacent residential area while providing users a safe, functional appropriately scaled multimodal facility.

The attached Figure 8 includes precedent images of bicycle boulevards and related treatments illustrating potential applications for a Lake Avenue Bicycle Boulevard.

Utility Considerations

There are utility poles on both sides of Lake Avenue and on the south side of Minnesota Avenue. For purposes of this report, it was assumed the poles would not be able to be relocated or lines buried. This would result in utility poles being within the new sidewalk areas. A modified typical section could eliminate this conflict depending on the City's preference.

We did not look in detail at the existing storm sewer, sanitary sewer, or water main systems in the area. It is likely that, at a minimum, there would be catch basin and manhole relocations needed between the bridge and 9th Street along with a relocation of the lift station to a new location or below grade.

Design Alternative 2

This alternative converts Lake Avenue and Minnesota Avenue to one-way pairs from 8th Street to 13th Streets as shown in the attached Figure 9. In this scenario both streets would be considered State Aid routes and would have to conform to State Aid standards.

Both Minnesota and Lake Avenues would have the same typical section consisting of two 12 -foot through lanes, and two 8- foot shoulders resulting in a pavement width of 40 feet. On Lake Avenue, the existing boulevards and sidewalks could be maintained. On Minnesota Avenue, the pavement width would increase over the existing 24 feet.

The construction of two one-way pairs would result in several major concerns between the bridge and 13th Street including:

- Having to meet State Aid Standards for both roadways.
- Merging two lanes northbound on Lake Avenue into one at the bridge.
- Merging two lanes southbound on Minnesota Avenue into one at 13th Street.
- One-ways promote increased speeds through residential neighborhoods (Lake Avenue).
- There is no good way to provide two-way access into/out of the beach parking lot.
- Franklin Park still has limited access, no connections, and increased speeds on roadway.

Based on the 2035 traffic volume forecast, Alternative 2 would provide excess capacity, though constraining that capacity at the Lift Bridge to the north and Minnesota Avenue to the south where there is only one lane of traffic in each direction. The forecast demand volumes as discussed below do not require two lanes of traffic in each direction. Thus the traffic impact analysis was only conducted for Alternative 1. Because Alternative 2 provides more capacity than Alternative 1, operations would naturally be better. However, the recommendation is not to overbuild the excess capacity Alternative 2 would provide, but rather to take the opportunity to provide improved safety and connections for all users and develop a street network that complements adjacent land use while satisfactorily serving traffic demand volumes.

Traffic Impact Analysis

To gain understanding of how design Alternative 1 would be impacted by planned or potential development projects, a traffic impact analysis was conducted.

Traffic Volumes

SEH obtained turning movement counts during the morning and afternoon peak period at the Lake Avenue intersections with 10th Street and 11th Street. The morning and afternoon weekday peak hour

turning movement counts and the 2011 Average Annual Daily Traffic Volumes (AADT) are shown on Figure 10.

SEH also obtained 2035 forecasted daily volumes for Lake Avenue from the Metropolitan Interstate Commission (MIC)/City of Duluth Comprehensive Plan. Using the 2035 forecast, SEH determined the growth rate to apply to the 2011 AADT and existing turning movements to generate 2035 Base daily and peak hour turning movement forecasts for Lake Avenue. Based on the MIC model, the area growth is minimal with an annual rate of 0.2%.

The base 2035 forecast volumes were re-routed to represent the realignment of Lake Avenue to Minnesota Avenue in Alternative 1.

Trip Generation and Distribution

Using the information provided by the City of Duluth, trips were generated for the two planned hotels at 10th and 11th Streets, respectively. The Institute for Transportation Engineers Trip Generation Manual, 9th Edition was used to generate trips for the two 55-room hotels as well as three residential build-out scenarios. The City provided three potential build-out scenarios for two areas on Park Point. The scenarios had varying degrees of density including the following: single family homes, two family homes, or townhomes. Trip generation was conducted for each of the three scenarios and is summarized in the attached Table 1.

2035 No-Build

The development generated demands for the two hotels and the highest density residential build-out scenario were added to the Base 2035 forecast turning movements to generate a no-build scenario; no change to existing Lake Avenue and Minnesota Avenue. The daily and peak hour turning movement volumes are shown in Figure 11. The highest density residential scenario was used to understand the implications of the most conservative or highest volume scenario.

2035 Build – Alternative 1

The Base 2035 forecast volumes and the development generated demand volumes were re-routed to represent the realignment of Lake Avenue to Minnesota Avenue in Alternative 1. The daily and peak hour turning movement volumes are shown in Figure 12.

Capacity Assessment

Based on the 2035 scenarios, SEH conducted a high level capacity review of the forecast traffic volumes due to the 2035 No-Build and 2035 Build – Alternative 1 scenarios.

The turning movement volumes at the intersections were evaluated for side street stop conditions using capacity analysis methods defined in the Highway Capacity Manual. Under the 2035 No-Build condition scenario, the side street approaches to the intersections of 10th Street/Lake Avenue and 11th Street/Lake Avenue operated with acceptable LOS C with delays of 16.8 seconds/per vehicle or less.

The 2035 Build – Alternative 1 scenario was evaluated at the intersections of 10th Street/Minnesota Avenue and 11th Street/Minnesota Avenue. The morning peak hour LOS for the side street approaches was LOS B and during the afternoon peak hour the southbound side street approaches had LOS B and northbound side street approaches had LOS C. The Minnesota Avenue approaches were all at LOS A at both intersections.

The overall capacity of the two lane street proposed for Minnesota Avenue under Alternative 1 is approximately 12,000 vehicles per day. The 2035 forecast for Minnesota Avenue ranges from 9,300 to

8,100 vehicles per day, well under the capacity of the proposed two lane street. A three lane cross-section with a two-way center left turn lane was also considered for this segment of Minnesota Avenue to provide left turning motorists with a dedicated lane; however, the typical capacity of a three lane cross-section is 12,000 to 17,000 vehicles per day which is much higher than forecast traffic volumes. Thus a two lane section should be sufficient under the forecast 2035 AADT (assumptions discussed above). Improved operations could potentially be obtained through prohibition of parking near intersections, to allow for motorists to drive around motorists waiting to turn left, or for right turning motorists to move to the right before executing their turn.

It should be noted that the seasonal variation in traffic volumes was not included in this review.

Traffic Speeds

Due to speed concerns, the City obtained motor vehicle speed data along Lake and Minnesota Avenues using Stealth Stat equipment for one week in the month of June. The equipment measured vehicle speeds of all vehicles and then calculated the 85th percentile speed, which is the speed typically used by traffic engineers to determine the appropriate speed limit for a street. The 85th percentile speed is the speed at which 85 percent of the traffic is driving at or below. The collected speed data is described below:

- Southbound Lake Avenue at 1109 South Lake Avenue – 85th percentile speed = 30 mph
- Northbound Minnesota Avenue at 3720 Minnesota Avenue – 85th percentile speed = 32 mph

Based on the data collected, it appears that the posted speed limit of 30 mph is appropriate and the majority of motorists are complying with the speed limit.

Buchanan Street and Lake Avenue Traffic Signal

SEH investigated concerns about the operation of the traffic signal at the intersection of Buchanan Street and Lake Avenue north of the Lift Bridge. Traffic signal design and timing information was provided by the City for the traffic signal. No existing traffic counts were available.

SEH also conducted field observations of the traffic signal operation and noted the following concerns and provides recommendations below each. A map of this area is shown on Figure 13.

1. *The green time for Lake Avenue seems insufficient for the peak hour demands.*

   Recommendation 1
   The traffic signal is operating "free" with a 90-second cycle based on the set maximums within the controller.

   The 90-second cycle length is likely insufficient during busy periods, such as summer weekends, during events, or possibly even weekday peak hours. Volume data would be needed to fully assess the appropriate cycle lengths and splits. It is recommended to develop traffic signal timing plans for morning, afternoon, off-peak and weekend peak periods for this traffic signal to optimize operations for all traffic conditions. An outline of a traffic signal optimization study is included.

2. *During busy periods, the southbound Lake Avenue dedicated left turn lane is too short to store demand volumes and waiting motorists due to opposing traffic and pedestrian traffic. This results in a long queue of primarily through traveling motorists on southbound Lake Avenue waiting behind a few left turning motorists.*

Recommendation 2
The southbound left turn lane could be extended to provide additional storage though this would require the loss of one to two on-street parking spaces. Another consideration is installation of a protected/permissive southbound left turn phase. During the protected ("green arrow") phase of the cycle southbound left turning motorists would be able to proceed without conflicting northbound motorists and without conflicting pedestrians crossing in the crosswalk. This would improve the ability of all southbound motorists to progress through the traffic signal.

3. *The offset between the parking lot entrance and Buchanan Street results in motorist confusion. When leaving the parking lot and traveling in any direction, but straight in particular, opposing traffic from Buchanan Street doesn't always notice or yield.*

Recommendation 3
The offset approaches to the intersection could be split phased to avoid the conflict observed between opposing motorists and enhance safety. This would enable each eastbound and westbound approach to proceed separately. This may have an impact on traffic operations due to the time required / additional delay introduced by the addition of another signal phase; however, the signal may still operate more efficiently if motorists are presently hesitating or getting stuck traveling through the intersection. The development of updated time of day traffic signal timing plans (Recommendation 1) could include review of this phasing scheme and related impacts.

Recommendation 4
Complete a Traffic Signal Optimization Study. The following describes the tasks required to develop time of day traffic signal timing plans for the intersection of Buchanan Street and Lake Avenue to improve and optimize operations and safety for all traffic conditions.

1. Gather traffic volume data and detector occupancy data from the in-pavement detection for the Lake Avenue and Buchanan Street approaches. The controller must be set to the correct date and time. The controller must be set to start collecting the detector data but no end time should be set. This will allow for staff to continuously extract data; a biweekly basis is recommended.
2. Local knowledge or detector data may be used to identify the morning, afternoon and weekend peak periods.
3. Obtain turning movement counts at the Lake Avenue and Buchanan Street intersection including pedestrians and truck traffic. For weekend peaks the data should be obtained while the area experiences typical tourist traffic. Unless event timing plans are desired (e.g. Grandma's Marathon).
4. Using Synchro/SimTraffic software, complete timing plan optimization for the intersection during the morning peak, off-peak, afternoon peak and weekend peak periods. Include appropriate timing parameters based on MnDOT and City of Duluth guidelines.
5. Test the geometric and phasing recommendations 1-3 above and various timing plans to optimize operations and safety at the intersection.
6. Implement the time of day traffic signal timing plans. Enter the plans into the controller and review operations during the different periods such that adjustments may be made as necessary.

mh
Attachments: Figures 1-13 and Table 1
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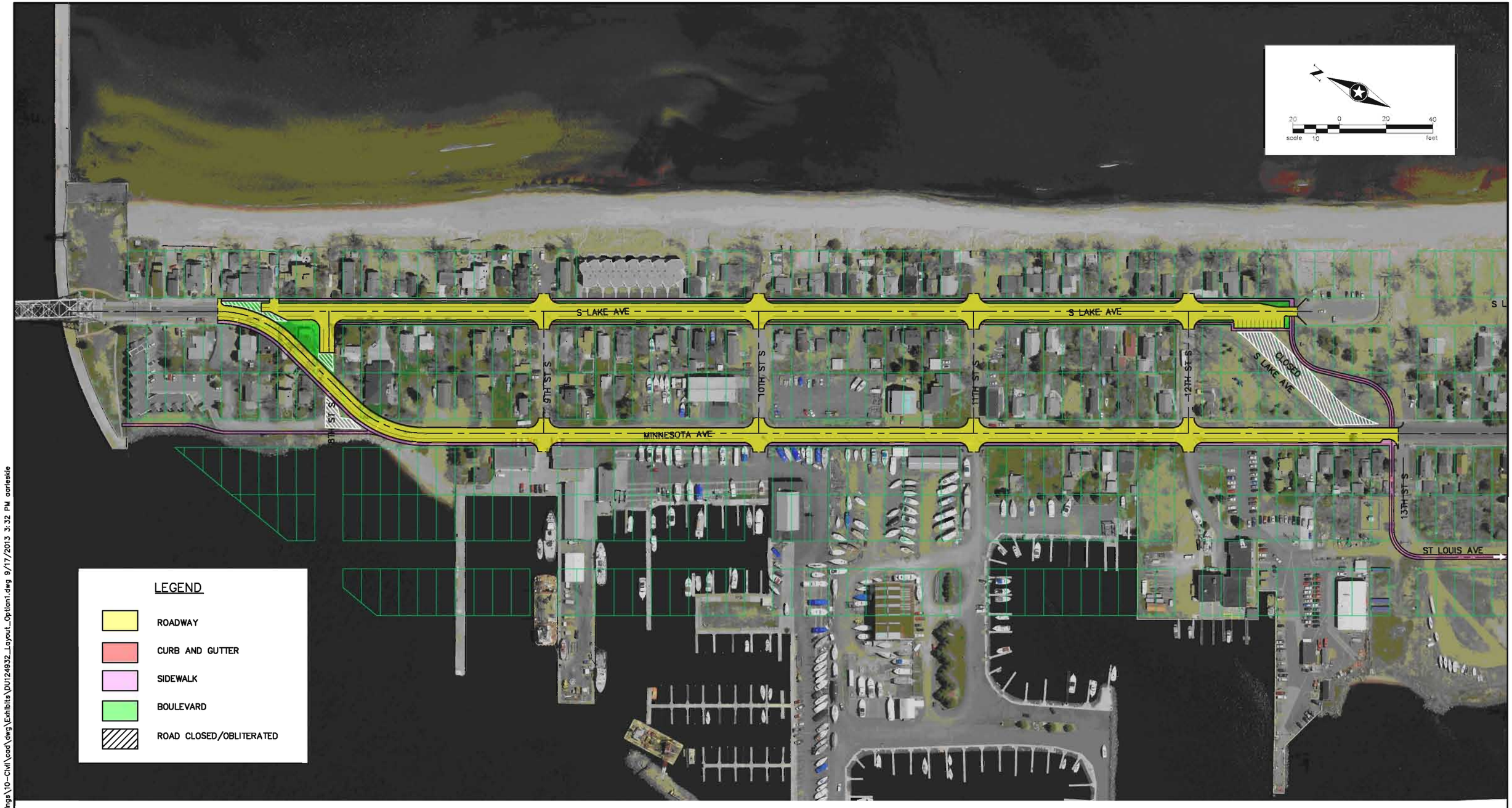

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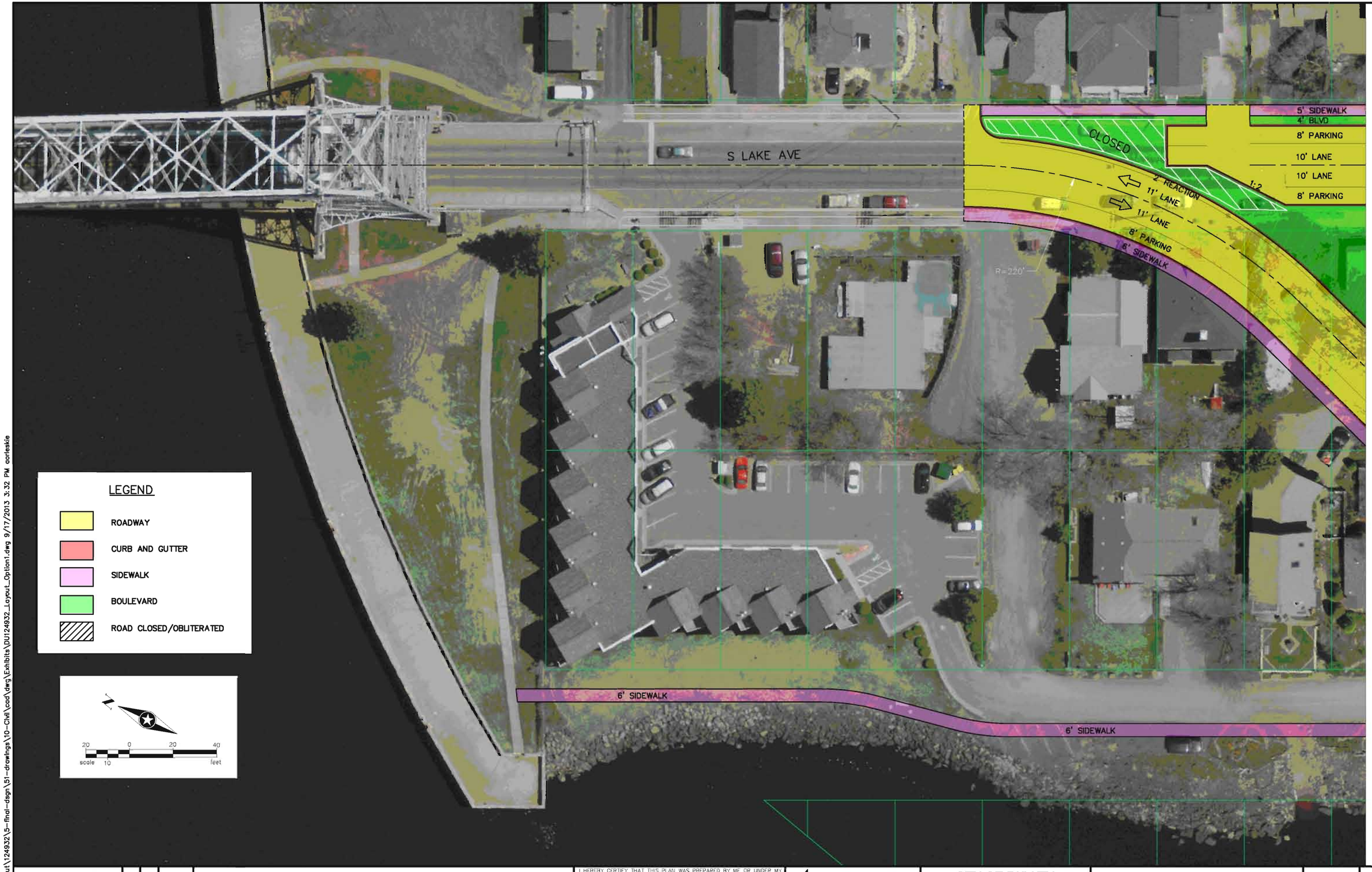
CITY OF DULUTH
PARK POINT TRAFFIC IMPACT EVALUATION

ALTERNATIVE 1
GENERAL LAYOUT

FILE NO. DULUT124932 PARK POINT

FIGURE 1



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ALTERNATIVE 1

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FIGURE 2

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MATCHLINE - SEE SHEET NO. 2

MATCHLINE - SEE SHEET NO. 4

S LAKE AVE

5' SIDEWALK
4' BLVD
8' PARKING
10' THRU LANE
10' THRU LANE
8' PARKING
4' BLVD
5' SIDEWALK

BLVD

8TH ST S

8' PARKING
12' LANE
12' LANE

9TH ST S

8TH ST S

R=220'

6' SIDEWALK

MINNESOTA AVE

2' REACTION
11' LANE
11' LANE
8' PARKING
6' SIDEWALK

LEGEND

- ROADWAY
- CURB AND GUTTER
- SIDEWALK
- BOULEVARD
- ROAD CLOSED/OBLITERATED

N

20 0 20 40
scale 10 feet

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FIGURE 3

MATCHLINE - SEE SHEET NO. 3

MATCHLINE - SEE SHEET NO. 5

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ALTERNATIVE 1

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FIGURE 4

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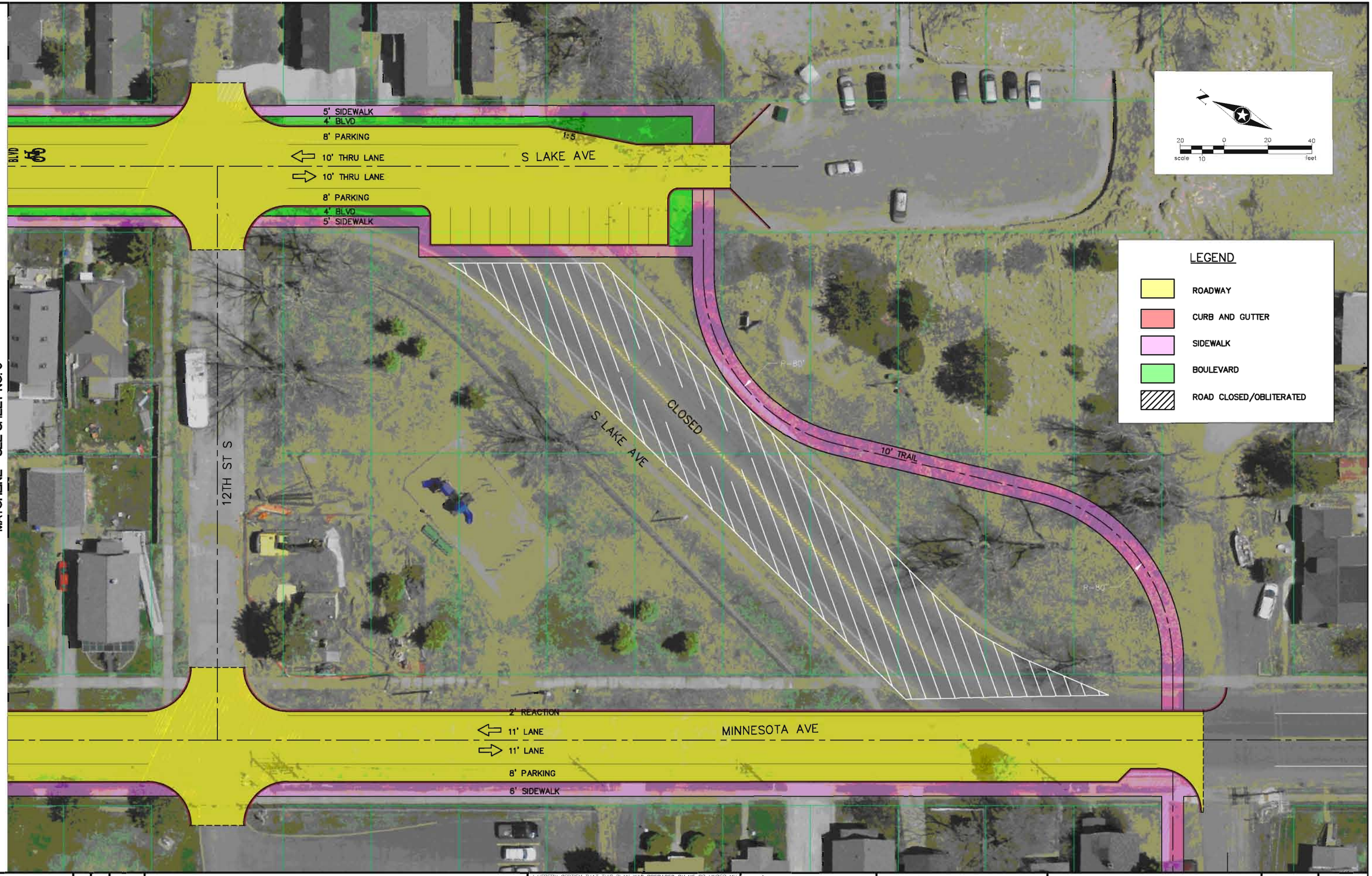
FIGURE 5



MATCHLINE - SEE SHEET NO. 5

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CITY OF DULUTH
PARK POINT TRAFFIC
IMPACT EVALUATION

ALTERNATIVE 1

FILE NO.
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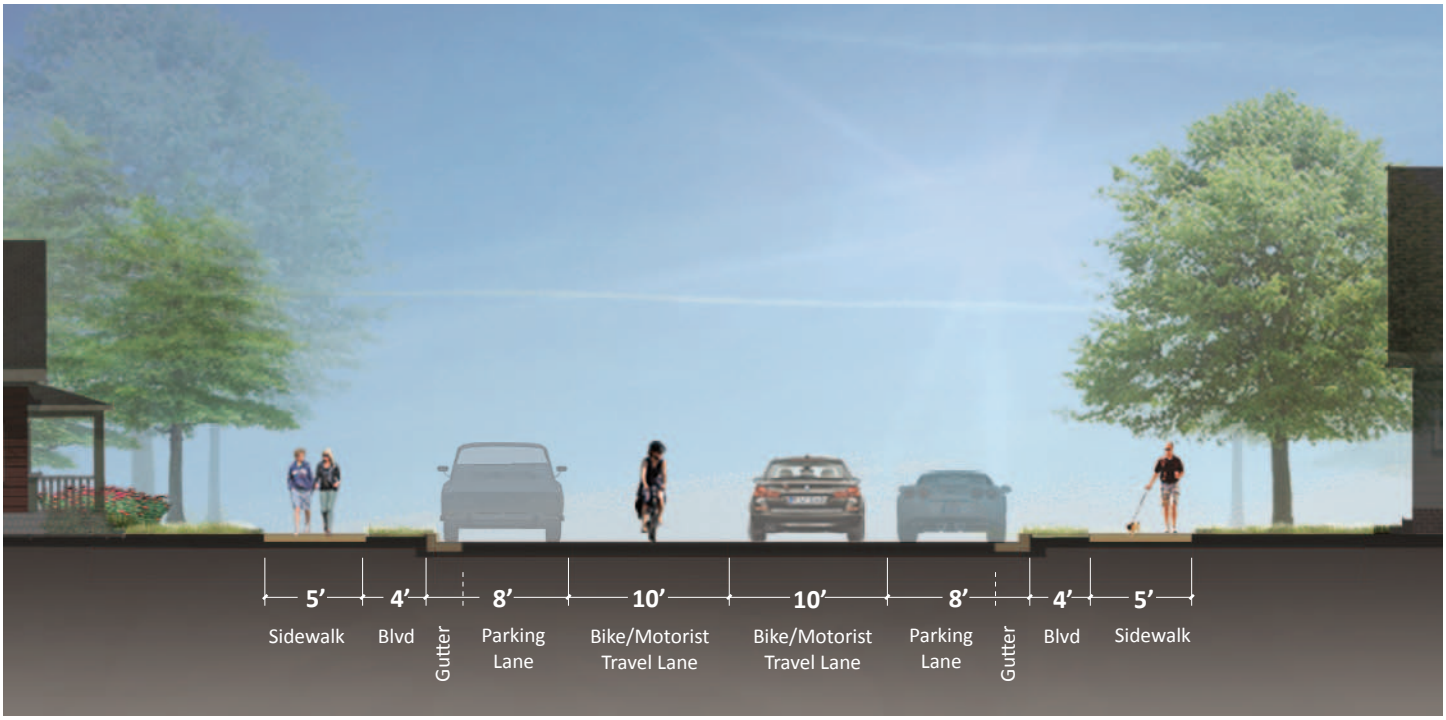
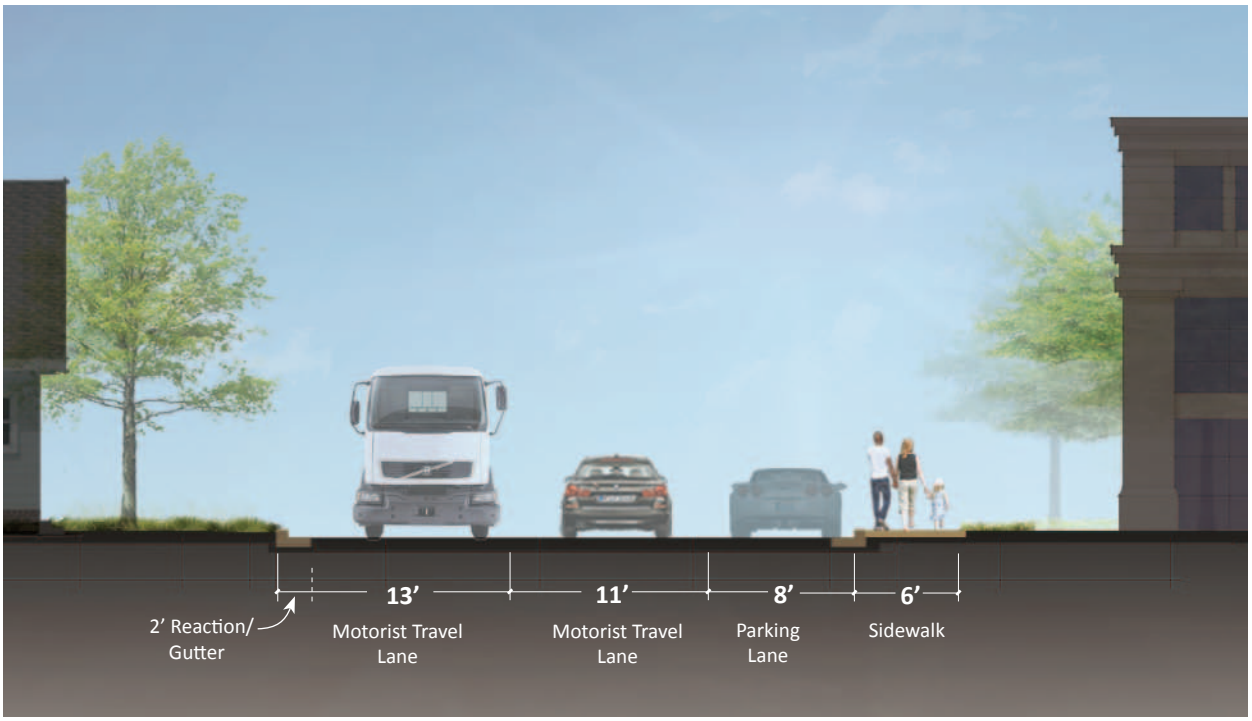
PARK POINT

FIGURE
6



LAKE AVENUE - BICYCLE BOULEVARD MIDBLOCK



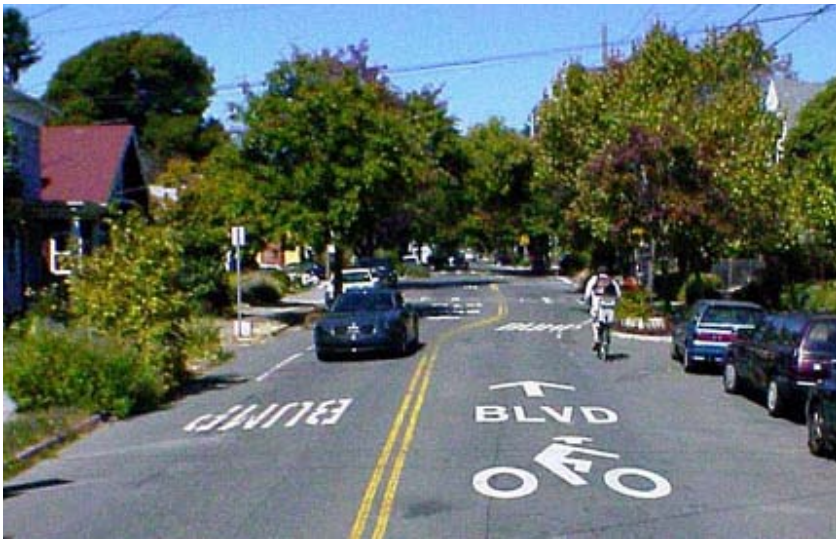
MINNESOTA AVENUE STATE AID STREET - MIDBLOCK

Figure 7
PROPOSED CROSS SECTIONS:
Lake Avenue Bicycle Boulevard and
Minnesota Avenue State Aid Street
Park Point Traffic Impact Evaluation
September 2013

Bike Boulevard curb extension from NACTO guide

Bike Boulevard Pavement Marking

Bike Boulevard Example 1



Bike Boulevard Example 2

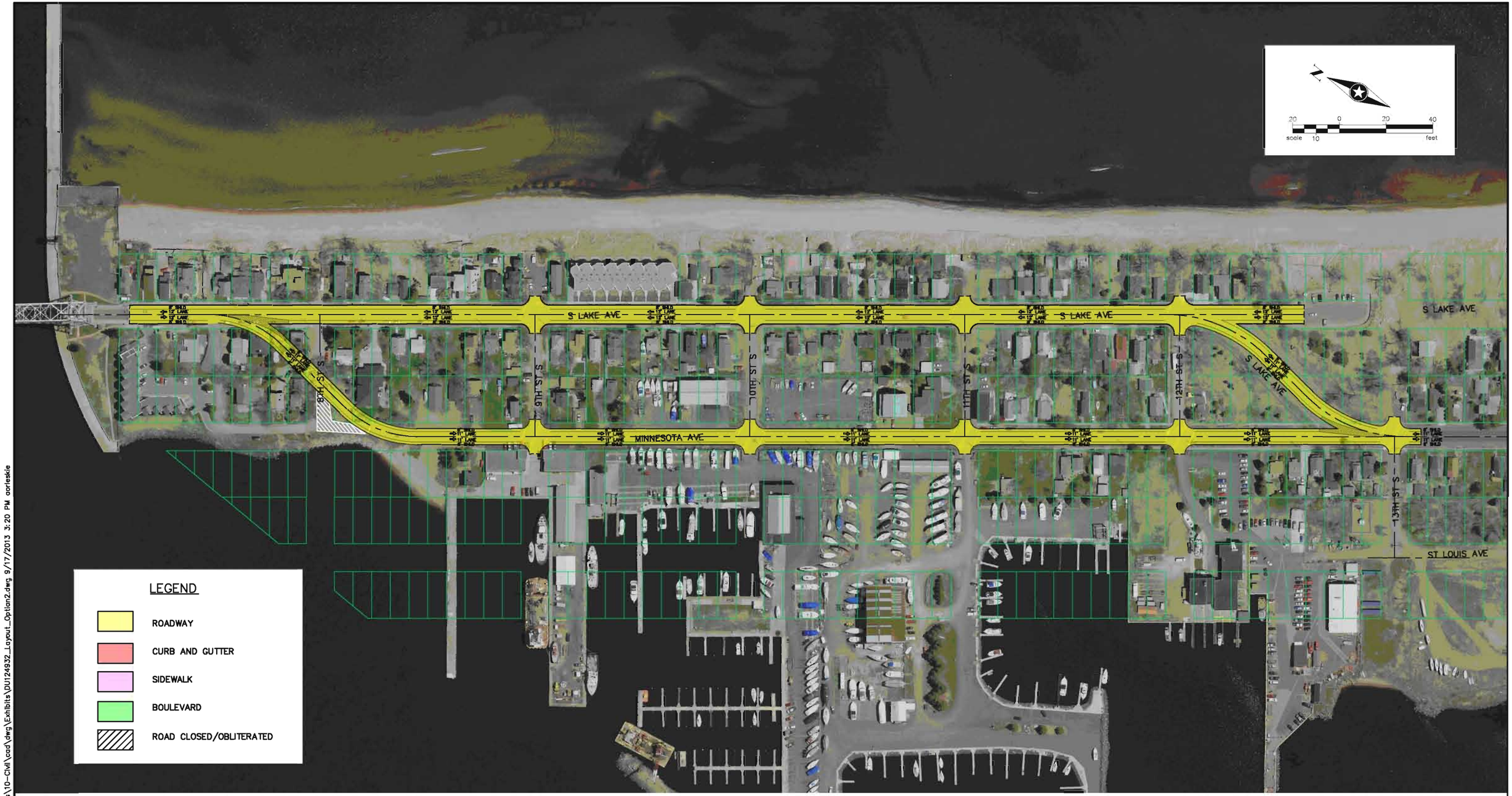
Potential North end treatment

Figure 8

Bicycle Boulevard Precedents

Park Point Traffic Impact Evaluation

September 2013



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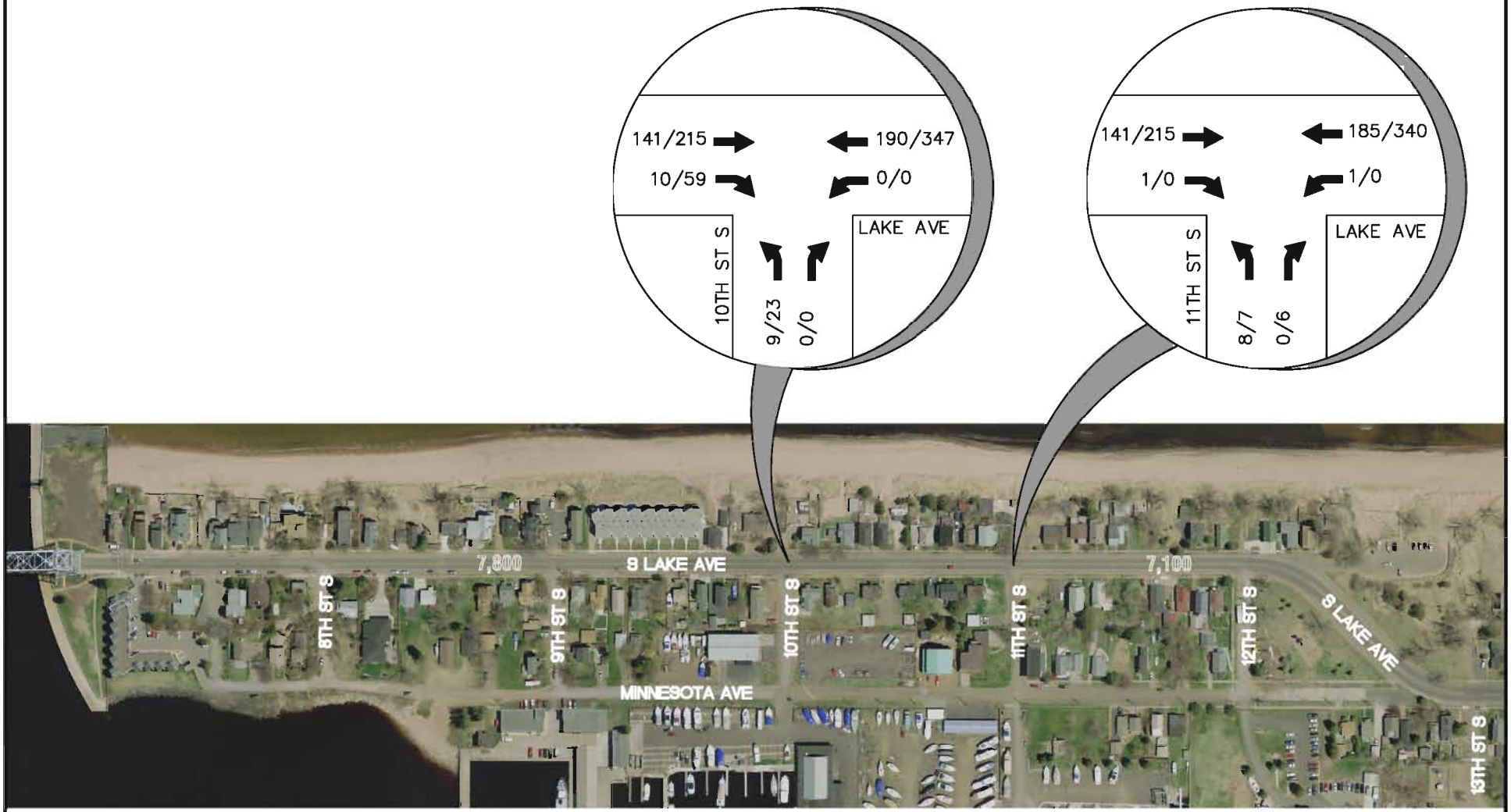

LEGEND

X/X
PM PEAK
AM PEAK

X,XXX 2011 AADT

N

150 0 150 300
scale 75 feet

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Existing
Traffic Volumes
Park Point Traffic Study

FIGURE 10

LEGEND

X/X
- PM PEAK
- AM PEAK

X,XXX 2035 BASE FORECAST

X,XXX 2035 BASE FORECAST PLUS HOTEL AND RESIDENTIAL ASSUMPTIONS

N

150 0 150 300
scale 75 feet

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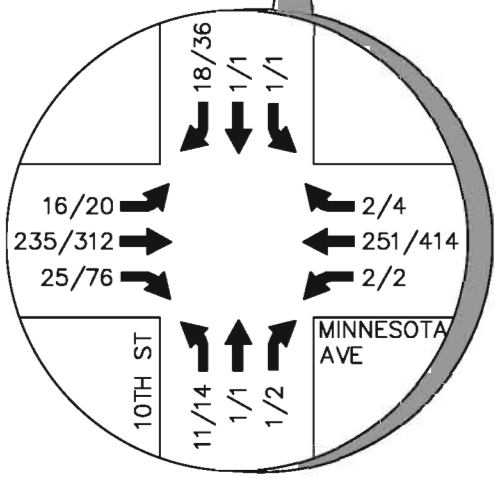
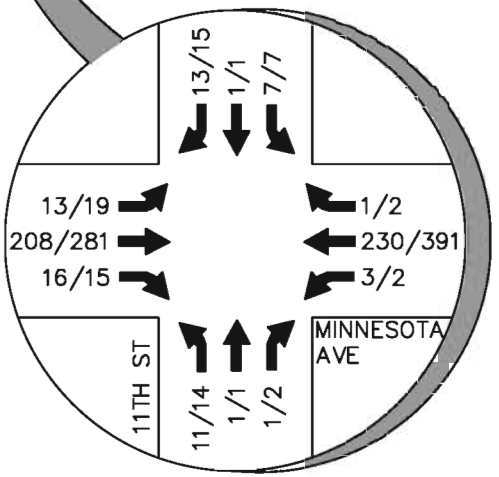
2035 No-Build
Traffic Volumes
Park Point Traffic Study

FIGURE
11

CENTERLINE REALIGNMENT





LEGEND

X/X — PM PEAK / AM PEAK

X,XXX 2035 BASE FORECAST

X,XXX 2035 BASE FORECAST PLUS HOTEL AND RESIDENTIAL ASSUMPTIONS

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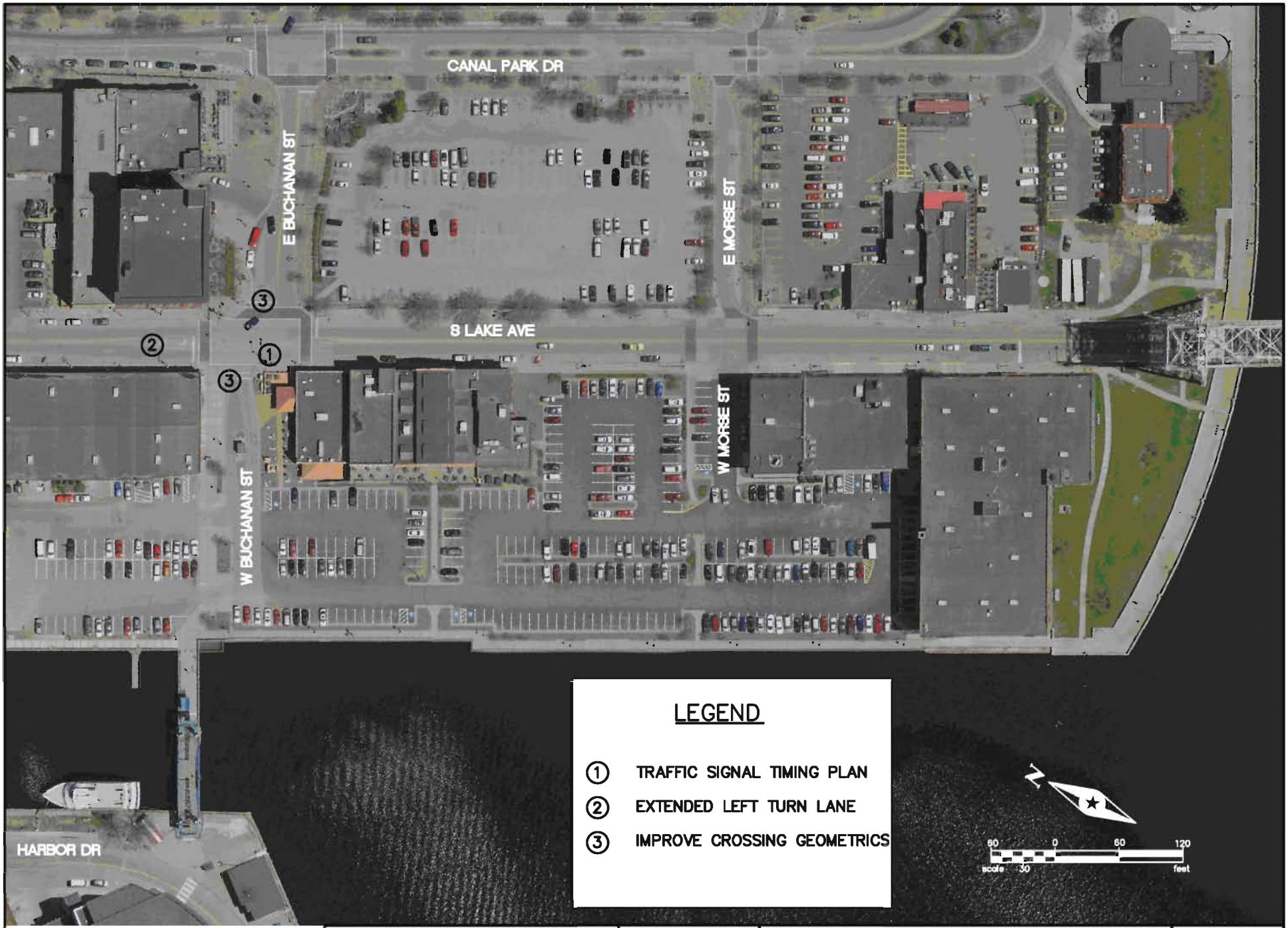
2035 Build Alternative 1
Traffic Volumes
Park Point Traffic Study

FIGURE 12



SEH
PHONE: 218.279.3000
418 W SUPERIOR ST STE 200
DULUTH, MN 55802-1512
www.sehinc.com

FILE NO.
DULUT 124932

DATE:
9/17/13

BUCHANAN STREET INTERSECTION
PROPOSED IMPROVEMENTS
PARK POINT TRAFFIC EVALUATION

Figure 13

TABLE 1 - PARK POINT TRIP GENERATION

DRAFT: July 25, 2013

Park Point - New Hotels				AM Peak						PM Peak						Daily
				Rate / Trips		Directional %		Directional Trips		Rate / Trips		Directional %		Directional Trips		Total Trips
Date: 25-Jul-13	ITE Category	Size	Unit	Rate	Total	in	out	in	out	Rate	Total	in	out	in	out	
Hotel 1 (10th Street)	310	55	rooms	0.53	29	59%	41%	17	12	0.60	33	51%	49%	17	16	119
Hotel 2 (11th Street)	310	55	rooms	0.53	29	59%	41%	17	12	0.60	33	51%	49%	17	16	119
TOTAL New Trips					**58**			**34**	**24**		**66**			**34**	**32**	**238**

Park Point - Residential Scenarios Parcels 1 thru 5				AM Peak						PM Peak						Daily
				Rate / Trips		Directional %		Directional Trips		Rate / Trips		Directional %		Directional Trips		Total Trips
Date: 25-Jul-13	ITE Category	Size	Unit	Rate	Total	in	out	in	out	Rate	Total	in	out	in	out	
Single Family	210	62	DU	0.75	47	25%	75%	12	35	1.00	62	63%	37%	39	23	590
Two Family	230	109	DU	0.44	48	17%	83%	8	40	0.52	57	67%	33%	38	19	633
Townhome	230	124	DU	0.44	55	17%	83%	9	46	0.52	64	67%	33%	43	21	720

Park Point - Residential Scenarios Parcels 6 thru 8				AM Peak						PM Peak						Daily
				Rate / Trips		Directional %		Directional Trips		Rate / Trips		Directional %		Directional Trips		Total Trips
Date: 25-Jul-13	ITE Category	Size	Unit	Rate	Total	in	out	in	out	Rate	Total	in	out	in	out	
Single Family	210	49	DU	0.75	37	25%	75%	9	28	1.00	49	63%	37%	31	18	466
Two Family	230	78	DU	0.44	34	17%	83%	6	28	0.52	41	67%	33%	27	14	453
Townhome	230	89	DU	0.44	39	17%	83%	7	32	0.52	46	67%	33%	31	15	517