HENNEPIN COUNTY'S APPROACH TO LAKE STREET DESIGN

Hennepin County's approach to the design of the Lake Street reconstruction/streetscaping improvement can be described as context sensitive design (CSD). Using the CSD concept the county engaged the public in a number of open houses where neighbors and businesses were invited to express their values via surveys and open discussion. Values were identified and openly discussed by a Project Advisory Committee (PAC) consisting of neighborhood and business representatives who validated the views and passed them to a Technical Advisory Committee (TAC) consisting of various agencies and their consultants who were then responsible for balancing the values as the design unfolded.

The goal of the PAC/TAC relationship was to gain an understanding of how the values affect the Lake Street design and gain consensus that the street and streetscapes design meet the values to the greatest extent possible. Perhaps the most important aspect of the consensus building was the admission that compromise is necessary where values may conflict. As the PAC/TAC relationship matured, it was recognized that when values appeared to be in conflict, compromises were sought so that no values were wholly abandoned. Sidewalks and street widths along Lake Street represented an excellent example of compromise where the county sought variances from street design standards to allow for modest sidewalk widening.

Lyndale Avenue – 31st Street to 29th Street

As discussion of the Lake Street design unfolded, the PAC supported the inclusion of Lyndale Avenue between 31st Street and 29th Street as a logical component of the overall improvement. Stakeholder agreement was generally reached; however, value discussions remain on a number of items including the number of travel lanes along Lyndale Avenue, the desire to retain on-street parking, improve safety (both pedestrian and vehicular), maintain a strong transit environment, maintain reasonable intersection operation and improve the pedestrian realm represented a value conflict.

The Lyndale Avenue design developed by the TAC attempted to balance the identified values by developing bumpouts in each quadrant of the Lake Street/Lyndale Avenue intersection. While the bumpouts reduced the street crossing widths for pedestrians and significantly increased sidewalk areas where pedestrian congregation occurs. The bumpout design moved transit stops approximately 30 feet from where they exist today. Upon review, the PAC considered the modest transit stop relocation to be inconsequential.

The most controversial value conflict occurred along the Lyndale Avenue approaches to Lake Street where the TAC-developed design introduced (approximate) 200 foot left turn lanes (including taper and storage lengths). The turn lane use is expected to reduce intersection crashes by 25 percent, reduce related economic impacts (damage, injury, etc.) by $300,000 per year and support improved intersection operation for 20 years. The turn lane does necessitate a sidewalk width reduction from 20 feet to 15 feet over a portion of the turn lane length. While the 5 foot reduction is viewed as a diminution of the pedestrian realm at the point of reduction, a question arises as to the effect of the reduction.

As the TAC considered the effects of a sidewalk width reduction, it referred to a 2004 comparison of Minneapolis and Portland sidewalk standards (the Portland standards were reviewed because they are widely recognized as a thoughtful approach to evaluation of the pedestrian realm.). When the Portland standards were considered against the Lyndale Avenue design, they yielded a minimum desirable sidewalk width of 15 feet. This standards overlay further supported the conformance of the Lyndale Avenue design to a wider range of perspectives.

Upon review of the overall Lake Street/Lyndale Avenue design, the consensus among the Lake Street PAC members and a west segment subcommittee is that the design does represent a reasonable response to the values identified by the many stakeholders affected by the proposed improvement.

Lake Street Pedestrian Accommodation Considerations
(Based Upon July 13, 2004 Hennepin County Presentation)

1. **Does the City of Minneapolis have specific standards for sidewalk width?**
   No

2. **What standard prevails?**
   The Americans with Disability Act (ADA) provides guidance for sidewalk width. To meet ADA requirements city sidewalks are to provide a 5-foot clear passageway.

3. **What standards are being used for the Lake Street Reconstruction Project?**
   Hennepin County is using Minnesota Department of Transportation (Mn/DOT) standards for urban cross sections and 30 mile per hour (mph) speed zones.

4. **Calculation of minimum sidewalk width based on City practice and Mn/DOT standards:**

Mn/DOT separation distance (curb face to clear passageway)	4 feet
City clear passage width	5 feet
Mn/DOT separation to building face	1 foot
	10 feet

5. **How does the Portland Pedestrian Design Guide pertain to Lake Street?**
   The Design Guide offers seven principles for pedestrian design:
   1. ***The pedestrian environment should be safe.***
      The design should minimize conflicts with vehicular traffic and protruding architectural elements. The proposed design incorporates a 4-foot separation from the street and a 1-foot separation from buildings.
   2. ***The pedestrian network should be accessible to all.***
      The proposed design has a 5 foot-4 inch clear passageway where parking occurs and a 6 foot-5 inch clear passageway where parking is prohibited in response to ADA requirements.
   3. ***The pedestrian network should connect to places people want to go.***
      The proposed design meets this principle.
   4. ***The pedestrian environment should be easy to use.***
      The proposed design will include signage to direct people to the Midtown Greenway and provide crosswalks to alert motorists to the existence of crossings.
   5. ***The pedestrian environment should provide good places.***
      Amenities such as street furniture, banners, art, plantings and transit amenities, either occur or are accommodated for in both the proposed basic and enhanced streetscape designs. Lighting will be uniform and attractive. Business nodes can have a distinct identity with an appealing pedestrian image.
   6. ***The pedestrian environment should be used for many things.***
      The proposed design provides bumpouts at street corners where vending and outdoor dining may occur. Bumpouts can also host civic festivals, music and neighborhood events.
   7. ***Pedestrian improvements should be economical.***
      The proposed design provides for all amenities to be placed in the public realm without acquisition of private property.

As shown in the attached diagrams, the proposed 10.34 foot wide sidewalk layout with bumpouts will increase the pedestrian realm by 25 percent in a typical block face. Over 35 percent of the block face will be widened with the bumpout being 16.84 feet. The proposed layout where parking is prohibited increases the pedestrian realm by 16 percent.

6. **The Design Guide recognizes that at times existing right of way may be too narrow: "When the existing right of way is too narrow to accommodate both street and sidewalk improvements, the following steps to allow room for a sidewalk improvement should be pursued:**
   - **Acquire additional Right of Way or Public Walkway Easements**
   - **Narrow existing roadway in accord with established minimum roadway standards"**

   The proposed design recognizes that building faces are at the right of way line; therefore, travel lane widths will be designed to a 10.83-foot (3.3 meter) width for which a variance from State Aid Rules will be sought. In addition, a variance in parking lane width (from 10 feet to 8 feet) has been sought.

   The Design Guide acknowledges, "...in many cases the existing Sidewalk Corridor is too narrow to accommodate the recommended zone widths. Competing needs for space in a constrained Sidewalk Corridor can be resolved in either of two ways: by compromising on the minimum required clearance for some or all of the zones or by increasing the dimensions of the Sidewalk Corridor."

7. **The Design Guide identifies four zones in the Sidewalk Corridor:**
   - **Curb Zone**
   - **Furnishings Zone**
   - **Through Pedestrian Zone**
   - **Frontage Zone**

   The Design Guide recommends the project planners explore the feasibility of either acquiring more right of way or narrow the roadway. As noted earlier, building faces at the right of way line tend to make right of way acquisition impractical. Since the proposed design uses minimum standards for travel lanes and incorporates a variance for reduction of parking lane widths, narrowing the various sidewalk corridor zone widths appears to be a logical course of action.

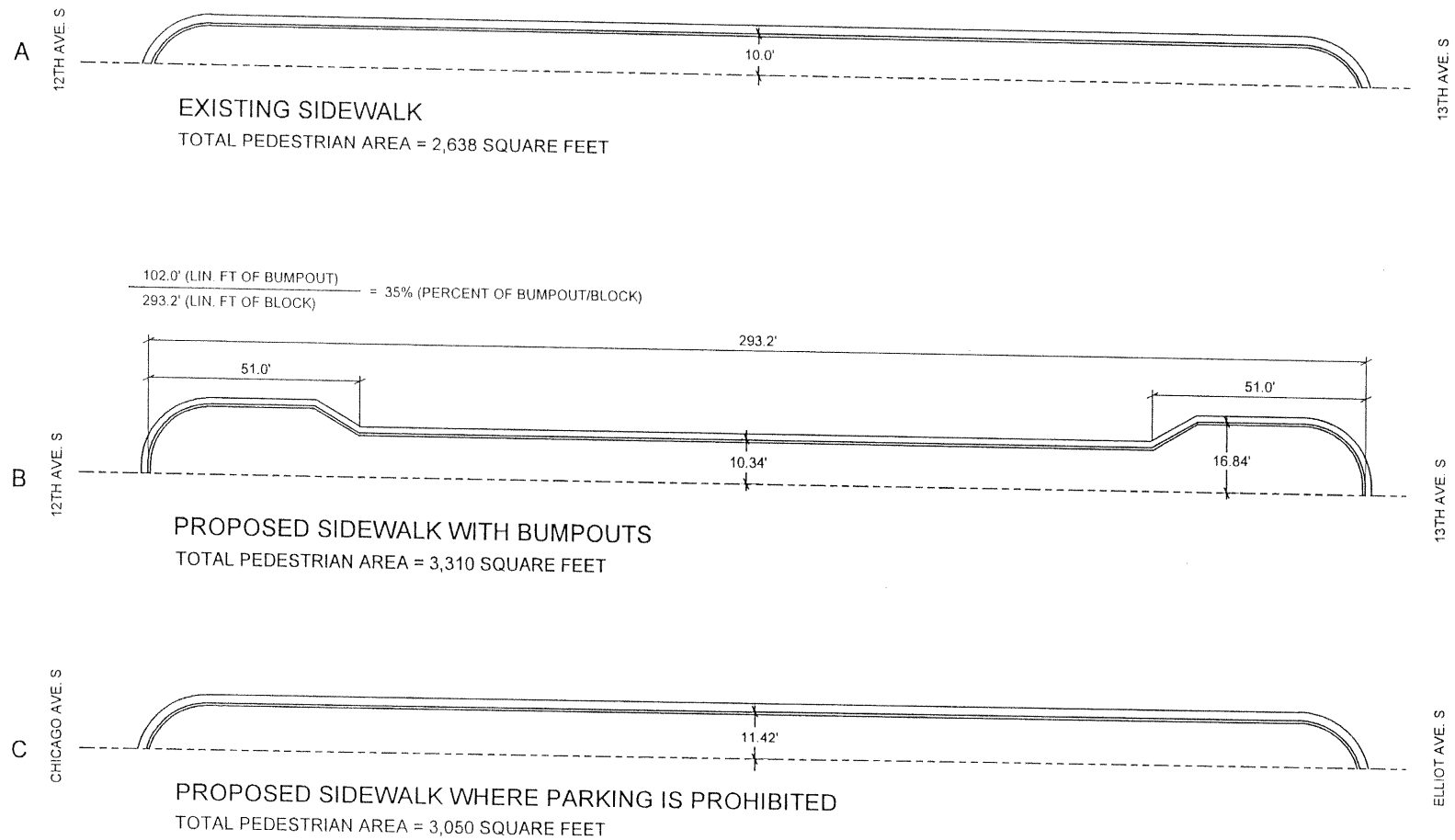
COMPARISON OF PORTLAND GUIDELINES AND LAKE STREET DESIGN

Portland Guideline	Zone	Lake Street Design
0.5 foot	Curb	0.5 foot
4.0 feet	Furnishing	3.5 feet
8.0 feet	Pedestrian	5.34/6.42 feet
2.5 feet	Frontage	1.0 foot
15.0 feet	TOTAL	10.34/11.42 feet

PUBLIC MEETING OUTCOMES AND PRIORITIES

It should be noted that the Lake Street design reflects the priorities expressed by the public in open houses held on June 25, 26 and 28, 2003 and February 23, 24, 26 and 28 and March 13, 2004. These priorities take into consideration narrowed, travel and parking lanes recommended by the street design. Records indicate 152 people attended the June 2003 open houses. 129 of the attendees completed surveys that informed the Lake Street Project Advisory Committee (PAC) as it considered design options. At that time 111 attendees indicated that transit accommodations were important. This preference was followed by adequate street capacity for autos (94 indicated it was important) and on-street parking retention (87 indicated it was important). In February/March 2004, 237 people attended the open houses and returned 184 surveys. 125 attendees expressed a desire to avoid congestion even if parking and/or sidewalk width is sacrificed for turn lanes. 47 attendees preferred to retain parking even if congestion occurs.

Feedback and priority surveys received at the open houses verify that the corridor's businesses and adjacent restricted areas have Lake Street as a transportation and transit corridor. Parking and sidewalks are important; however, the corridor's historical function to safely move vehicles, goods and services should not be compromised by congestion.



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SRF
CONSULTING GROUP, INC.

SRF Project No. 4421

SIDEWALK AREA COMPARISON

LAKE STREET RECONSTRUCTION AND STREETSCAPE ENHANCEMENTS

Hennepin County Public Works - Department of Transportation

July 14, 2004

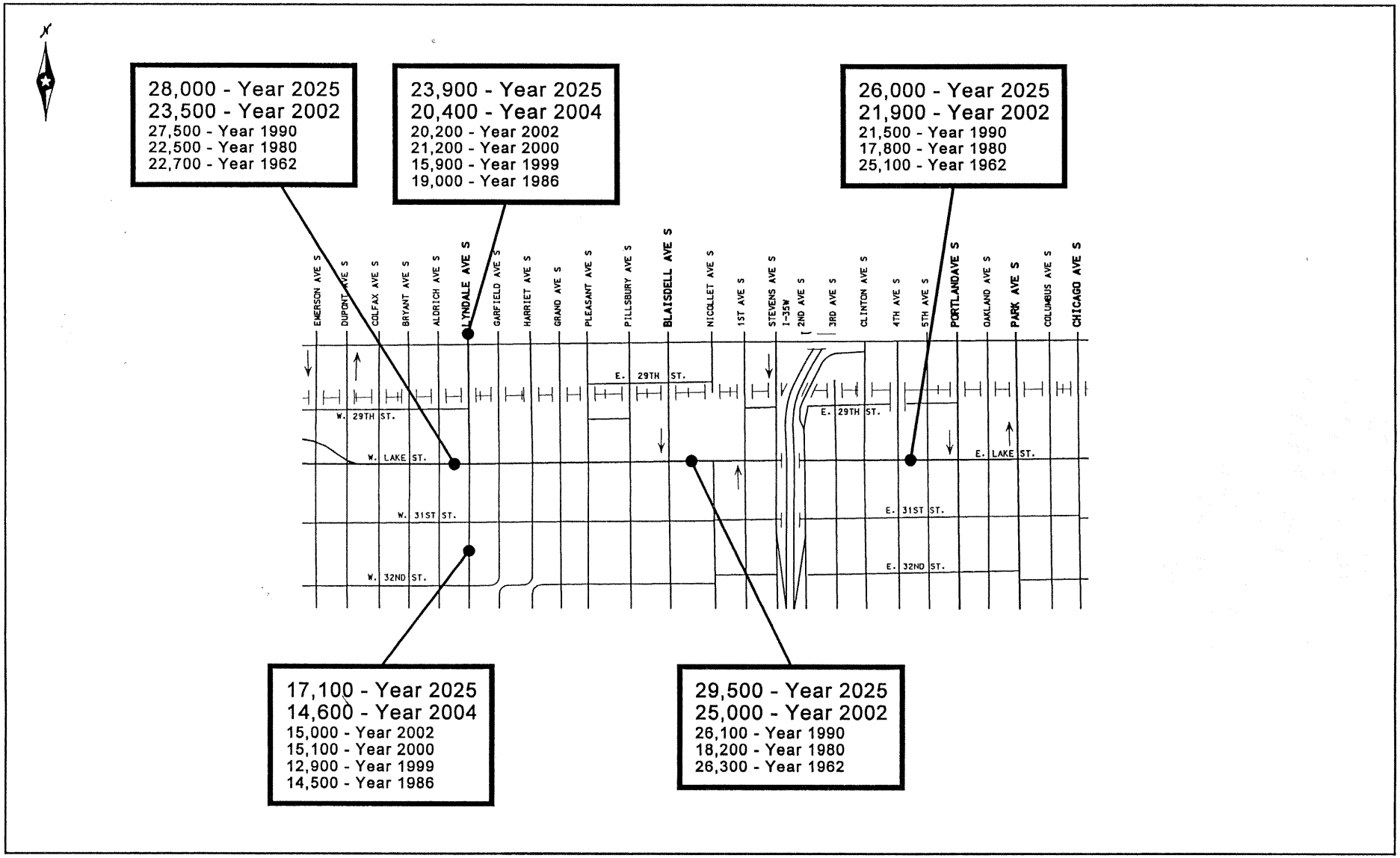
COMPARISON OF LAKE STREET/LYNDALE AVENUE LAYOUTS

Numerous layouts have been examined for use along the west segment of Lake Street and Lyndale Avenue. A three-lane section has not been considered on Lake Street because traffic volumes along the west segment are similar to traffic volumes in the middle segment where three lane and four lane sections were closely examined. In both segments the traffic volumes on Lake Street are much greater than a three-lane roadway can carry and would result in a significant diversion of traffic.

The two block Lyndale Avenue segment (between 31st Street and 29th Street) is included in the west segment Lake Street improvement project. As a County State Aid Highway (CSAH), its reconstruction is governed by the Department of Transportation (Mn/DOT) State Aid for Local Transportation Division State-Aid Operations Rules, Chapter 8820. These rules stipulate that for traffic volumes greater than 15,000 projected Average Daily Traffic (ADT), at least four through traffic lanes are required unless a capacity analysis demonstrates that level of service D or better is achieved. For the purpose of comparative evaluation, the project design team analyzed the performance of three lane and various four lane intersection approach configurations. The analysis indicated a three lane section on Lyndale Avenue does not meet the aforementioned Mn/DOT standards for existing traffic. Accordingly, the three lane layout for Lyndale Avenue was not considered further.

The attached matrix compares the 19 different intersection approach layouts that were developed for the Lyndale Avenue/Lake Street intersection. The 9 parameters of the matrix were developed in response to values expressed by business owners, area neighbors, the city and the county. The expressed values and related parameters are as follows:

Interested Party	Expressed Value	Related Parameters
Business Owner	Customer access	– On street parking – Intersection level of service (LOS) – Sidewalk width – Transit accommodation
	Employee access	– Sidewalk width – Transit accommodation
	Delivery of goods	– Delivery vehicle provisions
Neighbors	Pedestrian environment	– Sidewalk width – Sidewalk area – Pedestrian crossing width – On street parking (buffer)
	Driving safety	– Crash reduction
	Livability/traffic diversion	– Intersection LOS
	Transit access	– Transit accommodation – Sidewalk area
City	Business support	– See above (business owner)
	Pedestrian environment	– See above (neighbors)
	Driver safety	– Intersection LOS – Crash reduction
	Transit access	– Transit accommodation – Sidewalk area
County	Driver safety	– Intersection LOS – Crash reduction
	Transit access	– Transit accommodation – Sidewalk area
	Pedestrian safety	– Pedestrian crossing width
	Traffic diversion	– Intersection LOS
	Compliance with Mn/DOT Standards	– Forecast intersection LOS



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AVERAGE DAILY TRAFFIC VOLUMES (WEST SEGMENT OF LAKE ST. & LYNDALE AVENUE)

LAKE STREET RECONSTRUCTION AND STREETSCAPE ENHANCEMENT PROJECT TRAFFIC ANALYSIS

Hennepin County

4421
5/5/2006

SRF CONSULTING GROUP, INC.

Transportation • Civil • Structural • Environmental • Planning • Traffic • Landscape Architecture • Parking • Right of Way

SRF No. 0034421W

MEMORANDUM

TO: Lake Street TAC

FROM: David Juliff, PE, Principal
Patrick Corkle, PE, PTOE, Senior Associate

DATE: June 29, 2006

SUBJECT: ANALYSIS OF ALTERNATIVE CROSS-SECTIONS AND SIGNAL PHASING FOR THE LAKE STREET/LYNDALE AVENUE INTERSECTION

This memo serves as an update to the one completed on April 20, 2006. Additional traffic signal phasing scenarios for Lyndale Avenue have been added to the geometric alternatives. The intersection has been analyzed using the following lane configurations and signal phasing:

- Lyndale (3-Lane)
  - Geometrics: Left-turn lane, through-lane and short right-turn lane
  - Signal phasing: Protected/permissive left-turn phasing
- Lyndale (4-Lane Permissive)
  - Geometrics: Left-through lane and through-right lane
  - Signal phasing: Permissive left-turn phasing
- Lyndale (4-Lane SB Lead)
  - Geometrics: Left-through lane and through-right lane
  - Signal phasing: One direction has protected/permissive left turn phase (southbound in pm peak hours)
- Lyndale (4-Lane Split)
  - Geometrics: Left-through lane and through-right lane
  - Signal phasing: Split phases for Lyndale (service one direction at a time)

- Lyndale (4-Lane w/ left turn lane)
  - Geometrics: Left-turn lane, through lane and through-right lane
  - Signal phasing: Protected/permissive left-turn phasing
- Lake (3-Lane)
  - Geometrics: Left-turn lane, through lane and short right-turn lane
  - Signal phasing: Protected/permissive left-turn phasing
- Lake (4-Lane)
  - Geometrics: Through lane and through-right lane (left-turns are restricted during peak periods)
  - Signal phasing: Permissive phasing with left-turns restricted during peak periods

EXISTING CONDITIONS

Table 1 shows the Level-of-Service (LOS) results for the Lake Street/Lyndale Avenue intersection using combinations of the above alternatives. The alternatives with high delays (LOS F) would result in queuing which would also impact adjacent signalized intersections (Bryant Avenue, Grand Avenue and 31st Street). This would cause higher delays at adjacent intersections and diversion of traffic to parallel routes.

Table 1
Intersection LOS and Vehicle Delay (in seconds)
Existing PM Peak Hour Volumes

	Lyndale Avenue				
Lake Street	**3-Lane**	**4-Lane (Permissive)**	**4-Lane (SB Lead)**	**4-Lane (Split)**	**4-Lane w/ left turn lane**
3-Lane	**LOS F** (430s/veh)	**LOS F** (370s/veh)	na	na	**LOS F** (175s/veh)
4-Lane	**LOS F** (200s/veh)	LOS D (50s/veh)	**LOS E** (60s/veh)	**LOS F** (180 s/veh)	LOS C (35s/veh)

Using the simulation model, we can estimate the number of vehicles that can enter the intersection during the pm peak hour using existing volumes, associated geometrics and signal phasing. This allows us to estimate the intersection capacity and the minimum amount of traffic diversion. Based on year 2001 volumes, approximately 4,150 vehicles enter the intersection during the pm peak hour. Table 2 shows the maximum number of vehicles the intersection can accommodate (for different intersection geometrics) up to the demand, and the corresponding volume of diverted traffic. In addition, as traffic volumes increase over time, the amount of diversion will increase accordingly.

Table 2
Intersection Volumes Served and Level of Diversion
Existing PM Peak Hour Volumes

Lake Street	Lyndale Avenue				
	3-Lane	4-Lane (Permissive)	4-Lane (SB Lead)	4-Lane (Split)	4-Lane w/ left turn lane
3-Lane	2,900 veh (-1,250)	3,050 veh (-1,100)	na	na	3,500 veh (-650)
4-Lane	3,750 veh (-400)	4,150 veh (0)	4,150 veh (0)	3,800 veh (-350)	4,150 veh (0)

Note: x,xxx veh (-xxx); number of vehicles served (minimum number of diverted vehicles)

Poor intersection operations (LOS E or F) means congested roadways, which create other adverse impacts not addressed in this analysis. Other impacts include increase in bus travel time and reduction in schedule reliability, difficulty making parallel parking maneuvers, greater conflicts for delivery vehicles and degradation of safety.

FUTURE CONDITIONS – YEAR 2027

The alternatives that had excess capacity were evaluated under future volume levels. Other alternatives were not examined since they are unable to serve even current volumes. The annual growth rate used was 0.75 percent per year, consistent with what has been used throughout this project. The results of the analysis of future (2027) conditions are shown in Table 3.

Table 3
Intersection LOS and Vehicle Delay (in seconds)
Year 2027 - PM Peak Hour Volumes

Lake Street	Lyndale Avenue				
	3-Lane	4-Lane (Permissive)	4-Lane (SB Lead)	4-Lane (Split)	4-Lane w/ left turn lane
3-Lane	na		na	na	na
4-Lane	na	**LOS F** (165s/veh)	**LOS F** (180s/veh)	na	LOS D (55s/veh)

The only intersection configuration that operates at an acceptable level of service (LOS D) with forecast volumes is the 4-Lane Lake Street/5-Lane Lyndale Avenue alternative.

TRAFFIC SAFETY OF LYNDALE AVENUE ALTERNATIVES

This intersection is identified as a high hazard location with a significantly higher crash rate than similar intersections. Therefore, improving the safety at the Lake Street/Lyndale Avenue intersection is a goal of this project. The following looks at the different intersection lane configurations and signal phasing alternatives and how they could impact safety at the intersection.

The change in the number of crashes was based on information used for the HES (Highway Elimination Safety) program. Tables show the expected change in the number of crashes by type (both property damage and injury) given the proposed improvement.

4-Lane (Permissive)

This is the existing condition and will be considered the baseline. This lane configuration has potential for rear-end crashes as movements are shared in the same lane. Vehicles turning left or right are in conflict with pedestrians as they move during the same phase. Left-turning vehicles will have difficulty determining opposing vehicle movements because of the shared lanes. Opposing vehicles in the left-through lane restrict sight distance of the right-through lane.

4-Lane (SB Lead)

This operation provides a phase when one direction starts before the other. It provides a protected left-turn movement. However, the left-turning vehicles are not detected (although loops can be installed to extend the phase). This phasing operation is best used when one direction of traffic is much higher than the other. According to the HES data, phase changes can improve safety. This would help some of the left-turning conflicts with opposing vehicles and pedestrians, although a majority of the left-turning vehicles would still turn during the permissive phase. It also does not help with sight distance of left-turning vehicles.

4-Lane (Split)

The operation allows one direction to make all movements, including pedestrians, then the other direction. This phasing reduces many of the conflicts, except with right-turning vehicles and pedestrians and when these right-turners stop for pedestrians there is potential for rear-end collisions with through vehicles. Any improvement in safety at the intersection would likely be offset by the expected poor operation of the intersection using this type of phasing. The rear-end crash potential during congested hours would increase, because vehicles would wait multiple cycles creating a start and stop condition. The long delay times would likely lead to aggressive driving at the intersection.

Split phase can appear to be sluggish and adds an additional pedestrian phase and clearance interval. This phasing is best used when the space for lanes is limited, turning movements are high and the other roadway volumes are moderate.

4-Lane with a Left-Turn Lane

By providing a left-turn lane, left turning vehicles can be detected (therefore the left-turn arrow does not necessarily need to be used every cycle, giving more green time to other movements). The protected left-turn phase allows this move to be made without conflict with pedestrians, left-turns face each other allowing better sight-lines, and one through lane is not hindered by turning vehicles. Using the HES data and methodology, this configuration provides the largest reduction in crashes.

EVALUATION OF THE ALTERNATIVES ECONOMIC BENEFIT

The alternatives for Lyndale Avenue approaches were evaluated based on the improvement in reducing crashes and delay compared to the existing configuration and phasing (4-Lane Permissive). This analysis is summarized in Table 4. Reduction in user costs is a benefit to the public. The change in the cost of crashes shown in Table 4 is for one year, and the change in delay is only for the pm peak hour in that same year. The evaluation is not intended to be a rigorous benefit-cost analysis, but a method to screen the alternatives for reducing user costs at the intersection.

Table 4
Comparison in the Change of User Costs

Value	Lyndale Avenue			
	4-Lane (Permissive)	4-Lane (SB Lead)	4-Lane (Split)	4-Lane w/ left turn lane
Change in cost of crashes per year	$0	($161,500)	($161,500)	($323,500)
Change in cost of delay per year (pm peak hour)	$0	$32,250	$370,000	($48,500)

Note: (Negative values) are a benefit to the user

Another alternative for Lyndale Avenue is to restrict the left-turn movements from Lyndale during the pm peak hours. The expected benefit would be about $30,000 per year in crash reduction user benefits.