4. The Road Network

The road network represents the "back bone" of the surface transportation system - the patterns of nearly all modes of surface transportation tend to reflect it, if not utilize it directly. It is also the transportation asset that most travelers in the neighborhood rely on. For example, as the numbers in Table 4.1 indicate, the vast majority of Lincoln Park's working residents depend on the road network because they are driving alone, carpooling, or using public transit in order to access work. In addition, the FHWA estimates more than 2/3 of goods in this nation are shipped by truck. Lincoln Park contains some key segments of truck routes that are important to the region. It is also home to a number of freight-related businesses. Therefore, the conditional and operational integrity of the road network is central to planning for the future of transportation within the Lincoln Park neighborhood.

This chapter provides some assessment of the road network in Lincoln Park in terms of efficiency, accessibility, connectivity, and its physical integrity. The assessment was conducted in reference to the three planning perspectives that were identified in Chapter 1 of this study, as well as the growth scenarios established in Chapter 3.

T a b l e 4.1: | Commute-to-work trips: Duluth and US (5-Yr est., 2009 -2013)

Means of travel to work	Lincoln Park, Duluth	United States
Worked at home	130 (2.7%)	4.3%
Taxi, motorbike, bike, or other	77 (1.6%)	1.8%
Walked	159 (3.3%)	2.8%
Transit	269 (5.6%)	5.0%
Car, truck, van - carpool	476 (9.9%)	9.8%
Car, truck, van - alone	3,699 (76.9%)	76.3%
Total	*4,810 (100%)*	*100%*

Data source: Us Census Bureau - American Community Survey, 5-Year estimate (2009-2015).

Image source: MIC (2015)

F I g u r e 4.1 | View of US Highway 53 from W 5th Street & 22nd Avenue W.

Network Design & Function

Functional Classification:

The Lincoln Park neighborhood contains about 104 lane-miles of roadway. Interstate 35 and State Highway 53 together account for about 18% of this network. Minor arterial and collector routes account for approximately 30 lane-miles, and local streets account for the remaining 52.2 lane-miles. The functional arrangement of these roads is shown in Map 4.1 to the right. It is an arrangement that helps facilitate the dynamic relationship that Figure 4.2 illustrates, where there is an intentional trade-off between higher degrees of mobility and more direct access to adjacent land uses.

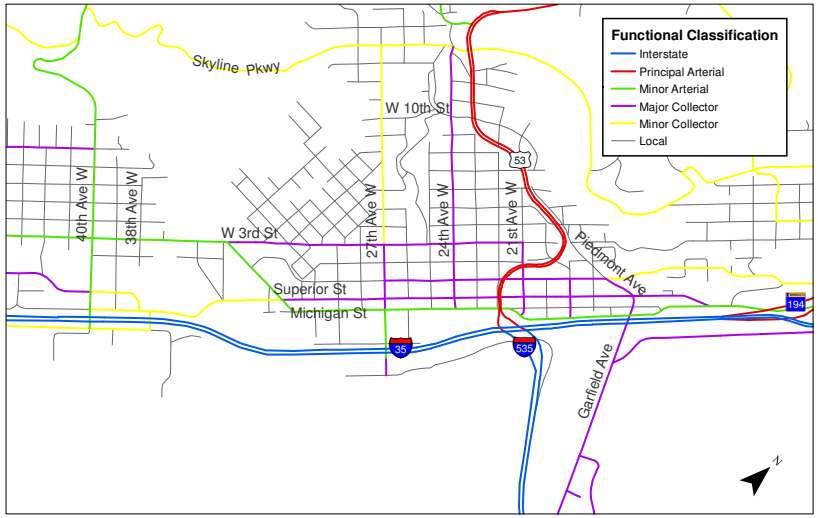
Traffic volumes:

In terms of daily traffic volume, the flow of traffic through the neighborhood mostly follows the functional classification of the roadways Lincoln Park. This can be seen in Map 4.2 on the following page, which shows that the annual average daily traffic (AADT) on I-35 and US Highway 53 are more than twice that of the minor arterials and major collectors within the study area.

Since the higher-order routes (interstates and arterials) carry the greatest amount of traffic, the intersections of these roads also tend to be among the most traveled. Map 4.3 on page 33 shows the location of the highest-volume intersections in the study area. It is worth noting the concentration of higher-volume intersections in the central business district (CBD) towards the east end of the neighborhood, below US Highway 53. That is an area where a substantial amount of traffic is circulating in response to the diversity and densities of land uses there.

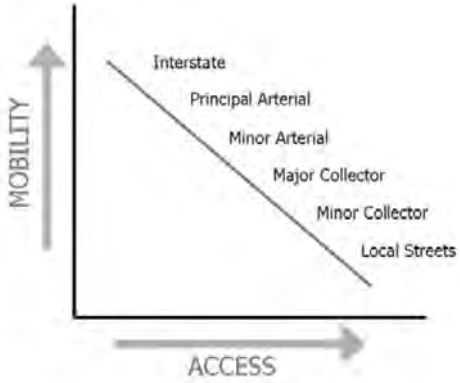
Traffic circulation and thru-routes:

In addition to interstate and US 53, which allow large volumes of traffic to bypass the local street network, a number of roadways



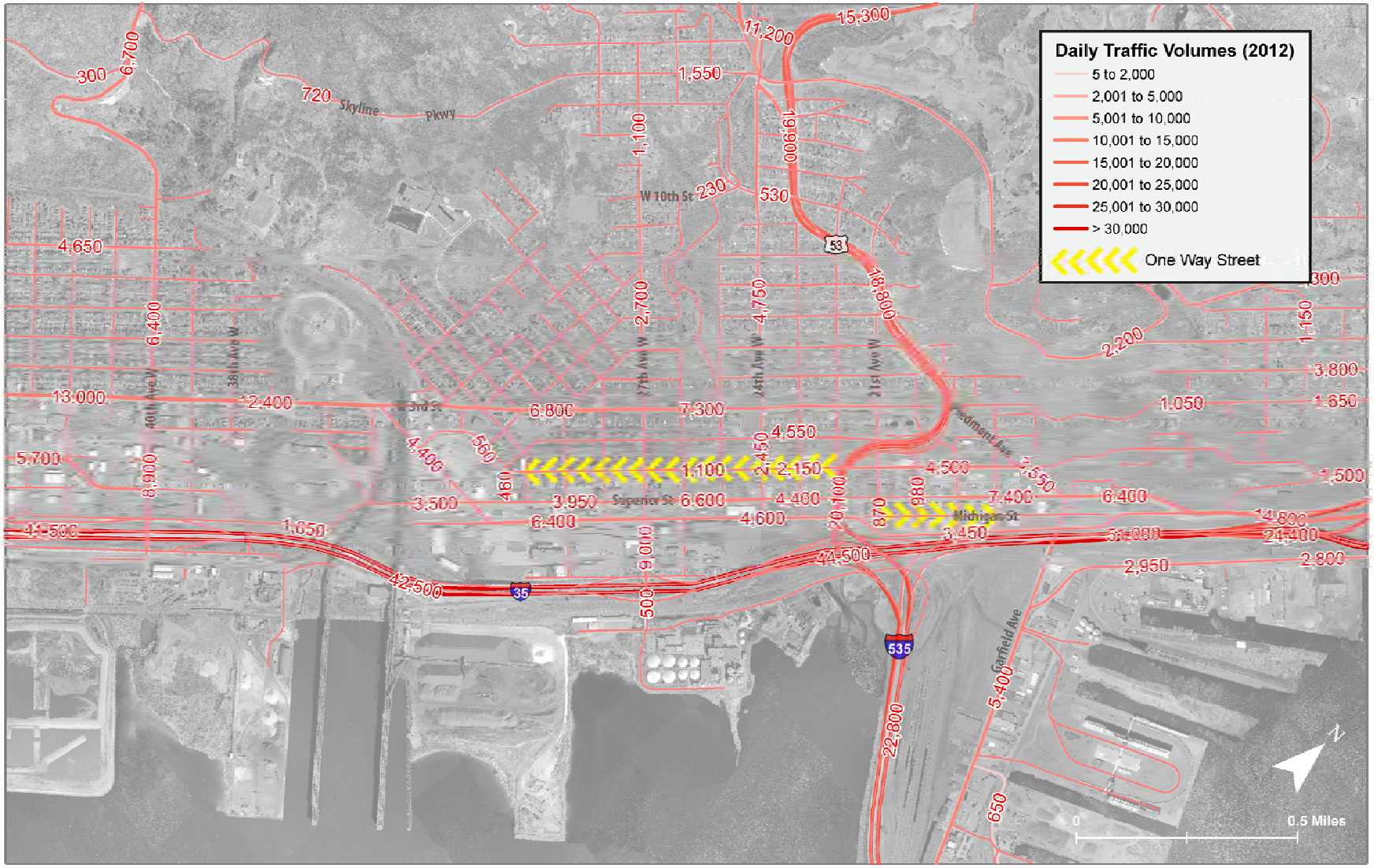
M a p 4.1 | Functional classification of roadways within the Lincoln Park neighborhood

The road network within the Lincoln Park neighborhood is made up of state-, county-, and city-maintained facilities. I-35 and STH 53 represent about 18% of the lane-miles in the study area, while the remaining 82% are county and city facilities that make up the local street network.



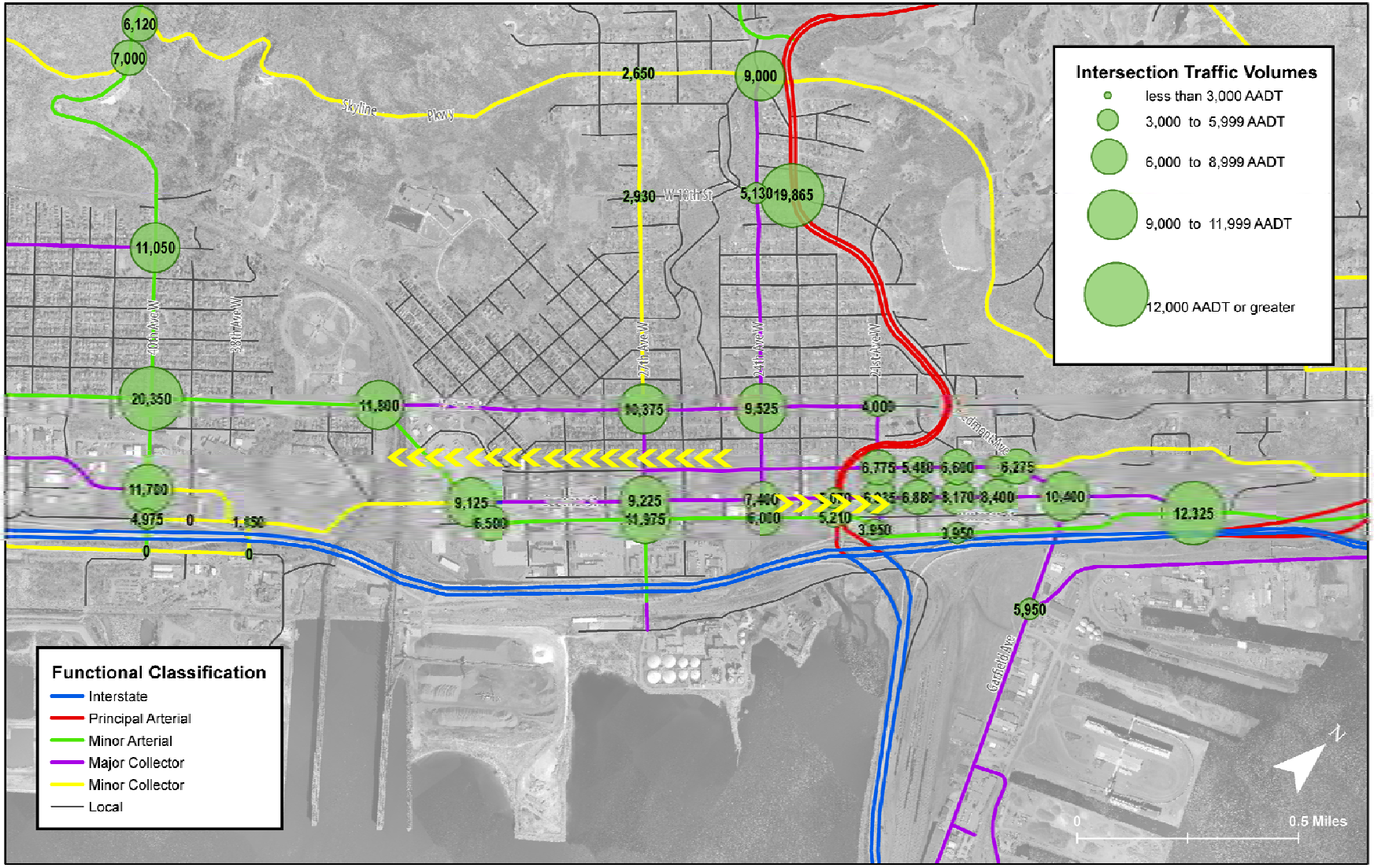
F i g u r e 4.2 | Roadway classification and intended function

An illustration the dynamic relationship between mobility and access as one moves from roadways of one classification to another. Locals streets are intended primarily for access, while the function of higher-order roadways proved more mobility for more traffic, at the expense of access.



M a p 4.2 | Annual Average Daily Traffic (AADT) in the Lincoln Park Neighborhood (2012)

The limited-access, grade-separated freeways facilitate the majority of traffic through the neighborhood, representing 68% of the daily traffic in the neighborhood. Michigan St/Lower Michigan St (3,450 - 6,400 AADT), Superior St (3,500 - 7,400 AADT) and W 3rd St (6,800 - 12,400 AADT) are the main cross-routes passing directly through the neighborhood, while 40th Ave W (6,700 - 8,900 AADT) and 24th Ave W (2,450 - 4,750 AADT) are the main streets up the hillside.



M a p 4.3 | Annual Average Daily Traffic (AADT) for intersections in the Lincoln Park Neighborhood (2012)

The busiest intersections in the neighborhood correspond to the functionally classified network of roads. The busiest intersections are at W 3rd St & 40th Ave W and at W 10th St & US Hwy 53, with AADTs of about 20,000 vehicles per day. A number of busy intersections are also found along Superior St and Michigan St, as well as along W 3rd St and 24th Ave W.

serve as key thoroughfares within the neighborhood. Those roads are listed in Table 4.2 and shown in Map 4.3 with the traffic controls that exist along them.

Table 4.2: | Key thoroughfares of the local street network in the Lincoln Park neighborhood

Direction	Roadway	Functional Class
East/West	Lower Michigan St *(22nd Ave W to Superior St)*	Minor Arterial
	Michigan St/Carlton St	Minor Arterial
	Superior St	Maj Collector/Min collector
	W 3rd St	Min Arterial/Maj Collector
	Skyline Pkwy	Minor Collector
North/South	40th Ave W	Minor Arterial
	27th Ave W	Maj Collector/Min Collector
	24th Ave W	Major Collector
	21st Ave W	Major Collector
	Piedmont Ave	Major Collector

Superior Street serves as an East/West collector that facilitates efficient travel between the commercial, industrial, and institutional uses in the lower portion of the neighborhood. As seen in Map 4.3, however, there are a number of stop signs and traffic signals on this route. The connection of W 3rd Street, Carlton Street, Michigan Street, and Lower Michigan Street provide an East/West minor arterial that allows travelers to bypass those stops.

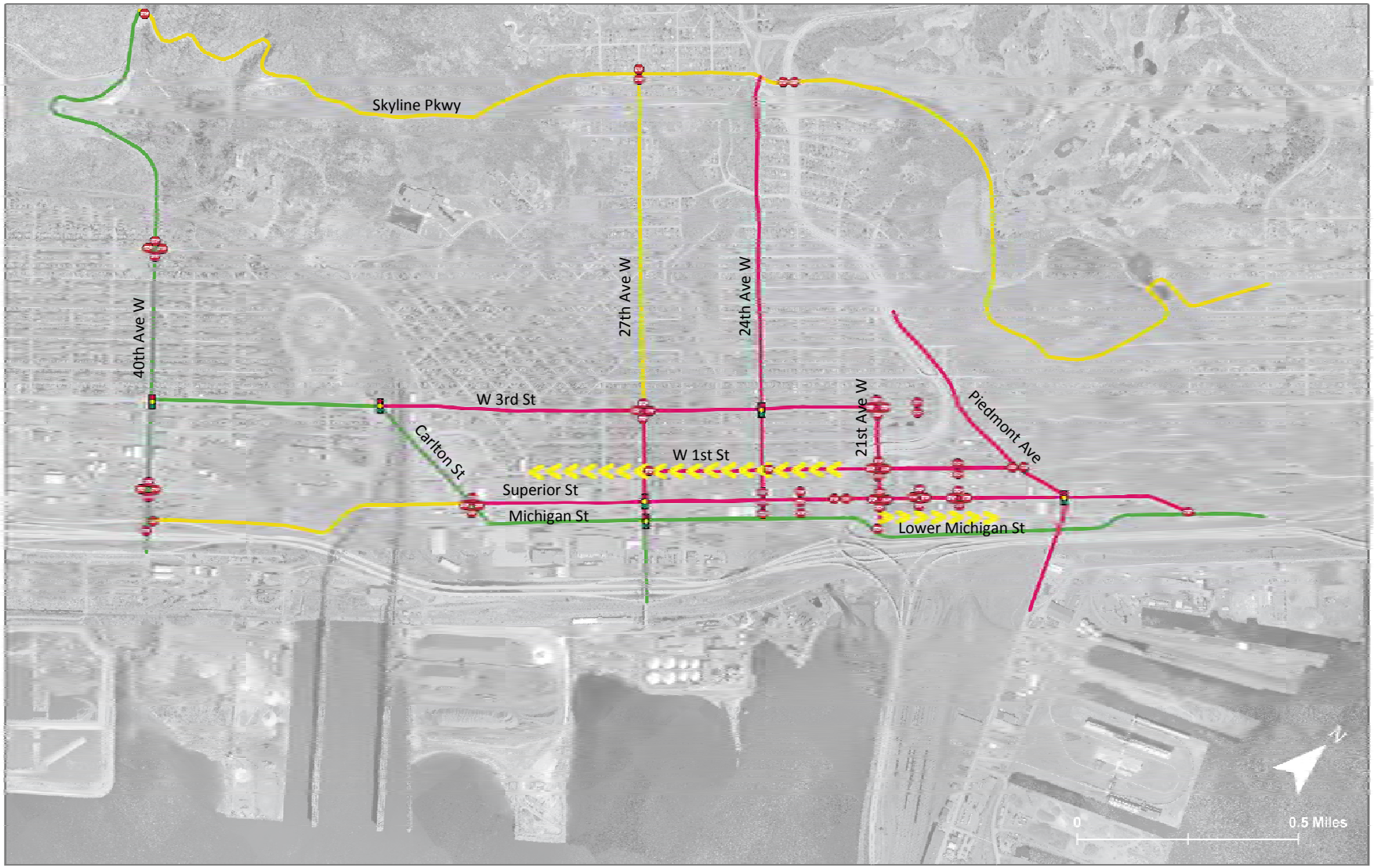
Facilitating efficient movements up and down the hillside are 40th Avenue W, 27th Avenue W, and 24th Avenue W. Whereas 27th Avenue W can be considered the main route between I-35 and W 3rd Street, it narrows significantly (to 24 feet wide) as it continues northward. Once above W 3rd Street, 40th Avenue W and 24th Avenue W become the major routes. The existing arrangement of these thoroughfares appears to provide sufficient mobility throughout the local street network. No issues of inefficient mobility were raised by stakeholders during the study, except for some concerns about travel along 27th Avenue W in the wintertime, when an already narrow street is further constrained by the accumulation of snow piles.

Some input was received about traffic delays at the intersections of Skyline Parkway & 24th Avenue W and Superior Street & Michigan Street. Conditions at these intersections are discussed further in the "Travel Demand & Mobility" section beginning on page 41.

One potential improvement to the network of thoroughfares that was recognized during this study, however, is the connection between W 3rd Street and Piedmont Avenue. That connection exists via 20th Avenue W/19th Avenue W and W 2nd Street, but the current configuration of these streets and intersections does not make it an intuitive pathway. Instead, traffic intending to access Garfield Avenue or Superior Street west of the CBD tends to travel down 21st Ave W to Superior Street, which is a busier area and involves added delay at several stop-controlled intersections. A more streamlined connection between W 3rd Street and Piedmont would offer a more efficient travel way between the 3rd Street corridor and the uses along Garfield Avenue, as well as to Superior Street heading west into downtown Duluth (see Map 4.5 on page 36).

One-way streets:

Maps 4.2, 4.3, and 4.4 also show the location of two one-way street segments in the neighborhood. There are a few historical reasons for why these segments remain one-way today, but the segments are the remnants of an old system designed for travel demand patterns that existed before the expansion of US Highway 53 and the creation of Lower Michigan Street. It is worth noting that neither the W 1st Street segment (one-way westbound for eight blocks) or the Michigan Street segment (one-way eastbound for three blocks) carry daily volumes much above 2,000 vehicles per day (see Map 4.2 on



M a p 4.4 | Key thoroughfares and stop controls on the local street network in Lincoln Park

A handful of key arterial and collector routes allow for quick travel through the Lincoln Park neighborhood. With the exception of Superior Street and 21st Avenue W in the Central Business District (CBD), there is minimal delay from traffic control devices along these routes.

M a p 4.5 | Potential improved connection between W 3rd Street and Piedmont Avenue

The dotted red line above signifies the potential for an improved alignment of the connection between W 3rd St and Piedmont Avenue in Lincoln Park. A more direct connection between the two roadways could improve access and mobility between the W 3rd Street Corridor and Superior St heading towards downtown Duluth.

page 32). From a through-way, travel-demand, or traffic operations perspective, these one-directional segments are serving no necessary function.

Access & Connectivity

Overall, the road network in the Lincoln Park neighborhood has good connectivity, both internally and regionally. Its proximity to the interchange of I-35 and US 53 provides for quick access to interregional travel in all directions, and a redundancy of connections throughout its local street network makes for efficient internal circulation. These characteristics make the network a valuable asset for both residents and businesses.

Access to Regional Travel Ways:

There are two direct accesses to I-35 in the neighborhood. Freeway ramps at 40th Avenue W facilitate quick access between the interstate and Grand Avenue (W 3rd Street) at the western end of the neighborhood, and ramps at 27th Avenue W facilitate quick access to Superior Street. There are also freeway ramps immediately north of the CBD that allow quick access between that commercial area and the interchange of US 53/I-35/I-535 – known colloquially as, "the Can of Worms" (see Map 4.6 on the following page).

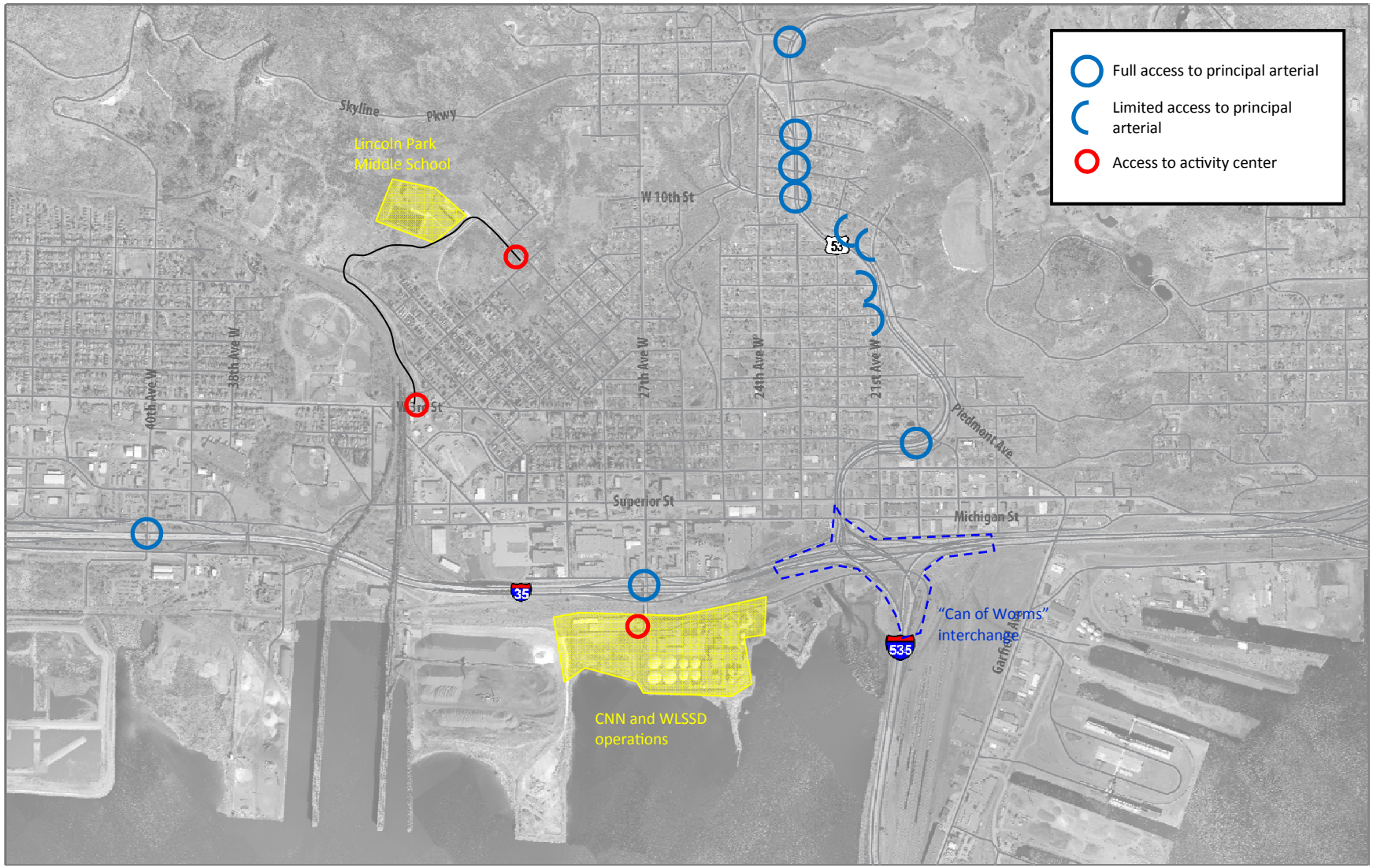
There are also several direct connections to US 53 in the northern portion of the neighborhood. These provide efficient connections to the residential areas atop the hill. Map 4.6 identifies the full- and partial-accesses to this facility, as well the ramp connections to I-35.

Access to Major Activity Centers:

Map 4.5 also identifies Network connections to two important centers of activity in the neighborhood: the Lincoln Park Middle school and the Western Lakes Sanitary Sewer District (WLSSD) facilities. Of all the major activity centers in the study area, these two generate the most traffic on a daily basis and both could benefit from improved access.

The middle school was relocated to a new building atop the hillside in 2012. The school is no longer centrally located in the neighborhood, and because of topography and other physical impediments it presents access challenges to other parts in the neighborhood. In particular, the residential areas to the northeast could benefit from a connecting route to W 10th Street and 27th Avenue W (see Map 4.7 on page 38). This would also facilitate efficient travel between US 53 and the school. Unfortunately, the topography and lack of other developments in the area make such a connection impractical, if not entirely unfeasible.

The WLSSD facilities receive and process sewage and solid waste,



M a p 4.6 | Roadway access to regional arterials and key activity centers with access concerns

An assessment of roadway access in the Lincoln Park neighborhood found that access is good both internally and externally to the neighborhood. There are sufficient opportunities to directly access I-35 and US 53. However, access to two key activity centers - the middle school and the CNN and WLSSD operations - could be improved.

M a p 4.7 | Potential connection between Anson Ave and W 10th St

The dotted red line above signifies a potential road connection between Anson Ave and W 10th Street to create a more direct access to the new middle school from US Highway 53.

M a p 4.8 | Potential improved connection between Lower Michigan St and Courtland St

The dotted red line above signifies the potential to create a street connection between Courtland Ave and Lower Michigan St as part of a future redesign and reconstruction of the "Can of Worms" interchange.

which require the arrival and departure of heavy trucks on a regular and frequent basis. WLSSD staff has reported that the site receives more than 100 heavy trucks on a daily basis. Most are garbage trucks, but semi-trailer trucks also regularly deliver and haul away chemicals and other materials.

At present, there is only one formal access to WLSSD and adjacent operations: the 27th Avenue W bridge across I-35. Emergency vehicles can also access these sites from an informal, unpaved access off of Lower Michigan Street, but this cannot be used by regular traffic traveling to and from the site. Staff at WLSSD have reported concerns about the lack of a secondary access in the event of an incident, as well as concerns about the slopes of the existing access during icy, winter conditions.

The "Can of Worms":

The Can of Worms interchange (I-35/I-535/US 53) is a large elevated structure made up of 20 separate bridges. Its design not only facilitates the efficient movement of over 60,000 vehicles per day, but it allows for unimpeded travel on local arterials and collectors beneath its raised decks. The design, therefore, also helps to maintain connection between the CBD and the rest of the neighborhood.

Most of the bridges within the Can of Worms interchange will be 60 years old by 2030 and likely need to be replaced by then. MnDOT has begun to explore design options for the interchange, some of which involve a redesign that would replace the raised bridges with a grand, at-grade intersection. Such a design could result in substantial savings in public investment.

Although none of the design options have been officially selected as of yet, it is important to recognize that any redesign will have impacts on traffic patterns in the neighborhood, for better or worse. An at-grade design would be transformative to the neighborhood –

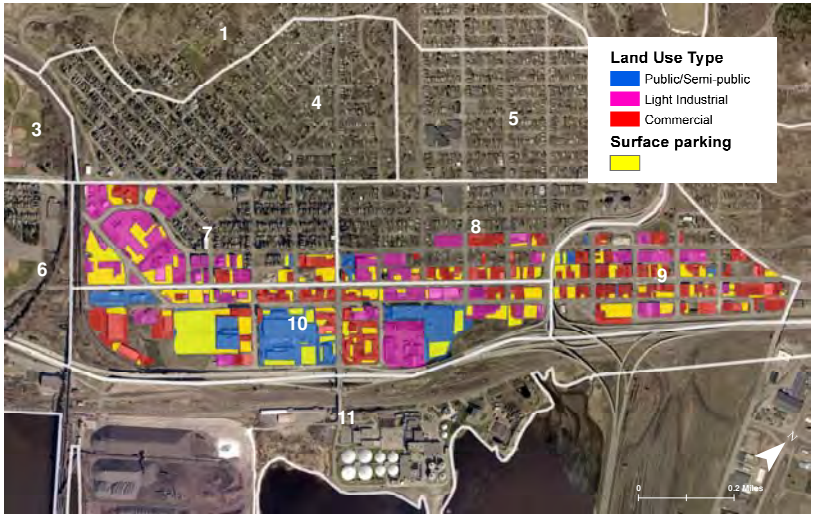
potentially having the effect of isolating certain sub-areas of the neighborhood from others.

It is recognized that a reconstruction of the Can of Worms offers opportunities for altering the alignments of roads, or even creating new connections. The previously mentioned improvement that could be made to the W 3rd Street/Piedmont Avenue connection and a secondary access to WLSSD could potentially both be addressed in a different redesign of the interchange (see Map 4.8 on the previous page).

Access to Parking:

Spaces for vehicle parking – both public and private - are abundant throughout the Lincoln Park neighborhood. For instance, a comparison of surface parking to commercial, industrial, and public/ semi-public uses within the high employment zone identified in Chapter 3 showed there is approximately 1 acre of space available for parking for every 4 acres of land being used. And, as Map 4.9 shows, this space is distributed fairly evenly throughout the area. While much of it is privately held and not formalized as designated parking spaces, its abundance presents many opportunities to meet customer and employee parking demand in the area.

Nevertheless, parking is generally cited as an issue of priority to different stakeholders, and a few specific areas of concern were the focus of discussion during the course of this study. First, concerns were expressed about insufficient parking in the CBD, which echoes the concerns heard during a 2002 assessment of transportation issues in the neighborhood. At that time, an extensive study of the available spaces in and their usage was conducted. The results indicated there were, in fact, ample parking opportunities within ½ block of almost all areas in the CBD.



Source: MIC (2015)

Map 4.9 | Location of off-street surface parking space in the business areas of the Lincoln Park neighborhood.

There is an abundance of surface lots on both public and private property that are either available, or could be made available for vehicle parking.

Image source: MIC (2015)

Figure 4.3 | On-street parking on Superior Street between Garfield Ave and 18th Ave - Weekday, midmorning.

A site observation during midmorning on Thursday, August 21st 2014 showed an abundance of on-street parking along Superior Street east o of 21st Ave W.

Image source: MIC (2014)

Figure 4.4 | Underutilized off-street parking space underneath US Highway 53.

There is more than 40,000 square feet of surface parking below the raised sections of US Highway 53. As was observed on Thursday, August 21, 2014, this space is generally underutilized.

Image source: Google Earth, modified by MIC (2014)

Figure 4.5 | Location of the renovated Esmond building.

It is hoped that the renovation of the Esmond Building will revitalize the residential and commercial potential of the site. This could, however, bring more demand for parking where there is limited parking available.

Image source: Google Earth (2014)

Figure 4.6 | On-street parking demand along 27th Avenue W.

There are a number of residences along 27th Avenue W above W 6th St that do not have off-street parking available to them.

A parking study of similar complexity was not feasible within the constraints of this study, though observations with respect to parking were continuously made during repeated visits to the neighborhood at various times of the day and week. An abundance of parking spaces were noted in nearly every observation. This was true of on-street parking opportunities, such as along Superior St (see Figure 4.3 on the previous page). Furthermore, there is an abundance of free public parking beneath the overpass of US 53 north of W 1st Street, as well as along 22nd Avenue W (Figure 4.4).

One very specific area of concern in the CBD is near in the vicinity of Superior Street & 20th Avenue W. There is the potential need for more parking spaces associated with the city's Housing and Redevelopment Authority's (HRA) revitalization of the Esmond Building at Superior Street & 20th Avenue W (Figure 4.5). The reinvestment in residential units there, as well as new effort to bring commercial ventures in at the street level may lead to increased demand for parking in the immediate vicinity of the building, and there is no long-term parking for residents of the building.

Parking is also a potential issue along 27th Avenue W between W 3rd Street and W 9th Street. There are a lot of residences along the avenue, many that do not have off-street parking. So, many of those residences rely on the avenue for parking their vehicles (Figure 4.6).

There are also few cross-street connections on the eastern side of the avenue, which further limits parking options in the area.

27th Avenue W is narrow: 24 feet from curb to curb. With 8 feet reserved for parking, there is only 16 feet left available for travel lanes. That width is below what is allowed by State Aid standards. Upon reconstruction, the parking will likely need to be removed, or the roadway widened. The latter alternative presents problems, since many of the residences sit close to the street and to widen the

roadway would mean bringing the roadway close to the homes, and even taking away many of the off-street parking spaces that currently do exist.

Travel Demand & Mobility

Travel demand for the roadway network in Lincoln Park is measured in terms of the daily number of miles traveled per vehicle, per day (DVMT). For 2012, the most recent year of count data available at the time of the study, the estimated total DVMT within the study area was 211,400 miles of travel per day.

Trends in travel demand:

Table 4.3 below shows the neighborhood's road miles classified by their function, as well as the estimated change in total DVMT in the neighborhood between the years 2000 and 2012. The data show the MnDOT-managed routes (I-35 and US 53) accounting for 68% of the DVMT in the area, yet only represent around 18% of the lane miles. Conversely, the county– and city-owned streets (which include the minor arterials and collector routes) accounts for 32% of the traffic in the area, but makes up 82% of the network. This relationship suggests that at least 36% of DVMT (32% subtracted from 68%) in Lincoln Park is traffic just passing through the neighborhood on the interstate or US 53.

Table 4.3: | Roadway miles in and daily vehicle miles traveled (DVMT) - Lincoln Park neighborhood - *years 2000 and 2012*

Functional Class	Linear Miles	Lane Miles	DVMT		Change	% Change
			2000	2012		
Interstate	2.2	8.8	94,328	94,565	237	*0.3%*
Principal Arterial	2.5	10.0	30,658	49,248	18,590	*60.6%*
Minor Arterial	4.1	9.1	24,194	27,606	3,412	*14.1%*
Collector	10.8	24.3	39,955	29,660	-10,295	*-25.8%*
Local Roads*	26.1	52.2	13,018	10,348	-2,670	*-25.8%*
Total	**45.7**	**104.4**	**202,153**	**211,427**	**9,274**	***23.4%***

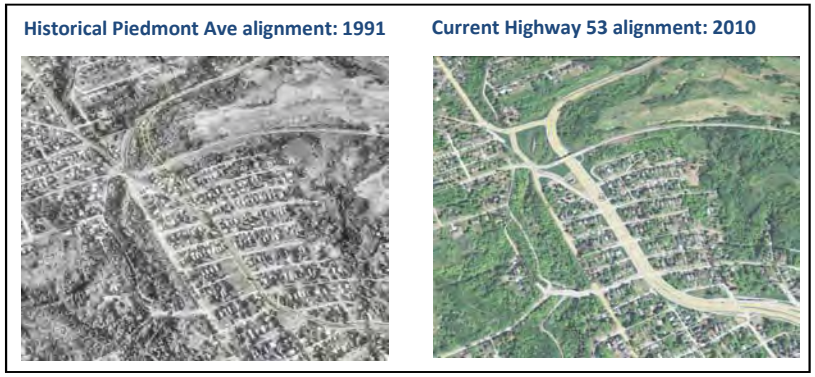
Data source: MnDOT Traffic Forecasting & Analysis (2015); MIC estimates (2015).

* DVMT for local roads was based on estimated average daily traffic (AADT) ranges from 250 - 1,000 vehicles per day.

The demand for automobile travel in the Lincoln Park neighborhood appears to have increased over the past decade by about 9,000 DVMT (~23%). Yet, that increase occurred primarily on US 53, which was expanded from a 3-lane roadway to a 4-lane, access-controlled expressway in 2003 (see Figure 4.7 below). This change created greater capacity for faster travel between I-35 and the Miller Hill Mall area, which is a major gateway to the growing community of Hermantown, Minnesota. This would appear to explain the higher rate of growth in traffic along that corridor.

In contrast, most of the local street network experienced the reverse pattern - a 25% loss in travel demand during that same period on average. A clear exception to this was 40th Avenue W, which turns into Haines Road above Skyline Parkway and also heads up to the Miller Hill Mall area. These patterns of increased/decreased demand are shown in Map 4.10 on the following page.

Figure 4.7: | US Highway 53 - before and after

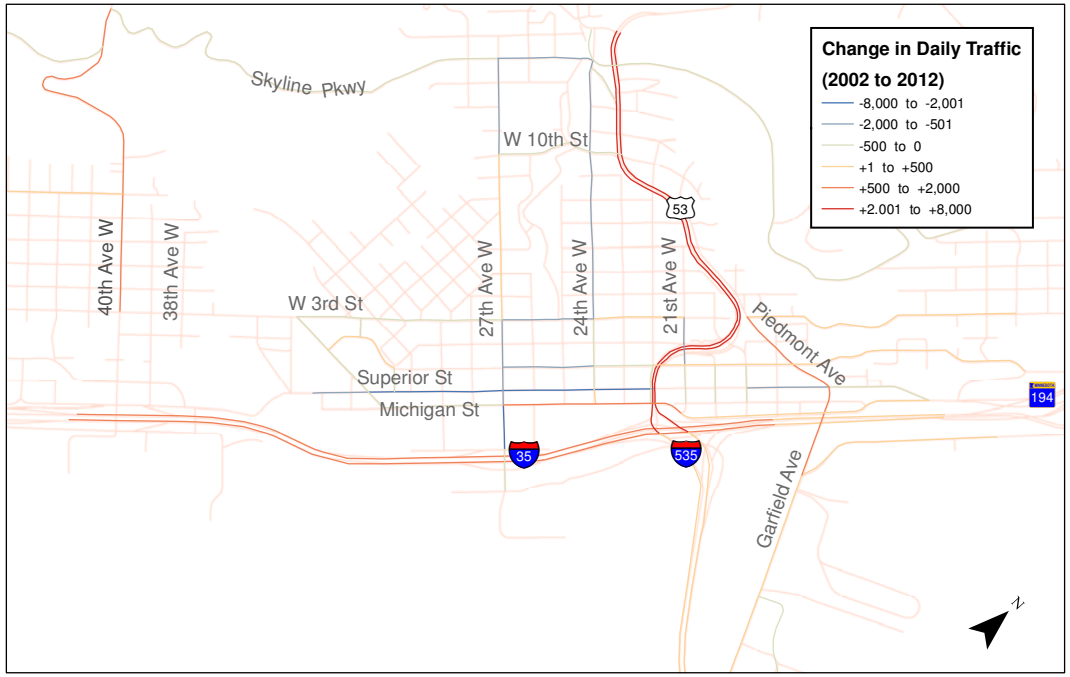


Source of images: Google Earth (2015).

Map 4.10 |

Change in annual average daily traffic (AADT): years 1992 to 2012

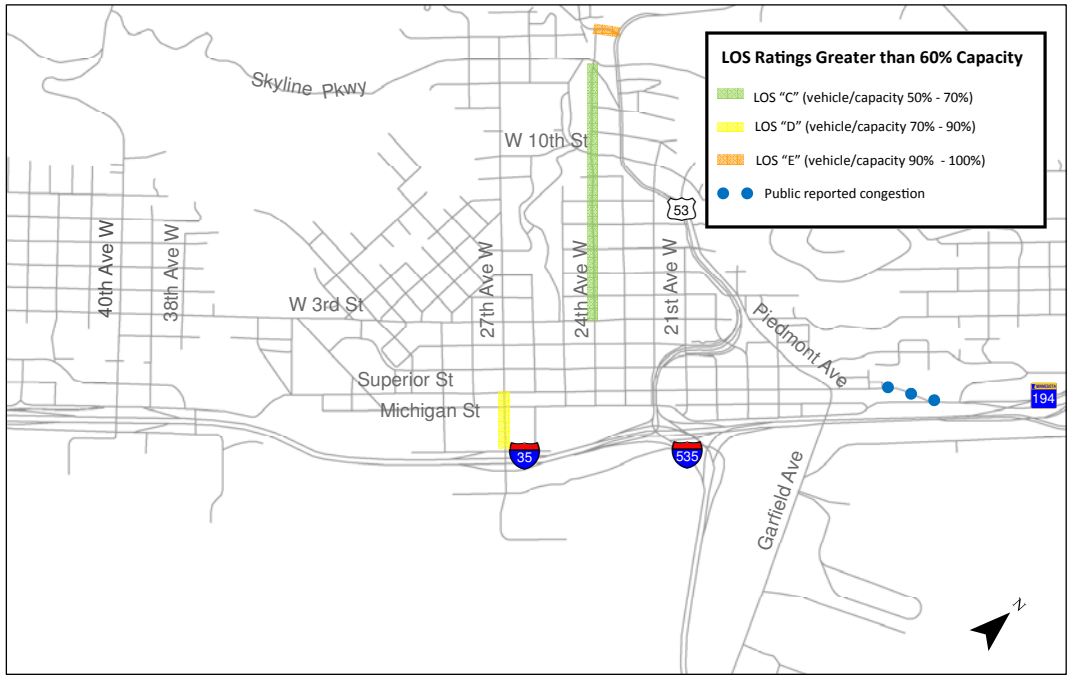
The Lincoln Park neighborhood has experienced a decrease in the daily vehicle miles traveled over the past decade. When looking strictly at AADT count data, it can be seen that I-35 and STH 53 increased in daily traffic, while daily traffic declined on much of the neighborhood streets.



Map 4.11 |

Locations of poor level of service (LOS) - PM peak hour of traffic (year 2015)

The MIC area travel-demand model uses existing AADT data and network characteristics to run scenarios of peak travel-demand over the entire Duluth-Superior road network. The model has indicated that, under current levels of demand, one network segment within the Lincoln Park neighborhood is experiencing poor LOS at the heaviest traveled hour of the day (PM peak hour). Site observations indicate this level of traffic is very short-lived (less than 10 minutes).



Demand modeling and Level of Service (LOS)

Computer applications have been used to model travel demand in the Duluth-Superior metro. The modeling software estimates demand according to the location and combination of different socioeconomic variables (household income, age, employment, etc.) for the entire Duluth-Superior metropolitan region. It then compares the estimated demand to the segment characteristics of the existing road network.

The outputs of the modeling have identified a few road segments within or adjacent to the Lincoln Park study area with the potential for recurring traffic congestion. Those segments are shown in Map 4.11 on the previous page. A segment of Superior Street between Garfield Avenue and Michigan Street is also shown because it was reported to the MIC during outreach in the neighborhood as also having regular congestion problems.

For this study, traffic congestion is defined for segments as more than 15 minutes of traffic volume in excess of 85% of road's vehicle-to-capacity (V/C) ratio. Table 4.4 shows how the V/C ratio is expressed in terms of LOS.

Modeling was used to calculate V/C ratios under a PM rush-hour scenario, when traffic levels are known to be most concentrated in the neighborhood. Aside from the three segments identified in Map 4.11, however, traffic congestion is virtually non-existent in the neighborhood. A 0.1 mile segment of Piedmont Avenue between 24th Avenue W and US 53 just north of the study area appears to experience the greatest level of congestion (LOS E). That arterial segment is functionally connected to 24th Avenue W, which also has segments with V/C ratios greater than 50%.

Volume/Capacity	LOS Rating
< 30%	A
> 30% < 50%	B
> 50% < 70%	C
> 70% < 90%	D
> 90% < 100%	F
> 100%	F

Table 4.4: | Level of Service (LOS) ratings of traffic congestion for road segments

Peak-hour observations:

Observations were made along these segments in order to verify the models results and assess causal factors. Photos taken during these observations are shown in figures below. It was determined that the segment of Piedmont Avenue (Figure 4.8) does experience congestion during the PM peak due to the volume and speed of traffic on US 53 during the PM rush hour. The vehicles on US 53 are not required to stop at that intersection, and gaps sizeable enough for vehicles to entering the stream become limited during the PM rush. If the traffic on Piedmont Avenue grows significantly in coming years, a traffic signal may need to be installed at the intersection.

Conditions of traffic congestion along 24th Avenue W (Figure 4.9) are less clear. No significant durations of delay were observed during the PM rush hour. It is noted, however, that the width of the

Figure 4.8 | Congestion on Piedmont Ave during PM peak hour of traffic

Image source: MIC (2015)

Figure 4.9 | 24th Ave W at W 3rd St during PM peak hour of traffic

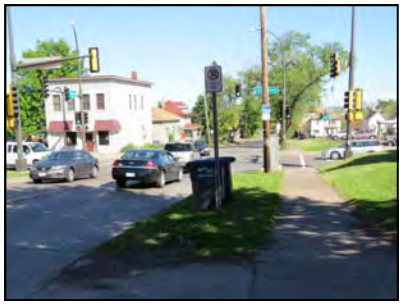


Image source: MIC (2015)

upper half of the avenue is small. The 33′ cross section limits the street to just two thru-lanes. It is conceivable that a combination of this, a steep slope, number of residential cross streets, and a frequent bus line could constrain the free flow of traffic at times, and that these conditions warrant further monitoring into the future.

A segment that was not identified as congested in the model, but reported to the MIC during its stakeholder outreach efforts was the eastbound segment of Superior Street that connects with Lower Michigan Street. Site observations suggest that, even though the eastbound vehicles may have slightly longer-than-average wait times during peak traffic, the intersection is still operating with an acceptable LOS (Figure 4.10).

Lastly, both the demand-model and site observations showed that the segment of 27th Ave W between I-35 and Superior Street is operating at a LOS D during peak hours of traffic (Figure 4.11). It is natural for greater numbers of vehicles to be traveling on through the segment, as it provides a connection to the interstate. But a concentration of auto-oriented businesses also draws a substantial amount of traffic to the area and generate a lot of turning vehicles at various places along the segment. Add to this the fact that two major cross-streets (Superior Street and Michigan Street) intersect the segment less than 160′ from each other (a typical block width in the area is double that distance) and conditions for congestion are ripe.

Figure 4.10 |

Superior St at Lower Michigan St during Weekday PM peak traffic

Image source: MIC (2015)

Figure 4.11 |

27th Ave W between Superior St and Michigan St - PM peak hour of traffic

Image source: MIC (2015)

27th Avenue W – Operations at Superior Street and Michigan Street:

In addition to the site visits, MIC staff conducted turning - movement counts at the Superior Street and Michigan Street intersections along 27th Avenue W during the morning, noon, and evening peak hours of traffic. Those counts were compared to data collected at the Helm Street intersection by MnDOT in 2009 in order to get a better picture of how these adjacent intersections (see Figure 4.12) function together. The peak hour traffic volumes recorded at these intersections are shown in Figure 4.13.

Figure 4.12 |

Location of high-volume adjacent intersections on 27th Ave W

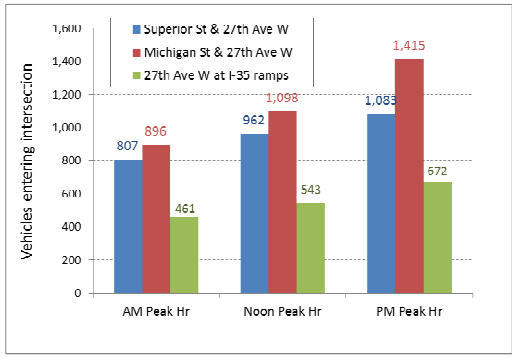


Figure 4.13 |

Comparison of peak periods of traffic - adjacent intersections on 27th Ave W

The data shows that the Michigan Street intersection during the PM peak facilitates, by far, the most traffic, 367 (35%) more vehicle movements than the Superior Street intersection. Yet, as Figures 4.14 and 4.15 convey, a vast majority of the peak hour traffic is shared between the two intersections, which has the potential to create problems, given the their close physical proximity.

Some "back of the napkin" estimates of signal operations were done using methodology outlined in the 2010 Highway Capacity Manual (HCM 2010), the results of which suggest that current signal operations have the capacity to move existing peak volumes efficiently (Table 4.5 on page 46). However, the queue lengths that can result exceed the actual distance that exists between the two signals. This is illustrated in Figure 4.17 on the following page. Such queue lengths were observed only but a couple of times during the greatest 15 minutes of traffic, but involved semi-trucks and did not cause any backups of significant duration. Yet, traffic jams of longer duration could become an issue with increased traffic in future years.

Image source: MIC (2014)

Figure 4.14 | Directional counts at Superior St & 27th Ave W - Oct 30, 2014 (4:15 pm to 5:15 pm)

Counts of vehicles' turning movements during the weekday PM peak hour of traffic show the NW bound (33% of the movements) and the SE bound (32%) legs of the Superior St & 27th Ave W intersection to be the critical lane groups during that period.

Image source: MIC (2014)

Figure 4.15 | Directional counts at Michigan St & 27th Ave W - Nov 6, 2014 (4:15 pm to 5:15 pm)

The traffic entering the Michigan St & 27th Ave W intersection during the PM peak hour of traffic was found to be 23% greater than that of the intersection of Superior St & 27th Ave W. The NE bound (36% of the movements) and SE bound (29%) legs of the intersection represent the most critical lane groups during the PM peak.

Table 4.5 | Vehicle-capacity (V/C) ratios for critical lane groups at the intersections of Superior St & 27th Ave W and Michigan St & 27th Ave W

The estimated V/C ratios for critical lane groups do not approach 90% (LOS E) at PM peak, indicating that the integrity of the signal operations are not compromised during existing peak traffic levels.

	Critical lane group	15 min peak volume	15 min capacity	Flow ratio	Cycle length*	Lost time + red clearance time	Critical V/C ratio for intersection
Superior St & 27th Ave W	NB	100	338	0.30	120	3.5	0.58
	WB	91	338	0.27	120	3.5	
Michigan St & 27th Ave W	SB	121	450	0.27	150	3.5	0.64
	EB	80	225	0.36	150	3.5	

Table 4.6 | Estimates of operations at 27th Ave W & Michigan St traffic signal.

Signal cycles per hour	24 cycles
Average vehicles/lane/hour*	178 vehicles
Max vehicles/lane/hour**	264 vehicles
Max queue length (at 20' per vehicle)	220 ft
Existing storage limit	133 ft
Estimated current peak queue length	140 ft

Figure 4.16 | PM peak traffic by direction - Intersection of 27th Ave W & Michigan St.

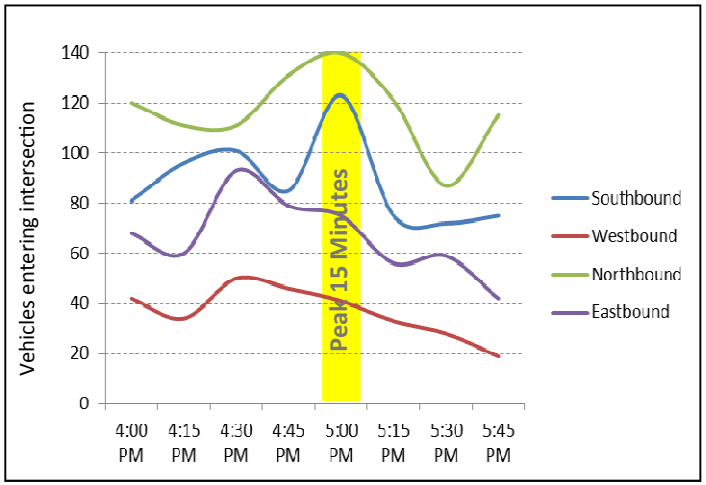


Figure 4.17 | PM peak queue length for southbound traffic vs. actual storage space - 27th Ave W & Michigan St.

Image source: MIC (2014)

Travel demand under future growth scenarios:

There were not enough resources available to do sophisticated travel demand modeling as part of this study. Without such modeling, it is difficult to say what degree of traffic growth will occur at various locations throughout the Lincoln Park study area. An attempt was made, however, to estimate levels of growth area across the study area as whole using the daily trip estimates of the three growth scenarios established in Chapter 3, as well as regional growth rates from the Duluth-Superior regional travel demand model last run in the Fall of 2014.

For an estimate of internal traffic growth in the neighborhood, the 25 -year growth rates shown in Table 4.7 were generated using the trip estimates and growth scenarios in Chapter 3. Because it is likely that a number of trips would be shared between the households and employment areas, the household trips produced were reduced by 4.3%, which is the portion of Duluth's working population with commute times of less than 5 minutes, according to the Census Bureau's 2009-2013 5 ACS estimates.

While the growth rates shown in Table 4.7 are appropriate for Lincoln Park's internal street network, they are not appropriate for estimating future traffic on I-35 and US 53. Regional growth estimates from the MIC's macro-scale, regional travel demand model were used to derive growth estimates for those roadways, which are shown in Table 4.8 and Figure 4.18 below. Under a high-growth, low -density scenario, there could be 40,500 more miles traveled within Lincoln Park than there are today. And it could be even 10,000 miles more under a high-density growth scenario.

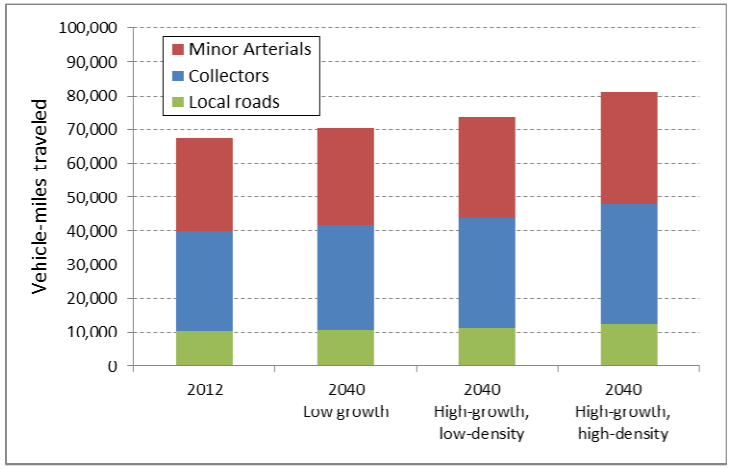
Table 4.7 | 25-year growth scenarios for trip-demand in Lincoln Park (local street network)

Scenario	Growth in household produced trips	Increase in employment produced trips	Traffic growth rate
Low growth	3.6%	0.6%	4.2%
High-growth, low-density	6.3%	2.8%	9.1%
High-growth, high-density	11.3%	8.8%	20.1%

Table 4.8 | 25-year growth scenarios for daily vehicle-miles traveled (DVMT) per functional class in Lincoln Park

Functional Class	2012	2040 Low growth	% increase	2040 High-growth, low-density	% increase	2040 High-growth, high-density	% increase
Interstate	94,565	107,804	*14.0%*	121,043	*28.0%*	121,043	*28.0%*
Principal Art.	49,248	52,695	*7.0%*	57,128	*16.0%*	57,128	*16.0%*
Minor Arterial	27,606	28,765	*4.2%*	30,118	*9.1%*	33,155	*20.1%*
Collector	29,660	30,906	*4.2%*	32,359	*9.1%*	35,622	*20.1%*
Local Roads	10,348	10,783	*4.2%*	11,290	*9.1%*	12,428	*20.1%*
Total	211,427	230,953	*9.2%*	251,938	*19.2%*	259,375	*22.7%*

Figure 4.18 | 25-year growth scenarios for daily vehicle-miles traveled (DVMT) for the local street network in Lincoln Park



While it is not reasonable to assume that the percent increases in traffic shown in Table 4.8 can be applied equally to every roadway of the same functional classification within the study area, some inferences could be made based on existing patterns. For instance, traffic on 27th Avenue W between I-35 and Superior Street has historically been between 20% and 30% of the AADT on the adjacent segments of I-35. Given this trend, the AADT ranges shown in Table 4.9 could be reasonable to consider for the purposes of planning. Since the PM peak volumes in the neighborhood were found to represent approximately 12% of AADT, this could mean another 1,700 to 1,900 vehicles in that segment during the PM rush hour. Using a similar approach with the Piedmont Avenue & US 53 intersection, as many as 263 more vehicles could be trying to exit Piedmont Avenue during the PM peak, while approximately 400 more vehicles would be moving along US 53 at that time, making suitable gaps in traffic available less frequently.

Table 4.9 | Ranges of annual average daily traffic (AADT) on 27th Avenue W and Piedmont Avenue under two 2040 growth scenarios.

	2012	Low Growth Scenario	High Growth Scenario
I-35 at 27th Ave W	42,500 AADT	48,500 AADT	54,400 AADT
27th Ave W: I-35 and Michigan St	9,000 AADT	9,700 to 14,535 AADT	10,800 to 16,320 AADT
US Hwy 53	19,900 AADT	21,293 AADT	23,084 AADT
Piedmont Ave at US Hwy 53	11,200 AADT	11,075 to 12,350 AADT	12,004 to 13,389 AADT

Network Condition

A windshield survey of pavement surfaces on the local street network (I-35 and US 53 excluded) was done to identify segments that are in poor condition and in need of improvements (see Figure 4.18). The observed pavement conditions were them cross-referenced against the City of Duluth's Street inventory data and also discussed with City Engineering staff. The results of the survey suggest that as much as 33% of the road pavements are in poor condition (Figure 4.19).

The profile of pavement conditions in Lincoln Park are not unique among the city's neighborhoods, and how the city will continue to fund the growing maintenance needs of its infrastructure is expected to be an ongoing challenge in coming years. As an illustration of this, projects involving full road reconstruction have cost an average of $3.5 million a mile in recent years, while the city's annual budget for street repairs is around $7.5 million/year. At these levels, it would take the city many years to repair the pavements identified as poor, if

Figure 4.18 | Example of pavement in "poor" condition - 20th Avenue W

Image source: MIC (2015)

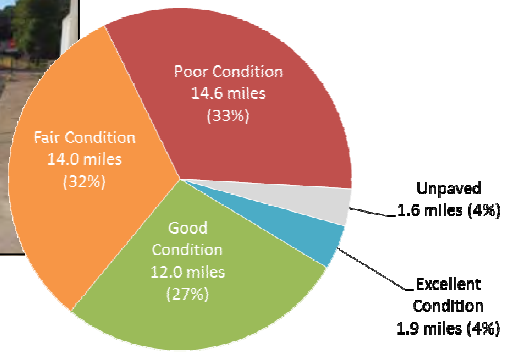


Figure 4.19 | Pavement condition profile of the local street network in

Lincoln Park streets were made the only priority streets in the city.

With this challenge in mind, an attempt was made to call out a few high-priority segments of roadway based on their functional importance to the network and their connections to other important corridors and activity centers in the neighborhood. Those segments are shown in Map 4.12 on the following page. The rationale for their prioritization is as follows:

- *Wellington Avenue* acts as a secondary access to the Lincoln Park Middle School site. Unlike Lincoln Park Middle School Road, Wellington Avenue is intersected by several other streets and can act as a strategic reliever route in the event that the main entrance to the school becomes impeded or inaccessible.
- *27th Avenue W* is a minor collector up the hill, connecting Skyline Parkway to the neighborhood below W 3rd Street. In addition to providing functional redundancy to 24th Avenue W, the avenue is the only access to a number of residences in the neighborhood.
- *20th Avenue W* is a major collector in the neighborhood's central business district (CBD). It provides a direct connection to Superior Street and the CBD from the US 53 off-ramp.
- *Courtland Street* is the only formalized connection between I-35 and WLSSD. In addition to serving employees and residents accessing WLSSD, the road serves an average of 100 heavy truck trips daily.

Despite the prioritization of the above routes as a result of this study, it is important to emphasize that the City of Duluth's policy has been to prioritize street repairs based on the condition of the utilities underneath them in order to optimize investments. Since it was beyond the scope of this study to analyze the condition of underground utilities, the segments identified in Map 4.12 may or may not be consistent with the city's current capital improvement strategies.

Seasonal maintenance:

Another aspect of network condition in the Lincoln Park neighborhood is the seasonal complications from snow accumulation on certain streets. A substantial number of streets in the neighborhood are narrow, while also accommodating on-street parking.

As identified in Chapter 2, input received from neighborhood residents indicates that the combination of snow accumulation and on -street parking can cause issues along 27th Avenue W and along W 4th Street. A review of parking regulations, as well as plowing policies and procedures may reveal ways that conditions on some of these streets in the winter months might be improved with only minor modifications.

Chapter Conclusion

The existing conditions and estimated future scenarios summarized in this chapter present the following implications with respect to the following three planning perspectives:

Multi-modal integration:

A review of the road network in Lincoln Park shows that there is generally sufficient access throughout the neighborhood, with the exception of secondary connections to the middle school and the WLSSD site. Likewise, operational delays are minimal throughout the network. This is the case even with existence of some legacy one-way segments that do not optimize current operations.

Only two locations appear to be concerns regarding existing or impending future congestion: 27th Avenue W between Superior Street and I-35; and Piedmont Avenue between 24th Avenue W and US 53. Planning for future operational improvements at both of these

M a p 4.12 | Priority pavements identified as being in "poor" condition

The segments of roadway above were identified as priorities for pavement improvements. Of all the pavements in poor condition, these segments were prioritized according to their functional importance in the local road network.

locations is advised. Such improvements should seek to optimize the mobility and safety of multiple modes of transportation.

Another future event that deserves substantial planning in advance is the impending redesign of the "Can of Worms" interchange. MnDOT has considered a rebuild of the interchange that would replace the elevated bridge structures with an at-grade design. Such a design would greatly alter traffic patterns in the neighborhood, possibly impeding movements between the CBD and the western portion of the neighborhood for multiple modes.

Existing opportunities for motor vehicle parking were determined to be sufficient under current conditions. There also exists ample surface space to expand both public and private parking opportunities in the neighborhood to help address any growing demand.

Parking may present occasional challenges at a couple of locations in the neighborhood. New uses in the renovated Esdmond Building may generate more parking demand around the adjacent blocks, where there is limited off-street parking opportunities. Parking along 27th Avenue W can also present challenges, as several residences north of W 6th Street do not have off-street parking options. Under conditions of accumulating snow, parking can also lead to operational impediments along the narrow avenue.

Public investment:

Maintenance of the road network in Lincoln Park will continue to be challenging, as the existing needs are disproportionate to current revenues for street repairs. With this reality in mind, the maintenance needs of those streets that serve important functions in the network should be prioritized. Four such segments have been identified in this study.

The ongoing management of snow also presents a maintenance challenge for the City of Duluth. The city is unable to immediately address every street segment immediately or with equal attention. With that said, greater attention might be strategically given to certain segments with unique circumstances, such as along 27th Avenue W, 24th Avenue W, and Wellington Avenue.

Funding limitations are not a challenge unique to the city. MnDOT has been considering ways to minimize infrastructure costs as it begins planning for a future rebuild of the "Can of Worms" interchange. The two jurisdictions should work to coordinate their the planning for and maintenance of their facilities within Lincoln Park in order to seize opportunities with which to synchronize the timing of network improvements in order to minimize costs.

Future opportunities:

A future redesign of the "Can of Worms" interchange presents a window of opportunity to make significant improvements to the road network in Lincoln Park. It is possible that a secondary access to Courtland Street and an improved connection between W 3rd Street and Lower Piedmont Avenue could be created, depending on the design.

Also depending on the design of the future interchange, the parking spaces beneath US 53 could be enhanced to make them more inviting. One particular area that could be especially capitalized on is the space under the overpass along Superior Street, directly adjacent to the CBD. Minor investments in signage, lighting, and other amenities could make this an attractive parking area for those traveling to the CBD for shopping and entertainment opportunities.

Lastly, future traffic conditions within the segment of 27th Avenue W between Superior Street and I-35 may require significant investments in order to maintain an acceptable level of service (LOS). Recognizing

this presents an opportunity for the City of Duluth to do planning well in advance and take several strategic actions over the coming years. This includes opportunities to develop an access management plan to guide Planning and Engineering staff working with developers on future projects on adjacent properties, as well as budgeting for incremental investments in signal upgrades and improved geometrics.

5. The Freight Network

The movement of freight is an important aspect of transportation in and around the Lincoln Park neighborhood. The study area has a number of important regional freight corridors passing through its boundaries and it also is home to several commercial and industrial activities that rely on the movement of shipments to and from their facilities.

This chapter provides a summary of existing conditions and future opportunities facing the transportation of freight in the Lincoln Park neighborhood. It looks at issues related to the design, operations, and maintenance of publicly funded, freight-based surface transportation assets in the neighborhood.

Image source: MIC (2015)

Figure 5.1 | Heavy truck traveling on US 53 in Lincoln Park.

Network Design & Function

The freight network in Lincoln Park consists principally of on-street, designated truck routes. There are approximately eight miles of rail line within the study area that serve mostly the movement of freight. There are direct rail connections to the CN ore docks and WLSSD sites at the waterfront. The CN ore docks (Figure 5.2), in particular, reflect a significant multi-modal facility in the neighborhood where freight is transferred from rail to waterborne transport.

Map 5.1 on the following page shows the location of the rail lines and designated truck routes in the neighborhood. The rail lines in in the neighborhood represent privately held investments, so the rest of this chapter will focus primarily on the on-street truck routes.

Image source: Google Earth (2015)

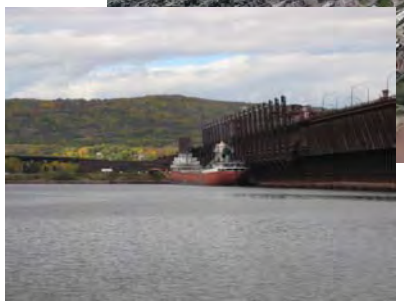


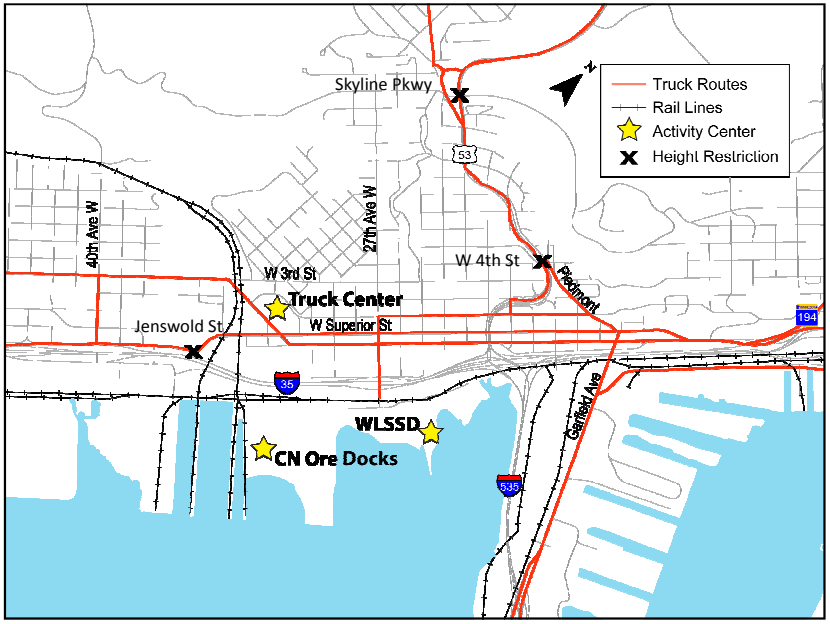
Image source: MIC (2015)

Figure 5.2 | The CN ore docks

The CN ore docks at the southern end of the Lincoln Park neighborhood provide a direct rail-to-ship connection for the shipment of iron ore from the region.

Designated Truck Routes:

There are approximately 12 linear miles of designated routes within the Lincoln Park study area (shown in Map 5.1). While heavy trucks are legally allowed to travel on virtually all State Aid eligible



M a p 5.1 | Rail lines, designated truck routes, and intermodal facilities in the Lincoln Park study area

Lincoln Park contains segments of truck routes and railways of both regional and local importance. Some impediments to freight movements also exist within the study area.

roadways in order to have access to business sites and to serve residences, the expectation is that majority of truck traffic will utilize the designated routes. The designated routes represent a select number of arterials and collectors for which heavy truck traffic is to be concentrated in the interest of minimizing impacts to residential areas and to help preserve the longevity of the city's other street pavements.

Access & Connectivity

Map 5.1 shows how the truck routes within Lincoln Park provide access to the interregional corridors of I-35, I-535, US 53. Also, these routes are part of a local roadway network that, as discussed in Chapter 4, provide multiple points of access to those regional corridors. Such redundancy in access, however, does not exist for the two activity centers that have rail connection in the study area: the ore docks and WLSSD. Both facilities would benefit from an additional access to Courtland Street.

Truck Center Drive:

A third center of activity with an important connection to the truck routes within the study area is the area around Truck Center Drive (see Figure 5.3). Historically, efforts were undertaken to promote that area as a concentration of businesses serving truck freight, and the form of the adjacent streets reflect this. Truck Center Drive itself is a one-directional, four-lane circulator designed to provide efficient movement of semi-trailer trucks. While there is no guarantee that market conditions would sustain truck-related businesses there into the future, the City of Duluth

Image source: Google Earth (2015)

F i g u r e 5.3 | Relation of Truck Center Drive to truck routes

Truck Center Drive was designed to serve a concentration of heavy truck related businesses and provide efficient access to the interstate. Changes in adjacent land use patterns and street designs risk working against the effective use of this transportation asset.

should recognize the existing infrastructure is a tangible transportation asset that is valuable for existing businesses, but also future economic development potential. As such, efforts should be made to protect efficient connections between this area and the regional corridors.

The connection of W 1st Street to this area is an example of the types of small changes that can work against this goal. Prior to the last reconstruction of the segment of W 1st Street between Truck Center Drive and 22nd Avenue W, commercial trucks could exit US 53 onto W 1st Street and take it directly to Truck Center Drive. Upon reconstruction, the street was narrowed and signed "No Trucks" (see Figure 5.4) for the benefit of the residences along it. While perhaps justified, the change now requires truck traffic to route through the CBD, move through a number of stops along Superior Street, and navigate a number of corners.

Image source: Google Maps (2015)

Figure 5.4 | Restricted commercial truck traffic on W 1st St

W 1st Street is potentially a direct and efficient connection between US 53 ramps and Truck Center Drive, but the street was narrowed and signed "No Trucks" during its last reconstruction.

Weight & Height Restrictions:

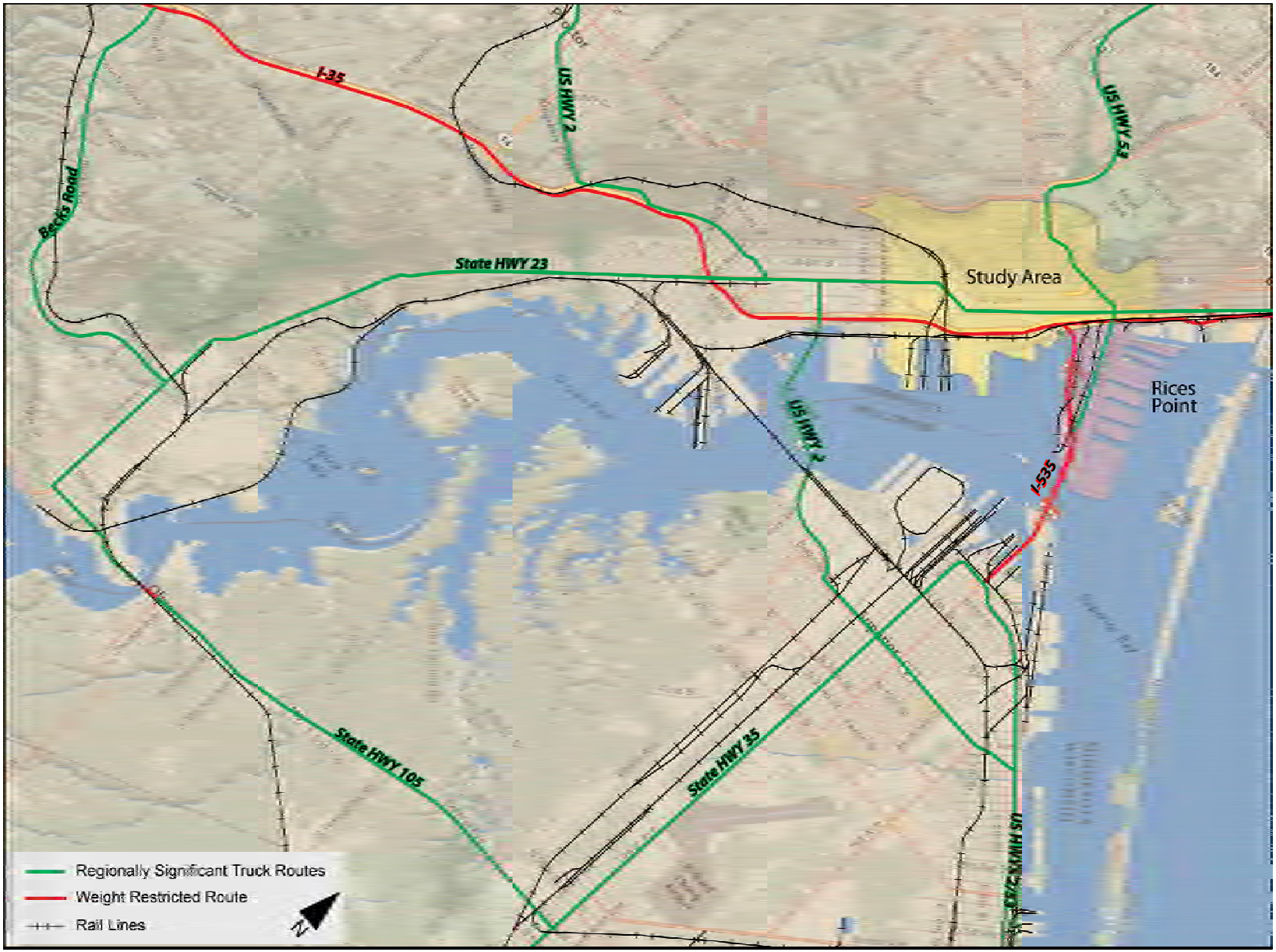
While I-35 and its associated freeway ramps are recognized as truck routes, federal weight restrictions for vehicle loads apply to these facilities. Federal law limits vehicle weights to 20,000 lbs per axel or 80,000 lbs gross vehicle weight to all segments of interstate highway in the Duluth-Superior metro area (i.e. I-35 and I-535). The State of Minnesota has similar restrictions for the State Trunk Highway system, but does allow for the movement of loads in excess of 80,000lbs via a permitting process.

Occasionally, there is demand to move such loads through the Lincoln Park study area. At times, that demand directly connected to port related operations on Rices Point, which is located directly southeast of the Lincoln Park neighborhood. From that perspective, the non-interstate truck routes through the study area are very important transportation assets to the local and regional economy.

In light of the weight restrictions on I-35 and I-535, Lincoln Park contains two vital links for oversized/overweight (OS/OW) freight movements: US 53 and Superior Street (see Map 5.2 on the following page). Without these connections, OS/OW loads cannot leave or enter Rices Point by road.

Height restrictions are another important issue within the study area. There a few bridges under which loads taller than 25 feet high cannot pass. Two of these brides exist on US 53 (one at Skyline Parkway and another W 4th Street) and another on Jenswold Street/ W Superior Street – each located on a designated truck route (see the locations denoted by "X" in Map 5.1 on the previous page).

If such loads need to travel on US 53, they need to bypass the the West 4th Street Bridge using "Lower" Piedmont Avenue (see Figure 5.5 on page 57). In order to bypass the Skyline Parkway Bridge, the "upper" segment of Piedmont Avenue is required (see Figure 5.6 on page 57). Even though direct access onto the upper segment of



M a p 5.2 | Regional truck routes and weight-restricted segments

Federal weight restrictions on I-35 and I-35 (shown as red in the map) require overweight trucks to use segments of the local network in Lincoln Park to connect to the regional truck routes for overweight loads (shown in green).

Piedmont Avenue from US 53 is restricted with bollards, those bollards can be temporarily removed in the event of a high-clearance load. The segment can also be used for the temporary staging of OS/OW loads if they run into difficulties climbing the long hill because of mechanical issues or adverse road conditions (see Figure 5.6). This multifunctional aspect makes this short segment a very important transportation asset in the Lincoln Park neighborhood that is worth protecting in the event of any future development of adjacent parcels of land.

The third bridge that is a barrier for high-clearance loads is the historic railway bridge that crosses Jenswold Street (refer to Map 5.1 on page 54 and Figure 5.7 at lower right). Jenswold Street would be a preferred truck route over the alternative route on Garfield Avenue because it runs through a non-residential area, has less traffic, contains less traffic stops, and requires fewer turning movements. The 14′ clearance of the bridge, however, is insufficient for large loads. Though the bridge is recognized as historically significant, opportunities to either raise the structure and/or lower the roadway to allow for the MnDOT recommended clearance of 16′ for freight corridors should be explored.

Image source: Google Earth (2015)

Image source: MIC (2014)

Figure 5.6 | OS/OW staging area on "Upper" Piedmont Avenue

An "upper" section of the old Piedmont Avenue allows for both the bypass of a height restriction and a staging area for oversized truck loads..

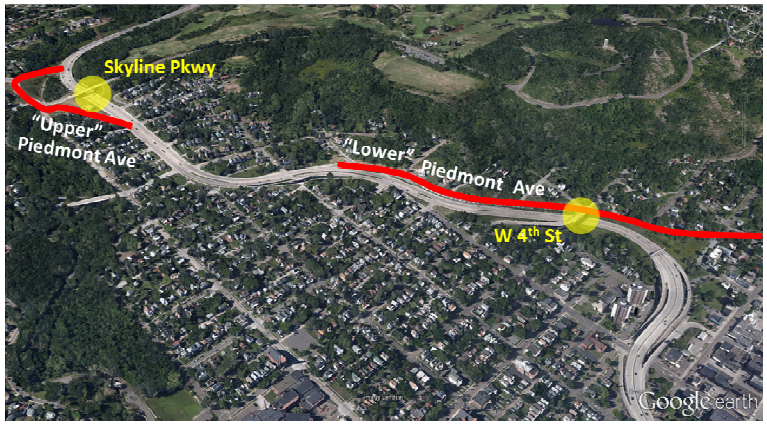


Image source: Google Earth (2015)

Figure 5.5 | Bypass connections for oversize/overweight loads on US 53

Remaining segments of the old Piedmont Avenue now provide important routes to navigate oversized/overweight truck loads around the overpasses on US 53.

Image source: Google Earth (2015)

Image source: MIC (2014)

Figure 5.7 | Height restriction on Jenswold Street

The historic rail bridge on Jenswold Street is of insufficient height for truck loads above 13.9 feet tall.

Travel Demand & Mobility

Travel demand for commercial freight traffic within the Lincoln Park study area is not easy to discern. Count data are limited to a handful of roadway segments and typically do not include details about the types of trucks in the wide range of vehicles that make up those counts. The remainder of this section describes travel demand patterns regarding these vehicles, noting that limited data is available.

Heavy Vehicle Classification:

MnDOT's classification scheme and definition for heavy commercial vehicles was used for this study: any truck with at least two axels and six tires is considered a heavy truck and is included in MnDOT's heavy commercial annual average daily traffic (HCAADT) data. According to that definition, heavy trucks fit into the classification types 5 through 13 shown in Figure 5.8.

Trends in travel demand:

While data of vehicle counts by class type is limited to only a few road segments in the study area, crash data by vehicle type could be considered as proxy data, indicating a relative "presence" of truck types in the neighborhood. To that end, Figure 5.9 is presented as a comparison of truck crash percentages for the Lincoln Park study area with those of the City of Duluth at large. That data would suggest that heavy trucks represent 6.5% of the traffic in Lincoln Park, compared to 3.9% within the city at large. Although it is difficult to say with certainty what portion of the daily traffic in Lincoln Park is made up of heavy trucks, observations made during site visits throughout the neighborhood support the notion that there is a strong presence of these vehicles on a variety of street types throughout the day (see Figure 5.10 on the following page).

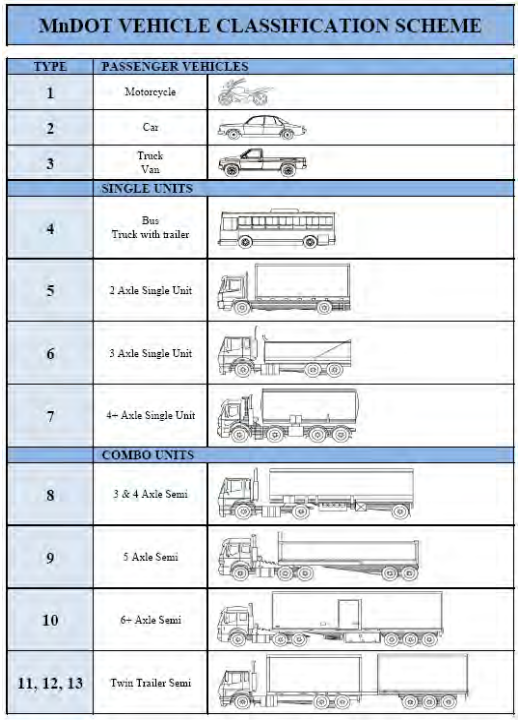
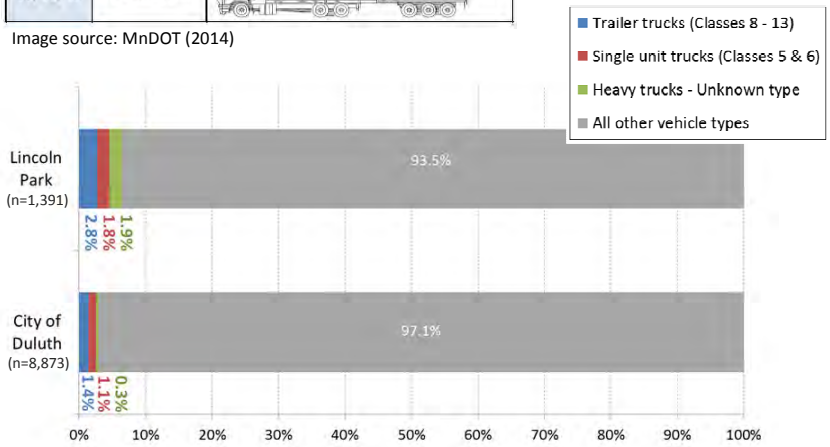


Image source: MnDOT (2014)

Figure 5.8 | MnDOT Vehicle Classifications

Classification types 5 through 13 shown above were all considered as "heavy trucks" in the Lincoln Park study.



Data source: MnDOT Crash Mapping Analysis Tool (2014)

Figure 5.9 | Percentage of heavy vehicle crash incidents in the Lincoln Park Study Area (2009-2013)

Heavy trucks represented 5.8% of all vehicle crashes in the study area, compared to 2.5% of crashes city wide.

Image source: MIC (2014)

Figure 5.10 | Heavy truck traveling on Superior Street in the Lincoln Park CBD

During this study, heavy trucks were observed on a variety of roadways in the neighborhood. The image above shows a semi -tractor truck traveling on Superior Street in the neighborhood's central business district (CBD).

Ten years of HCAADT counts on the MnDOT managed facilities in the neighborhood show that heavy trucks have been between 4.6% and 8.3% of the daily traffic (see Map 5.3 and Table 5.1 on page 60). For the segments of US 53, this means around 850 heavy trucks per day. For I-35, daily truck counts averaged well above 2,000 per day. It is interesting to note that these percentages of heavy truck traffic on these principle arterials are fairly consistent with the percentage of heavy truck crashes in the neighborhood shown in Figure 5.9 on the previous page.

Over the years, heavy vehicle volumes appear to have waxed or waned on the different principle arterial segments in and around the neighborhood. Truck traffic on the Blatnik Bridge (I-535), for instance, experienced a 1.3% drop in HCAADT since 2002. In contrast, the segment of I-35 just north of the Blatnik Bridge had a 1% increase in truck traffic over the same period.

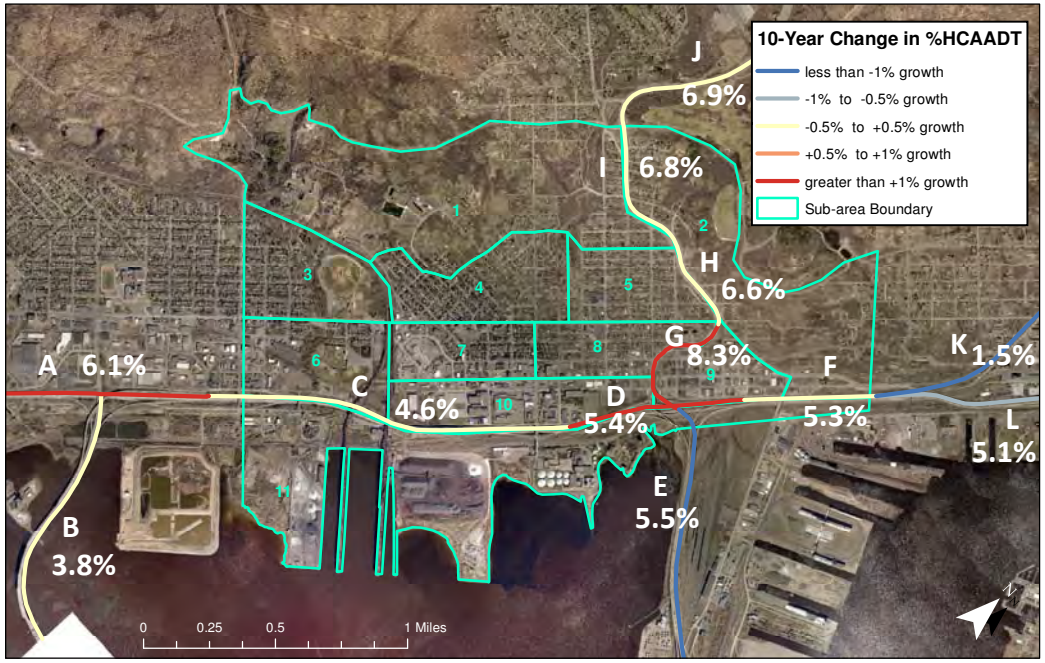
Map 5.3 on the following page shows the variation in HCAADT trends in and around the Lincoln Park neighborhood. It can be seen that the greatest increase in heavy truck traffic occurred within the segments of I-35 (Segment D) and US 53 (Segment G) directly adjacent to the Lincoln Park CBD (Sub-area 9). Though it is difficult to say without heavy trunk counts on the adjacent neighborhood streets, the data suggests there has been an increase in the amount of heavy trucks accessing the neighborhood via the ramps in that area. An increase in trucks circulating through that part of the neighborhood is a trend worth watching, as it can have implications for the efficient integration of other activities and modes of travel there.

As seen in Figure 5.11 below, the location of freeway ramps and the Superior Street/Garfield Ave intersection - a key point of access to regional truck routes - make heavy truck traffic through the CBD inevitable. The presence of a one-way segment of Michigan Street, however, is a much less permanent feature. That street segment fronts a number of light industrial operations served by trucks. MIC staff reached out to a number of those

Image source: Google Earth (2015)

Figure 5.11 | Key intersections and One-way segment in the Lincoln Park CBD

Truck traffic through the Lincoln Park CBD is influenced by the location of the freeway ramps and key intersections (such as Superior St & Garfield Ave) for accessing regional truck routes.. The presence of a one-way segment of Michigan St also dictates how trucks access the light industrial uses in that part of the CBD.



M a p 5.3 | Percent of traffic that is heavy trucks & 10-yr change in that percentage (year 2012)

This map represents the percent of average daily traffic in on MnDOT highway segments in 2012. The letters in the map correspond to data in Table 5.1 below. The slight growth in *percent-truck-traffic* near 46th Ave W (Segment A) and the "Can of Worms" interchange (segments D and G) suggests more of the area's heavy truck traffic may be accessing the Lincoln Park neighborhood than in previous years.

Segment	Highway	AADT 2002	HCAADT 2002	% AADT	AADT 2007	HCAADT 2007	% AADT	AADT 2012	HCAADT 2012	% AADT	10-YR Change in %HCAADT
A	I-35	45,000	2,130	4.7%	43,000	2,504	5.8%	44,500	2,700	6.1%	1.3%
B	Bong Br (US 2)	17,600	670	3.8%	17,700	678	3.8%	16,300	620	3.8%	0.0%
C	I-35	40,800	1,880	4.6%	48,000	2,208	4.6%	42,500	1,950	4.6%	0.0%
D	I 35	43,800	1,910	4.4%	52,600	2,564	4.9%	44,500	2,400	5.4%	1.0%
E	Blatnik Br (I-535)	28,100	1,910	6.8%	29,560	2,006	6.8%	22,800	1,250	5.5%	-1.3%
F	I-35	55,600	2,750	4.9%	59,000	1,239	2.1%	51,000	2,690	5.3%	0.3%
G	US 53	16,300	1,040	6.4%	15,500	1,182	7.6%	16,300	1,350	8.3%	1.9%
H	US 53	13,200	860	6.5%	19,000	1,495	7.9%	18,800	1,250	6.6%	0.1%
I	US 53	12,600	820	6.5%	18,100	1,414	7.8%	19,900	1,350	6.8%	0.3%
J	US 53	13,200	860	6.5%	15,600	1,191	7.6%	15,300	1,050	6.9%	0.3%
K	STH 194	17,900	470	2.6%	21,900	328	1.5%	24,400	375	1.5%	-1.1%
L	I-35	37,700	2,240	5.9%	37,100	3,105	8.4%	35,020	1,800	5.1%	0.8%
									Area Average	*5.5%*	*0.2%*

T a b l e 5.1: | AADT and HCAADT Comparisons for years 2002, 2007, and 2012

Ten years of traffic data on MnDOT roadways within the study area suggest that heavy trucks represent an average of daily traffic in the area. The segment of US 53 nearest the on/off ramps in the neighborhood CBD (segment G) stands out as having the greatest increase in percent truck traffic.

operations to determine the benefit or impact of that one-way segment on their businesses, and received little return input. Reverting the segment back to two-way could provide greater flexibility and accessibility with respect to the key access points. It could reduce the travel distances required of heavy trucks within the CBD, as well as the number of those trucks traveling, or navigating intersections on Superior Street, where there is a greater potential for conflicts with other modes of transportation.

Superior Street & Garfield Avenue intersection:

It is believed that there is a potential for increased conflicts between heavy trucks and other modes of transportation at the intersection of Superior Street & Garfield Avenue (see Figure 5.12). As mentioned, this is an important intersection for accessing the key designated truck routes: Piedmont Avenue and Garfield Avenue.

For similar reasons, the intersection is also an important one for passenger vehicles and public buses. It is a major transfer point for DTA transit riders to cross the harbor to Superior, WI. Also, where key transit stops exist, there is significant pedestrian crossing demand.

Figure 5.12 | The intersection of Superior Street & Garfield Avenue

The intersection of Superior St & Garfield Ave is a key intersection for accessing regional truck routes.

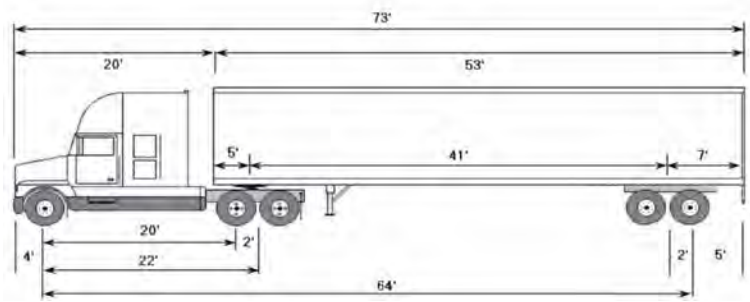
One distinguishing characteristic of the intersection is that it is very large, with crossing distances in excess of 85 ft. This is especially important for the navigation of OS/OW loads through the intersection, but it is not ideal for pedestrian crossings. Meanwhile, recent proposals for new multi-family residential developments adjacent to the intersection suggests that increased demand from all modes is likely to occur in coming years. For this reason, both the City of Duluth and the DTA should coordinate with other stakeholders in an effort to optimize conditions for these various transportation user groups at this intersection.

27th Avenue W – Operations at Superior Street and Michigan Street:

Another location of concern regarding intermodal conflicts with truck traffic in the study area are the intersections of 27th Avenue W on Superior Street and Michigan Street. As discussed in Chapter 4, the close proximity of these intersections raises concern about queue lengths. Those concerns are amplified when the length of semi-trailers are added to the mix.

As illustrated with Figure 5.13 and Figure 5.14 (next page), there is

Figure 5.13 | Length dimensions of a typical semi-trailer truck



not enough room to fit two semi-trucks of the typical 73-foot length between the stop bars of the opposing intersections. While the analysis offered in Chapter 4 indicated there is enough room available to accommodate current peak traffic demand, those conditions could easily be disrupted with an increase in PM truck traffic.

Heavy trucks were accounted for during the peak-hour traffic counts done as a part of this study. Figure 5.15 shows the counts recorded at the AM, noon, and PM peak hours of traffic (signified by the yellow bars). The portion of those counts that were heavy trucks are shown in orange. It can be seen that the greatest concentration of truck traffic occurred around the noon-hour peak and that the truck traffic tapered off during the PM peak.

Figure 5.14 | Comparison of typical semi-truck lengths with the

Image source: MIC (2014)

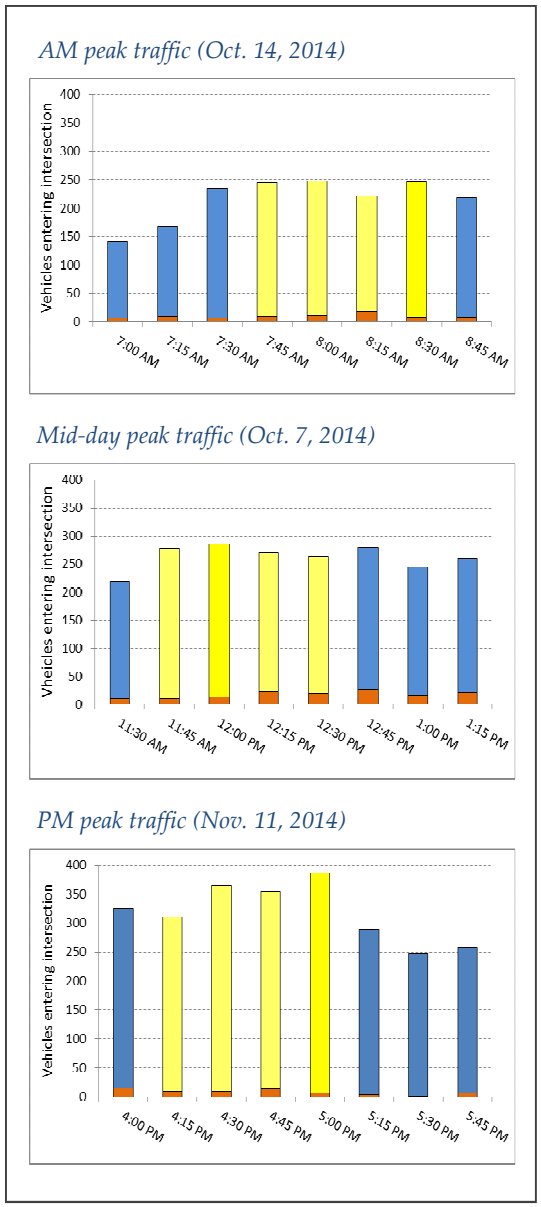


Figure 5.15 | Peak traffic counts at Michigan Street & 27th Avenue W

Weekday peak traffic volumes increase over the course of the day at the intersection, with a peak 15-minute volume of nearly 400 vehicles in the PM. Heavy truck traffic, on the other hand, was observed to top out at 26 vehicles just after the noon peak hour of traffic.

There was only one occasion during the counts when the presence of more than one semi-trailer was observed causing back-ups into the Superior Street intersection. This was during the PM peak hour, and those conditions were resolved within one signal cycle. That observation did, however, emphasize the potential for those situations to occur at those intersections. It is another reason for the City of Duluth and its area transportation partners to continue to monitor traffic conditions at these 27th Avenue W intersections.

Network Condition

The condition of road pavements throughout the Lincoln Park street network were discussed in Chapter 4. The pavement on Courtland Street was identified as a priority for repairs based on its importance in facilitating the regular movement of heavy truck traffic to and from WLSSD. The segment of 20th Avenue W between US 53 and Superior Street was also called out as a priority due to its connection to the southbound off ramp from US 53. Reconstruction of that street segment would also benefit the movement of freight in the area (refer to Map 4.12 in Chapter 4, page 50).

Chapter Conclusion

The existing assets, issues, and opportunities for freight transport that have been identified in this chapter have the following implications for the three planning perspectives established in Chapter 1:

Multi-modal integration:

A substantial amount of movement between US 53 and the neighborhood street network is occurring in the neighborhood's CBD. This is a dense area of multiple uses where there is a greater potential for conflicts to occur between heavy commercial vehicles and other users. This is something that should continue to be monitored, especially since the City's Small Area Plan (SAP) for the neighborhood aims to encourage a greater density of mixed activities - residential, retail commercial, light industrial, etc. - in the area (see Chapter 3).

The economic importance of freight to Lincoln Park should be recognized, and the existing assets that support truck-related businesses should be conceived of as a system. Efforts should be made to protect against that could negatively impact the movement of freight. City planners, engineers, and other transportation partners should remain watchful for the piecemeal aggregation of such impacts that can result from individual redevelopment or road reconstruction projects over time.

Similarly, the opportunities that exist down at the waterfront for the intermodal transfer of freight between truck and rail should continue to be protected and supported through the coordinated efforts of multiple stakeholders.

Public investment:

Two segments of poor road pavement have been identified as important with respect to heavy truck movements: 20th Avenue W and Courtland Street (see Chapter 4). Barring the urgency of more immediate pavement and utility needs in the area, the City of Duluth should prioritize the repair or reconstruction of these street segments.

It is anticipated that the area around the segment of 27th Avenue W between W 1st Street and I-35 will become a busier commercial node in the future. This growth is expected to happen incrementally. In order to accommodate increased traffic and also continue to facilitate the efficient movement of heavy trucks

through this segment, planning will be required to likewise make the appropriate incremental improvements to street design and signal operations there. A particular objective of such improvements should be to minimize the number of direct accesses along, or directly adjacent to, 27th Avenue W. The City of Duluth should also explore ways to work in partnership with future developers in order to cooperatively implement coordinated future investments in both public and private infrastructure.

A number of key assets for the movement of OS/OW loads have been identified in the study area that need to be protected and maintained in order to support economic activity throughout the region, but especially such activities in the Duluth-Superior port.

Future opportunities:

As mentioned, the area around 27th Avenue W near the interstate is likely to see substantial redevelopment in coming years. This presents an opportunity for the City of Duluth to develop a strategic plan for how to best prepare for and manage that change in ways that will continue to support efficient freight movements. The City should determine any desired redesigns of the existing public and private infrastructure in the area and be prepared in advance to engage private interests in the event of future development proposals.

Opportunities should be sought to address existing height- or weight-restricted facilities in order to improve the mobility of freight throughout the area. Specifically, opportunities to improve or bypass the height-restriction on Jenswold Street could create greater efficiency for truck movements in the area and also help reduce the amount of trucks traveling on the busier streets of Grand Avenue and 40th Ave W.

Future opportunities should also be sought to provide secondary access to the industrial activities along Courtland Street. Such opportunities might occur during a future reconstruction of the "Can of Worms" interchange (see Chapter 4). The access should be built to standards that can accommodate large loads.