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May 2025

To: John Larson, City Engineer

From: Jennifer McCoy, PE, PTOE

Subject: Urbandale Downtown Master Plan
City of Urbandale, IA
Project No.: 0T6.133774000

RE: Traffic Summary for Urbandale Downtown Master Plan and Douglas Avenue

Purpose

The purpose of this memorandum is to summarize the volume review and cross section discussion for Douglas Avenue that took place during development of the Downtown Master Plan.

Volumes

Existing Volumes were collected in September 2024 on Douglas Avenue from 71st Street to east of 64th Street after the roadway re-opened from its construction closure near 64th Street. St Pius School was in session during this time as well.

13-Hour turn movement volumes were collected at 72nd Street, 70th Street, 64th Street, and the Merle Hay Mall Driveway. Our experience has found that these 13-hours represent 85% of the total daily traffic. This number was used to factor the 13-hour counts to ADT counts.

Figure 1 presents the actual counts collected in 2024 compared to the 2016 counts conducted by the Iowa DOT. As can be seen, the 2024 counts are lower than the 2016 counts along Douglas Avenue. To be most reflective of the latest traffic conditions, the 2024 counts collected were used in the No Build analysis and future year forecasting.

The volume profile over the main 13 hours of the day at 70th Street is shown in **Figure 2.** From this profile, it can be seen that volumes tend to peak during the AM and PM peak periods, but are less during the non-peak periods of the day.

Figure 1 – 2016 Iowa DOT ADTs & 2024 Count ADTs

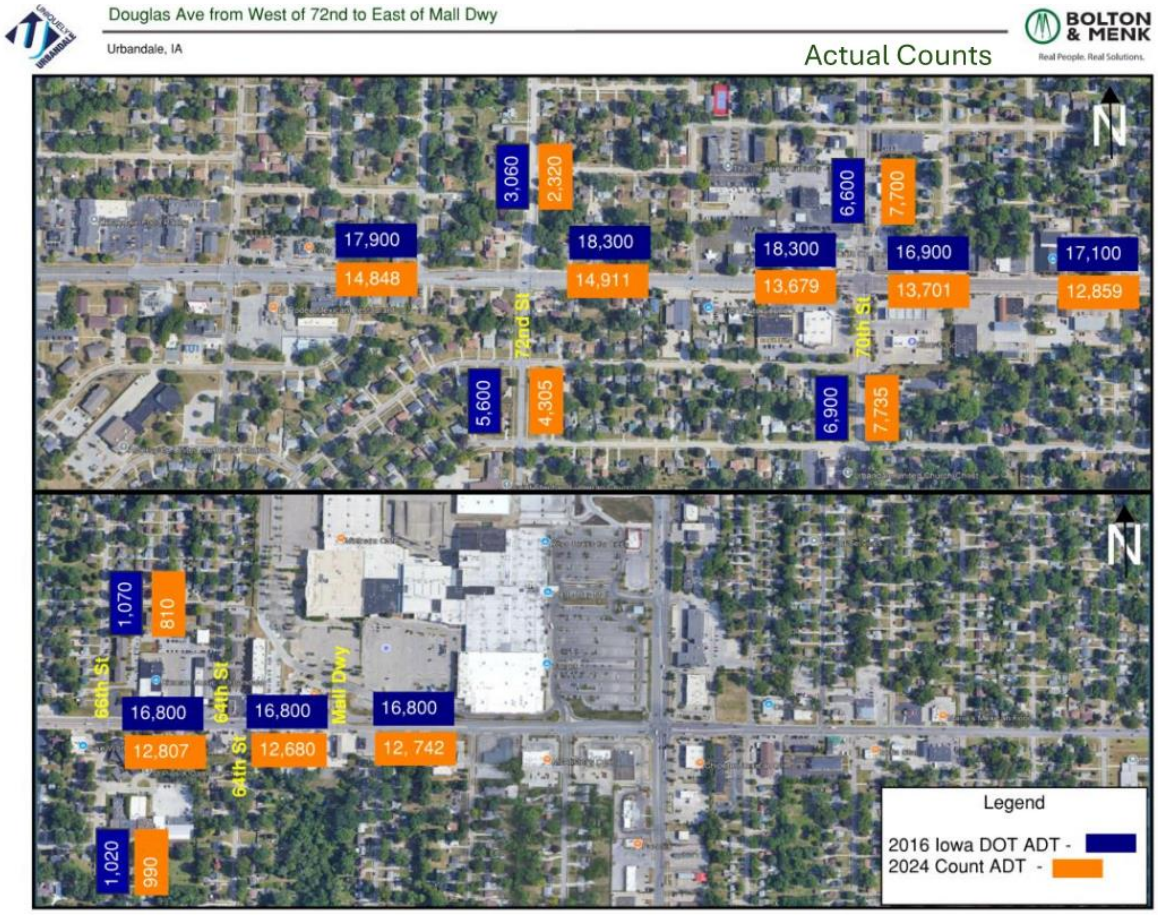
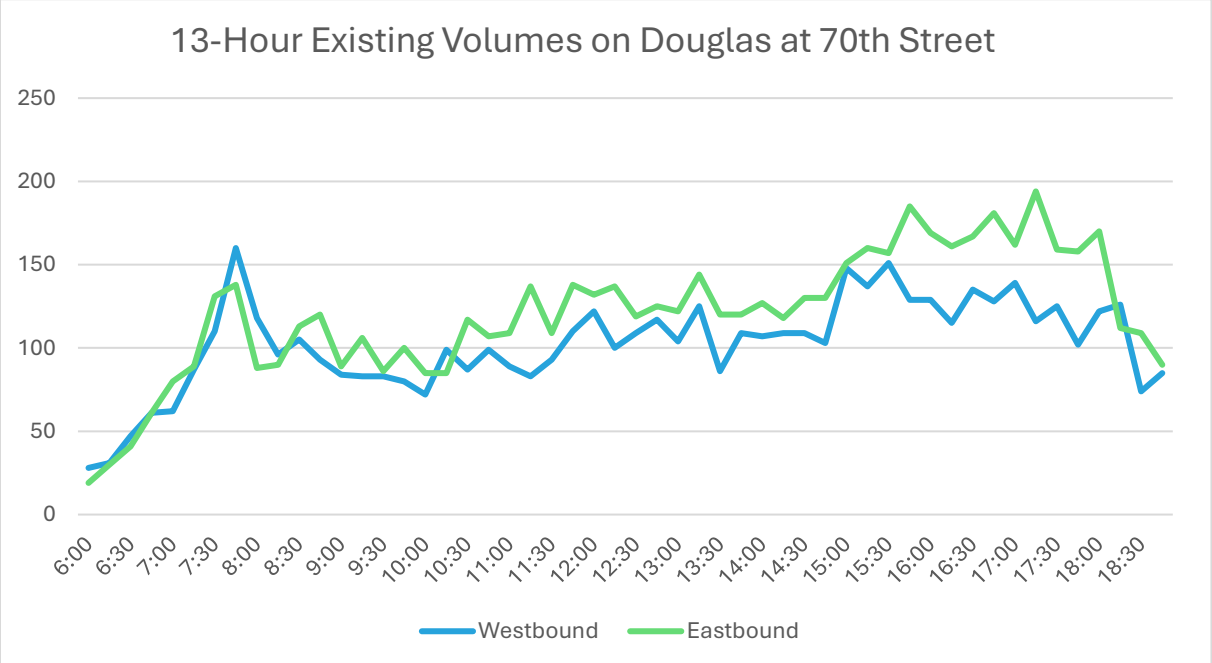


Figure 2 – Existing Volume Profile on Douglas at 70th Street



Trip Generation

Trips generated by the proposed redevelopments were added to the No Build volumes to determine the 20-year Future Build traffic volumes. The proposed redevelopment scenario for Downtown Urbandale over the next 20 years is shown in **Figure 3** below. The Trip Generation Manual, 11th Edition, Institute of Transportation Engineers (ITE), 2021 was used to estimate the trips generated from these proposed redevelopments. The ITE codes used, the size of the individual developments, and the number of peak hour trips generated from each type of development are shown in **Table 1**.

Land Use Codes 221 (multi-family Housing Mid-Rise) and 822 (Strip Retail Plaza <40k SF) were selected for the mixed use residential and commercial to be developed within downtown. Consistent with ITE, a 40% reduction for pass- by trips for commercial and a 5% internal reduction of trips for the residential was applied for the mixed use developments.

The AM Peak hour trips total 456 vehicles/hour. The PM Peak hours trips total 799 vehicles/hour. The total daily trips anticipated to be created with the redevelopments are 8,128 vehicles/day.

Figure 3 – Proposed Redevelopment Scenario

Table 1 – Trip Generation by Block

Block	Phase	Land Use	Quantity	ITE Land Use Code	AM		PM		Daily	
					In	Out	In	Out	In	Out
1a	0-5 yrs	Residential	50 DU	221	2	8	11	8	91	91
1b	6-10 yrs	Mid-Rise Residential with Ground Floor (Commercial)[1]	50 DU	221	2	8	11	8	91	91
			5000ft²	822	4	3	14	14	125	126
1c	6-10 yrs	Residential	50 DU	221	2	8	11	8	91	91
1d	10-20 yrs	Residential	50 DU	221	2	8	11	8	91	91
1e	6-10 yrs	Mid-Rise Residential with Ground Floor (Commercial)[1]	50 DU	221	2	8	11	8	91	91
			10000ft²	822	8	6	19	19	186	186
1f	10-20 yrs	Mid-Rise Residential with Ground Floor (Commercial)[1]	100 DU	221	7	24	23	14	204	205
			10000ft²	822	8	6	19	19	186	186
2	10-20 yrs	Retail	5000 ft²	822	4	3	14	14	125	126
3	6-10 yrs	Residential	50 DU	221	2	8	11	8	91	91
4	10-20 yrs	Mid-Rise Residential with Ground Floor (Commercial)[1]	100 DU	221	7	24	23	14	204	205
			10000ft²	822	8	6	19	19	186	186
5	0-5 yrs	Mid-Rise Residential with Ground Floor (Commercial)[1]	100 DU	221	7	24	23	14	204	205
			10000ft²	822	8	6	19	19	186	186
6	6-10 yrs	Mid-Rise Residential with Ground Floor (Commercial)[1]	100 DU	221	7	24	23	14	204	205
			5000ft²	822	4	3	14	14	125	126
7	0-5 yrs	Residential	50 DU	221	2	8	11	8	91	91
8	0-5yrs	Mid-Rise Residential with Ground Floor (Commercial)[1]	100 DU	221	7	24	23	14	204	205
			10000ft²	822	8	6	19	19	186	186
9	6-10 yrs	Residential	50 DU	221	2	8	11	8	91	91
10	20 yrs	Mid-Rise Residential with Ground Floor (Commercial)[1]	150 DU	221	12	39	34	22	318	317
			10000ft²	822	8	6	19	19	186	186
11	20 yrs	Mid-Rise Residential with Ground Floor (Commercial)[1]	150 DU	221	12	39	34	22	318	317
			10000ft²	822	8	6	19	19	186	186
				Total	***143***	***313***	***446***	***353***	***4061***	***4067***

Future Build Volumes

Existing 2024 No Build peak hour and ADT volumes were grown by 0.2% per year to get a 20-year forecasted Baseline (No Build) volumes. The Peak Hour trip generation volumes were added onto future forecasted No Build baseline volumes to get Future Build Peak Hour and Daily Volumes used in the analysis. A comparison of the Future 20 year No Build to the Future 20 Year Build ADT volumes are shown in **Figure 4.** To obtain the Future Build daily volumes, the ADT volumes were factored using the following equation: ADT = Peak Hour Volume/PHF

A Peak Hour Factor (PHF) of 0.08 was applied to an average of the Future Build AM and PM Peaks for even comparison. 8% of the daily volume on Douglas Avenue occurs in the peak hours based upon 2024 counts.

Table 2 presents the 2016 ADT counts collected by the Iowa DOT and the 20-Year Future Full Build ADT. As shown, the volumes on Douglas with the new 20-year full build redevelopment in downtown Urbandale are less than or within range of the 2016 Iowa DOT volumes (when Merle Hay Mall was full).

To note, existing site volumes were not removed from roadway volumes before adding development volumes which would likely reduce Build Volumes. Some existing uses may generate the same number or a bit more than the planned redevelopment. For example, the gas station on the corner of 70th Street today versus the proposed mixed-use development proposed. There is a net gain overall with the redevelopment sceanrio, but estimated ADT could be a bit conservative because of this slight double counting in some cases.

Figure 4 – 20-Year Future Full Build vs. No Build ADTs

Table 2 – 2016 Iowa DOT ADT vs. 20-Year Future Full Build ADT

Location		2016 IowaDOT AADT	20-Year Full Build AADT	Difference
Douglas Ave	West of 72nd	17,900	17,400	-500
	72nd - 70th	18,300	18,400	100
	70th - 68th	16,900	18,300	1,400
	68th - 66th	17,100	17,200	100
	66th - 64th	16,800	15,000	-1,800
	East of 64th	17,000	13,500	-3,500
72nd St	Northbound	5,600	4,900	-700
	Southbound	3,060	3,900	840
70th St	Northbound	6,900	10,700	3,800
	Southbound	6,600	11,200	4,600
66th St	Northbound	1,020	2,400	1,380
	Southbound	1,070	1,700	630

Cross Section Analysis

The feasibility of a cross-section change should consider both the ADT and the peak hour traffic, therefore, the number of travel lanes necessary to accommodate the Future Build traffic for the Douglas corridor was examined for both the peak and daily traffic volumes.

ADT

The ADTs for the 20-year Future Build were compared to the chart provided in **Figure 5.** This chart provides an estimate of Planning Level LOS, was used to determine the number of roadway lanes needed to maintain LOS D or higher. LOS D is a common target as it maintains a balance between performance, safety, and avoids overbuilding roadways. Using LOS D as a target addresses the City's goal of enhancing connectivity while also addressing the need for complete streets, which accommodate multiple modes of transportation.

The planning level estimate LOS chart shown in **Figure 5**, was used to determine the number of lanes needed based on the 20-year future volumes for the roadway to operate at LOS D.

Figure 5 - Planning Level Estimate of LOS

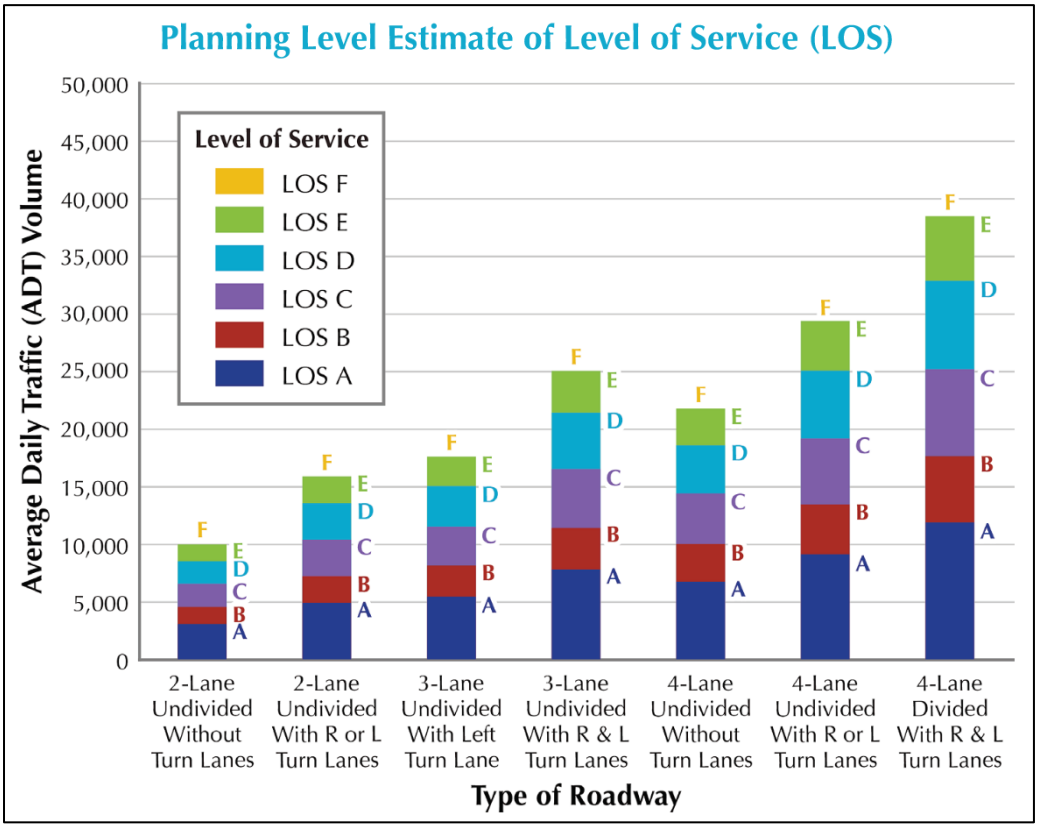
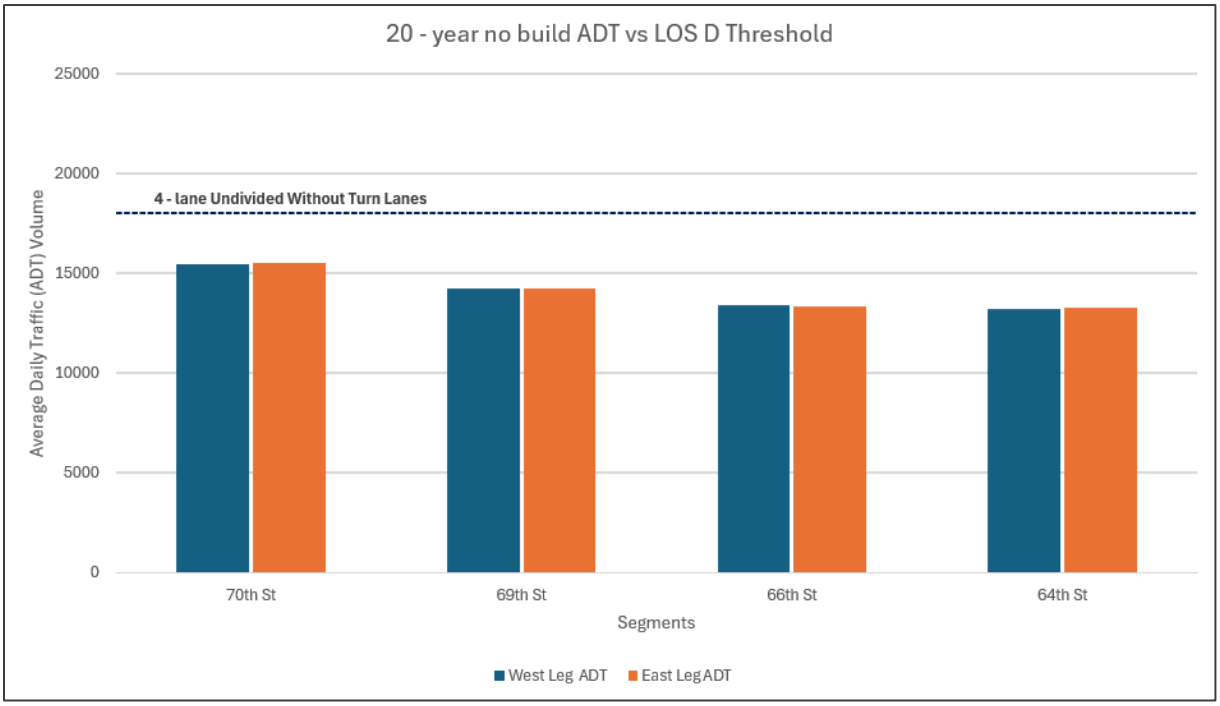
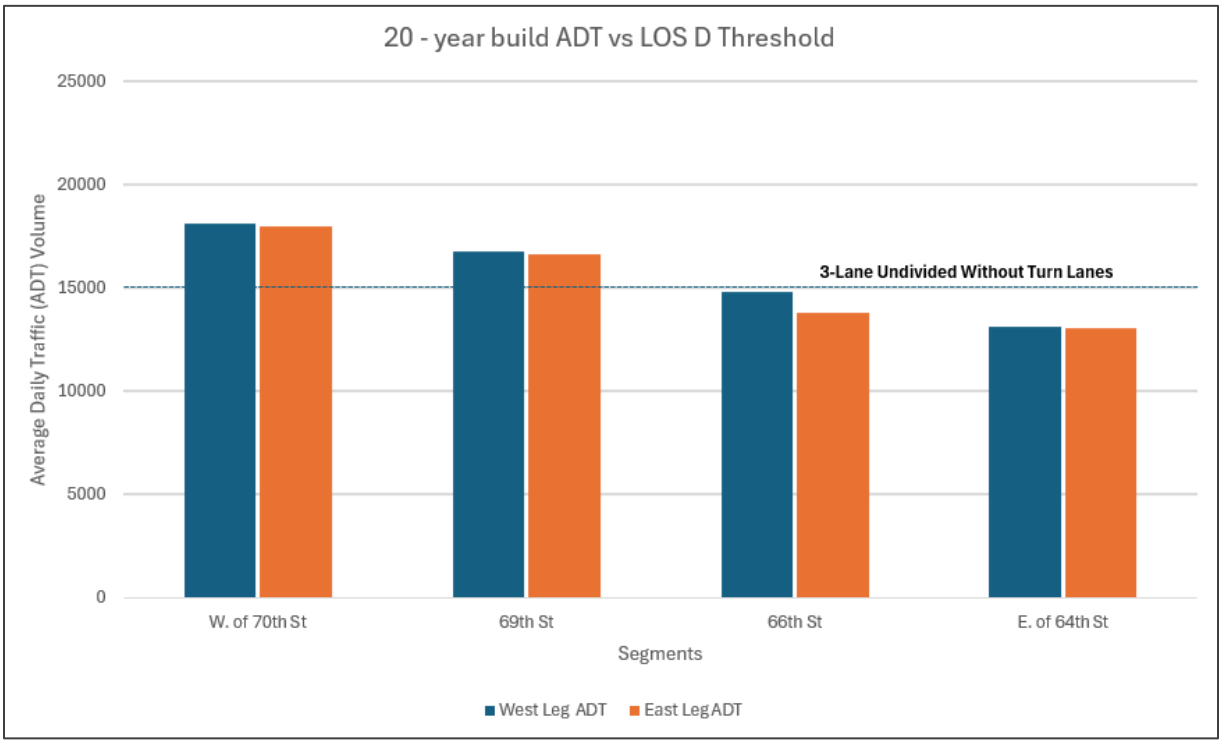


Figure based on the Highway Capacity Manual. Taken from the MnDOT Traffic Safety Fundamentals Handbook, page C-10.
https://www.dot.state.mn.us/trafficeng/safety/reportspubl.html

Figure 6 shows the 20-year No Build and Build volumes compared to the ADT volume threshold for LOS D provided in **Figure 5**.

Figure 6 – 20-year No Build and Build Volumes compared to LOS D Thresholds





This initial look at ADT Volumes shows that a 3-lane section with no right turn lanes could work with the redevelopment in the area, especially from 70th Street to 64th Street. The area of most delay would be on the west end closer to 70th Street, where the operations could increase to LOS E without right turn lanes at the intersection.

To understand what the anticipated change to a 3-lane section would mean for traffic travelling along Douglas Avenue, a comparison of LOS based on **Figure 5** was prepared and summarized in **Table 3.** From these values, it can be seen that 30-60 seconds more of delay on average could be expected for a driver traveling through downtown on Douglas Avenue with 3-lane section in the Build redevelopment scenario compared to Future No Build 4-Lane Roadway.

Table 3 – Anticipated Delays with the Future Build Condition

20-Year (2045) No Build:

Intersection	Douglas Ave AADT	4-Lane Level-of-Service	4-Lane Anticipated Delay (s)
70th St	15500	D	35-55
69th St	14200	C	15-25
66th St	13400	C	15-25
64th St	13100	C	15-25

2045 Build Condition:

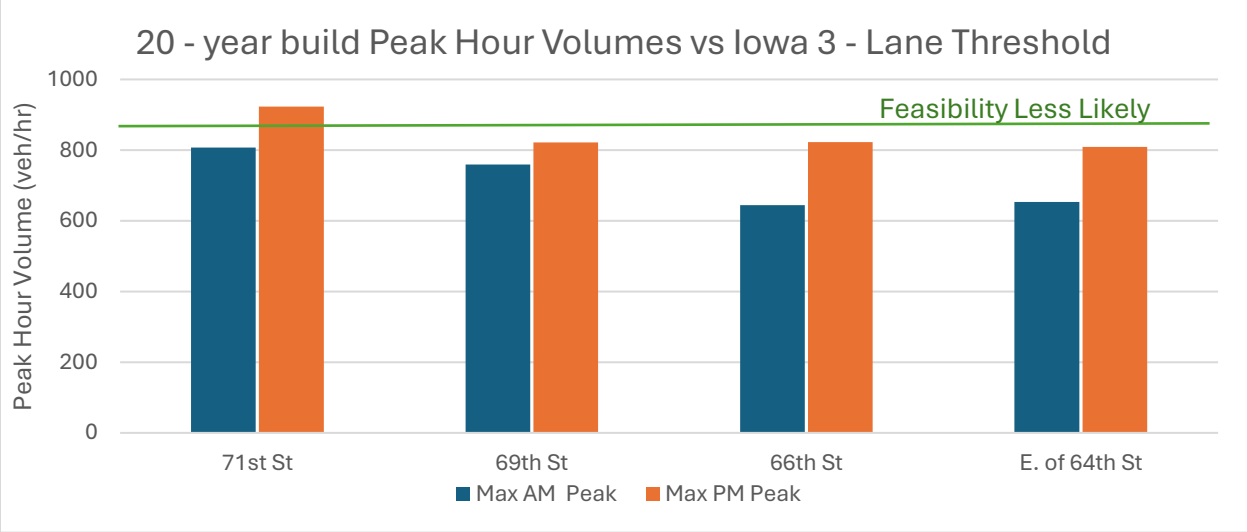
Intersection	Douglas Ave Averaged ADT	3-Lane Level-of-Service	3-Lane Anticipated Delay (s)
70th St	18100	F	80+
69th St	16700	E	35-50
66th St	14300	D	25-35
64th St	13200	D	25-35

Peak Hour

The peak hours were found to be 7:30-8:30 AM and 3-4 PM on Doulgas Avenue in this area. Another threshold used to determine the feasibility examines peak hour volumes on the corridor by comparing vehicles per hour per direction to specific guidelines. A 1999 study conducted in Iowa by K. Knapp, et al, developed guidelines that suggest, from an operational point of view, that Feasibility of a three-lane section is less likely above 875 vphpd during the peak hour.

Using the 20-year projected Future Build volumes, **Figure 7** was created showing how the Max Peak (AM or PM) compared to this threshold. These charts show that a 3-lane section is feasible based on the projected 20-year Build peak hour volumes, however, the west end near 70th Street will experience more delay than east end.

Figure 7 – 20-year Build Peak Hour Volumes vs. 3-Lane Threshold



Right Turn Lane Assessment

Figure 5 shows that the Future Build forecast estimated LOS improves with the addition of right turn lanes with the 3-lane section. Turn Lane warrants for the signalized and unsignalized intersections were prepared.

For signalized intersections, the guidelines found in Chapter 19 of the Highway Capacity Manual 6*th* Edition (HCM 6*th* Ed) were utilized for when a right turn lane should be considered.

- *An exclusive right turn lane should be considered when the right turn volume exceeds 300 veh/hr and the adjacent mainline volume exceeds 300 veh/hr/ln.*

For unsignalized intersections, the charts provided by NCHRP *Report 457* were utilized to determine the need to provide separate turn lanes for vehicles that are preparing to turn off the arterial roadway at a two-way stop-controlled intersection. The guidelines are found in National

Cooperative Highway Research Program (NCHRP) *Evaluating Intersection Improvements: An Engineering Study Guide*, commonly referred to as NCHRP *Report 457*.

The right turn charts utilize right turn volume, major road volume, and the posted speed limit. The right turn volume is the traffic turning right for an approach. The major road volume is all traffic approaching for that same approach.

Results for right turn lane needs are shown in **Table 4**. Based on the results shown in this table, no right turn lanes are warranted.

Table 4 – Right Turn Lane Needs with 20-Year Build Volumes

Intersection	Control Type	Time Period	20 Year Development			
			NBR	SBR	EBR	WBR
Douglas Ave & 71st St	unsignalized	AM Peak	No	No	-	-
		PM Peak	No	No	-	-
Douglas Ave & 70th St	signal	AM Peak	No	No	No	No
		PM Peak	No	No	No	No
Douglas Ave & 69th St	unsignalized	AM Peak	No	No	-	-
		PM Peak	No	No	-	-
Douglas Ave & 68th St	unsignalized	AM Peak	No	No	-	-
		PM Peak	No	No	-	-
Douglas Ave & 67th St	unsignalized	AM Peak	No	No	-	-
		PM Peak	No	No	-	-
Douglas Ave & 66th St	signal	AM Peak	No	No	No	No
		PM Peak	No	No	No	No
Douglas Ave & 64th St	unsignalized	AM Peak	No	No	-	-
		PM Peak	No	No	-	-
Douglas Ave & Merle Hay Mall Dwy	signal	AM Peak	No	No	No	No
		PM Peak	No	No	No	No

Considerations

Although, right turn lanes on Douglas Avenue are not needed based upon the Highway Capacity Manual and NCHRP *Report 457,* the volume thresholds for a 3-lane section appear to be less feasible in the PM peak on the west end of the downtown area. From **Figure 5,** it appears that the operations at the 70th Street signal would benefit from the addition of an eastbound and westbound right turn lane at this intersection. These right turn lanes can also help to handle any re-routed traffic from the closing of 69th Street or 67th Street with redevelopment.

These eastbound and westbound right turn lanes at 70th Street could be peak hour restricted to allow for parking in the non-PM peak hours. For example, the first three parking spaces from the corner could be signed no parking from 4-6pm Monday to Friday to allow for a right turn lane during PM peak hours as that's when it's needed most. Below is an example from 2nd Avenue in downtown Des Moines. The curb lane serves as a drive lane during the weekday in the PM peak, but a parking lane during the remainder of the time.

Figure 8 – Peak Hour Restricted Parking Lane in downtown Des Moines

Right Turn Lane Length

To estimate the length of right turn lane needed for eastbound and westbound traffic on Douglas Avenue at 70th Street, the *Design of Turn Lane Guidelines,* published by the Minnesota Department of Transportation Research Services in July 2010 was used. https://www.lrrb.org/pdf/201025.pdf

Figure 9 provides the calculation from these guidelines for a right turn lane based upon hourly volume, % heavy vehicles, and cycle length. For this calculation a 90 second cycle length was assumed with Douglas Avenue receiving 60 seconds of green time, 161 PM Peak eastbound right turns (2% heavy vehicles) and 71 westbound right turns (3% heavy vehicles) were used based on the 2024 counts collected.

This equation shows the need for 70-foot of storage + 35-foot decel at 30 MPH for the eastbound right turn lane at 70th Street. Total eastbound right turn = 105-feet.

This equation shows the need for 35-foot of storage + 35-foot decel at 30 MPH for the westbound right turn lane at 70th Street. Total westbound right turn = 70-feet.

35-foot deceleration distance needed assumes an Urban Conventional Roadway with 10 mph deceleration in through lane.

Figure 9 – Storage Length Calculation for Right Turn Lane at Signalized Intersection