



SM ROCHA, LLC

TRAFFIC AND TRANSPORTATION CONSULTANTS

December 7, 2023

Steve Cromer
The Dimension Group
5600 S Quebec Street, Suite 205B
Greenwood Village, Colorado 80111

**RE: Nick's Convenience – Jackson Gap
Traffic Generation Comparison and Impact Analysis
Aurora, Colorado**

Dear Steve,

SM ROCHA, LLC is pleased to provide traffic generation information for the development entitled Nick's Convenience – Jackson Gap. This development is located on the southeast corner of Jackson Gap Street and E 64th Avenue in Aurora, Colorado.

This information has been revised to address City Staff review comments dated October 25, 2023, regarding trip generation table updates and a site generated distribution and assignment figure.

The intent of this analysis is to present traffic volumes likely generated by the proposed development, provide a traffic volume comparison to previous land use assumptions approved for the development site within the Porteos PA 9A/9C Transportation Impact Study¹, and consider potential impacts to the adjacent roadway network. This analysis is also provided to include an updated traffic signal warrant analysis at the intersection of Jackson Gap Street and E 64th Avenue.

The following is a summary of analysis results.

Site Description and Access

Land for the development is currently vacant and surrounded by open space and a mix of commercial and industrial land uses. The proposed development is understood to entail the new construction of an approximate 6,200-square foot gas station convenience store supporting 16 fueling positions.

Proposed access to the development is provided at the following locations: one right-in / right-out access onto Jackson Gap Street (referred to as Access A) and one right-in / right-out access onto E 64th Avenue (referred to as Access B). Access A and Access B will operate as shared access drives with future commercial developments within the overall area.

General site and access locations are shown on Figure 1. A site plan, as prepared by The Dimension Group, is shown on Figure 2. This plan is provided for illustrative purposes only.

¹ Porteos PA 9A/9C in Aurora: Transportation Impact Study, Felsburg Holt & Ullevig, February 2023.

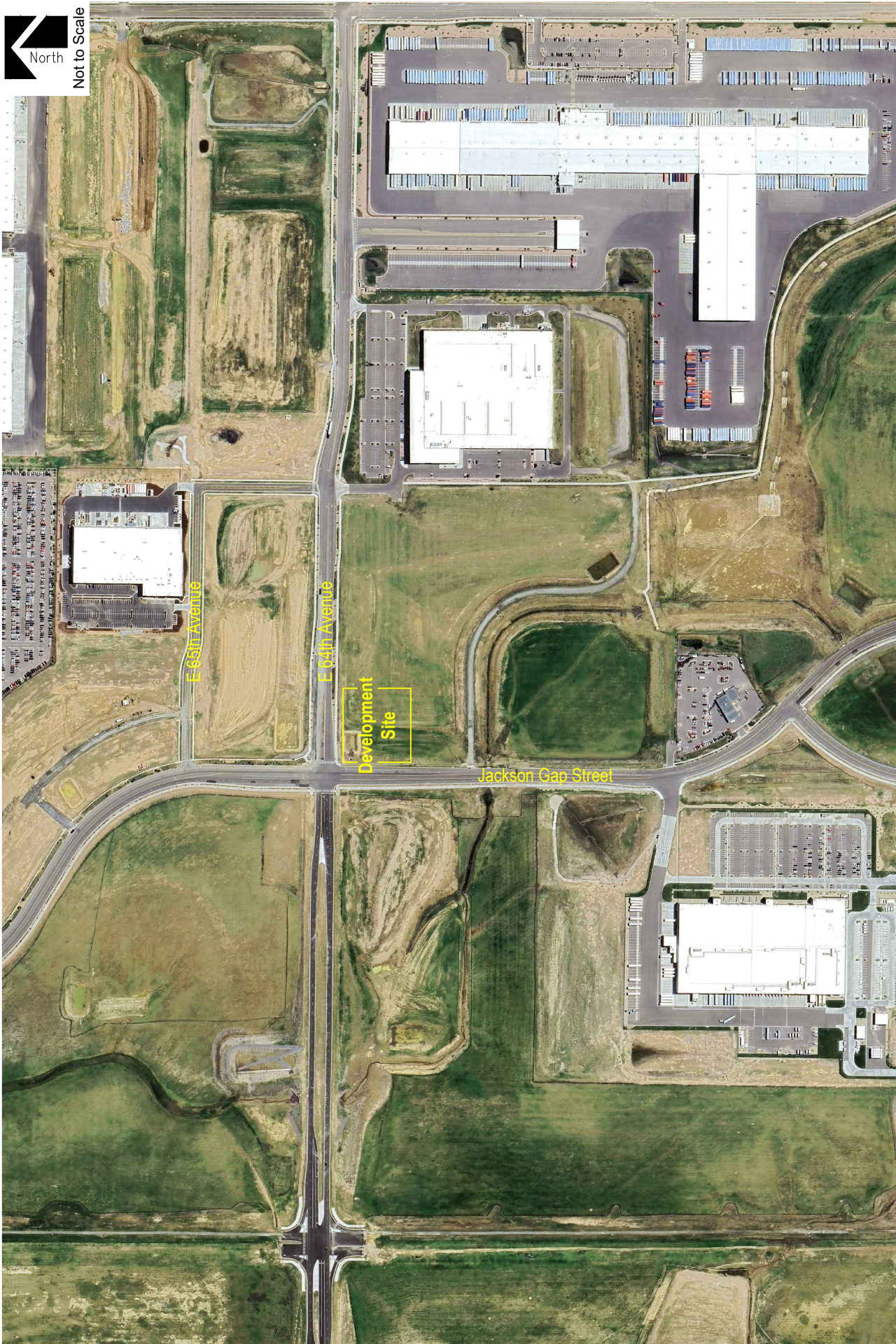


Figure 1
SITE LOCATION





Not to Scale



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Vehicle Trip Generation

Standard traffic generation characteristics compiled by the Institute of Transportation Engineers (ITE) in their report entitled Trip Generation Manual, 11th Edition, were applied to the proposed land use in order to estimate the average daily traffic (ADT) and peak hour vehicle trips. A vehicle trip is defined as a one-way vehicle movement from point of origin to point of destination.

Table 1 presents average trip generation rates for the development area proposed. Use of average trip generation rates presents a conservative analysis. ITE land use code 945 (Convenience Store / Gas Station) was used for analysis because of its best fit to the proposed land use.

Table 1 – Trip Generation Rates

ITE CODELAND USEUNIT			TRIP GENERATION RATES						
			24 HOUR	AM PEAK HOUR			PM PEAK HOUR		
				ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
945	Convenience Store/Gas Station (GFA (5.5-10k))	VFP	345.75	15.80	15.80	31.60	13.45	13.45	26.90

Key: VFP = Vehicle Fueling Positions.

Note: All data and calculations above are subject to being rounded to nearest value.

Table 2 summarizes the projected ADT and peak hour traffic volumes likely generated by the land use area proposed and provides comparison to traffic volume estimates of the previously approved land use.

Table 2 – Trip Generation Summary

ITE CODELAND USESIZE				TOTAL TRIPS GENERATED						
				24 HOUR	AM PEAK HOUR			PM PEAK HOUR		
					ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
<u>Site Development - Previously Approved</u>										
945	Convenience Store/Gas Station (GFA (2-4k)) *	16	VFP	3,383	128	129	257	147	148	295
Previously Approved Total:				3,383	128	129	257	147	148	295
<u>Site Development - Proposed</u>										
945	Convenience Store/Gas Station (GFA (5.5-10k))	16	VFP	5,532	253	253	506	215	215	430
Proposed Total:				5,532	253	253	506	215	215	430
Difference Total:				2,149	125	124	249	68	67	135

Key: VFP = Vehicle Fueling Positions.

* = Volumes obtained from Porteos PA 9A/9C Transportation Impact Study

Note: All data and calculations above are subject to being rounded to nearest value.

As Table 2 shows, the proposed development area has the potential to generate approximately 5,532 daily trips with 506 of those occurring during the morning peak hour and 430 during the afternoon peak hour.

Adjustments to Trip Generation Rates

A development of this type is likely to attract pass-by trips from the adjacent roadway system. ITE defines a pass-by trip as an intermediate stop on the way from an origin to a primary trip destination without a route diversion. Due to this behavior, pass-by trips are not considered as “new” traffic generated by the development since the trips are already present on the roadway network enroute to their primary destination.

Pass-by trips are especially common to service stations with convenience store land uses given the convenience provided by these businesses on the way to another primary destination such as a place of work or home. For example, published ITE pass-by and diverted link trip data from ITE's Trip Generation Handbook, 3rd Edition, indicates an average trip generation reduction rate of 62 percent during the AM peak traffic hour and 56 percent during the PM peak traffic hour as typical to convenience store / gas station land uses.

Upon consideration of the proposed land use, reductions were applied pursuant to ITE average data to the proposed land use in order to account for the high probability of pass-by trip generation. ITE average pass-by trip percentages used are presented in Table 3. It is noted that the approved Porteos PA 9A/9C traffic study did not apply reductions due to pass-by trips. However, pass-by rates were applied to the previously approved trip generation in order to provide for a more accurate comparison.

Table 3 illustrates projected ADT, AM Peak Hour, and PM Peak Hour traffic volumes likely generated by the proposed development upon build-out with reductions applied due to pass-by trips. Average daily (24-Hour) pass-by trip percentages were estimated as the average between the AM and PM peak hour rates indicated by ITE.

Table 3 – Trip Generation Summary with Reductions

ITE CODELAND USESIZE				TOTAL NEW TRIPS GENERATED						
				24 HOUR	AM PEAK HOUR			PM PEAK HOUR		
					ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
<u>Site Development - Previously Approved</u>										
Pass-By Trip Reduction:				59%	62%	62%	62%	56%	56%	56%
945	Convenience Store/Gas Station (GFA (2-4k)) *		16 VFP	1,387	49	49	98	65	65	130
Previously Approved Total:				1,387	49	49	98	65	65	130
<u>Site Development - Proposed</u>										
Pass-By Trip Reduction:				59%	62%	62%	62%	56%	56%	56%
945	Convenience Store/Gas Station (GFA (5.5-10k))		16 VFP	2,268	96	96	192	95	95	189
Proposed Total:				2,268	96	96	192	95	95	189
Difference Total:				881	47	47	94	30	30	60

Key: VFP = Vehicle Fueling Positions.

* = Volumes obtained from Porteos PA 9A/9C Transportation Impact Study

Note: All data and calculations above are subject to being rounded to nearest value.

Upon build-out and with consideration for pass-by trip reductions, Table 3 illustrates that the proposed development has the potential to generate approximately 2,268 daily trips with 192 of those occurring during the morning peak hour and 189 during the afternoon peak hour. Compared to the previously approved land use, this represents a potential increase in site traffic generation of approximately 881 new daily trips with 94 of those occurring during the morning peak hour and 60 during the afternoon peak hour.

It is noted that the proposed development accommodates an approximate 6,200 square foot convenience store, compared to the previously approved 3,500 square foot development. ITE trip generation rates consider both vehicle fueling positions and square-footage of the development, therefore gas station/convenience store developments with the same amount of vehicle fueling positions will likely experience different site-generated trip rates if the convenience stores have different footprints. As a result, the proposed convenience store/gas station is expected to generate more trips than that previously approved.

Trip Generation Distribution and Assignment

Overall directional distribution of site-generated traffic was determined based on existing area land uses, the site location within the City, and the available roadway network. Site-generated traffic is anticipated to be distributed through each proposed access. Distribution along Jackson Gap Street is general and assumed to be 50 percent to/from the north and 15 percent to/from the south. Distribution along E 64th Avenue is assumed to be 30 percent to/from the west and 5 percent to/from the east. Additional pass-by trip distribution is assumed to include vehicle routes heading east along E 64th Avenue and north along Jackson Gap Street. Distribution percentages utilized for pass-by trips are anticipated to be 50 percent from the west and the south. Overall trip distribution patterns for the development are shown on Figure 3.

Traffic assignment is how the site-generated and distributed trips are expected to be loaded on the roadway network. Applying trip distribution patterns to site-generated traffic provides the overall site-generated trip assignments shown on Figure 3. Figure 3 uses the difference in trip generation volumes from Table 3 and denotes projected traffic volumes at each proposed access and the adjacent intersection.

It is to be noted that the overall site-generated trip assignments shown in Figure 3 represent the combination of both primary trip generation and pass-by trips. Due to the application of pass-by trips, some negative site-generated trips are shown at the study intersections. These negative trips are the result of redistributing existing through volumes along Jackson Gap Street and E 64th Avenue to site-generated ingress volumes.

Given the right-in/right-out nature of the site accesses, vehicle trips originating from the east and trips returning to the south are likely to perform a U-turn movement at the first available intersection or median break. Therefore, trip assignment assumes various U-turn trips and adds them the appropriate movements as necessary.

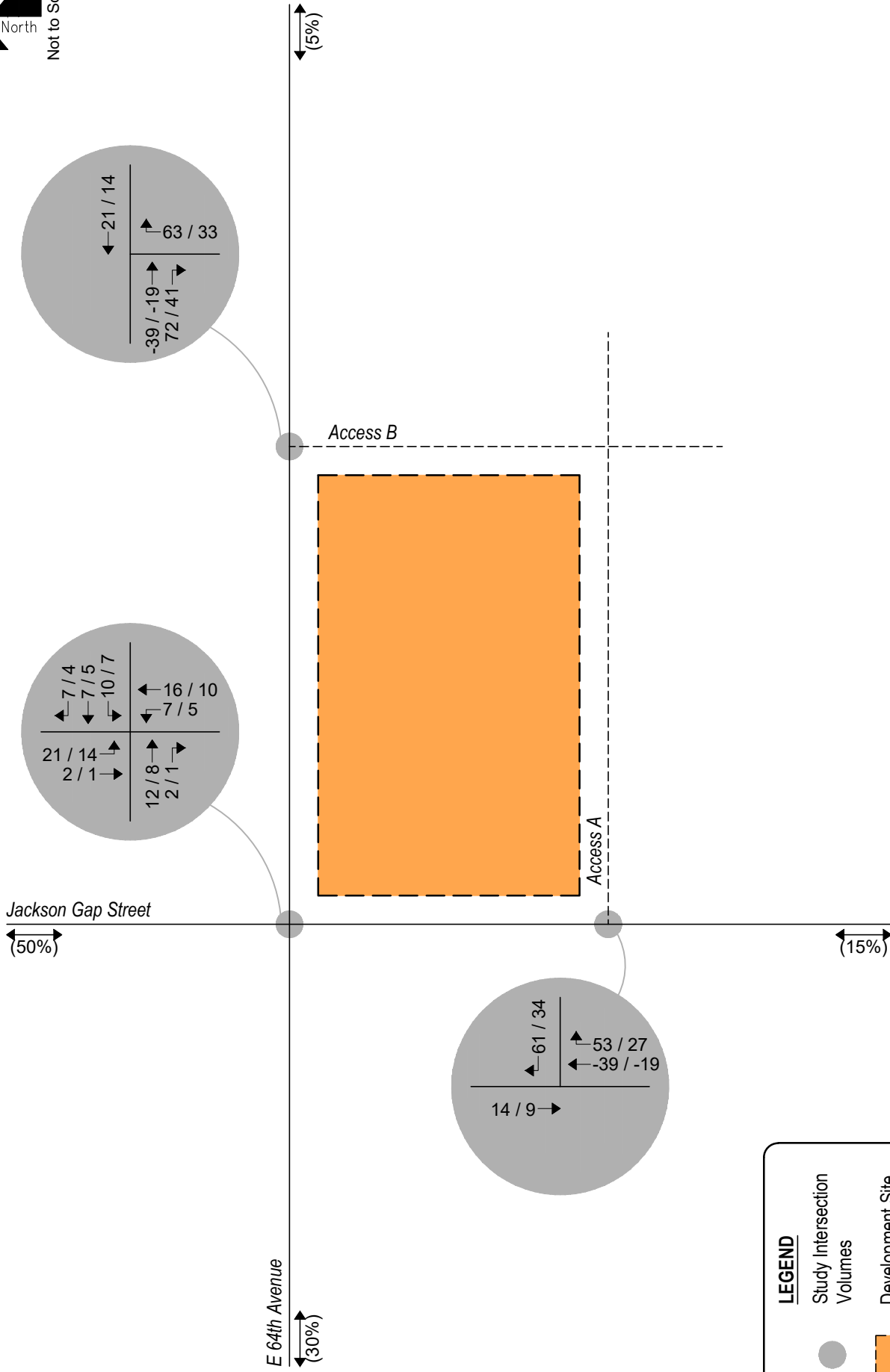


Figure 3
SITE DEVELOPMENT DISTRIBUTION
(%) : Overall
SITE-GENERATED
AM / PM Peak Hour
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Development Impacts

As Table 3 and Figure 3 show, there is an increase in peak hour traffic volumes anticipated for the proposed development. These volumes are expected to have a potential impact for when signalization at the intersection of Jackson Gap Street and E 64th Avenue may be warranted.

Total Traffic Signal Warrant – Year 2025

For purposes of this study, it is anticipated that development construction would be completed by end of Year 2025. In order to conduct a signal warrant analysis for Year 2025 total traffic conditions, traffic volumes were obtained from the Porteos PA 9A/9C Transportation Impact Study. Short-term total volumes were obtained from the reference study which also accounts for projected trips from future developments in the area. These volumes were then added to the site-generated trips for this development in order to project Year 2025 total traffic volumes for the Jackson Gap Street and E 64th Avenue intersection.

These total volumes were then used to conduct a signal warrant analysis for the Jackson Gap Street and E 64th Avenue intersection in order to review potential for traffic signal control. Analysis results conclude that the intersection was found to be above the minimum vehicle volumes required to meet Warrant 3 – Peak Hour, from the Manual on Uniform Traffic Control Devices (MUTCD)², for the installation of a traffic signal. Warrant study worksheets are provided for reference in Attachment A.

Warrant 3 is intended for use at locations where traffic conditions are such that for a minimum of one hour on an average day, the minor-street (E 64th Avenue) traffic suffers undue delay when entering or crossing the major street (Jackson Gap Street). This assumption provides for a conservative analysis. Said intersection should be monitored further by City Staff as area development occurs to determine when signalization installation is appropriate.

² Manual on Uniform Traffic Control Devices, 2009 Edition, Federal Highway Administration, May 2012.

Conclusion

This analysis assessed traffic generation for the Nick's Convenience – Jackson Gap development, provided a traffic volume comparison to previous land use assumptions approved for the development site, and considered potential impacts to the adjacent roadway network.

It is our professional opinion that the proposed site-generated traffic is expected to create minimal negative impact to traffic operations for the surrounding roadway network and proposed site accesses, as well as at the Jackson Gap Street intersection with E 64th Avenue. Signal warrant analysis concludes that a traffic signal is warranted at the Jackson Gap Street and E 64th Avenue intersection under projected Year 2025 total traffic conditions.

We trust that our findings will assist in the planning and approval of the Nick's Convenience - Jackson Gap development. Please contact us should further assistance be needed.

Sincerely,

SM ROCHA, LLC

Traffic and Transportation Consultants



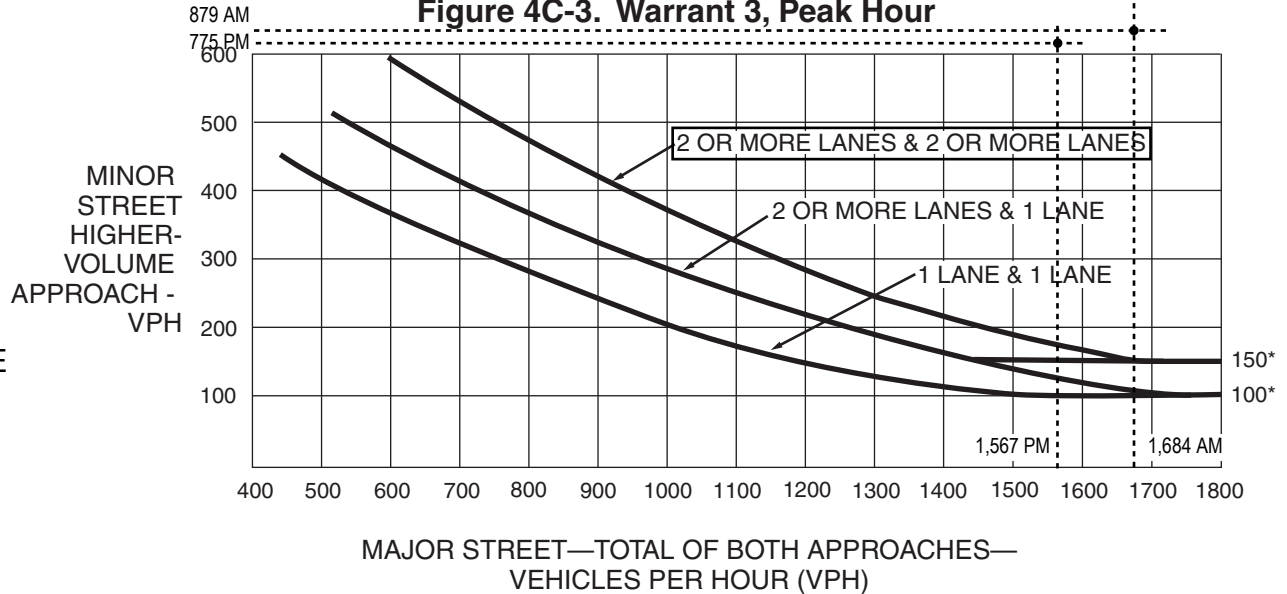
Megan Bock, EIT
Traffic Engineer



Fred Lantz, PE
Traffic Engineer

ATTACHMENT A

Warrant Analysis Forms

Figure 4C-3. Warrant 3, Peak Hour

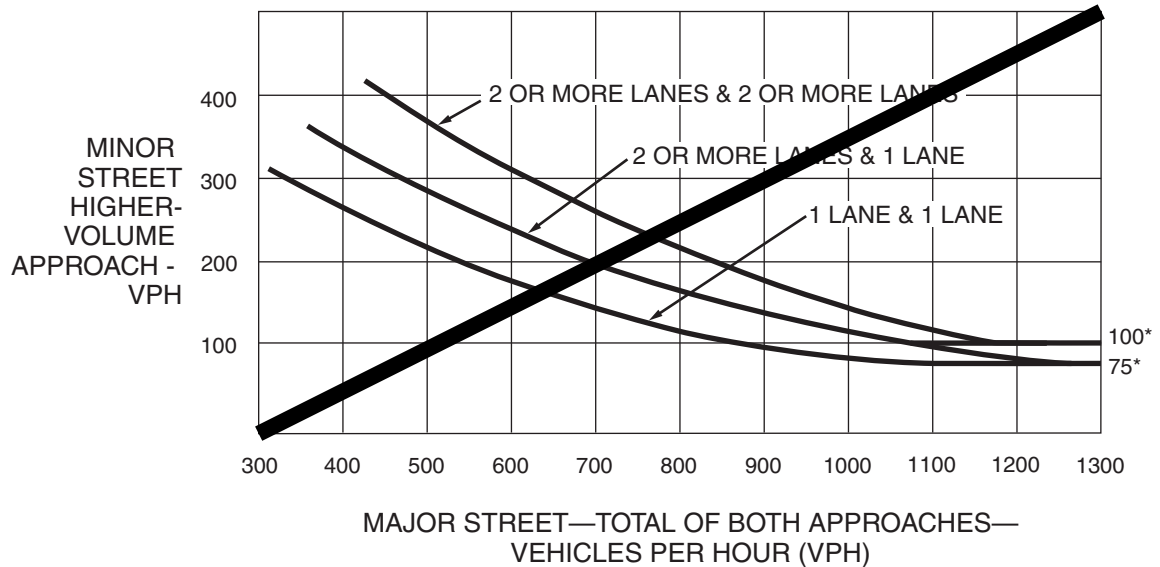
*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

JACKSON GAP STREET (40 MPH)

Note: 100% right turn reduction applied along Jackson Gap Street.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.