



The purpose of this study was to determine the number of additional trips that would be generated by the respective phases of the proposed Midway USA development, evaluate the impact on the operating conditions for the adjacent roadways, and determine the ability of motorists to safely enter and exit the site. If necessary, roadway improvements (lane additions and/or traffic control modifications) would be recommended to mitigate the impact of the development and to accommodate the additional traffic. The focus of this study was the morning and afternoon peak hours of a typical weekday.

CBB discussed the scope of work for this traffic study with Boone County and the Missouri Department of Transportation (MoDOT) at the commencement of the traffic study process. CBB also provided Boone County and MoDOT a Technical Memo summarizing the proposed site trip generation and directional distribution estimates and gained their consensus on the assumptions prior to completing the traffic analyses.

As requested, the following intersections were included in the study:

- I-70 and Highway 40 interchange;
- I-70 and Route J interchange;
- Highway 40 and Route J; and
- The proposed Midway USA driveways along Highway 40 and Route J.

The following analysis scenarios were considered:

- 2019 Existing Conditions;
- 2019 Build Conditions (Existing plus Phase 1 Trips);
- 2029 No-Build Conditions (Existing plus 10 years of background growth); and
- 2029 Build Conditions (2029 No-Build plus Midway USA build-out trips).

The following report presents the methodology and findings relative to the Existing, 2019 Build and 2029 Design Year conditions.



EXISTING CONDITIONS

Area Roadway System: **Highway 40** is an east-west, two-lane Minor Arterial (MoDOT Functional Classification Map) maintained by MoDOT. Highway 40 is approximately 24 feet wide with 12-foot soft gravel shoulders and ditch drainage. Sidewalks are not provided along the roadway. The posted speed limit on Highway 40 is 60 miles per hour (mph). Highway 40 provides access to I-70 and Columbia, Missouri to the east of the study area and access to Rocheport, Fayette and Boonville to the west. The intersection of North Sermon Road/North Rollingwood Boulevard is the only intersection along Highway 40 within the study area that has separate turn lanes provided on Highway 40. The I-70 off ramps at Highway 40 are stop controlled except for the westbound I-70 off ramp right-turn which operates under yield control. **Figure 3** provides an aerial view of the Highway 40 and I-70 interchange.



Figure 3: Highway 40 and I-70 Interchange

Route J is a north-south, two-lane Major Collector (MoDOT Functional Classification Map) maintained by MoDOT. Route J is approximately 20 feet wide with ditch drainage. Shoulders and sidewalks are not provided along the roadway. The posted speed limit on Route J is 55 mph. Route J is side-street stop controlled at the intersection with Highway 40. **Figure 4** provides an aerial view of the Highway 40 and Route J intersection.



Figure 4: Highway 40 and Route J Intersection

Route J provides access to Woodlandville and Harrisburg north of Highway 40, while providing access to I-70 approximately one mile to the south of Highway 40. South of the interchange with I-70, Route J changes names to Route O. Route J remains one lane in each direction at the interchange with I-70. The I-70 off ramps at Route J are stop controlled. **Figure 5** provides an aerial view of the Route J and I-70 Interchange.

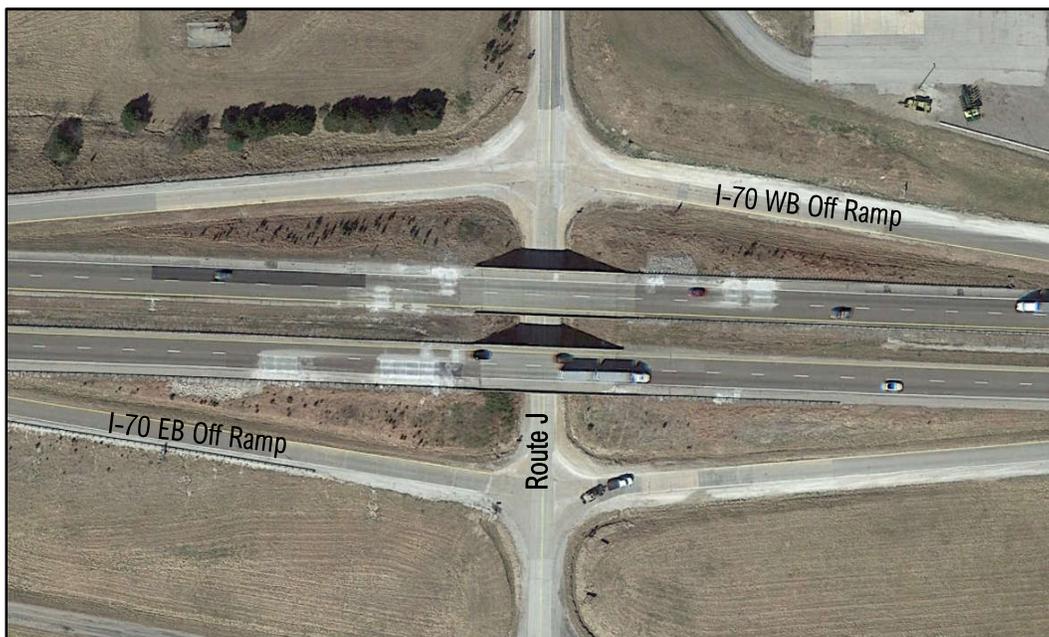


Figure 5: Route J and I-70 Interchange



Based on field observations of the roadway conditions at the I-70 and Route J interchange, it is apparent that vehicles are tracking on the shoulders when completing their turns. As such, the shoulders at the intersections of the ramps with Route J need repair. It would be desirable to provide reinforced shoulders that could stand up to the traffic, and or, to improve the corner radii.

It is our understanding that MoDOT has a project to add shoulders to Route J within the study area with construction expected to begin in 2021.

Existing Traffic Volumes: Video, turning movement traffic counts were conducted at the following intersections during the morning (7:00-9:00 a.m.) and evening (4:00-6:00 p.m.) peak periods.

- Highway 40 and Eastbound I-70 Ramps;
- Highway 40 and Westbound I-70 Ramps;
- Route J and Eastbound I-70 Ramps; and
- Route J and Westbound I-70 Ramps.

Additionally, a 14-hour traffic count was collected at Highway 40 and Route J. A weekday AM and PM peak period traffic count was also performed at the intersection of Route UU and West Van Horn Tavern Road to determine the existing trip levels for the Midway USA facility.

The counts were conducted the third week of August 2019. Both the University of Columbia and the Columbia public schools academic calendars were reviewed to ensure the data was collected during normal school operations. Additionally, the counts were not collected during bad weather days.

To better understand the existing truck traffic in the area, the number of trucks was also counted at each study intersection in order to reflect the percent trucks in the analyses. Based on the counts, the weekday AM peak hour occurred from 7:00 to 8:00 a.m. and the weekday PM peak hour occurred from 5:00 to 6:00 p.m. The existing peak hour traffic volumes are summarized in **Exhibit 1**.

Given the traffic characteristics in the area and the anticipated trip generation for the proposed development, the weekday peak periods identified would represent a “worst-case scenario” with regards to the traffic impact. If traffic operations are acceptable during these weekday peak hours, it can be reasoned that conditions would be acceptable throughout the remainder of the day.

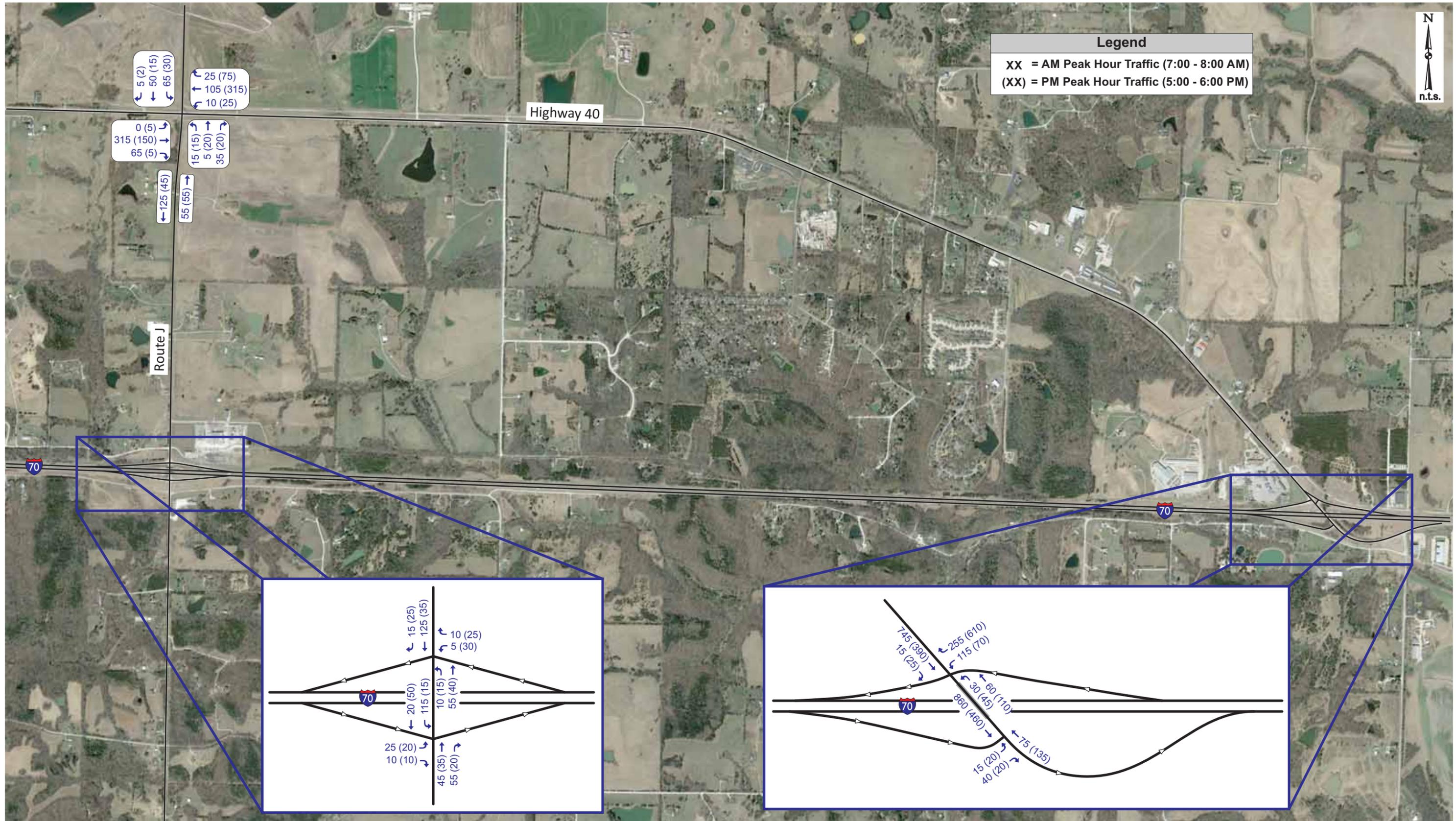


Exhibit 1: 2019 Existing Traffic Volumes



PROPOSED SITE

Proposed Land Use: The existing Midway USA facility has outgrown its current facility located in the northeast quadrant of Highway UU and Van Horn Tavern Road. As a result, Midway USA is proposing to relocate and expand their operations at a new site located in the southeast quadrant of Highway 40 and Route J.

It is our understanding the proposed relocation and expansion of the Midway USA facility could take several years to build out. Currently, only the initial Phase I development is proposed which would consist of 300,000 square feet of warehouse space with one access drive on Route J. It is anticipated that the Midway USA facility would be relocated from its existing location at Route UU and West Van Horn Tavern Road to this new location in the next 10 years. Upon full build-out, it is estimated that the site will consist of a total of 1,000,000 square feet of warehouse/distribution space, 100,000 square feet of light industrial, and 150,000 square feet of office space with up to 1,200 employees. Upon full build-out of the Midway USA facility, access for the site is proposed via two drives on Route J and one drive on Highway 40.

Site Access: As shown on the site plan in **Figure 2**, the Phase I Midway development would be served via one access drive on Route J approximately 2,275 feet south of Highway 40.

Upon full build-out the Midway USA facility, primary access would be provided via one drive on Highway 40 approximately 1,300 feet east of Route J and one additional access drive on Route J approximately 1,300 feet south of Highway 40. The access for Phase I would be used primarily as a truck access upon build-out the Midway USA facility.

Intersection Sight Distance: Intersection sight distance provides a sufficient view of the intersecting roadway so that the side-street vehicle can decide when to enter or cross the roadway. MoDOT's sight distance criteria is based on the "Green Book" methodology, which incorporates the design speed of the major road and the required gap time for a minor road vehicle to enter or cross the major road, to define the minimum safe distance for entrance visibility.

$$\text{Intersection Sight Distance (ISD)} = 1.47 * \text{Design Speed (mph)} * \text{Minimum Gap (seconds)}.$$

The intersection sight distance calculation uses the design speed to serve as a "safety cushion". The design speed is generally assumed to be the posted speed limit plus five mph, unless detailed speed study data is available. Highway 40 has a posted speed limit of 60 mph; therefore the design speed was assumed to be 65 miles per hour. Route J has a posted speed limit of 55 mph; therefore the design speed was assumed to be 60 miles per hour.

The minimum acceptable gap time for a passenger car is typically assumed to be 7.5 seconds plus 0.5 seconds for each additional lane. The minimum acceptable gap time for a



combination truck is typically assumed to be 11.5 seconds plus 0.7 seconds for each additional lane.

A mainline left-turn lane is not warranted on Route J at the driveways, so the minimum gap for the Route J entrances is 7.5 seconds for a passenger vehicle and 11.5 seconds for a combination truck. A mainline westbound left-turn lane is warranted at the driveway on Highway 40, so the minimum gap for the Highway 40 entrance is 8.0 seconds for a passenger vehicle and 12.2 seconds for a combination truck.

Therefore, the minimum sight distance at the Highway 40 entrance for a truck is 1,170 feet and 765 feet for a passenger vehicle. The minimum sight distance at the Route J entrances for a truck is 1,015 feet and 665 feet for a passenger vehicle.

The MoDOT methodology assumes the driver's eye of a passenger vehicle stopped on the side-street (Site Entrance) is 3.5 feet above the roadway surface and should see an object height of 3.5 feet above the surface on the intersecting roadway (Highway 40 or Route J). The MoDOT methodology assumes the driver's eye of a truck stopped on the side-street (Site Entrance) is 7.6 feet above the roadway surface and should see an object height of 3.5 feet above the surface on the intersecting roadway (Highway 40 or Route J). The location of the driver's eye on the side-street (Site Entrance) is located approximately 12 feet from the traveled roadway and three foot off set from the centerline of the entrance.

It is our understanding that Crockett Engineering is reviewing the sight distance at the proposed access points and is providing that information directly to MoDOT and the County. CBB did not review or measure the sight distance in the field.

Careful consideration should be given to sight distance obstructions when planning future aesthetics enhancements, such as signs, berms, fencing and landscaping, to ensure that these improvements do not obstruct the view of entering and exiting traffic at the site drives on Sinclair Road. It is generally recommended that all improvements wider than two inches (posts, tree trunks, etc.) and higher than 3.5 feet above the elevation of the nearest pavement edge be held back at least 20 feet from the traveled roadway.

Existing Trip Generation: The proposed development is unique, in that, there is an existing facility already in operation. As a result, manual traffic counts were collected at the intersection of Route UU and West Van Horn Tavern Road to determine the actual trip generation rate for the existing Midway USA facility based on the current number of employees.

Based on the existing AM and PM peak hour traffic counts and the current employment level at 346 employees at the time of the traffic count, the existing Midway USA site generates 0.50 trips per employee (97% inbound 3% outbound) during the AM peak hour and 0.54 trips



per employee (14% inbound 86% outbound) during the PM peak hour. **Table 1** summarizes the current trip generation for the existing facility.

Table 1: Existing Trip Generation – Midway USA

Land Use	Size	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Midway USA Passenger Vehicles	346 employees	171	4	175	24	162	186
Midway USA Trucks		1	0	1	1	1	2
Total Midway USA Trips ¹		172	4	176	25	163	188
Existing Trip Rate		97% In	3% Out	0.51	14% In	86% Out	0.54

¹ Trip Rate based on current manual count at existing location

Midway USA Phase I Trip Generation: Phase I of the Midway USA development would consist of a 300,000 square foot warehouse building. The current logistics employees at Midway USA will be relocated to this new warehouse. Based on data provided by Midway USA, there are currently 200 part-time/full-time employees that work four-hour blocks as follows:

- Block 1 - 6:00 a.m. - 10:00 a.m.
- Block 2 - 10:30 a.m. - 2:30 p.m.
- Block 3 - 3:00 p.m. - 7:00 p.m.
- Block 4 - 7:30 p.m. - 11:30 p.m.

On a typical Monday through Friday the following logistics employees would be arriving and leaving the new warehouse (Phase I):

- 6:00 a.m. - 49 logistics employees arrive
- 10:30 a.m. - 17 logistics employees arrive
- 2:30 p.m. - 66 logistics employees *leave*
- 3:00 p.m. - 49 logistics employees arrive
- 7:00 p.m. - 13 logistics employees *leave*
- 11:30 p.m. - 36 logistics employees *leave*

Given the existing peak hours identified of 7:00 to 8:00 a.m. and 5:00 to 6:00 p.m., there would be minimal, if any, additional traffic in the AM and PM peak hours associated with the new Phase I warehouse building. The greatest impact, though still light, would be between the hours of 2:00 and 3:00 p.m. when 66 employees leave and 49 employees arrive.



For comparison purposes, traffic forecasts for the proposed 300,000 square-foot warehouse were based upon information provided in the latest edition of the *Trip Generation Manual*, published by the Institute of Transportation Engineers (ITE). This manual, which is a standard resource for transportation engineers, is based on a compilation of nationwide studies documenting the characteristics of various land uses. Estimates for the proposed warehouse were based upon Land Use: 150 - Warehouse. The number of trips that would be generated by a typical 300,000 square-foot warehouse building, based on ITE, are shown in **Table 2**.

Table 2: Trip Generation for Typical 300,000 SF Warehouse Building

Land Use	Size	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
ITE Land Use 150: Warehouse	300,000 ft ²	45	15	60	15	50	65

In an effort to provide a conservative analysis, the trip generation based on the ITE data will be used for the typical weekday AM and PM peak hours for the Phase I scenario since the actual trips associated with Phase I of the Midway USA warehouse would be minimal, if any, during the typical weekday AM and PM peak hours.

Midway USA Full Build-Out Trip Generation: The full build out of the Midway USA facility is anticipated to reach up to 1,200 total employees. Based on the unique land use, the future trip generation for the Midway USA expansion was estimated based on a linear growth of trips related to the number of employees (i.e. the trip rate discussed previously).

The number of trips that would be generated by the full build-out of the Midway USA site is shown in **Table 3**. Since the full build out of the site is unknown at this time but thought to be in the next 10 to 20 years, it was assumed that the build out would occur over the next 10-year design horizon (2029). The full build out for the Midway USA facility correlates to an estimated 610 trips during the AM peak hour and 648 trips during the PM peak hour which is approximately 434 more trips in the AM peak hour and 460 more trips in the PM peak hour when compared to the existing Midway USA facility (346 employees).

Note that no reductions in traffic were made to account for the relocation of the Midway USA facility since it is likely that the existing Midway USA site will be reoccupied at some point in the future.



Table 3: Trip Generation for Full Build Out of Midway USA Facility (1,200 Employees)

Land Use	Size	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Midway USA Passenger Vehicles	1,200 employees	585	20	605	90	550	640
Midway USA Trucks		5	5	10	5	5	10
Total Midway USA Trips ¹		590	25	615	95	555	650
Increase in Midway USA traffic over 2019 levels		+418	+21	+439	+70	+392	+462

¹ Trip Rate based on current manual count at existing location

Trip Distribution: The site-generated trips were then assigned into and out of the proposed site based upon the estimated directional distribution. Based on the current traffic patterns near the existing facility, as well as employee origin information from Midway USA, it is anticipated that the distribution of site-generated trips would be as summarized in **Table 4**.

Table 4: Trip Distribution Assumptions – Midway USA

Land Use	Trip Distribution Assumptions
To/from the west/north on Highway 40	20%
To/from the west on I-70	5%
To/from the east on I-70	65%
To/from the south/east on Route UU	5%
To/from the south/east on Route J/Route O	5%

The Midway USA Phase I site-generated trips for the weekday AM and PM peak hours are shown in **Exhibit 2**. The full build out of the Midway USA site-generated trips are shown in **Exhibit 3** for the weekday AM and PM peak hours.

2019 Build Traffic Volumes (Existing plus Midway Phase I): The assigned traffic volumes resulting from the trip distribution for the proposed Midway Phase I development (Exhibit 2) were added to the Existing traffic volumes (Exhibit 1) to determine the total volumes in the forecasted scenario. The forecasted, 2019 Build, traffic volumes for the weekday AM and PM peak hours are shown in **Exhibit 4**.

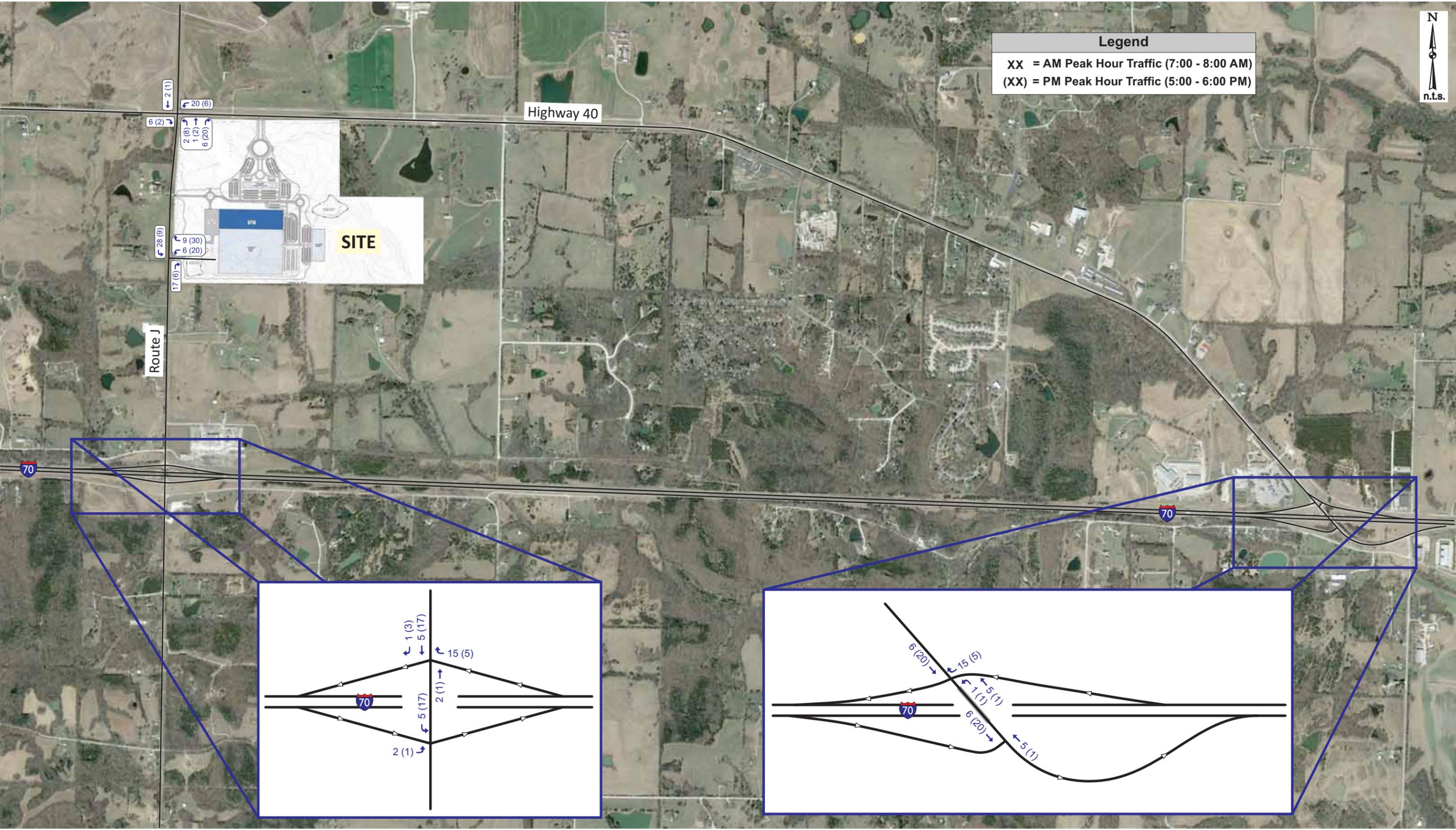


Exhibit 2: Phase 1 Midway USA Trips

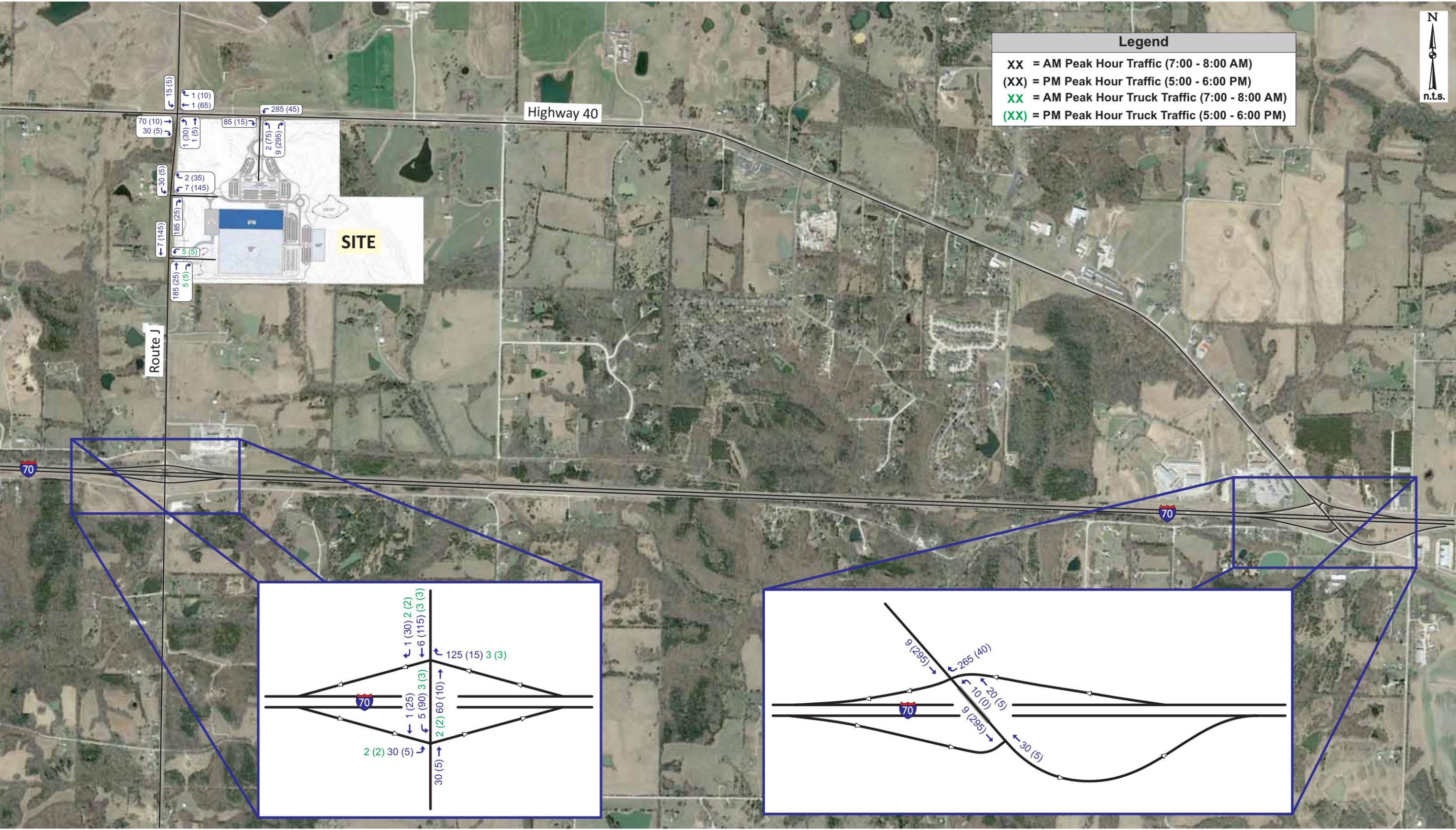


Exhibit 3: Build-Out Midway USA Trips

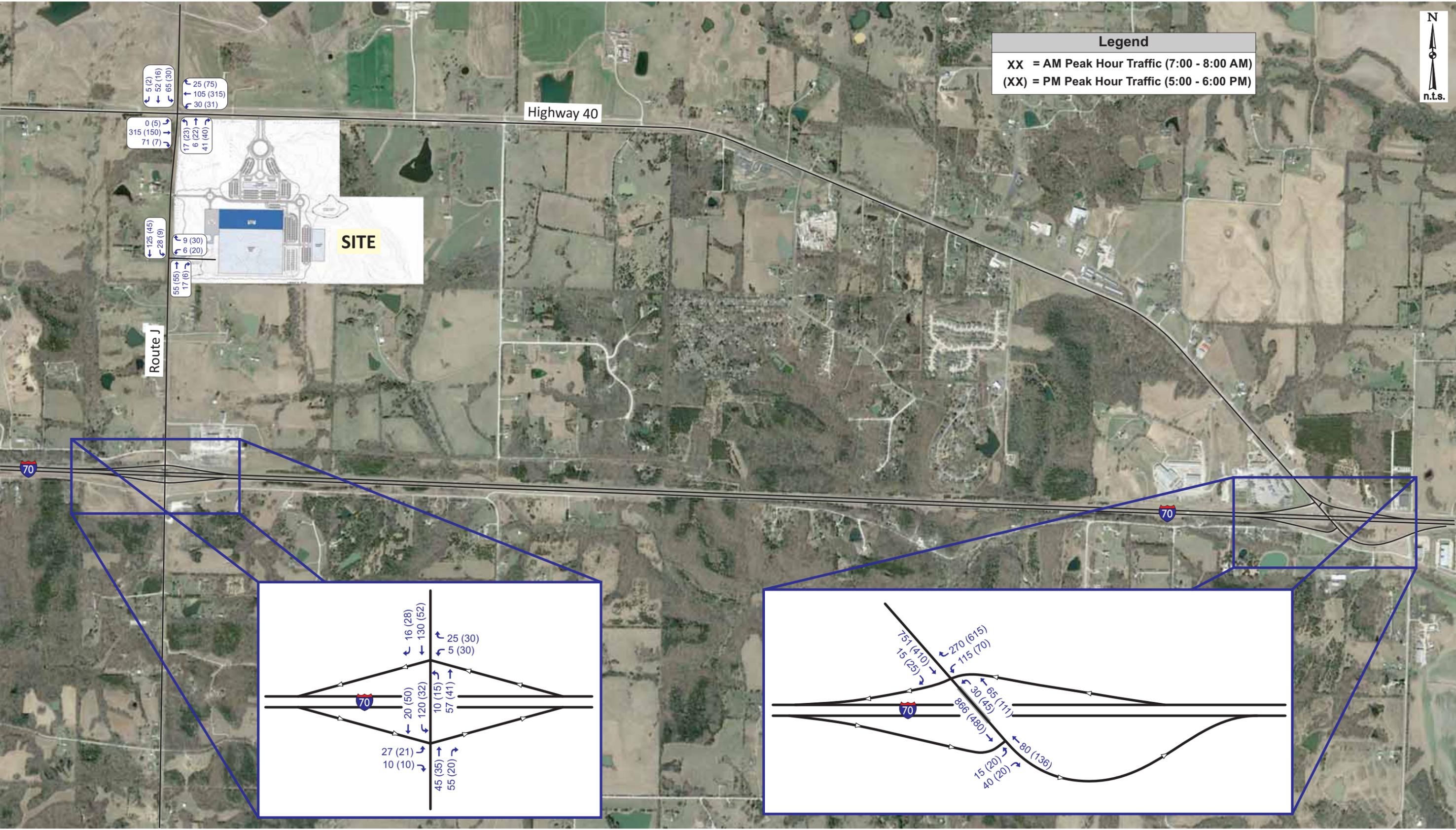


Exhibit 4: 2019 Build (Phase 1) Traffic Volumes



2019 TRAFFIC ANALYSIS

Auxiliary Turn Lane Needs – Existing Conditions: The need for separate auxiliary turn lanes on Highway 40 and Route J were evaluated using MoDOT’s Access Management Guidelines (AMG). These guidelines consider auxiliary lanes an asset in promoting safety and improved traffic flow at relatively high conflict locations. Separate turn lanes are intended to remove turning vehicles from the through lanes to reduce the potential number of rear-end collisions at intersections. The MoDOT method provides volume guidelines for the consideration of separate turn lanes by comparing the total advancing volume (which includes all turning traffic) to the number of right and left-turns during the design hour with respect to a given major road speed.

Utilizing MoDOT’s AMG *Right-Turn Lane Guideline for Two-lane Roadway* nomograph, separate eastbound and westbound right-turn lanes are warranted on Highway 40 at Route J. With a posted speed of 60 mph, a mere 10 to 20 right-turns per hour would exceed the volume guidelines. **Figures 6 and 7** graphically illustrate the right-turn evaluation utilizing the 2019 Existing traffic volumes on Highway 40 at Route J. These right-turn lanes are warranted with or without the Midway USA development.

As shown later in this report the existing operating conditions at the study intersections are highly desirable with adequate capacity without the ‘warranted’ auxiliary right-turn lanes.

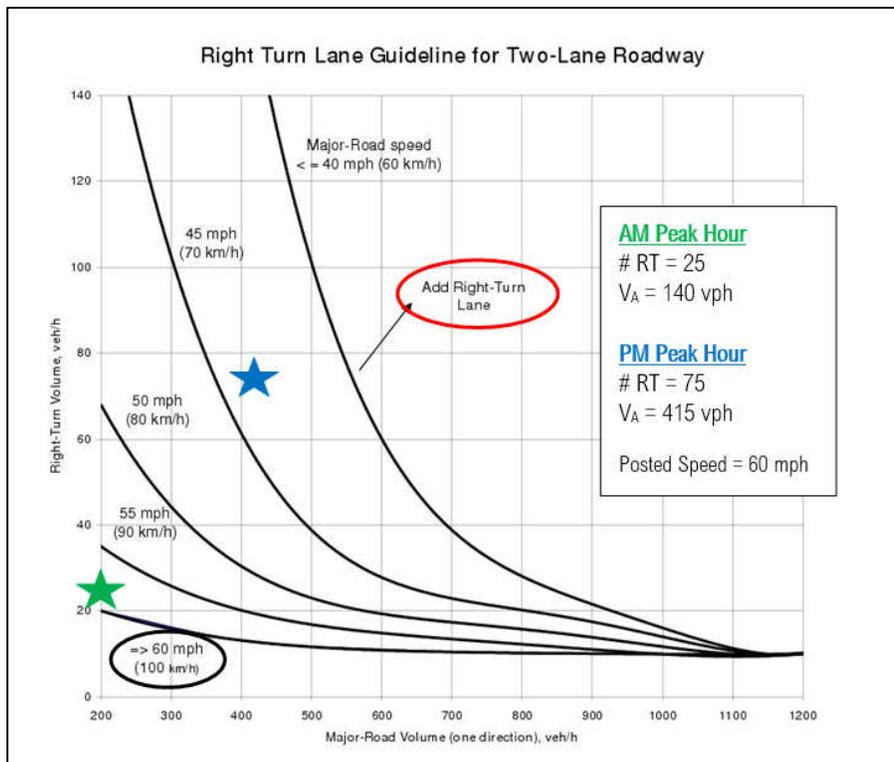


Figure 6: 2019 Existing Right-Turn Lane Warrant – Westbound Highway 40 at Route J

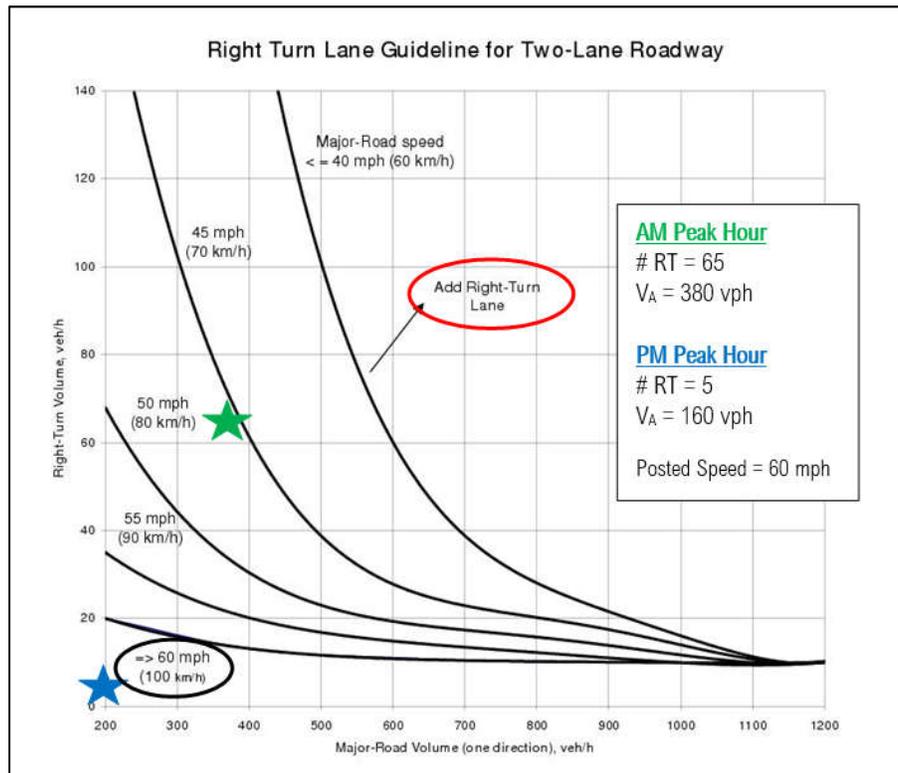


Figure 7: 2019 Existing Right-Turn Lane Warrant – Eastbound Highway 40 at Route J

2019 Build (Phase 1) Auxiliary Turn Lane Needs: The need for separate northbound and southbound auxiliary turn lanes on Route J at the proposed site drive were also evaluated using MoDOT’s AMG.

Utilizing MoDOT’s AMG *Right-Turn Lane Guideline for Two-lane Roadway* nomograph, a separate northbound right-turn lane is not warranted on Route J at the Phase I Midway drive. **Figure 8** graphically illustrates the right-turn evaluation utilizing the 2019 Phase I Build traffic volumes.

Utilizing MoDOT’s AMG *Left-Turn Lane Guideline for Two-lane Road* = 55 mph nomograph, a separate southbound left-turn lane is not warranted on Route J at the Phase I Midway drive. **Figure 9** graphically illustrates the left-turn evaluation utilizing the 2019 Phase I Build traffic volumes.

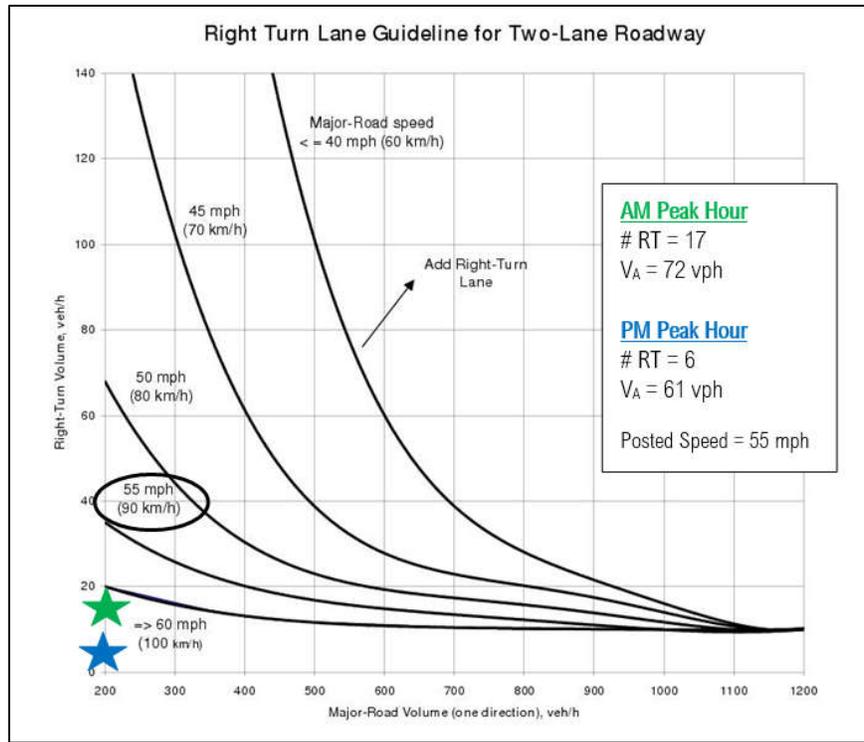


Figure 8: 2019 Phase I Build Right-Turn Lane Warrant – Northbound Route J at Midway Drive

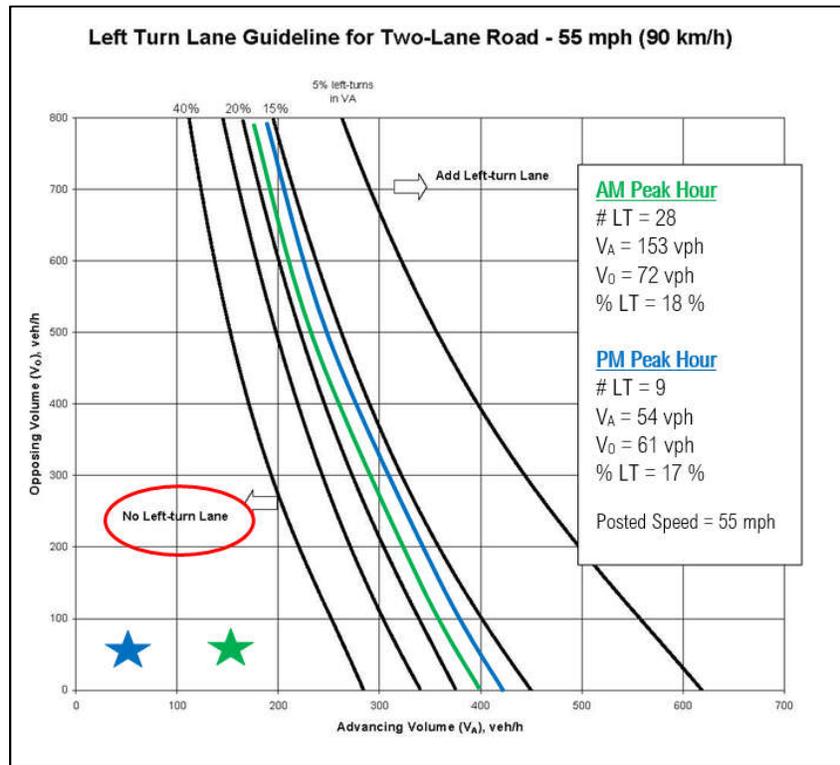


Figure 9: 2019 Phase I Build Left-Turn Lane Warrant – Southbound Route J at Midway Drive



The need for a separate westbound left-turn lane on Highway 40 at Route J was evaluated using MoDOT's AMG. Utilizing MoDOT's AMG *Left-Turn Lane Guideline for Two-lane Road ≥ 60 mph* nomograph, a separate westbound left-turn lane on Highway 40 at Route J is right on the line of being warranted. **Figure 10** graphically illustrates the left-turn evaluation utilizing the 2019 Phase I Build traffic volumes.

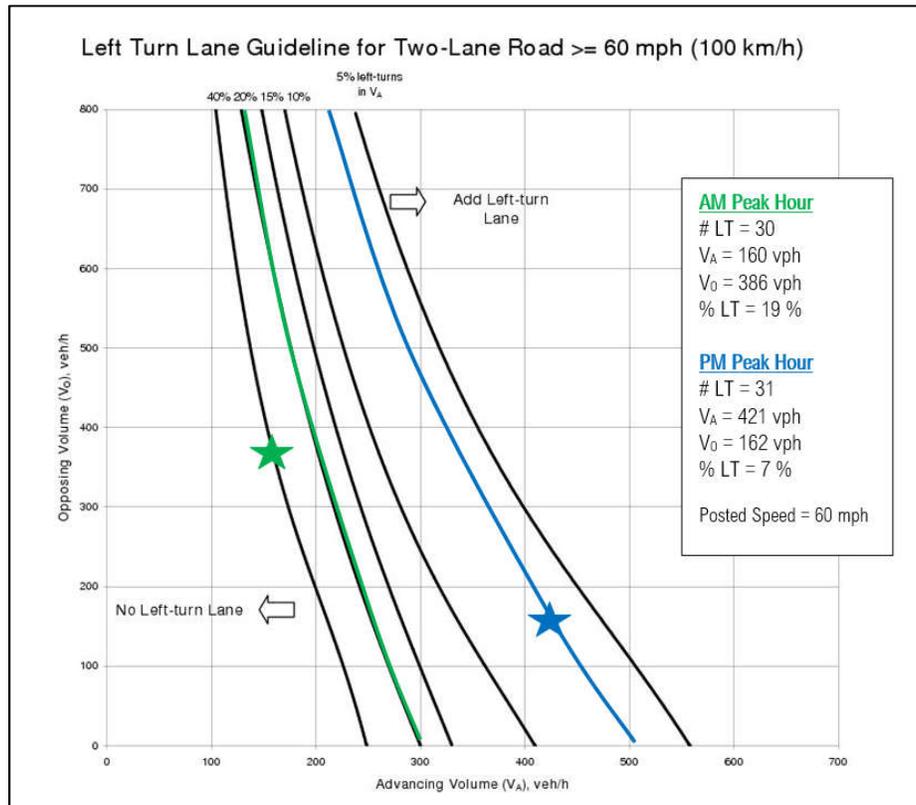


Figure 10: 2019 Phase I Build Left-Turn Lane Warrant – Westbound Highway 40 at Route J

Study Procedures: The Existing and 2019 Build (Phase I) operating conditions were analyzed using SYNCHRO 10, a macro-level analytical traffic flow model. SYNCHRO is based on study procedures outlined in the *Highway Capacity Manual*, published by the Transportation Research Board. This manual, which is used universally by traffic engineers to measure roadway capacity, establishes six levels of traffic service: Level A ("Free Flow"), to Level F ("Fully Saturated"). Levels of service (LOS) are measures of traffic flow, which consider such factors as speed, delay, traffic interruptions, safety, driver comfort, and convenience. Level C, which is normally used for highway design, represents a roadway with volumes ranging from 70% to 80% of its capacity. However, Level D is often considered acceptable for peak period conditions in urban and suburban areas.

The thresholds that define level of service at an intersection are based upon the type of control used (i.e., whether it is signalized or unsignalized) and the calculated delay. For signalized and all-way stop intersections, the average control delay per vehicle is estimated



for each movement and aggregated for each approach and then the intersection as a whole. At intersections with partial (side-street) stop control, delay is calculated for the minor movements only since motorists on the main road are not required to stop.

Level of service is directly related to control delay. At signalized intersections, the level of service criteria differ from that at unsignalized intersections primarily because varying transportation facilities create different driver expectations. The expectation is that a signalized intersection is designed to carry higher traffic volumes, and consequently may experience greater delay than an unsignalized intersection. **Table 5** summarizes the thresholds used in the analysis for signalized and unsignalized intersections.

Table 5: Level of Service Thresholds

LEVEL OF SERVICE (LOS)	CONTROL DELAY PER VEHICLE (SEC/VEH)	
	SIGNALIZED INTERSECTIONS	UNSIGNALIZED INTERSECTIONS
A	≤ 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

Existing and 2019 Build Operating Conditions: The study intersections were evaluated using the methodologies described above. **Table 6** summarizes the results of this analysis, which reflects the existing and 2019 Build (Phase 1) operating conditions and average delay for each of the study intersections during the weekday AM and PM peak hours. Although separate eastbound and westbound right-turn lanes are warranted on Highway 40 at Route J, they are not necessary from a capacity standpoint (i.e., the eastbound and westbound approaches operate freely), and as such, these additional right-turn lanes were not assumed in the 2019 analyses. Obviously, if the right-turn lanes were provided, the operating conditions reflected in **Table 6** for the respective movements would be slightly improved.

It is important to note that the actual truck percentages for each movement were used for the study intersections. Additionally, based on the existing traffic count of the Midway USA facility, the traffic movements in and out of Midway experience a relatively high concentration of traffic leaving and/or arriving within a short time period. As such, a peak hour factor (PHF) of 0.50 was used for the Midway USA site traffic in lieu of the default PHF of 0.92 commonly used.



Table 6: 2019 Operating Conditions

Intersection / Approach	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Existing Conditions	2019 Build Conditions	Existing Conditions	2019 Build Conditions
Highway 40 at Route J (Side-Street STOP)				
Eastbound Highway 40 Approach	A (<1.0)	A (<1.0)	A (<1.0)	A (<1.0)
Westbound Highway 40 Approach	A (<1.0)	A (<1.0)	A (<1.0)	A (<1.0)
Northbound Route J Approach	B (13.4)	B (14.2)	B (14.0)	B (14.1)
Southbound Route J Approach	C (19.8)	C (23.0)	C (16.6)	C (17.6)
Westbound I-70 Ramps at Route J (Side-Street STOP)				
Westbound I-70 Off-Ramp Approach	A (9.2)	A (9.0)	A (9.4)	A (9.5)
Northbound Route J Approach	A (1.2)	A (1.2)	A (2.1)	A (2.1)
Eastbound I-70 Ramps at Route J (Side-Street STOP)				
Eastbound I-70 Off-Ramp Approach	B (11.2)	B (11.4)	A (9.3)	A (9.5)
Southbound Route J Approach	A (6.6)	A (6.7)	A (1.8)	A (3.1)
Westbound I-70 Ramps at Highway 40 (Side-Street STOP)				
Westbound I-70 Off-Ramp Approach	C (24.0)	C (24.3)	C (18.6)	C (18.9)
Northbound Highway 40 Approach	A (3.7)	A (3.6)	A (2.7)	A (2.8)
Eastbound I-70 Off-Ramp at Highway 40 (Side-Street STOP)				
Eastbound I-70 Off-Ramp Approach	C (24.2)	C (24.5)	B (13.6)	B (13.9)
Route J at Midway USA South/Truck Drive (Side-Street STOP)				
Westbound Site Drive Approach	N/A	A (9.7)	N/A	A (9.4)
Southbound Route J Approach	N/A	A (2.3)	N/A	A (2.0)

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)

As shown in **Table 6**, all approaches of the study intersections currently operate at highly desirable levels and are expected to continue to operate at highly acceptable levels of service with negligible increases in delay for the majority of the movements following Phase 1 of the relocation of the Midway USA facility.

It should be noted that the westbound left-turn movement from the I-70 off ramp at Highway 40 currently operates at LOS F with 54 seconds of delay on average per vehicle during the AM peak hour due to the heavy southbound movement traveling to eastbound I-70, though the overall approach operates acceptably. Most of the westbound left-turns are vehicles oriented to the existing Midway USA facility. In order to provide a conservative analysis, the Midway USA Phase I trips were not reassigned from the existing site to the new site so there could



actually be a reduction in trips for the westbound left-turn movement from the I-70 off ramp following the Phase I Midway USA development.

In order to provide improved levels of service for the westbound left-turn movement exiting I-70 during the AM peak hour, a traffic signal or roundabout would be necessary. MoDOT typically requires that the traffic volumes at the intersection meet the minimum volume warrants outlined in the Manual on Uniform Traffic Control Devices (MUTCD), published by the Federal Highway Administration, United States Department of Transportation. Based on a review of the intersection of Highway 40 and the westbound I-70 ramp, the 2019 Build traffic volumes would not satisfy the minimum volume thresholds to warrant a traffic signal.

The existing and Phase I Build average delay of 54 seconds per vehicle for the westbound I-70 off ramp approach at Highway 40 is on the borderline of LOS E/F (i.e. delays less than 50 seconds equate to LOS E while delays over 50 seconds equate to LOS F). Additionally, the less than desirable levels of service would be isolated to the AM peak hour. As such, it is not recommended to install an unwarranted traffic signal at the intersection of Highway 40 with the westbound I-70 off ramp just to improve the delay during the AM peak.



10-YEAR DESIGN HORIZON

To determine the ability of the area road system to accommodate the long-term traffic demands, a 10-year traffic analysis was evaluated. Before analyzing the long-term impact of the proposed development, it was necessary to establish a baseline forecast to reflect the 10-year traffic conditions without the proposed development. To that end, a 2029 No-Build scenario was developed to evaluate baseline conditions and to provide a basis of comparison between the 2029 No-Build and 2029 Build conditions.

2029 No-Build Traffic Volumes: As agreed to in the Technical Memorandum, an annual growth rate of 1.0% for both Highway 40 and Route J within the study area was used. The 2029 No-Build traffic volumes apply a 1.0% annual growth rate to the existing traffic volumes for 10 years (or an approximate 10.5% overall growth). The 2029 No-Build traffic volumes are shown in **Exhibit 5** for the weekday AM and PM peak hours.

2029 Build Traffic Volumes: The assigned traffic volumes resulting from the trip distribution for the full build of the Midway USA relocation (Exhibit 3) were added to the 2029 No-Build traffic volumes (Exhibit 5) to determine the total volumes in the 10-year scenario. The 2029 Build traffic volumes for the weekday AM and PM peak hours are shown in **Exhibit 6**.

Auxiliary Turn Lane Needs – 2029 Build Conditions: The need for separate auxiliary turn lanes on Highway 40 and Route J were re-evaluated using MoDOT's Access Management Guidelines (AMG).

As previously shown in **Figures 6 and 7**, separate eastbound and westbound right-turn lanes are warranted on Highway 40 at Route J for the existing traffic volumes. With a posted speed of 60 mph, a mere 10 to 20 right-turns per hour would exceed the volume guidelines. While the Midway USA development would add little traffic to the right-turn movements, the eastbound and westbound right-turn lanes on Highway 40 at Route J are warranted with or without the Midway development.

The need for a separate westbound left-turn lane on Highway 40 at Route J was re-evaluated for the 2029 Build conditions since the left-turn lane was borderline warranted in the Phase I conditions. Utilizing MoDOT's AMG *Left-Turn Lane Guideline for Two-lane Road ≥ 60 mph* nomograph, a separate westbound left-turn lane on Highway 40 at Route J is warranted with the additional background traffic and Midway USA development. **Figure 11** graphically illustrates the left-turn evaluation utilizing the 2029 Build traffic volumes.

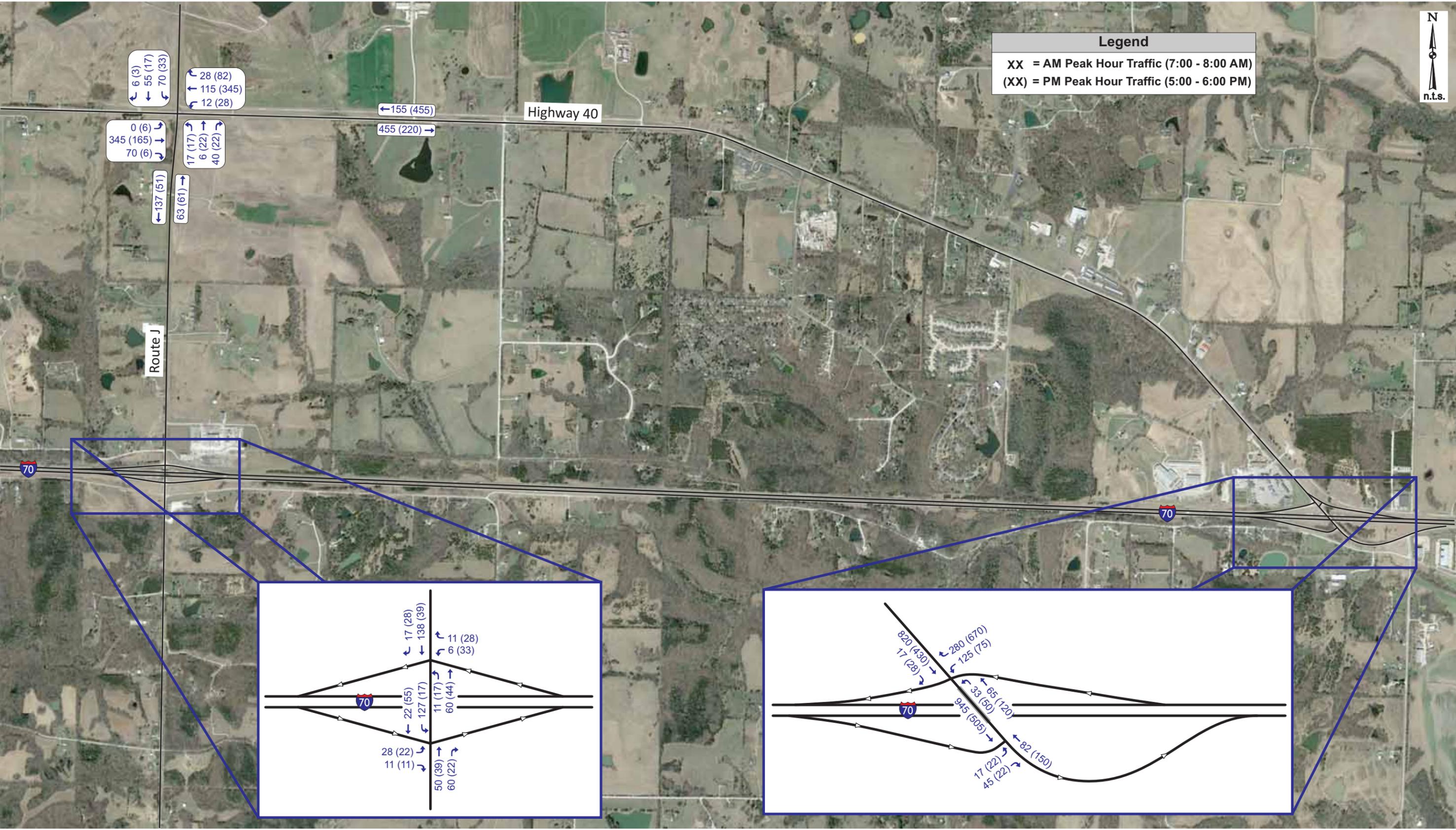


Exhibit 5: 2029 No-Build Traffic Volumes

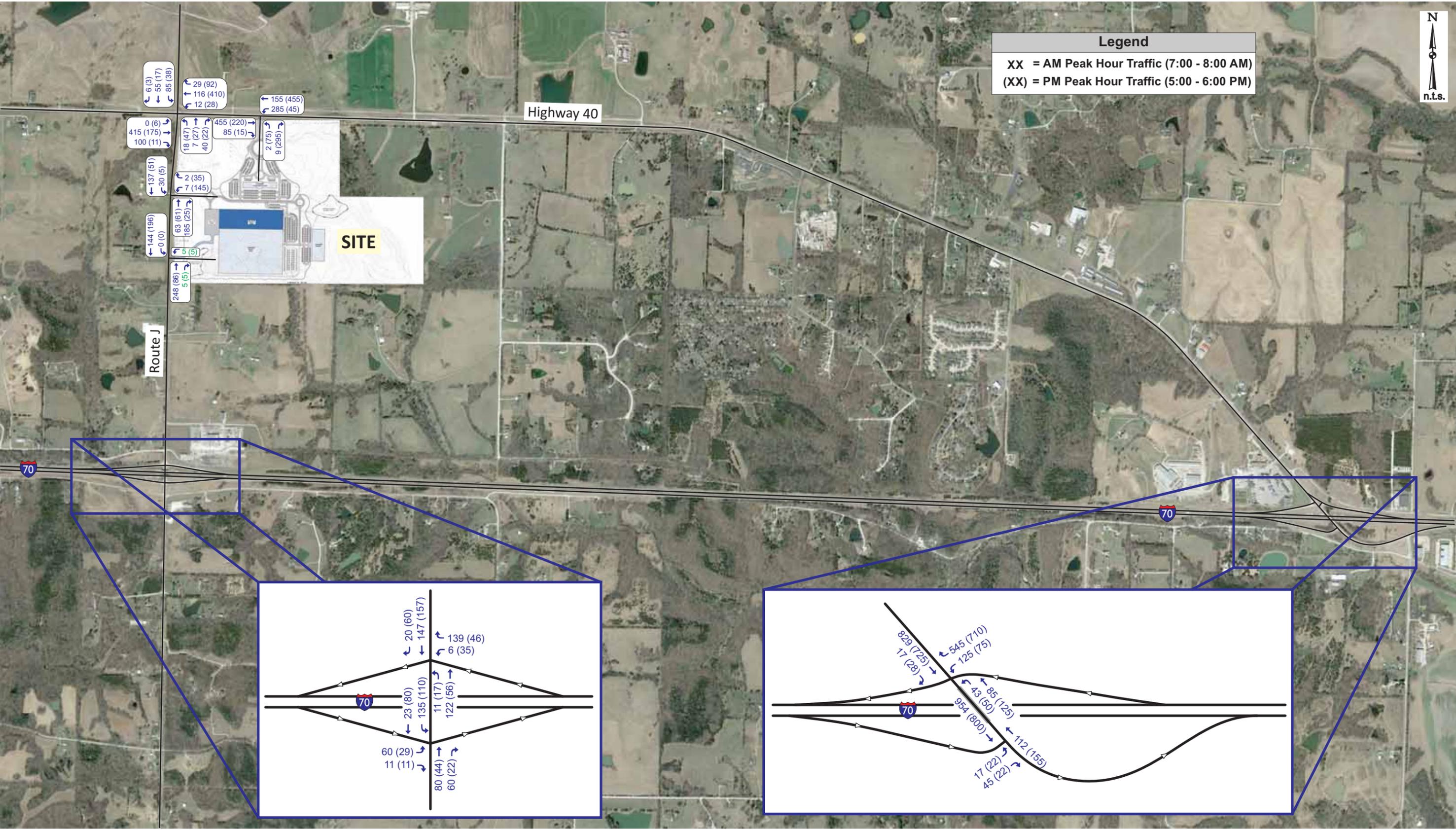


Exhibit 6: 2029 Build Traffic Volumes

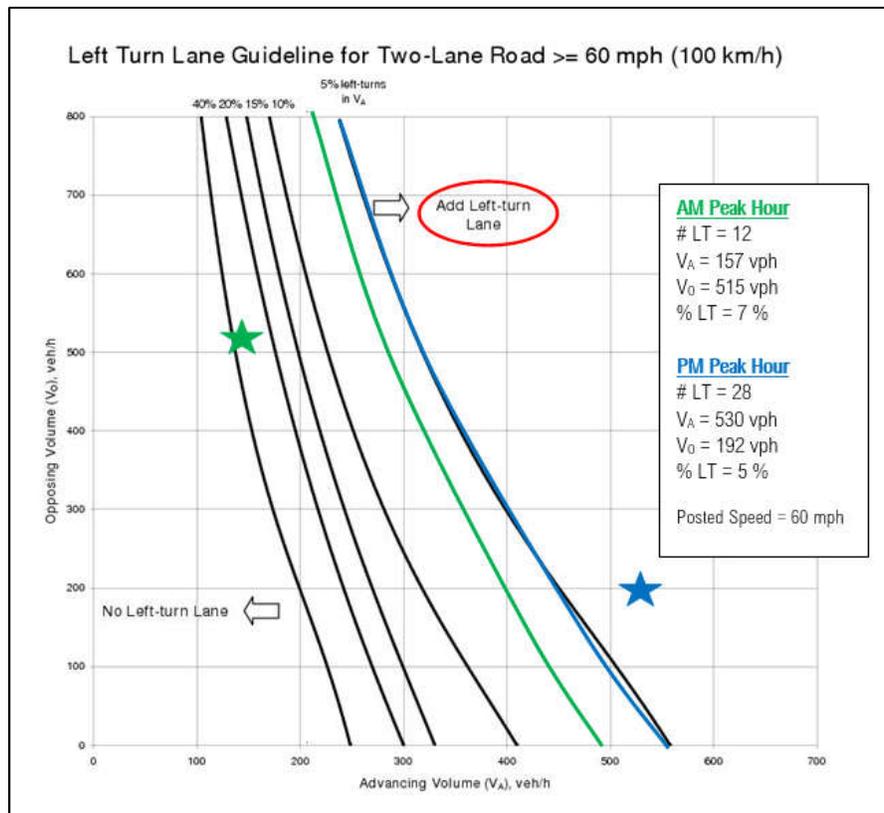


Figure 11: 2029 Build Left-Turn Lane Warrant – Westbound Highway 40 at Route J

The need for a separate eastbound left-turn lane on Highway 40 at Route J was not evaluated since left-turn volumes less than 10 vph do not require a separate left-turn lane.

The need for separate auxiliary turn lanes on Route J at the Midway USA north drive were evaluated using MoDOT’s AMG. Separate auxiliary turn lanes on Route J at the Midway USA south drive are not required, since the turn volumes are less than 10 vph.

Utilizing MoDOT’s AMG *Right-Turn Lane Guideline for Two-lane Roadway* nomograph, a separate northbound right-turn lane is warranted on Route J at the Midway USA north drive. **Figure 12** graphically illustrates the right-turn evaluation utilizing the 2029 Build traffic volumes.

Utilizing MoDOT’s AMG *Left-Turn Lane Guideline for Two-lane Road = 55 mph* nomograph, a separate southbound left-turn lane is not warranted on Route J at the Midway USA north drive. **Figure 13** graphically illustrates the left-turn evaluation utilizing the 2029 Build traffic volumes.

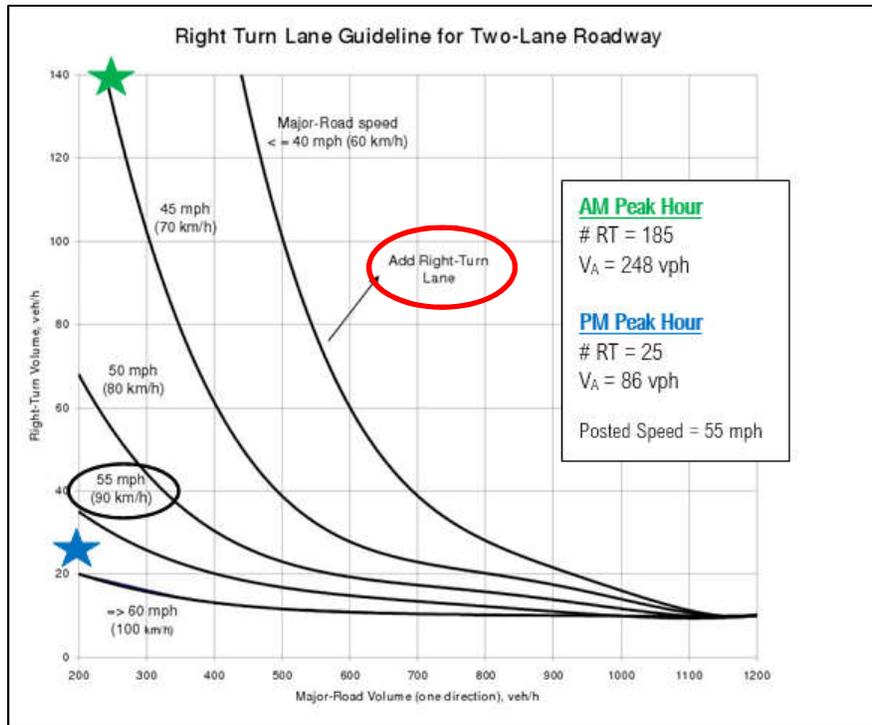


Figure 12: 2029 Build Right-Turn Lane Warrant – Northbound Route J at Midway Drive (North)

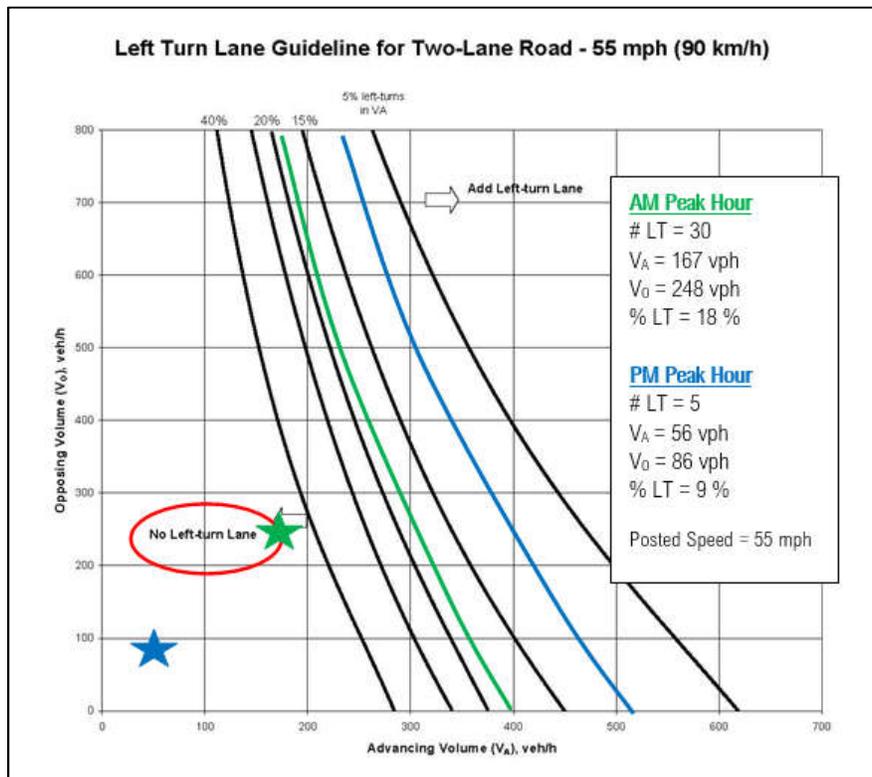


Figure 13: 2029 Build Left-Turn Lane Warrant – Southbound Route J at Midway Drive (North)



The need for separate auxiliary turn lanes on Highway 40 at the Midway USA drive were also evaluated using MoDOT's AMG.

Utilizing MoDOT's AMG *Right-Turn Lane Guideline for Two-lane Roadway* nomograph, a separate eastbound right-turn lane is warranted on Highway 40 at the Midway USA drive. **Figure 14** graphically illustrates the right-turn evaluation utilizing the 2029 Build traffic volumes.

Utilizing MoDOT's AMG *Left-Turn Lane Guideline for Two-lane Road* ≥ 60 mph nomograph, a separate westbound left-turn lane is warranted on Highway 40 at the Midway USA drive. **Figure 15** graphically illustrates the left-turn evaluation utilizing the 2029 Build traffic volumes.

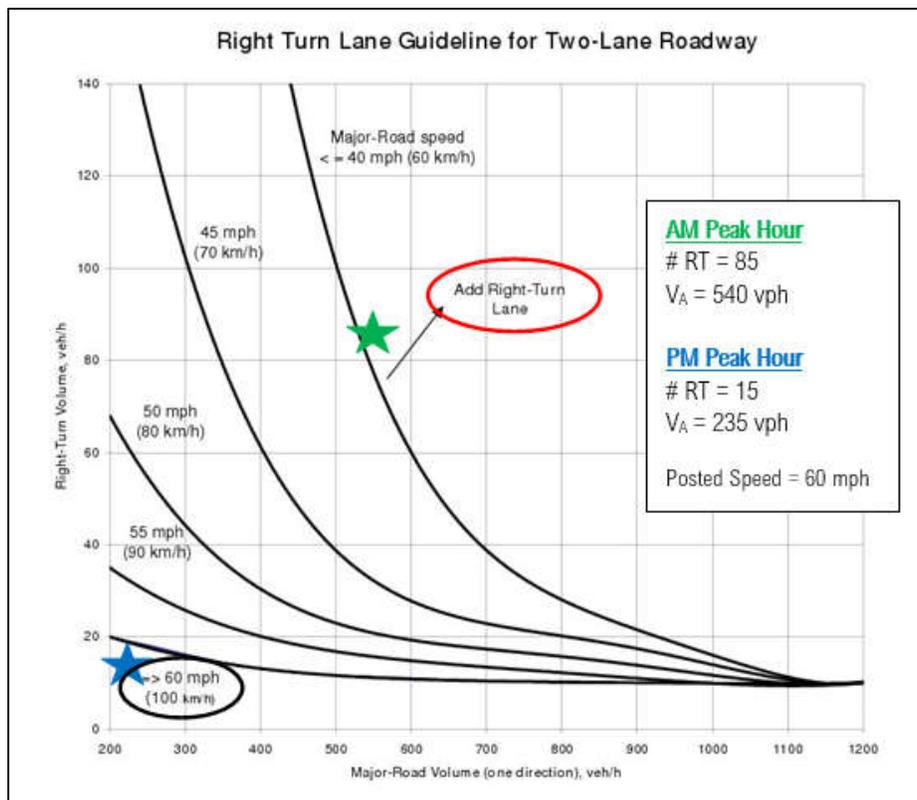


Figure 14: 2029 Build Right-Turn Lane Warrant – Eastbound Highway 40 at Midway USA Drive



Figure 15: 2029 Build Left-Turn Lane Warrant – Westbound Highway 40 at Midway USA Drive

2029 No-Build and Build Operating Conditions: The study intersections were re-evaluated using the 2029 No-Build and 2029 Build traffic volumes. **Table 7** summarizes the results of the 2029 No-Build and Build analysis. The following warranted auxiliary turn lanes are reflected in the 2029 Build analyses:

- A separate westbound left-turn lane on Highway 40 at the Midway USA drive;
- A separate eastbound right-turn lane on Highway 40 at the Midway USA drive;
- A separate northbound right-turn lane on Route J at the Midway USA north drive; and
- A separate westbound left-turn lane on Highway 40 at Route J.

As mentioned previously, although separate eastbound and westbound right-turn lanes are warranted on Highway 40 at Route J in the existing conditions, they are not necessary from a capacity standpoint (i.e., the eastbound and westbound approaches operate freely), and as such, these additional right-turn lanes were not assumed in the 2029 analyses.

The Midway USA site drive on Highway 40 was assumed to consist of two lanes exiting (i.e., separate left- and right-turn lanes). The Midway USA site drives on Route J were assumed to consist of one lane exiting.

As in the 2019 conditions, a PHF of 0.50 was used for the Midway USA site traffic in lieu of the default PHF of 0.92 commonly used.



Table 7: 2029 Operating Conditions

Intersection / Approach	Weekday AM Peak Hour		Weekday PM Peak Hour	
	2029 No Build Conditions	2029 Build Conditions	2029 No Build Conditions	2029 Build Conditions
Highway 40 at Route J (Side-Street STOP)				
Eastbound Highway 40 Approach	A (<1.0)	A (<1.0)	A (<1.0)	A (<1.0)
Westbound Highway 40 Approach	A (<1.0)	A (<1.0)	A (<1.0)	A (<1.0)
Northbound Route J Approach	B (14.5)	C (17.6)	C (15.2)	C (22.9)
Southbound Route J Approach	C (23.5)	E (41.2)	C (18.4)	C (23.1)
Westbound I-70 Ramps at Route J (Side-Street STOP)				
Westbound I-70 Off-Ramp Approach	A (9.3)	B (10.8)	A (9.5)	B (10.8)
Northbound Route J Approach	A (1.2)	A (<1.0)	A (2.1)	A (2.0)
Eastbound I-70 Ramps at Route J (Side-Street STOP)				
Eastbound I-70 Off-Ramp Approach	B (11.5)	B (14.5)	A (9.4)	B (13.2)
Southbound Route J Approach	A (6.7)	A (6.9)	A (1.9)	A (5.7)
Westbound I-70 Ramps at Highway 40 (Side-Street STOP)				
Westbound I-70 Off-Ramp Approach	E (36.3)	E (41.8)	C (23.3)	D (32.0)
Northbound Highway 40 Approach	A (3.9)	A (4.1)	A (2.9)	A (3.8)
Eastbound I-70 Off-Ramp at Highway 40 (Side-Street STOP)				
Eastbound I-70 Off-Ramp Approach	D (29.7)	D (30.9)	B (14.5)	D (27.9)
Highway 40 at Midway USA Drive (Side-Street STOP)				
Westbound Highway 40 Left-Turn	N/A	B (15.0)	N/A	A (8.0)
Northbound Site Drive Approach	N/A	D (32.4)	N/A	C (23.6)
Route J at Midway USA North Drive (Side-Street STOP)				
Westbound Site Drive Approach	N/A	B (10.5)	N/A	B (12.1)
Northbound Route J Approach	N/A	A (2.2)	N/A	A (1.2)
Route J at Midway USA South/Truck Drive (Side-Street STOP)				
Westbound Site Drive Approach	N/A	B (11.7)	N/A	B (13.5)
Southbound Route J Approach	N/A	A (<1.0)	N/A	A (<1.0)

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)

As shown in **Table 7**, all approaches of the study intersections are expected to operate at acceptable levels for the 2029 No-Build conditions and are expected to continue to operate at acceptable levels of service following the build out and relocation of the Midway USA facility with the exception of the southbound approach of Route J at Highway 40 which is forecasted



to operate at LOS E during the 2029 Build AM peak hour and the westbound I-70 off ramp approach at Highway 40 which is forecasted to operate at LOS E during the 2029 No-Build and Build AM peak hour.

The southbound approach of Route J at Highway 40 is forecasted to operate at LOS E with 41 seconds of delay per vehicle during the 2029 Build AM peak hour due to the additional through traffic on Highway 40. This less than desirable delay would be isolated to the AM peak hour. Given the low traffic volumes on the southbound Route J approach at Highway 40 and the limited duration of the less than desirable delay, roadway improvements are not recommended.

As discussed in the 2019 conditions, the westbound left-turn movement from the I-70 off ramp at Highway 40 is still forecasted to operate at LOS F due to the conflicts with the heavy southbound movement on Highway 40 traveling to eastbound I-70 in the AM peak hour. However, as mentioned previously, most of the westbound left-turns are vehicles oriented to the existing Midway USA facility. In order to provide a conservative analysis, the Midway USA trips were not reassigned from the existing site to the new site so there would actually be a reduction in trips for the westbound left-turn movement from the I-70 off ramp following the relocation of the Midway USA development. Consequently, the operation of the westbound left-turn movement from the I-70 off ramp would be more directly related to the new user of the exiting Midway USA facility. As such, it is recommended that the Highway 40 and westbound I-70 off ramp intersection be re-evaluated when a new user develops the old Midway USA site.



ADEQUACY OF TWO-LANE CROSS-SECTION

The maximum Annual Average Daily (AAD) traffic volume was based upon information provided in the latest edition of the *Quality Level of Service Handbook*. The *Quality Level of Service Handbook* (QLOS) determines the capacity of a roadway based upon different variables such as the posted speed, urban versus rural roadway, and state versus local roadway using the *Highway Capacity Manual*. LOS is a measure of traffic flow which considers such factors as speed, delay, traffic interruptions, safety, driver comfort, and convenience. Level C, which is normally used for highway design, represents a roadway with volumes ranging from 70% to 80% of its capacity. However, Level D is generally considered acceptable for peak period conditions.

Highway 40 and Route J are two-lane undivided roadways in a rural, undeveloped area. As mentioned previously, the posted speed is 60 mph on Highway 40 and 55 mph on Route J. The QLOS handbook determines that such a roadway has an AAD maximum capacity of 28,600 vehicles. In order to achieve LOS D, the AAD maximum is 14,300 vehicles.

Based on the August 2019 traffic count, the Average Daily Traffic (ADT) on Highway 40 is 5,740 vehicles and the ADT on Route J is 995 vehicles. Considering the full build-out of the Midway USA development and 10 years of background traffic growth, the estimated 2029 ADT is 7,625 vehicles on Highway 40 and 1,880 vehicles on Route J. Thus, the forecasted ADT volumes on both Highway 40 and Route J are well below the capacity of the roadway. As such, the two-lane cross-section on both Highway 40 and Route J is appropriate.



SUMMARY

CBB completed the preceding study to address the traffic impacts associated with the proposed relocation of the Midway USA facility in Boone County, Missouri. The existing Midway USA has outgrown its current facility located in the northeast quadrant of Highway UU at Van Horn Tavern Road. As a result, Midway USA is proposing to relocate and expand their operations at a new site located in the southeast quadrant of Highway 40 and Route J in Boone County, Missouri.

The proposed relocation and expansion of the Midway USA facility could take several years to build out. Currently, only the initial Phase I development is proposed which would consist of 300,000 square feet of warehouse space with one access drive on Route J. It is anticipated that the Midway USA facility would be relocated from its existing location at Route UU and West Van Horn Tavern Road to this new location in the next 10 years. Upon full build-out, it is estimated that the site will consist of a total of 1,000,000 square feet of warehouse/distribution space, 100,000 square feet of light industrial, and 150,000 square feet of office space with up to 1,200 employees. Upon full build-out of the Midway USA facility, access for the site is proposed via two drives on Route J and one drive on Highway 40.

Findings and Recommendations to Mitigate Existing Conditions

An analysis of the existing conditions found that all the study intersections currently operate at acceptable levels of service overall. Although not required from a capacity standpoint, a review of the existing traffic volumes utilizing MoDOT's Access Management Guidelines found that the following auxiliary lanes are technically warranted:

- Eastbound Right-Turn Lane on Highway 40 at Route J; and
- Westbound Right-Turn Lane on Highway 40 at Route J.

Based on field observations of the roadway conditions at the I-70 and Route J interchange, it is apparent that vehicles are tracking on the shoulders when completing their turns. As such, it would be desirable to provide reinforced shoulders that could stand up to the traffic, and or, to improve the corner radii.

Findings and Recommendations to Mitigate 2019 Build Conditions:

An analysis of the 2019 Build conditions found that all the study intersections would continue to operate at overall acceptable levels of service with the initial phase of the Midway USA relocation with negligible increases in delay for most movements.

No additional improvements are recommended beyond those discussed to address existing conditions.



Findings and Recommendations to Mitigate 2029 Build Conditions:

A review of the 2029 Build traffic volumes utilizing MoDOT's Access Management Guidelines found that the following additional auxiliary lanes should be considered:

- A separate westbound left-turn lane on Highway 40 at Route J;
- A separate westbound left-turn lane on Highway 40 at the Midway USA drive;
- A separate eastbound right-turn lane on Highway 40 at the Midway USA drive; and
- A separate northbound right-turn lane on Route J at the Midway USA north drive.

An analysis of the 2029 Build conditions found that all the study intersections would continue to operate at acceptable levels of service following the build out of and relocation of the Midway USA facility with the exception of the southbound approach of Route J at Highway 40 and the westbound I-70 off ramp approach at Highway 40 which are forecasted to operate at LOS E during the 2029 Build AM peak hour.

Given the low traffic volumes on the southbound Route J approach at Highway 40 and the limited duration of the LOS E operations, roadway improvements are not recommended.

The westbound left-turn movement from the I-70 off ramp at Highway 40 currently operates at LOS F in the AM peak hour and would continue to operate at LOS F due to the heavy through volumes on Highway 40. However, most of the westbound left-turns are vehicles oriented to the existing Midway USA facility. In order to provide a conservative analysis, the Midway USA trips were not reassigned from the existing site to the new site so there would actually be a reduction in trips for the westbound left-turn movement from the I-70 off ramp following the relocation of the Midway USA development. Consequently, the operation of the westbound left-turn movement from the I-70 off ramp would be more directly related to the new user of the exiting Midway USA facility. As such, it is recommended that the Highway 40 and westbound I-70 off ramp intersection be re-evaluated when a new user develops the old Midway USA site.

We trust that this traffic study adequately describes the forecasted traffic conditions that should be expected in the vicinity of the proposed Midway USA development in Boone County, Missouri. If additional information is desired, please feel free to contact me at 314-449-9572 or swhite@cbbtraffic.com.

Sincerely,

A handwritten signature in blue ink that reads "Shawn White".

Shawn White, P.E., PTOE
Associate - Senior Traffic Engineer