

February 10, 2022

Mr. Kevin Drozin, PE
ms consultants, inc.
300 Corporate Center Drive, Suite 200
Moon Township, Pennsylvania 15108

RE: Traffic Impact Study
Proposed Whataburger
Lee's Summit, Missouri
CBB Job No. 147-21

Dear Mr. Drozin:

As requested, CBB has completed a traffic impact study pertaining to a proposed Whataburger restaurant in Lee's Summit, Missouri. The site is located in the northeast quadrant of the intersection of Highway 150 and Hollywood Drive within the commercial area in the northwest quadrant of the Highway 150 and Highway 291 interchange. The location of the site in relation to the surrounding road system is depicted in **Figure 1**.

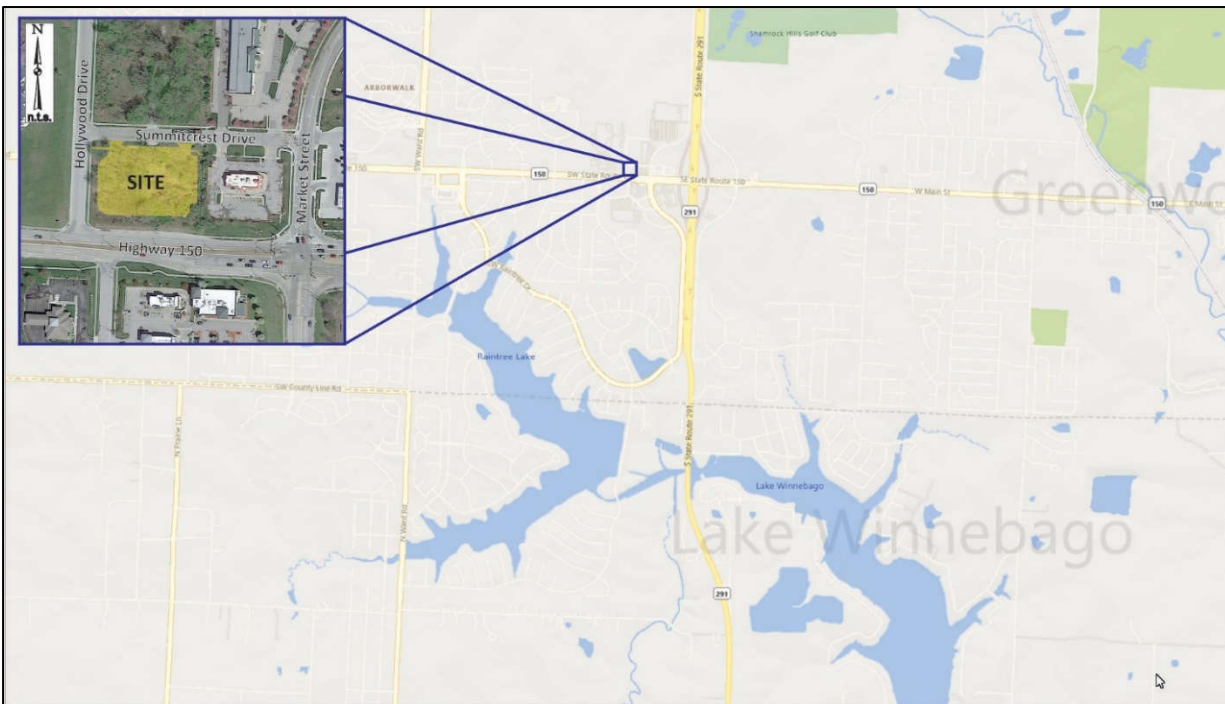


Figure 1: Project Location Map



Based on the concept plan provided by ms consultants, the proposed development would consist of a 3,751 square foot Whataburger restaurant with drive-through. Access to the development is proposed via two curb cuts on Summitcrest Drive with the primary access to Highway 150 via the signal at Market Street and the right-in/right-out (RIRO) at Hollywood Drive. A schematic of the concept plan is shown in **Exhibit 1**.

CBB discussed the scope of work for this study with the Missouri of Transportation (MoDOT) and the City of Lee's Summit at the commencement of the study process. CBB also discussed the proposed site trip generation and directional distribution estimates for the proposed development, as well as the 2022 Base traffic volumes to be used and gained their consensus on the assumptions prior to completing the traffic analyses.

The purpose of this study was to determine the number of trips that would be generated by the proposed development, evaluate the impact of those trips on operating conditions along the adjacent roadways, and determine the ability of motorists to safely enter and exit the site. Where necessary, roadway improvements and/or traffic control modifications were recommended to mitigate the impact of the development. The focus of this study was the AM and PM peak hours of a typical weekday.

The following intersections were included in the study:

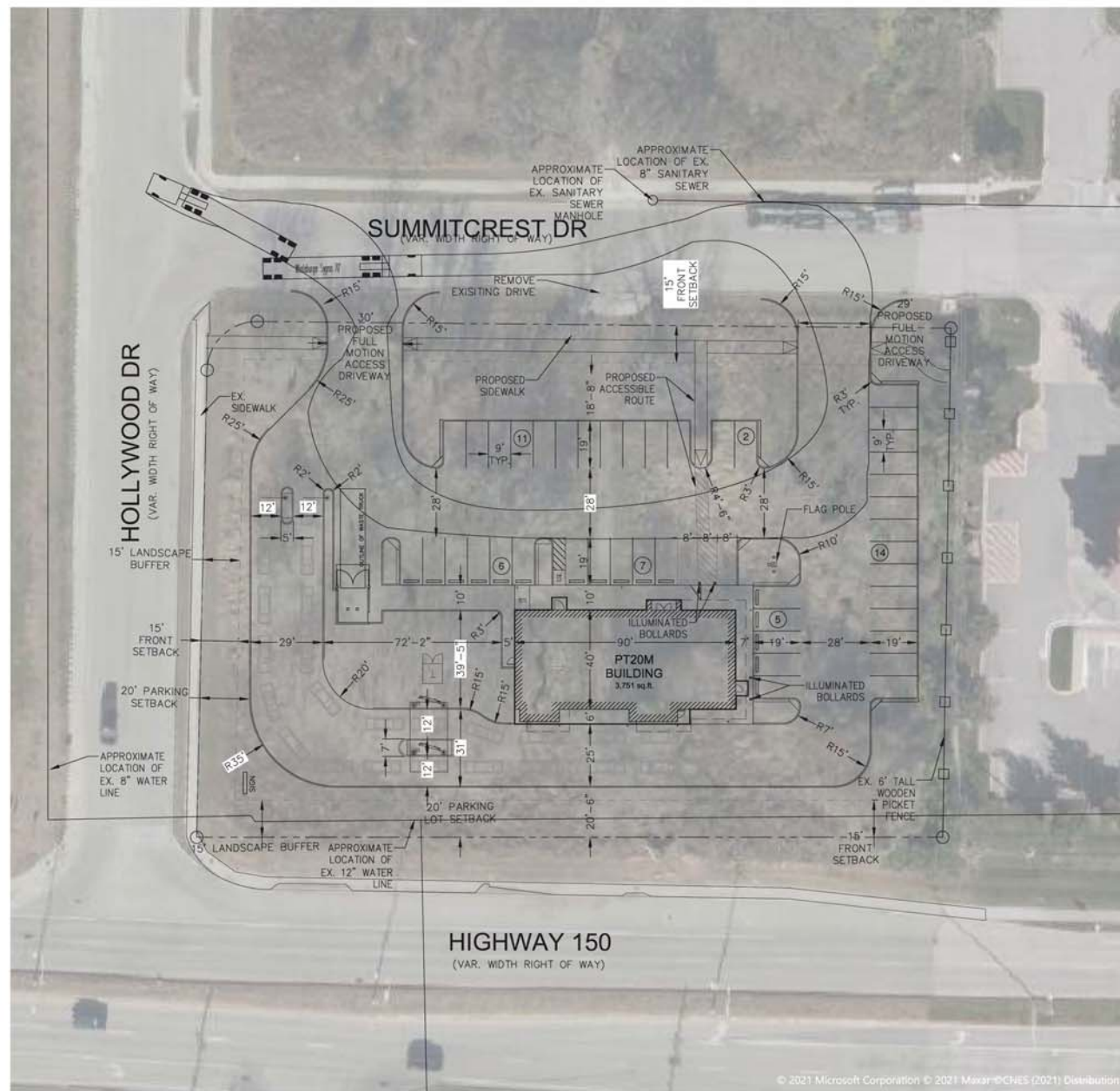
- Highway 150 and Market Street;
- Highway 150 and Hollywood Drive;
- Hollywood Drive and Summitcrest Drive;
- Market Street and Summitcrest Drive; and
- Summitcrest Drive and Proposed Site Drives.

The following analysis scenarios were considered:

- 2022 Base Conditions
 - 2022 Existing plus Market Street Center Trips
- 2022 Build Conditions
 - 2022 Base plus Site Trips

The following report presents the methodology and findings relative to the 2022 Base and Build conditions.

N:\03\04\448701\Lee's Summit, MO Market\Doc\CAD\DWG\1210706_CSP - NWQ Hwy 150 & Market St (Lee's Summit, MO) Aug. 15/2021 4:04 PM, burner, taylor

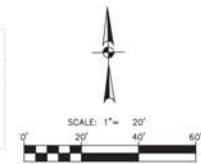


LOCATION MAP
N.T.S.

TRUCK INFORMATION

Truck Type	Truck
Truck Length	12' 0"
Truck Width	8' 6"
Truck Height	10' 0"
Truck Weight	10,000 lbs
Truck Clearance	10' 0"
Truck Turning Radius	10' 0"

Truck Type	Truck
Truck Length	12' 0"
Truck Width	8' 6"
Truck Height	10' 0"
Truck Weight	10,000 lbs
Truck Clearance	10' 0"
Truck Turning Radius	10' 0"



COMMENTS:

1. ZONING (AG): AG ZONING IS ESTABLISHED TO PROVIDE AREAS FOR RESTRICTED AGRICULTURAL USES. VERY-LOW-DENSITY RESIDENTIAL DEVELOPMENT AND TO SERVE AS A "HOLDING ZONE" TO PREVENT THE PREMATURE DEVELOPMENT OF LARGE LAND ACRES. A REZONING OF THE SITE WILL BE NECESSARY TO ABIDE BY THE MASTER PLANNED COMMUNITY PROVISIONS OF THE ZONING ORDINANCE IN EFFECT PRIOR TO JULY 31, 2020.
2. DRIVE ACCESS TO THE SITE IS ALONG SUMMITCREST DRIVE. THE EXISTING DRIVEWAY ON SITE WILL BE REPLACED BY TWO DRIVEWAYS AT THE EAST AND WEST ENDS OF THE PROPERTY.
3. SIGN LOCATION: ALL A MINIMUM OF 25 SQUARE FEET OF LANDSCAPED AREA, EXCLUSIVE OF THE SIGN STRUCTURE, SHALL BE LOCATED AT THE BASE OF EACH PRINCIPAL FREESTANDING SIGN AND MUST BE AT LEAST 75' AWAY FROM ANY OTHER FREESTANDING SIGN. ALL SIGNS MUST GO THROUGH A PERMITTING PROCESS.
4. THE SITE IS CURRENTLY ZONE AG. THE SITE WILL NEED TO BE REZONED TO CP2. PROPERTY SETBACKS FOR THE SITE ARE BASED OFF OF THE PROPOSED PROPERTY ZONING, CP2.
5. THE SITE WILL REQUIRE STORMWATER DETENTION SINCE THE SITE IS UNDEVELOPED. THE SITE IS ALLOWED TO UTILIZE AN UNDERGROUND DETENTION SYSTEM, SIMILAR TO THE PREVIOUS WHATABURGER SITE ON DOUGLAS ST.
6. THE MAXIMUM IMPERVIOUS AREA ALLOWED ON THE SITE IS 80%. AS CURRENTLY DRAWN THE SITE IS AT 65.0%.
7. THE SITE WILL NEED TO BE PLATTED. THE PRELIMINARY PLAT CAN BE TAKEN CARE OF IN THE PRELIMINARY DEVELOPMENT PLAN. AFTER THE PRELIMINARY PLAT IS APPROVED, THE SITE WILL NEED TO APPLY FOR A FINAL PLAT.
8. THE CITY IS REQUIRING WHATABURGER TO PROVIDE A MASTER PLAN FOR THE ORIGINAL .110 ACRE TRACT, WHICH INCLUDES THE TWO LOTS TO THE NORTH. PER THE CITY, IT IS SUFFICIENT THAT WHATABURGER JUST SHOW POTENTIAL UTILITY TAP LOCATIONS ENSURING THE LOTS CAN GET SERVICE. EVEN THOUGH WHATABURGER IS TAKING CARE OF THE REZONING PROCESS FOR THE ENTIRE TRACT, THE TWO NORTH LOTS WILL STILL HAVE TO GO THROUGH A SEPARATE PUBLIC HEARING PROCESS BEFORE DEVELOPMENT.
9. THE CITY HAS IDENTIFIED THE LOT TO PAY A \$45,968 LICENSE TAX. THIS IS AN ESTIMATE PROVIDED BY THE CITY.
10. THE SITE IS LOCATED IN THE CORRIDOR DEVELOPMENT OVERLAY DISTRICT.
11. THE CITY STATED THAT WE CAN REDUCE THE MINIMUM PARKING REQUIREMENT IF WE SHOW PROOF THAT WE HAVE SUCCESS WITH LESS PARKING. THIS WAS DONE WITH THE PREVIOUS WHATABURGER SITE. NOT MEETING THE PARKING REQUIREMENTS IS NOT ANTICIPATED TO BE AN ISSUE.
12. A TREE SURVEY AND CONSERVATION PLAN WILL BE REQUIRED FOR THE SITE.

SITE DATA

LOT AREA	=	62,632 SF	1.44 AC
PARKS	=	45 (53 REQ'D @ 14 PER 1000 SF GFA)	
CAR STACK	=	LINE A: 11	LINE B: 13

REVISION/DATE/DESCRIPTION

SUR UPDATES 08/19/21

NOTICE

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PROJECT

PROPOSED PT20M BUILDING

NWQ HWY 150 & MARKET ST
LEE'S SUMMIT, MO 64082

SHEET TITLE

PRELIMINARY SITE PLAN

DRAWN BY: TDB

CHECKED BY: PJK

PROJECT NO: 40497-21

DRAWING

Exhibit 1: Preliminary Site Plan (provided by others)

Job# 147-21
02/07/2022





EXISTING/BASE CONDITIONS

Area Roadway System: Highway 150 is an east-west principle arterial roadway owned and maintained by MoDOT. Within the study area, Highway 150 is a four-lane roadway (two lanes in each direction) divided by a concrete median. Sidewalks are provided on both sides of the roadway. East of Market Street, paved shoulders are provided on both sides of the roadway. Marked bike lanes are not provided along Highway 150 within the study area but “Share the Road” bike signs are provided on both sides of the roadway. Highway 150 has a posted speed limit of 35 miles per hour (mph).

Market Street/Raintree Drive is a local north-south roadway owned and maintained by the City of Lee's Summit. Within the study area, Market Street generally provides one lane in each direction with a center two-way left-turn lane provided from Summitcrest Drive to the north to the Walmart driveway. North of Highway 150, Market Street provides a sidewalk on the west side of the roadway to the northern most Walmart driveway as well as a sidewalk on the east side of the roadway to the Firestone Auto Care driveway. South of Highway 150, Raintree Drive provides a sidewalk on the west side of the roadway to Greenwich Drive. Shoulders and marked bike lanes are not provided along Market Street/Raintree Drive. Market Street/Raintree Drive has a posted speed limit of 35 mph.

Hollywood Drive is a local north-south roadway owned and maintained by the City of Lee's Summit. Hollywood Drive begins at Greenwich Drive and terminates at Kenbridge Crossing. Hollywood Drive provides two lanes, one in each direction as well as sidewalks on both sides of the roadway. Marked bike lanes, median, and shoulders are not provided along this roadway. Hollywood Drive has a posted speed limit of 25 mph.

Summitcrest Drive is a local east-west roadway owned and maintained by the City of Lee's Summit. Within the study area, Summitcrest Drive connects Hollywood Drive and Market Street. The roadway provides two lanes, one in each direction. A sidewalk is provided on the north side of the roadway, but no marked bike lanes are provided along the roadway. Summitcrest Drive has a posted speed limit is 25 mph.

Market Street intersects Highway 150 at a signalized intersection. The signal is operated under actuated coordinated traffic control. The northbound approach provides one left-turn lane, one through lane, and a channelized right-turn lane. The southbound approach provides two left-turn lanes and one shared through/right-turn lane. The eastbound approach provides one left-turn lane, three through lanes, and a channelized right-turn lane. The westbound approach consists of one left-turn lane, two through lanes, and a channelized right-turn lane. The eastbound, westbound, and northbound left-turn movements operate under protected plus permitted flashing yellow arrow phasing. The southbound left-turn movement operates under protected only phasing. Pedestrian crosswalks and push buttons are provided on the north, south, and west legs of the intersection. **Figure 2** provides an aerial view of the Market Street and Highway 150 intersection.



Figure 2: Aerial View of the Highway 150 and Market Street Intersection

The Market Street and Summitcrest Drive intersection operates under side-street STOP control with Summitcrest Drive stopping at Market Street. The northbound approach consists of a shared left-turn/through/right-turn lane. The southbound approach provides a left-turn lane and a shared through/right-turn lane. The eastbound and westbound approaches provide a shared left-turn/through/right-turn lane. A pedestrian crosswalk is provided on the west leg of the intersection. **Figure 3** provides an aerial view of Market Street and Summitcrest Drive intersection.

Hollywood Drive intersects Highway 150 at a right-in/right-out intersection. The westbound and eastbound approaches provide two through lanes and one right-turn lane. The northbound and southbound approaches provide one right-turn lane. A pedestrian crosswalk is provided on the south side of Highway 150. **Figure 4** provides an aerial view of the Hollywood Drive and Highway 150 intersection.



Figure 3: Aerial View of the Market Street and Summitcrest Drive Intersection

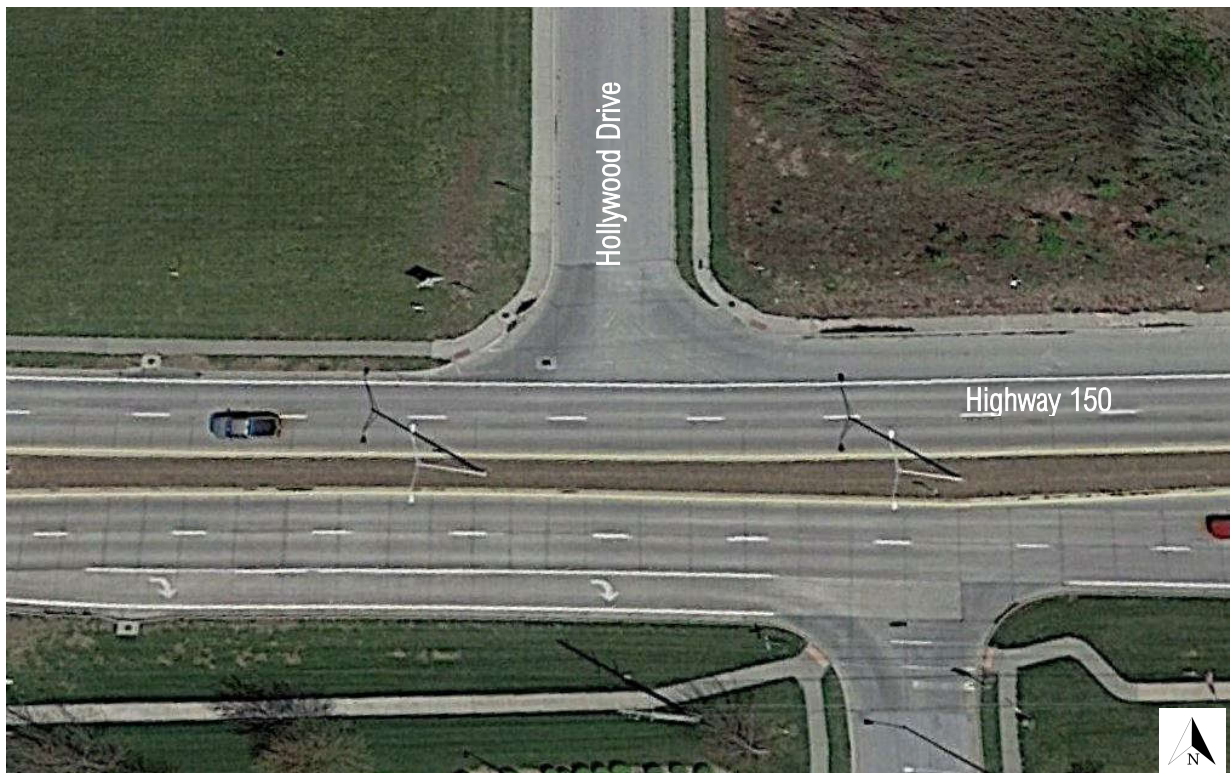


Figure 4: Aerial View of the Hollywood Drive and Highway 150 Intersection



The Hollywood Drive and Summitcrest Drive intersection is a side-street STOP controlled three-legged intersection with Summitcrest Drive required to stop. All approaches consist of a single shared lane. No pedestrian facilities are provided at this intersection. **Figure 5** provides an aerial view of the Hollywood Drive and Summitcrest Drive intersection.



Figure 5: Aerial View of the Hollywood Drive and Summitcrest Drive Intersection

2022 Existing Traffic Volumes: Video, turning movement traffic counts were conducted at the following intersections during the weekday morning (7:00 - 9:00 a.m.) peak period on Thursday, January 13, 2022 and the weekday afternoon (4:00 - 6:00 p.m.) peak period on Wednesday, January 12, 2022:

- Highway 150 and Market Street;
- Highway 150 and Hollywood Drive;
- Hollywood Drive and Summitcrest Drive; and
- Market Street and Summitcrest Drive.

The 2022 Existing peak hour traffic volumes are summarized in **Exhibit 2**. Based on the traffic data collected, the weekday morning peak hour occurred between 7:15 and 8:15 a.m. and the weekday afternoon peak hour occurred between 4:45 and 5:45 p.m. Given the traffic characteristics in the area and the anticipated trip generation for the proposed development, the peak periods identified would represent a likely “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 2: Existing Traffic Volumes



2022 Base Traffic Volumes: It is our understanding a new commercial development has been approved on the east side of Market Street north of Summitcrest Drive. The pending development, referred to as Market Street Center, includes approximately 9,200 SF of medical office space and a 15,200 SF hardware store. As such, the site generated trips for the pending Market Street Center development were included in the Base Traffic Volumes. The trip estimate in the memo prepared by Phelps Engineering, dated October 15, 2021 estimates 53 new trips during the weekday AM peak hour and 66 new trips during the weekday PM peak hour. The Market Street Center trips were assigned to the roadway network based on input from the City. The Market Street Center site-generated trips are shown in **Figure 6**.



Figure 6: Approved Market Street Center Development Trips

The Market Street Center site-generated trips were added to the 2022 Existing Traffic Volumes (Exhibit 2) to reflect the 2022 Base Traffic Volumes shown in **Exhibit 3**.



Exhibit 3: 2022 Base Traffic Volumes



PROPOSED SITE

Proposed Land Use: Based on the concept plan provided by ms consultants, shown in Exhibit 1, the proposed development would consist of a 3,751 square foot Whataburger restaurant with drive-through.

Site Access: Access to the development is proposed via two curb cuts on Summitcrest Drive with the primary access to Highway 150 via the signal at Market Street and the right-in/right-out (RIRO) at Hollywood Drive.

In conjunction with the proposed development, a sidewalk is proposed along the frontage of the site on the south side of Summitcrest Drive.

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 intersection of all drives with the public roadways. It is generally recommended that all improvements higher than three feet above the elevation of the nearest pavement edge be held back at least 20 feet from the traveled roadway.

Trip Generation: Forecasts were prepared to estimate the amount of traffic the proposed fast-food restaurant would generate during the weekday AM and PM peak periods. These forecasts were based upon information provided in the *Trip Generation Manual*, 11th Edition, 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 Whataburger restaurant were based on Land Use 934 – Fast-Food Restaurant with Drive-Through.

Not all of these trips would represent *new* traffic on the adjacent roadways. Nationwide studies have found that a large percentage of convenience-oriented trips, such as fast-food restaurants, would already be present on the adjacent roads and would be attracted to the development on their way to or from home, work or another destination (i.e., pass-by trips). The statistical information provided in the ITE Trip Generation Appendices *Pass-By Data and Rate Tables/2021*, supports a pass-by percentage of 50% for fast-food restaurants during the AM peak hour and 55% during the PM peak hour. The pass-by trips will add turning movements at the site access drives but will not increase total traffic levels on the adjacent roadways.

The resulting trip generation estimate, including both new trips and pass-by trips, for the proposed Whataburger restaurant are summarized in **Table 1**. As shown in the table, the proposed Whataburger is estimated to generate 83 new trips during the weekday AM peak hour and 55 new trips during the weekday PM peak hour with another 84 and 68 pass-by trips respectively during the AM and PM peak hours.



Table 1: Trip Generation Estimate – Proposed Whataburger

Land Use	Size	Weekday AM Peak Hour			Weekday PM Peak Hour		
		In	Out	Total	In	Out	Total
Fast-food w/ drive-through	3,751 ft ²	85	82	167	64	59	123
Pass-by Trips ¹		42	42	84	34	34	68
New Trips		43	40	83	30	25	55

¹ Pass by Trips: Fast-Food = 50% AM & 55% PM;

Trip Distribution: The new trips for the proposed development were then assigned into and out of the site based upon an assumed directional distribution. Based upon the existing travel patterns in the area, it is anticipated that the distribution of new site-generated trips would be as summarized in **Table 2**.

Table 2: Trip Distribution Assumptions

DIRECTION OF TRAVEL	AM / PM PEAK HOURS
To/from the north on Market Street	5%
To/from the south on Raintree Drive	5%
To/from the west on Highway 50	30%
To/from the east on Highway 50	60%

It should be noted that the pass-by trips were assigned in accordance with the adjacent street traffic along Highway 150 and via Highway 291. Note that a significant portion of the pass-by trips will essentially be new trips at the study intersections as they will be diverted trips from Highway 291. The site-generated trips (new and pass-by trips) for the weekday AM and PM peak hours are shown in **Exhibit 4**.

2022 Build Traffic Volumes: The proposed site-generated trips (Exhibit 4) were added to the 2022 Base Traffic Volumes (Exhibit 3) to determine the total volumes in the 2022 Build scenario. The forecasted, or 2022 Build, traffic volumes for the AM and PM peak hours are shown in **Exhibit 5**.

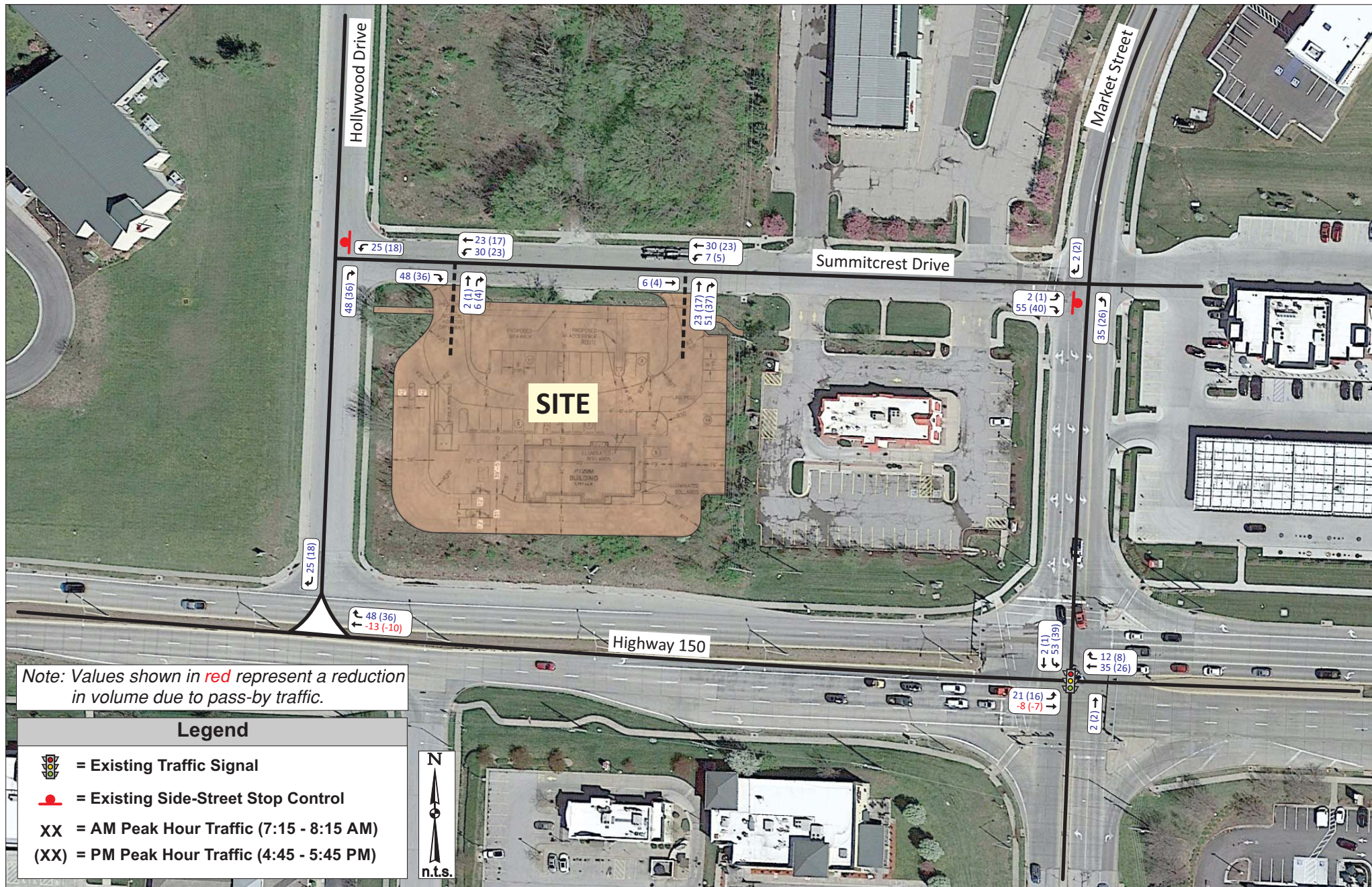


Exhibit 4: Site-Generated Trips



Exhibit 5: 2022 Build Traffic Volumes



2022 TRAFFIC ANALYSIS

Study Procedures: The 2022 Base and 2022 Build 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. Note, the City of Spring Hill *Traffic Impact Study Guidelines* states that LOS C or better is considered to be the target, but the City will accept LOS D under some circumstances.

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 differs 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 3** summarizes the thresholds used in the analysis for signalized and unsignalized intersections.

Table 3: 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



Left-Turn Lane Needs: The need for a northbound left-turn lane on Market Street at Summitcrest Drive was evaluated using Lee's Summit Access Management Code. Based on Section 16.1 Left-Turn Standards, a left-turn lane is warranted when the left-turn volume at a drive serving non-residential development is at least 30 vehicles per hour (vph) on a collector roadway.

Based on the Existing traffic volumes shown in Exhibit 2, the northbound left-turn volume is currently 35 vph in the PM peak hour which is above the minimum threshold of 30 vph. Consequently, a northbound left-turn lane on Market Street at Summitcrest Drive is warranted based on the existing traffic volumes.

The proposed Whataburger would add to this northbound left-turn volume, resulting in an estimated 55 northbound lefts in the AM peak hour and 61 northbound lefts in the PM peak hour, further warranting a northbound left-turn lane on Market Street at Summitcrest Drive.

2022 Operating Conditions: The study intersections were evaluated using the methodologies described previously. **Table 4** summarizes the results of this analysis, which reflects the 2022 Base and 2022 Build operating conditions and average delay at the study intersections during the weekday AM and PM peak hours. The Synchro estimated 95th percentile queue length for the critical movement on each approach is also shown in the table. The existing lanes and traffic control for the study intersections were assumed for the analysis. While a northbound left-turn lane on Market Street at Summitcrest Drive is warranted in the existing and build conditions, the analysis does not reflect this left-turn lane to reflect a worst-case scenario.

As shown in the table, all individual intersection approaches, as well as the overall intersections, operate at acceptable level of service (LOS D or better) in the Base conditions during the AM and PM peak hours except for the westbound QuikTrip drive approach at Market Street during the PM peak hour.

Under Build conditions, all individual intersection approaches, as well as the overall intersections, are expected to continue to operate at acceptable LOS with only slight increases in delay during both peak hours apart from the westbound QuikTrip Drive approach at Market Street during the PM peak hour.

As requested by MoDOT, the queue for the westbound Highway 150 right-turn lane at Market Street was reviewed to evaluate the need to extend the right-turn lane. The westbound right-turn lane on Highway 150 at Market Street provides approximately 250 feet of storage. As shown in Table 4, the estimated queue for this right-turn lane is less than 50 feet for all scenarios. Furthermore, the 95th percentile queue for the westbound Highway 150 through lanes at Market Street is estimated at 225 feet in the 2022 Build conditions during the PM peak hour. As such, the queue from the westbound Highway 150 through lanes are not expected to block entry into the westbound Highway 150 right-turn lane at Market Street. Consequently, the existing right-turn lane storage on Highway 150 at Market Street of 250 feet is adequate.



Table 4: 2022 Capacity Analysis Summary

Intersection / Approach	AM Peak Hour		PM Peak Hour	
	2022 Base	2022 Build	2022 Base	2022 Build
Highway 150 and Market Street/Raintree Drive (Signalized)				
Eastbound Highway 150 Approach	B (16.7) 95 th Q: 110' TH 95 th Q: 60' LT	B (17.5) 95 th Q: 110' TH 95 th Q: 70' LT	C (30.6) 95 th Q: 215' TH 95 th Q: 85' LT	C (30.9) 95 th Q: 215' TH 95 th Q: 95' LT
Westbound Highway 150 Approach	B (15.3) 95 th Q: 190' TH 95 th Q: <25' RT	B (17.2) 95 th Q: 205' TH 95 th Q: <25' RT	C (31.3) 95 th Q: 215' TH 95 th Q: 35' RT	C (31.8) 95 th Q: 225' TH 95 th Q: 40' RT
Northbound Raintree Drive Approach	C (21.7) 95 th Q: 75' LT	C (22.6) 95 th Q: 75' LT	C (23.6) 95 th Q: 80' TH	C (23.7) 95 th Q: 85' TH
Southbound Market Street Approach	D (37.2) 95 th Q: 100' LT	D (39.2) 95 th Q: 125' LT	D (43.7) 95 th Q: 160' TH	D (44.4) 95 th Q: 170' LT
Overall	C (20.1)	C (21.8)	C (32.3)	C (32.9)
Market Street and Summitcrest Drive/QuikTrip Drive (Side-Street Stop Control)				
Eastbound Summitcrest Drive Approach	A (9.7)	A (10.0)	B (12.3)	B (12.6)
Westbound QuikTrip Drive Approach	C (16.4)	D (25.5)	F (52.2)	F (108.2)
Northbound Market Street Approach	A (1.1)	A (2.5)	A (1.3)	A (2.1)
Southbound Market Street Approach	A (1.0)	A (<1.0)	A (<1.0)	A (<1.0)
Summitcrest Drive and Hollywood Drive (Side-Street Stop Control)				
Westbound Summitcrest Drive Approach	A (8.8)	A (9.4)	A (9.2)	A (9.6)
Northbound Hollywood Drive Approach	A (<1.0)	A (<1.0)	A (<1.0)	A (<1.0)
Southbound Hollywood Drive Approach	A (3.7)	A (3.8)	A (1.3)	A (1.3)
Highway 150 and Hollywood Drive (Side-Street Stop Control)				
Westbound Highway 150 Approach	A (<1.0)	A (<1.0)	A (<1.0)	A (<1.0)
Southbound Hollywood Drive Approach	A (9.4)	A (9.3)	A (9.2)	A (9.3)
Summitcrest Drive and Proposed West Site Drive (Side-Street Stop Control)				
Eastbound Summitcrest Drive Approach		A (<1.0)		A (<1.0)
Westbound Summitcrest Drive Approach		A (3.5)		A (2.3)
Northbound Proposed Site Drive Approach		A (8.8)		A (8.6)
Summitcrest Drive and Proposed East Site Drive (Side-Street Stop Control)				
Eastbound Summitcrest Drive Approach		A (<1.0)		A (<1.0)
Westbound Summitcrest Drive Approach		A (1.1)		A (<1.0)
Northbound Proposed Site Drive Approach		A (9.0)		A (8.8)

X (XX.X) - Level of Service (Vehicular delay in seconds per vehicle)
 95th percentile queue for the critical movement of the approach and lane (L-Left, T-Thru, R-Right, TR-Shared Thru/Right)



As previously mentioned, a northbound left-turn lane on Market Street at Summitcrest Drive is technically warranted per the City's Access Management Code for the Existing and Build conditions. Although the northbound approach is forecasted to operate at LOS A without a separate northbound left-turn lane.

In order to provide the northbound left-turn lane on Market Street at Summitcrest Drive, Market Street would need to be widened or the existing southbound outside left-turn storage on Market Street at Highway 150 would need to be decreased to allow back-to-back lefts for the northbound left-turn at Summitcrest Drive and the southbound left-turn at Highway 150.

Currently, the outside southbound left-turn lane provides approximately 225 feet of storage. Providing a short 50-foot northbound left-turn lane on Market Street at Summitcrest Drive is expected to decrease the outside southbound left-turn lane storage to approximately 100 feet when considering the transition taper with the inside left-turn lane still providing 225 feet of storage.

As shown in Table 4, the Synchro estimated 95th percentile queue for the southbound dual left-turn movement on Summitcrest Drive at Highway 150 is 170 feet in the 2022 Build conditions during the PM peak hour so there is the potential to reduce the outside southbound left-turn storage at Highway 150 to provide a short northbound left-turn lane at Summitcrest Drive.

The intersection of Highway 150 and Market Street was reanalyzed assuming the modified southbound left-turn storage. With the outside southbound left-turn lane being shorter than the inside left-turn lane, it was assumed the lane utilization would favor the longer left-turn lane. **Table 5** summarizes the results at the revised analysis at the intersection of Highway 150 and Market Street during the AM and PM peak hour. Note the existing signal timings were used in the analysis.

As can be seen, the overall intersection and individual intersection approaches are expected to operate at acceptable LOS during the AM and PM peak hours under Build conditions. Note, the southbound queues on Market Street at Highway 150 were reviewed to assess the potential for Summitcrest Drive to be blocked. Summitcrest Drive is about 225 feet north of the southbound Market Street stop bar at Highway 150. As shown in Table 5 with the modified lane utilization for the southbound dual left-turn lanes, the Synchro estimated 95th percentile queue on Market Street at Highway 150 is 235 feet during the PM peak hour Build conditions. Consequently, the southbound Market Street queue is expected to extend to Summitcrest Drive though the actual time the queue would be at Summitcrest Drive is expected to be short in duration.

However, minor signal timing adjustments at the intersection of Highway 150 and Market Street during the PM peak hour could be considered to decrease the forecasted queues for the southbound left-turn movement. Reallocating just four seconds from the northbound through phase to the southbound left-turn phase during the PM peak hour would decrease the



forecasted 95th percentile queue for the southbound Market Street approach to 205 feet which is less than the 225 feet available.

Table 5: 2022 Capacity Analysis Summary – Highway 150 and Market Street/Raintree Drive

Intersection / Approach	2022 Build ¹	
	AM Peak Hour	PM Peak Hour
Highway 150 and Market Street/Raintree Drive (Signalized)		
Eastbound Highway 150 Approach	B (18.3) 95 th Q: 110' TH 95 th Q: 70' LT	C (31.9) 95 th Q: 210' TH 95 th Q: 95' LT
Westbound Highway 150 Approach	B (18.0) 95 th Q: 205' TH 95 th Q: <25' RT	C (32.2) 95 th Q: 225' TH 95 th Q: 35' RT
Northbound Raintree Drive Approach	C (22.3) 95 th Q: 85' RT	C (23.7) 95 th Q: 85' TH
Southbound Market Street Approach	D (41.0) 95 th Q: 155' LT	D (48.6) 95 th Q: #235' LT
Overall	C (22.5)	C (34.2)

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

95th percentile queue for the critical movement of the approach and lane (L-Left, T-Thru, R-Right, TR-Shared Thru/Right)

¹Providing a northbound left-turn lane on Market Street at Summitcrest Drive and no signal timing adjustment at Highway 150 and Market Street

Table 6 summarizes the results of the signal timing adjustments at Highway 150 and Market Street intersection.

Table 6: 2022 Capacity Analysis Summary – Highway 150 and Market Street (Timing Adjustments)

Intersection / Approach	PM Peak Hour
	2022 Build ²
Highway 150 and Market Street/Raintree Drive (Signalized)	
Eastbound Highway 150 Approach	C (30.7) 95 th Q: 210' TH 95 th Q: 95' LT
Westbound Highway 150 Approach	C (31.1) 95 th Q: 225' TH 95 th Q: <25' RT
Northbound Raintree Drive Approach	C (23.78) 95 th Q: 105' TH
Southbound Market Street Approach	D (44.3) 95 th Q: 205' LT
Overall	C (32.6)

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

95th percentile queue for the critical movement of the approach and lane (L-Left, T-Thru, R-Right, TR-Shared Thru/Right)

²Providing a northbound left-turn lane on Market Street at Summitcrest Drive and minor signal timing adjustment at Highway 150 and Market Street/Raintree Drive



SUMMARY

CBB completed the preceding study to address the traffic impacts associated with the proposed Whataburger restaurant located in the northeast quadrant of the intersection of Highway 150 and Hollywood Drive in Lee's Summit, Missouri.

In summary, the following findings should be considered in conjunction with the proposed development:

- The proposed Whataburger is estimated to generate 83 new trips and 84 pass-by trips during the weekday AM peak hour and 55 new trips and 68 pass-by trips during the weekday PM peak hour.
- Under 2022 Build conditions, all signalized study intersections are expected to operate at overall acceptable level of service with minimal increases in delay as compared to the 2022 Base conditions.
- Based on the Existing traffic volumes, a separate northbound left-turn lane on Market Street at the Summitcrest Drive is warranted and would continue to be warranted with the proposed Whataburger.
- Consider providing a short, 50-foot northbound left-turn lane on Market Street at Summitcrest Drive. This would result in a shorter outside southbound left-turn lane on Market Street at Highway 150.
- Consider minor signal timing adjustments at the intersection of Highway 150 and Market Street during the PM peak hour to decrease the forecasted queues for the southbound left-turn movement (i.e., reallocating four seconds from the northbound through phase to the southbound left-turn phase).
- 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 intersection of all drives with the public roadways. It is generally recommended that all improvements higher than three feet above the elevation of the nearest pavement edge be held back at least 20 feet from the traveled roadway.

We trust this traffic impact study adequately describes the forecasted traffic conditions that should be expected as a result of the proposed Whataburger restaurant in Lee's Summit, Missouri. If additional information is desired, please feel free to contact me at 314-449-9572 or swhite@cbbtraffic.com.

Sincerely,

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