THOROUGHBRED ENGINEERING

Traffic Impact Study

April 6, 2018 | Ed Franz Estate | North Middletown Road | Paris, Kentucky

Mr. P. Keith Nally
Centrust Capital Homes
1010 Monarch Street
Suite 250 B
Lexington, KY 40513

Dear Mr. Nally,

Thoroughbred Engineering appreciates the opportunity to provide a Traffic Impact Study for your proposed development at North Middletown Road in Paris, Kentucky. Please review the document and let us know if you have any questions.

Thank you for the opportunity to assist with your project.

Sincerely,

Thoroughbred Engineering

Dylan Durbin, EIT
Staff Engineer

Darrin E. Croucher, P.E., S.I.
Principal Engineer
KY PE License No. 30150

Overview:

The proposed development is a 13-acre vacant property located on North Middletown Road (US 460) approximately 1,000 feet east of the intersection at East Main Street. The preliminary subdivision plat currently provides 47 lots that will contain single family homes. The development has a proposed access point at US 460 and will connect to Eastridge Drive, which is currently a dead-end street joining the property. Eastridge Drive and the existing development surrounding it, currently have an access point on East Main Street from Hopewell Drive. Traffic from the proposed intersection is expected to directly impact three intersections. We anticipate the site entrance at US 460, East Main Street at Hopewell Drive, and the signalized intersection at East Main Street and US 460 are expected to be the highest impacted intersections. **Figure 1** below shows the proposed development area and the areas of impact described above.

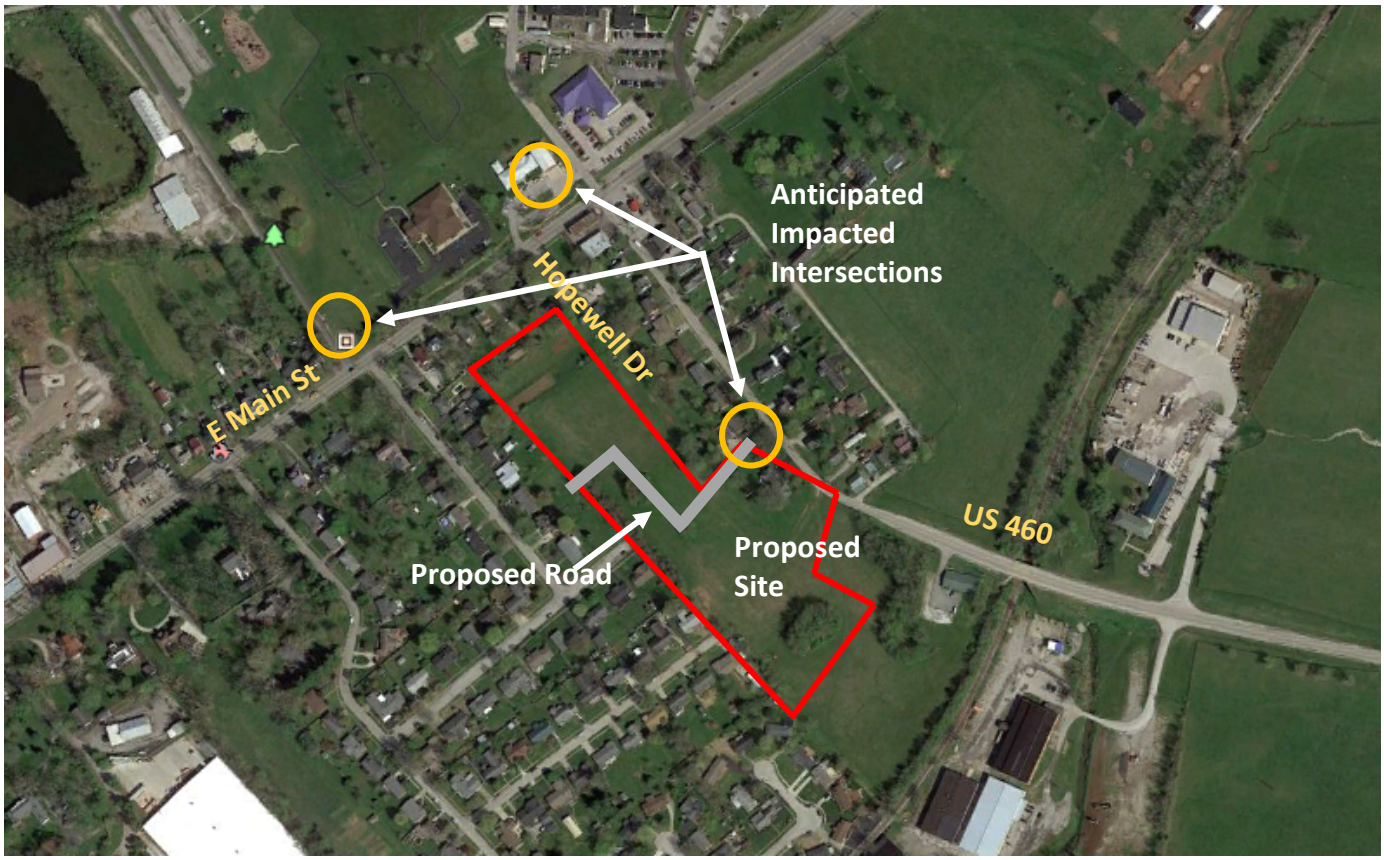


Figure 1: Site Map

Existing Conditions:

Geometry and Traffic Control:

Currently, US 460 is classified as an Urban Minor Arterial with approximate 10 feet lanes and a 2 feet shoulder at the proposed site entrance. East Main Street is also an Urban Minor Arterial with 12 feet lanes and 6 feet paved shoulders. Hopewell Drive is an Urban Local Street twenty-five (25) feet in width. The intersection at Hopewell Drive and East Main Street is "Stop" controlled. The intersection of US 460 and East Main Street is a signalized intersection with each approach consisting of one lane allowing left, right, and through movements. Based on the signal timing plan provided by KYTC on March 23, 2018, the signal is semi-actuated (alternating timing of light changes) with green times ranging from 30 to 35 seconds on East Main Street, and 10 to thirty (30) seconds on US 460. Yellow times for the light are 4.0 seconds with a 1.0 second all red clearance time.

Data Collection:

Traffic counts were taken at the three intersections on Thursday, March 22, 2018, during the typical weekday peak hours from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. Peak hours for the intersections range from 7:00 to 8:00 and 7:15 to 8:15 for the a.m. peak, and 4:00 to 5:00 and 4:30 to 5:30 for the p.m. peak. **Figures 3a-3c** below show the existing traffic volumes for each intersection along with the peak hour and peak hour factor.

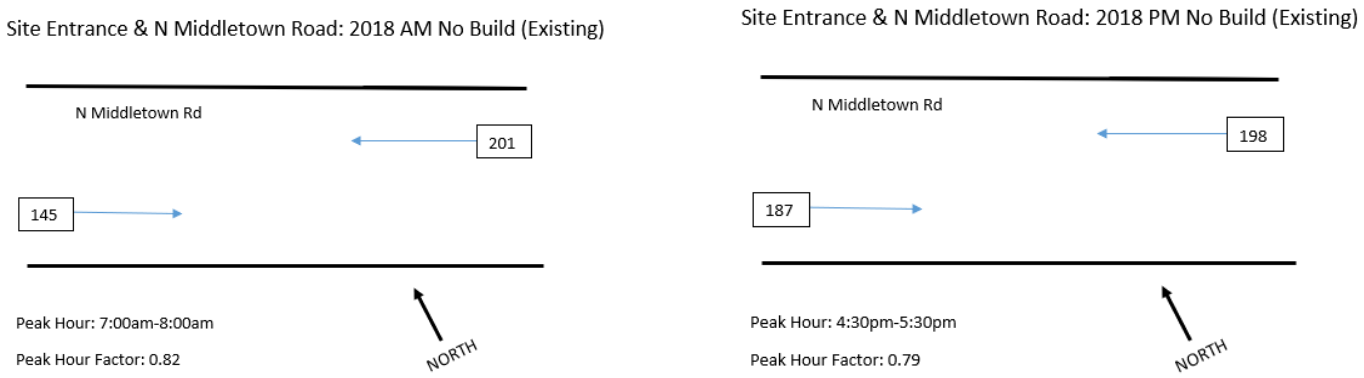


Figure 3a: US 460 at the Site Entrance 2018 existing volumes

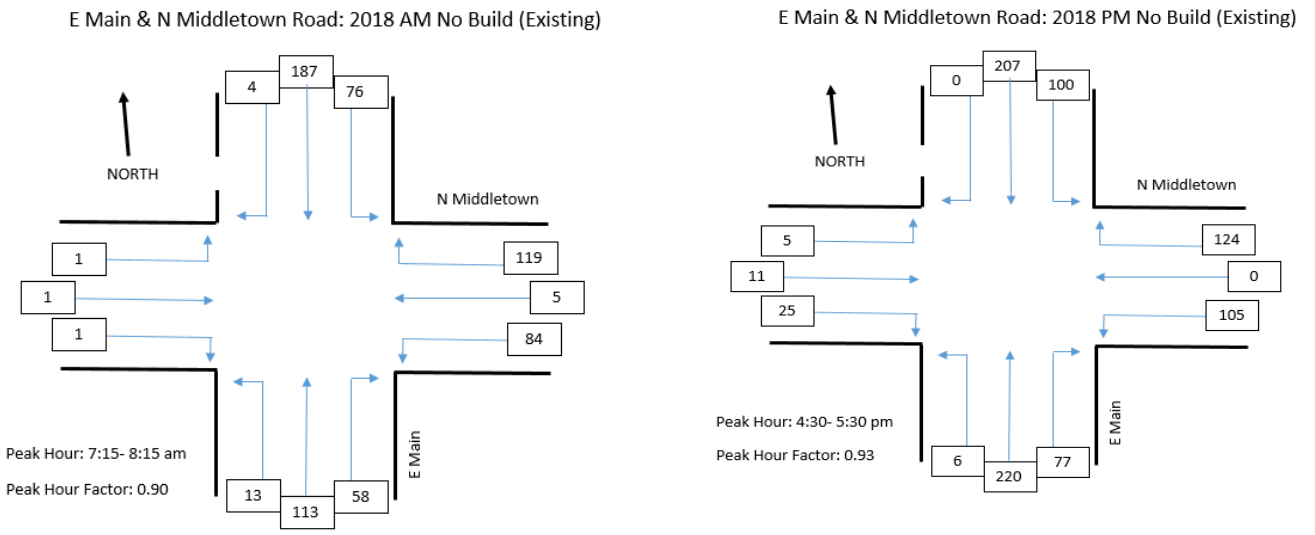


Figure 3b: US 460 and East Main Street 2018 existing volumes

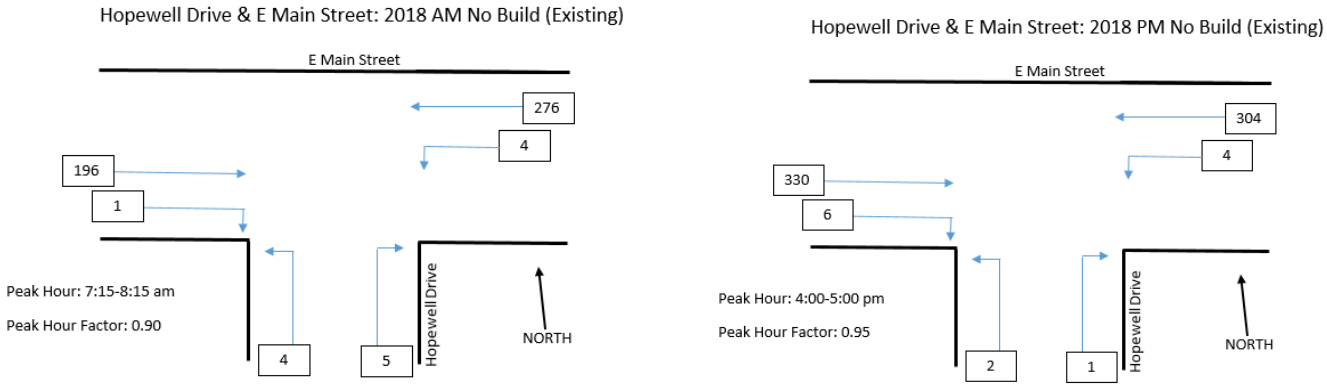


Figure 3c: East Main Street at Hopewell Drive 2018 existing volumes

Existing Analysis:

The traffic counts above in conjunction to other information were used to analyze existing level of service (LOS) and delays of each existing intersection. In order to model the traffic, we used Highway Capacity Software (HCS) 2010 to aid in our analysis. **Table 1** provides the control delay and LOS for each movement at the signalized intersection of E Main Street and US 460. **Table 2** shows the existing delay and LOS for the intersection at Hopewell Drive and E Main Street. You should know the intersection at the site entrance was not analyzed since it is currently not an intersection. As reviewing the information, please note the LOS does not appear to change as a result of the proposed development.

Table 1: Existing Delay and LOS at East Main Street and North Middletown

Delay and Level of Service (LOS) at East Main Street and North Middletown Road (US 460)									
Time	Year	Northbound (E Main)		Southbound (E Main)		Westbound (US 460)		Eastbound	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
AM	2018	6.1	A	6.4	A	23.0	C	18.2	B
PM	2018	6.1	A	6.4	A	23.0	C	18.2	B

Table 2: Existing Delay and LOS at Hopewell Drive and East Main Street

Delay and Level of Service (LOS) at East Main Street and Hopewell Drive					
Time	Year	Southbound (E Main)		Westbound (Hopewell Drive)	
		Delay (s)	LOS	Delay (s)	LOS
AM	2018	7.7	A	10.6	B
PM	2018	8.0	A	12.6	B

Future Conditions:

Trip Generation:

The proposed site is expected to contain forty-seven (47) single family homes. The 9th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Handbook was used to generate future traffic volumes for the proposed development. ITE Code 210 (Single Family Homes) was used to model the future traffic volumes. Based on forty-seven (47) dwelling units, the development will generate thirty-five (35) trips during the a.m. peak hour and forty-seven (47) trips during the p.m. peak hour. Of those trips, 20% will be coming in during the a.m. peak hour with 80% going out and during the p.m. peak hour, 65% of vehicles will be coming in while 35% will be going out. **Table 3** below shows the summary of trips generated by the development.

Table 3: Projected Trips

ITE Trip Generation Values (47 Lots, Single Family Homes)				
Time	AM in	AM out	PM in	PM out
Additional Volume	9	26	30	17

Trip Distribution:

Two worst case scenarios were generated based on the two access points into the development. The first scenario models all new traffic entering and exiting the development at the proposed entrance on US 460. The second scenario models all new traffic entering and exiting the development through Hopewell Drive at East Main Street. **Figures 4-7** below show distribution percentages based on existing traffic volumes at each intersection for both scenarios.

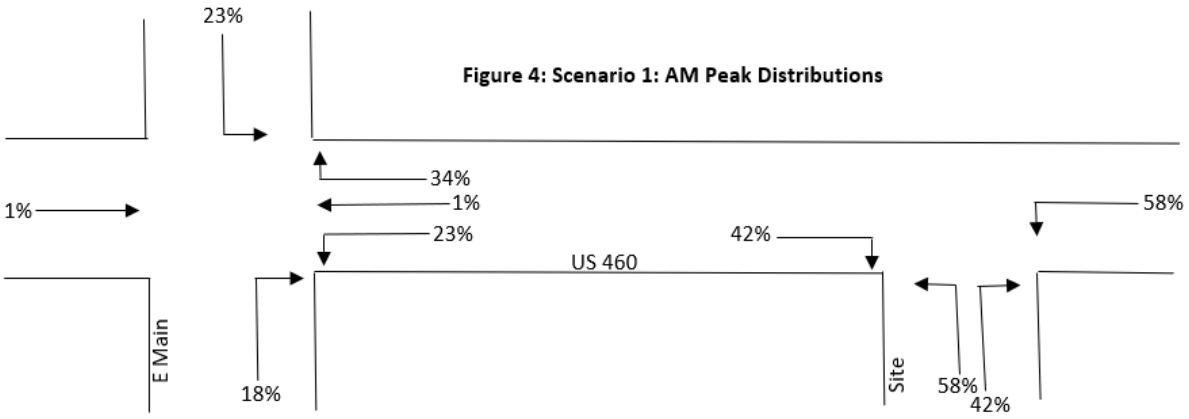


Figure 4: Scenario 1: AM Peak Distributions

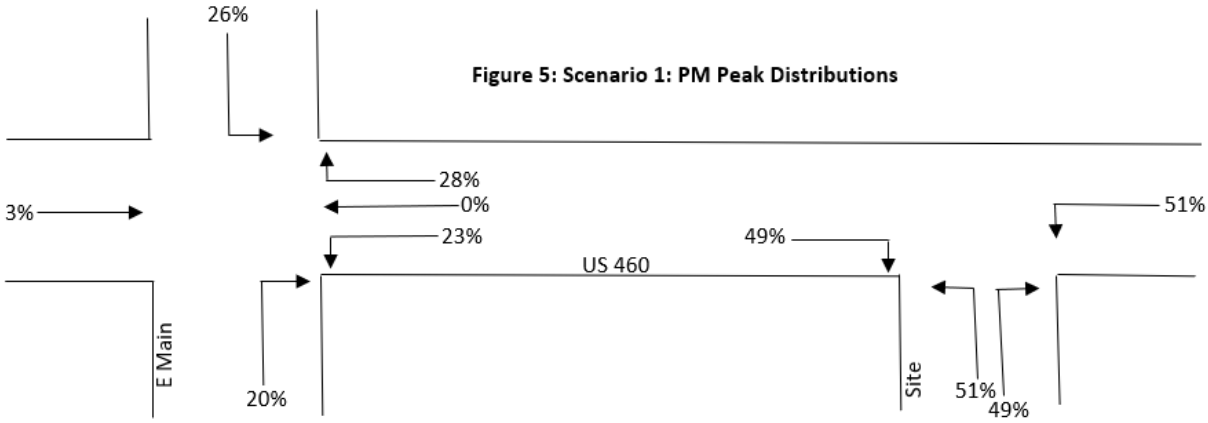


Figure 5: Scenario 1: PM Peak Distributions

Figure 6: Scenario 2: AM Peak Distributions

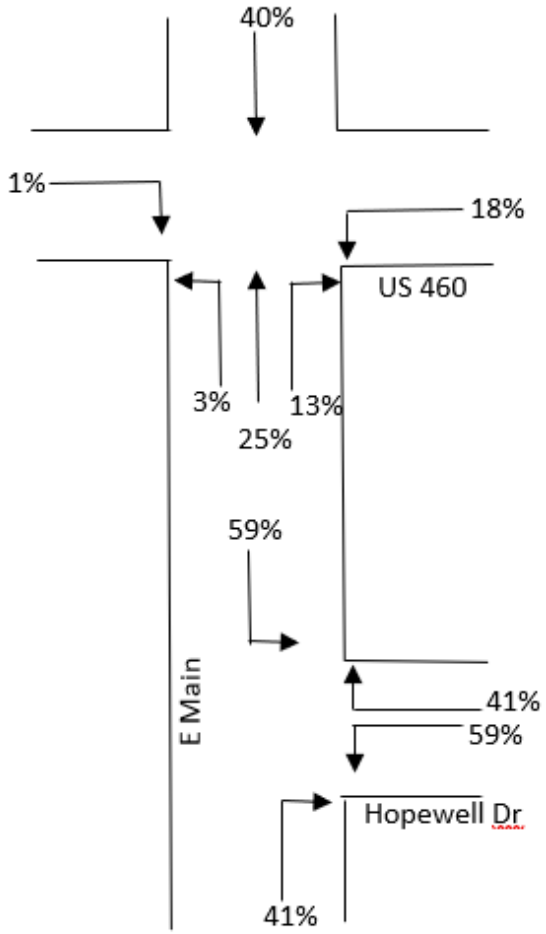
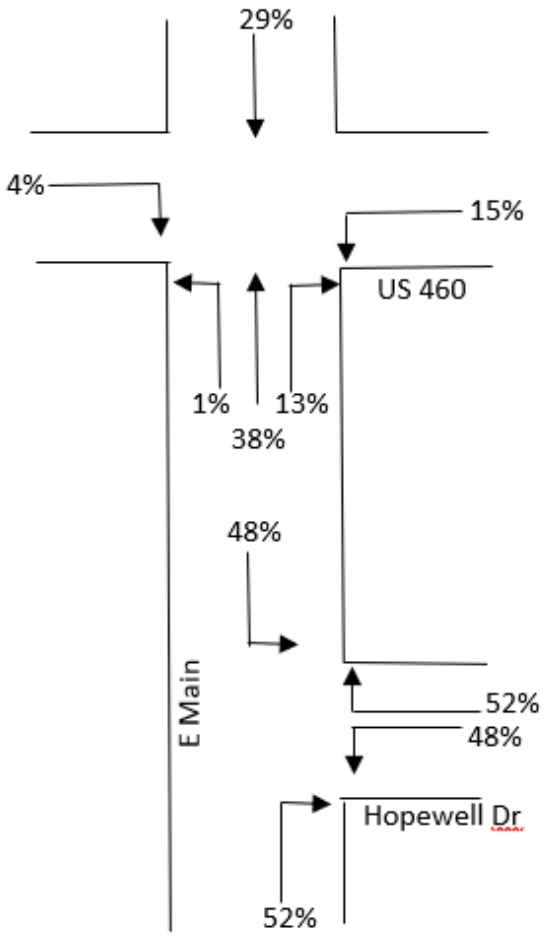


Figure 7: Scenario 2: PM Peak Distributions



Future Volumes:

Construction is expected to be completed in 2018, therefore generated traffic volumes were added to existing volumes for each scenario based on the distribution percentages shown above. Traffic volumes were also projected into 2028 with build and no build scenarios. A standard 2% growth rate per year was assumed, however based on KYTC traffic counts, the average growth rate for US 460 is 0.4%. **Figures 8a-8b** shows the a.m. peak future volumes for scenario 1 and **Figures 9a-9b** shows the p.m. peak future volumes for scenario 1. **Figures 10a-10b** show the a.m. peak future volumes for scenario 2 and **Figures 11a-11b** shows the p.m. peak future volumes for scenario 2.

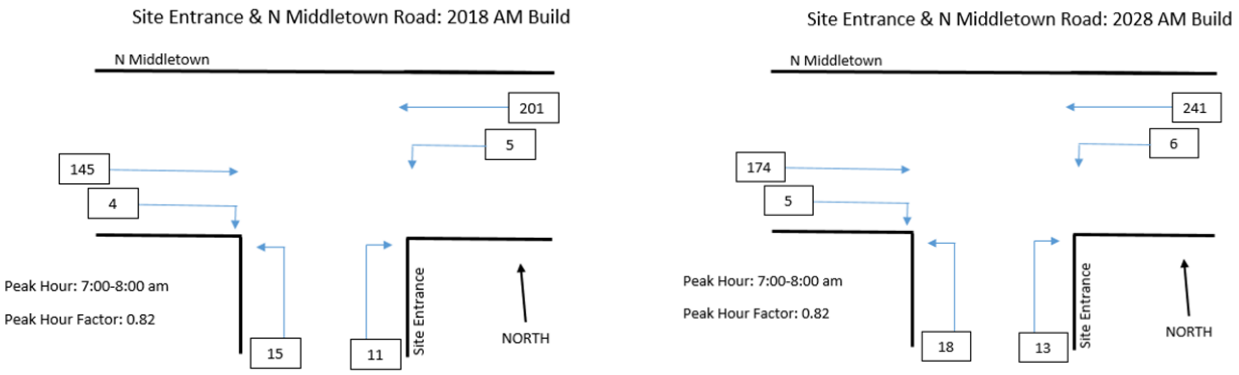


Figure 8a: Scenario 1: Site Entrance on US 460 AM Peak future volumes

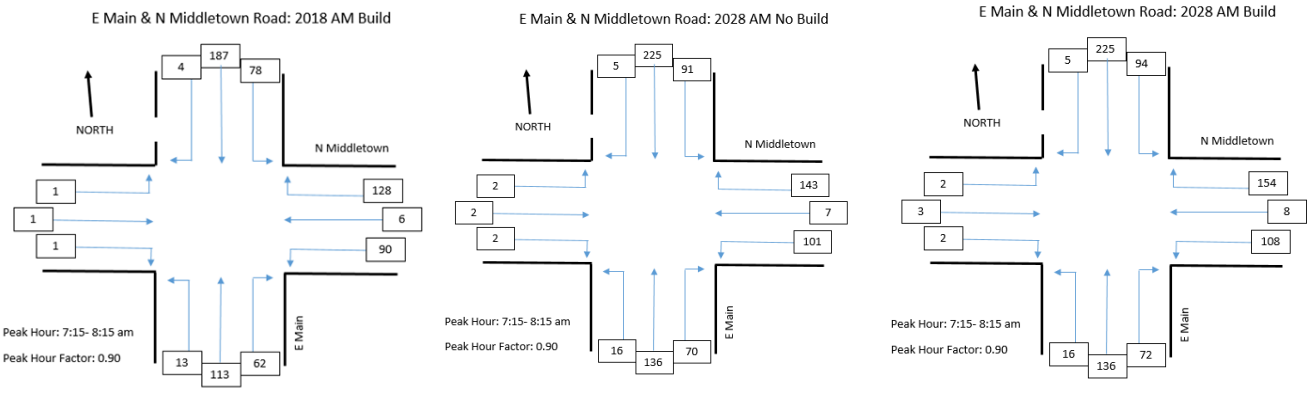


Figure 8b: Scenario 1: East Main Street and US 460 AM Peak future volumes

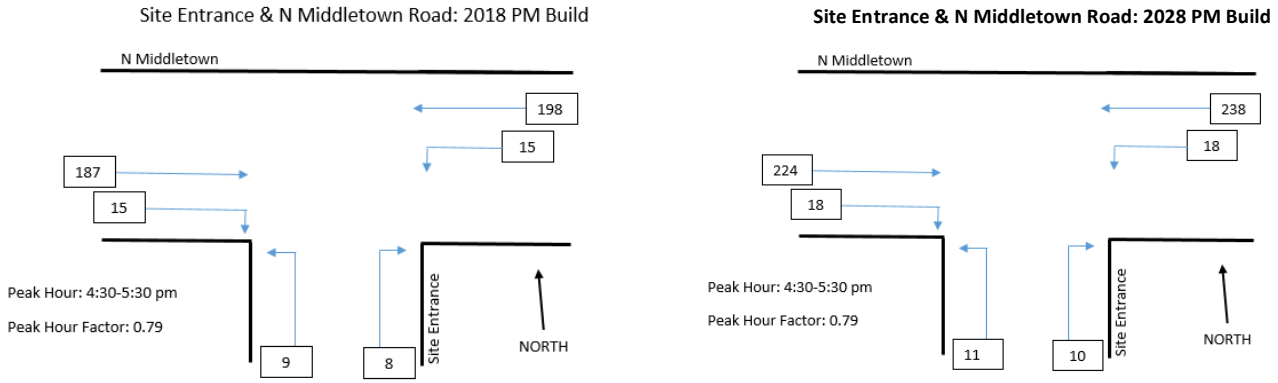


Figure 9a: Scenario 1: Site Entrance on US 460 PM Peak future volumes

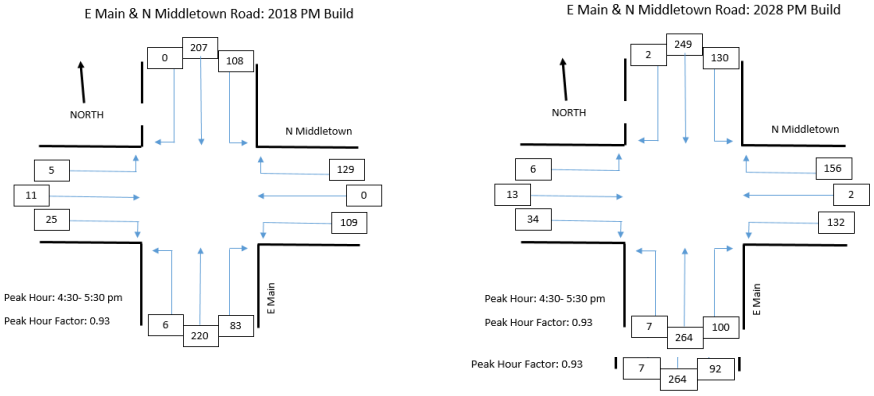


Figure 9b: Scenario 1: East Main Street and US 460 PM Peak future volumes

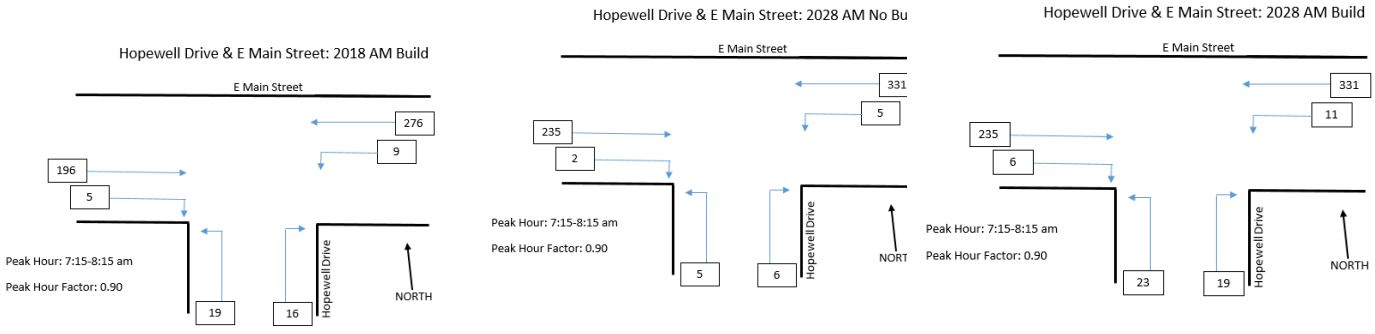


Figure 10a: Scenario 2: East Main Street and Hopewell AM Peak future volumes

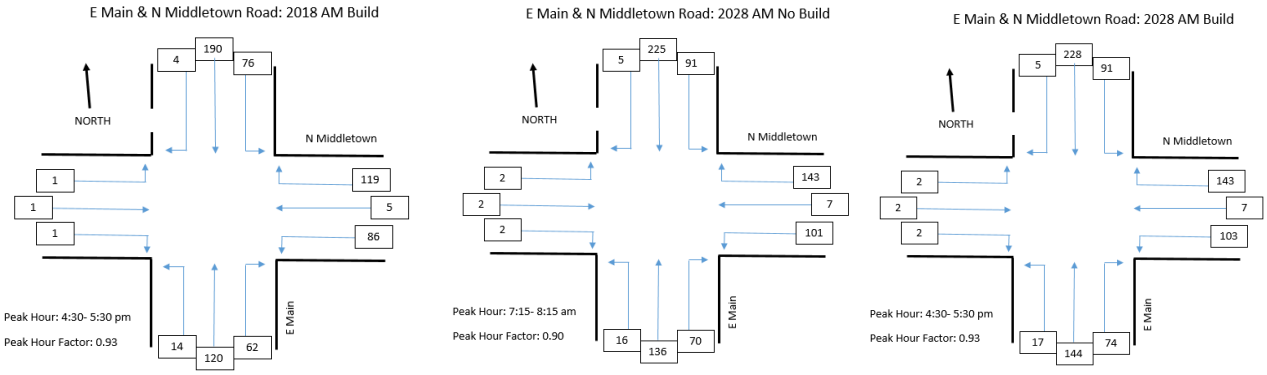


Figure 10b: Scenario 2: East Main Street and US 460 AM Peak future volumes

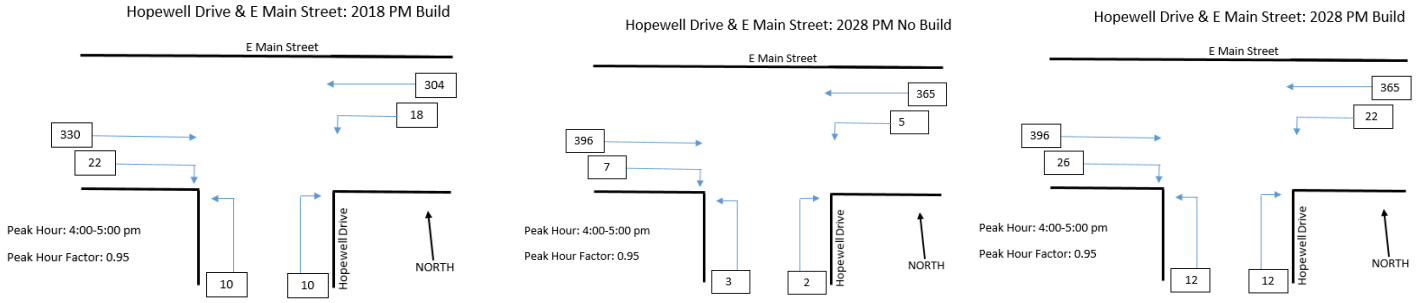


Figure 11a: Scenario 2: East Main Street and Hopewell PM Peak future volumes

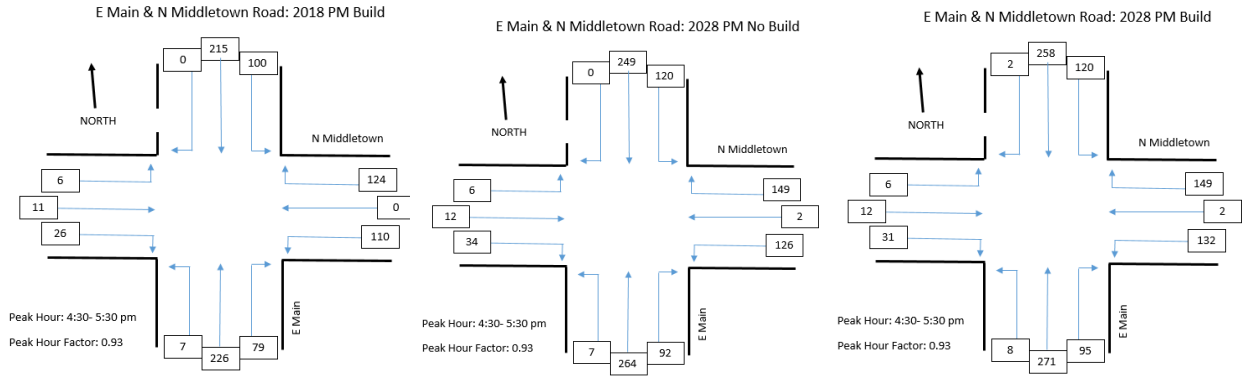


Figure 11b: Scenario 2: East Main Street and US 460 PM Peak future volumes

Future Analysis:

HCS 2010 was used to analyze future traffic delay and LOS. **Tables 4-7** show the expected delay and LOS for each intersection based on the scenario. HCS output reports can be seen in the attached document.

Table 4: Scenario 1: Site Entrance at US 460

Delay and Level of Service (LOS) at Site Entrance and North Middletown Road (US 460)					
Time	Year	Westbound (N Middletown)		Northbound (Site Entrance)	
		Delay (s)	LOS	Delay (s)	LOS
AM	2018 Build	7.7	A	10.6	B
	2028 Build	7.8	A	11.3	B
PM	2018 Build	7.9	A	11.2	B
	2028 Build	8.0	A	12.0	B

Note: Eastbound approach has no effect on the intersection

Table 5: Scenario 1: East Main Street and US 460

Delay and Level of Service (LOS) at East Main Street and North Middletown Road (US 460)									
Time	Year	Northbound (E Main)		Southbound (E Main)		Westbound (US 460)		Eastbound	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
AM	2018 No Build	6.1	A	6.4	A	23.0	C	18.2	B
	2018 Build	5.3	A	5.9	A	23.1	C	17.8	B
	2028 No Build	6.2	A	7.1	A	23.2	C	17.3	B
	2028 Build	6.7	A	7.7	A	23.2	C	17.0	B
PM	2018 No Build	6.1	A	6.4	A	23.0	C	18.2	B
	2018 Build	6.4	A	6.7	A	23.1	C	18.1	B
	2028 No Build	8.0	A	8.6	A	23.2	C	17.5	B
	2028 Build	8.5	A	9.3	A	23.2	C	17.2	B

Table 6: Scenario 2: East Main Street and Hopewell Drive

Delay and Level of Service (LOS) at East Main Street and Hopewell Drive					
Time	Year	Southbound (E Main)		Westbound (Hopewell Drive)	
		Delay (s)	LOS	Delay (s)	LOS
AM	2018 No Build	7.7	A	10.6	B
	2018 Build	7.7	A	11.4	B
	2028 No Build	7.8	A	11.5	B
	2028 Build	7.8	A	12.5	B
PM	2018 No Build	8.0	A	12.6	B
	2018 Build	8.1	A	12.6	B
	2028 No Build	8.2	A	13.7	B
	2028 Build	8.3	A	14.1	B

Note: Northbound lane not effected

Table 7: Scenario 2: East Main Street and US 460

Delay and Level of Service (LOS) at East Main and North Middletown Road (US 460)									
Time	Year	Northbound (E Main)		Southbound (E Main)		Westbound (US 460)		Eastbound	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
AM	2018 No Build	4.9	A	5.5	A	23.1	C	18.1	B
	2018 Build	5.1	A	5.6	A	23.1	C	18.0	B
	2028 No Build	6.2	A	7.1	A	23.2	C	17.3	B
	2028 Build	6.3	A	7.2	A	23.2	C	17.3	B
PM	2018 No Build	4.9	A	5.5	A	23.1	C	18.1	B
	2018 Build	5.1	A	5.6	A	23.1	C	18.0	B
	2028 No Build	6.2	A	7.1	A	23.2	C	17.3	B
	2028 Build	6.3	A	7.2	A	23.2	C	17.3	B

Safety Analysis:

A general safety analysis was performed to confirm any existing safety issues. Based on public record from the Kentucky State Police, the Paris Police Department recorded 22 crashes from the past three years (4/01/2015-4/01/2018) in the study area. Crash locations are mapped in **Figure 12** below.

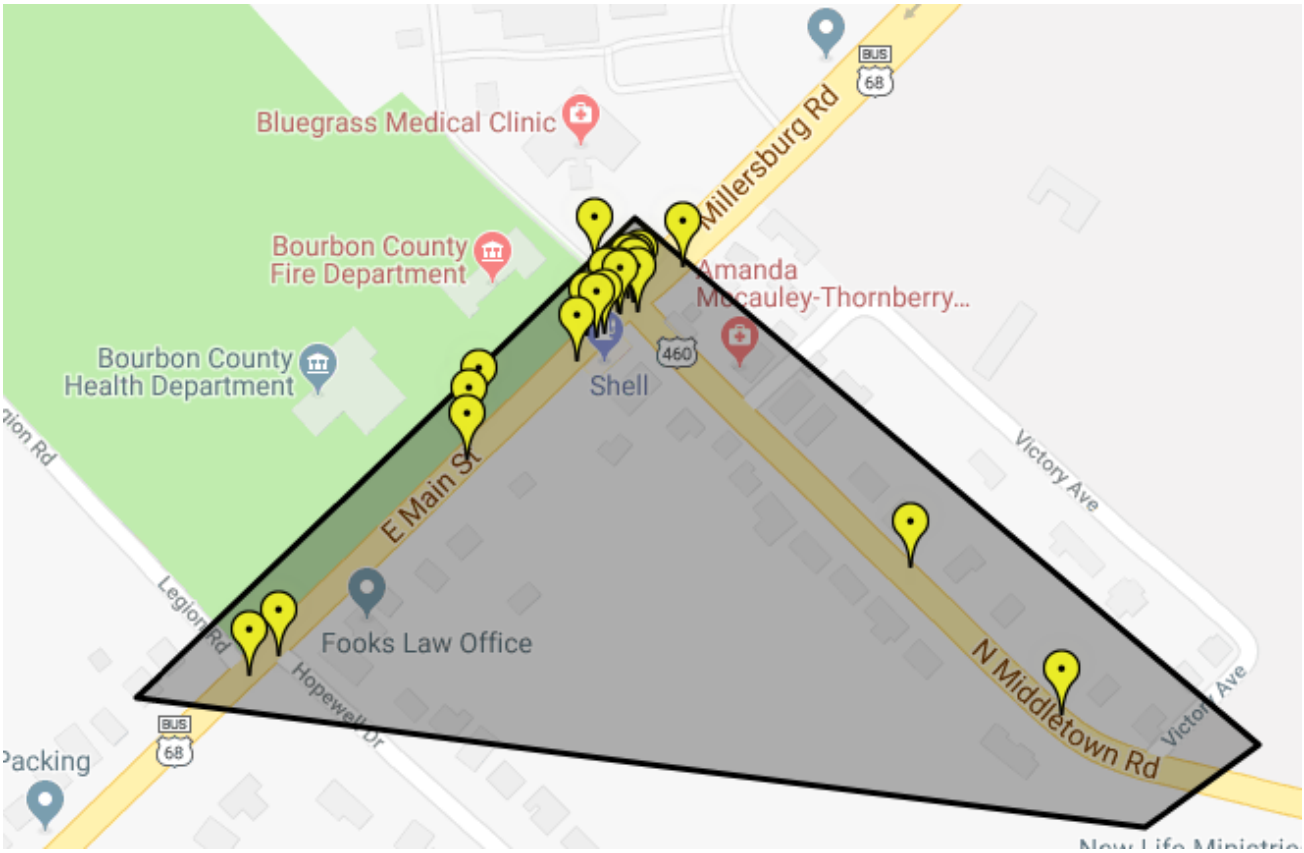


Figure 12: Crash locations from 4/01/2015-4/01/2018

Table 8 below provides a summary of the crash locations and crash types. In total there were 7 angle collisions, 5 rear-end collisions, 3 single vehicle accidents, and 1 sideswipe collision. The remaining 6 crashes in the area were backing collisions in parking lots. Of the twenty-two (22) collisions within the previous three years, none resulted in injury.

Table 8: Summary of Crash Date, Location, Type, Conditions and Injuries

Date	Intersection	Crash Type	Conditions	Injuries
11/8/17	E Main Street Gas Station	Backing (Parking Lot)	Clear, dry	None
8/21/17	E Main Street and US460	Angle Collision	Clear, dry	None
6/10/17	E Main at Hopewell Drive	Single Vehicle	Clear, dry	None
12/14/16	E Main Street and Hopewell	Rear- end	Clear, dry	None
10/12/16	E Main Street and US460	Angle Collision	Clear, dry	None
9/30/16	E Main Street and US460	Rear- end	Clear, dry	None
8/16/16	Middletown	Angle Collision	Cloudy, wet	None
3/18/16	E Main Street and US460	Backing (Parking Lot)	Clear, dry	None
3/25/16	E Main Street and US460	Angle Collision	Clear, dry	None
12/11/15	Middletown	Single Vehicle	Clear, dry	None
6/12/15	E Main Street and US460	Rear- end	Clear, dry	None
7/7/15	E Main Street Gas Station	Backing (Parking Lot)	Clear, dry	None
5/17/15	E Main Street Gas Station	Backing (Parking Lot)	Clear, dry	None
5/27/15	E Main Street and US460	Rear- end	Raining, wet	None
7/29/17	E Main Street and US460	Sideswipe- Same Direction	Clear, dry	None
8/4/16	E Main Street Gas Station	Backing (Parking Lot)	Clear, dry	None
7/18/16	E Main Street and US460	Angle Collision	Clear, dry	None
2/14/16	E Main Street and US460	Single Vehicle	Snow/ slush	None
10/9/15	E Main Street and US460	Opposing Left Turn	Cloudy, dry	None
12/11/15	E Main Street and US460	Rear- end	Cloudy, wet	None
4/2/15	E Main Street and US460	Angle Collision	Raining, wet	None
9/18/15	E Main Street Gas Station	Backing (Parking Lot)	Clear, dry	None

It is difficult for us to determine traffic accidents for the future. Our review of the crash type information suggests many of the accidents were at low speed (i.e. backing, rear-end). The area is somewhat residential and the accidents appear to be a result of poor attention to vehicular operation.

The proposed intersection will be a standard three-leg intersection. A three-leg intersection contains 9 potential conflict points as show in **Figure 13**.

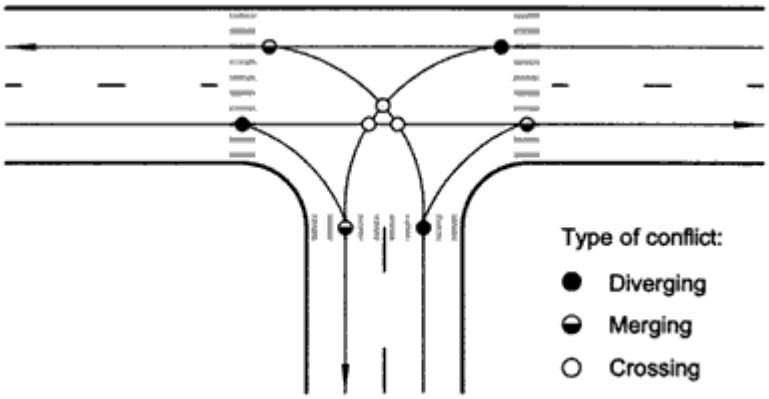


Figure 13: Conflict Diagram

Conclusions and Recommendations:

Our analysis indicates the traffic signal at US460 and East Main Street currently operates at LOS B, with the approaches on East Main Street operating at LOS A. The Westbound approach at US 460 operates at LOS C, while the Eastbound approach operates at LOS B. With either scenario, the traffic signal will continue to operate at that level of service through 2028 with or without the construction of the development.

The proposed entrance at US 460 will operate at LOS B, with US 460 operating at LOS A and the site entrance operating at LOS B. The intersection will operate at this level upon construction completion and through 2028. The intersection of East Main Street and Hopewell Drive currently operates at LOS B with East Main Street operating at LOS A and Hopewell Drive operating at LOS B. The intersection will continue to operate at this level with traffic flowing from the development through Hopewell Drive from 2018 to 2028.

Based upon the data obtained and our efforts provided in this report, the proposed development will have little effect on the surrounding traffic network.

If you should have any questions, please feel free to contact us.

Sincerely,

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Mr. Dylan Durbin, E.I.T.
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