

MEMORANDUM

DATE: May 3, 2016
SUBJECT: Montgomery Road & Kenwood Road
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Existing Conditions

The intersections of Kenwood Road with Montgomery Road and Orchard Lane are in very close proximity to one another (375 feet). Both intersections are signalized. The intersection of Kenwood Road and Montgomery Road carries a significant amount of traffic due to the Kenwood Towne Center and the regional character of the Montgomery Road corridor.

Kenwood Road is the major access path connecting I-71 with the Kenwood Towne Center and other commercial facilities both north and south of Montgomery.

Orchard Lane connects Kenwood Road to Blue Ash Road. Land use on Orchard is mostly residential, with some commercial clustered near Montgomery.

In the 375 feet along Kenwood Road between Montgomery Road and Orchard Lane, there are three driveways, including two accessing the shopping center and one driveway for the BP gas station.

The Kenwood Road and Orchard Lane signal adds significantly to traffic congestion due to its close proximity to the Kenwood Road and Montgomery Road signal. Southbound traffic often queues past Orchard from the Montgomery Road intersection; northbound traffic stopped at Orchard often queues into the intersection of Montgomery Road and Kenwood Road.

Another problem for southbound traffic is that the left turn lane is sometimes inadequate to hold the left turn queue, which then extends into the through lanes, adding to congestion.

Access Management

Access management standards have been established by two relevant governmental agencies: Hamilton County and the Ohio Department of Transportation.

The Hamilton County Access Management Manual specifies a minimum signal spacing on Major Arterials as 1800 feet. The Manual also specifies a minimum driveway spacing of 315 feet and a corner spacing of 405 feet.

The Ohio Department of Transportation Access Management Manual specifies a minimum signal spacing on Major Arterials as 1250 feet, with a minimum driveway spacing of 250 feet and a corner spacing of 405 feet.

Along Montgomery Road between Kenwood Road and the traffic signal at St. Vincent Ferrer, a distance of approximately 1000 feet, there are 13 driveways accessing the commercial businesses on the north and south sides of the roadway. Clearly, the driveway spacing does not meet the requirements of either Access Manual. In addition, the signalized intersection spacing from Montgomery Road and Kenwood Road to Orchard Lane and Kenwood Road does not meet the minimum spacing.

Crash Analysis

The driveways along both Kenwood Road and Montgomery Road have led to a number of accidents. The following table shows the accidents at several locations between the years of 2012 to 2015:

Roadway	Address	Location	# of Crashes
US 22	7752		3
US 22	7772	Honeybaked Ham	3
US 22	7776	Jiffy Lube	1
US 22	7781	Taco Bell	1
US 22	7788	Trader Joes	2
US 22	7789	Pep Boys	6
US 22	7790	Verizon	6
US 22	7796	Tennisport	1
US 22	7799	BP	12
US 22	7800		2
US 22	7840		2

Not only does the BP driveway experience the highest number of crashes during this time period, but a high percentage of those were angle accidents, the most dangerous type of collision.

It is difficult to quantify the crashes at the driveways along Kenwood Road between Montgomery Road and Orchard Lane because of the spacing and the constant traffic queues

between the intersections. Due to this, the crashes are often attributed to one of the two signalized intersections. During the same time period as above, the intersection of Kenwood Road and Orchard Lane experienced a total of 28 crashes. The intersection of Kenwood Road and Montgomery Road experienced a total of 74 crashes.

Capacity Analysis

To begin the analysis, TEC reviewed the intersection of Montgomery Road & Kenwood to determine the improvements necessary to improve the operation of the intersection. Since a major issue is the lack of queuing space for southbound traffic wanting to turn left at Montgomery, TEC investigated the possibility of providing a dual southbound left turn lane. This would require widening, which would obviously greatly impact the adjacent properties. Kenwood north of Montgomery would need to be widened a minimum of 12 feet to provide for the additional southbound left lane. In addition, a median would be needed to prevent drivers from turning right out of the driveways along the west side of Kenwood and attempting to cross several lanes of traffic to turn left at the Montgomery Road and Kenwood Road intersection.

In addition to additional storage distance in the southbound direction, the Kenwood Road and Montgomery Road intersection volumes indicate a need for a southbound right turn lane.

Based upon this review, TEC completed a Synchro model of several scenarios. This includes adding a southbound right turn lane, adding dual southbound left turn lanes, providing a lagging southbound left turn phase, and providing a southbound right turn lane *and* dual southbound left turn lanes. These scenarios are provided in the table below. The table shows delay in seconds for each movement under each scenario.

	EBL	EBT	EBR	EB TOTAL	WBL	WBT	WBR	WB TOTAL	NBL	NBT	NBR	NB TOTAL	SBL	SBT	SBR	SB TOTAL	INT TOTAL
<i>Existing</i>	24.4	38.5		34.8	35.7	27.6	15.0	25.9	42.3	43.9		43.6	58.8	48.4		51.0	39.0
SBR	25.6	38.7		35.3	37.9	27.3	14.6	26.2	25.3	43.4		40.2	53.1	31.3	4.3	33.0	33.7
SB Dual Left	23.3	36.7		33.2	33.7	25.5	16.4	24.9	51.1	39.3		41.5	61.6	40.8		46.0	37.0
Lag SB Left	23.9	36.6		33.3	34.5	25.9	22.7	27.3	72.5	71.8		71.9	57.9	42.3		46.2	45.5
SBR SB Dual Left	23.3	36.3		32.9	33.5	25.5	16.4	24.8	32.6	39.4		38.2	61.6	36.1	3.7	37.9	33.8

From the table it can be seen that the addition of the southbound right turn lane provides the biggest benefit, in that it produces the least overall intersection delay and least delay for the southbound movement. It may seem odd that the provision of both the southbound right turn lane and dual southbound left lanes does not produce less delay than the southbound right turn lane only. Because a dual left turn can only be made during a protected phase, no turns can be

made until the phase appears. During non-peak times, drivers must wait for the protected left turn phase and are unable to turn permissively, which can actually increase delay.

Given the vacant land on the northwest quadrant of Montgomery Road and Kenwood Road, it is likely that this land will eventually develop. When that happens, there may be an opportunity for roadway changes to alleviate the current problems and also accommodate new development. Sycamore Township has reviewed the potential of realigning Orchard Lane and closing the intersection of Kenwood Road and Orchard Lane. In addition, TEC has investigated a quadrant roadway that would connect Orchard Lane to St. Vincent Ferrer.

Closing the intersection of Orchard Lane and Kenwood Road and realigning Orchard Lane has another ramification; it would allow the extension to the north of the southbound left turn lane at Kenwood Road and Montgomery Road. Oftentimes, the demand for the southbound left turn lane exceeds the existing storage length and queue blocks the through lane.

Based upon this, TEC performed a capacity analysis of Kenwood and Montgomery with a single extended southbound left turn lane and an additional southbound right turn lane. This change would allow the access along Kenwood Road and Montgomery Road to be controlled, and the resulting traffic from any development to be delivered into the network at a single point. The following table displays the results from Synchro for the delay in seconds.

	AM		PM		% Change	
	Ex Geom.	Prop Geom.	Ex Geom.	Prop Geom.	AM	PM
Montgomery & Kenwood	31.6	31.9	48.9	40.5	1%	-17%

The slight increase in delay for the AM Peak is insignificant due to the volumes, but the PM Peak shows a drastic improvement in delay for the existing volumes.

Development Traffic

To further review the operation of each intersection, TEC reviewed the traffic that might be generated by development of the vacant land in the northwest quadrant of Montgomery Road and Kenwood Road.

ITE Land Use	Name		AM Peak	PM Peak
220	Residential	60 Units	34	51
710	Office	200,000 sq ft	334	303
820	Commercial	100,000 sq ft	156	600

TEC assumed an internal roadway network that included a connection to the Montgomery Road and St. Vincent Ferrer signal, as well as a right in/right out along Kenwood Road. This plan will maximize the developable land, while improving access management and providing direct access to Kenwood Road. Based upon the generated trips, TEC assumed an internal capture rate of 7% and a commercial pass-by rate of 34%; both rates were derived from the ITE Trip Generation Manual. These volumes were then distributed through the network. Approximately 85% of the traffic will enter the site through the signalized intersection at Montgomery Road and St. Vincent Ferrer, while the remaining 15% will access through the right in/right out on Kenwood Road. The exiting traffic will be distributed with approximately 80% using the signalized intersection and the remaining 20% using the right in/right out.

The following table shows the delay at each intersection based on existing conditions (no generated volumes, or improvements to Montgomery Road and Kenwood Road), and with generated traffic including improvements to Montgomery Road and Kenwood Road. "Build" means both development of the land and improvement of the intersection.

	AM		PM	
	Ex	Build	Ex	Build
Montgomery & St. Vincent	9.1	29.3	15.8	35.8
Montgomery & Kenwood	31.6	33.2	48.9	46.8

This demonstrates that the existing intersections can accommodate the additional traffic with the improvements to Montgomery Road and Kenwood Road. TEC reviewed the potential of allowing all of this traffic to exit at the Montgomery Road and St. Vincent Ferrer Driveway. This produced a higher than normal delay for both the existing southbound traffic exiting the Redstone Development. Therefore, it was decided that the new internal roadway would need to provide for a right in right out on Kenwood Road to provide direct access to Kenwood Road and southbound I-71.

Conclusion

The foregoing discussion indicates that the operational problems of the Kenwood and Montgomery intersection can be somewhat alleviated but not eliminated by widening of the southbound approach. But if development of nearby vacant land should occur, more drastic steps, including reconfiguring Orchard Lane and removing its connection to Kenwood, would need to be considered. This work will allow access management to be implemented along Kenwood Road to alleviate some of the crashes along this section of roadway.