

Maxwell Hill Area Traffic Study

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Organization

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Study Purpose

Traffic moving from Harper Road to US 19 near the Beckley Shopping Center Plaza “cuts through” the Maxwell Hill residential area using Pikeview Drive, Holliday Drive, and Pinewood Drive, and/or other streets in the neighborhood area. The purpose of this study is to evaluate the problems created by traffic cutting through the Maxwell Hill area and identify potential solutions.

Study Process

The study process is summarized by the graphic in **Figure 1** and is described below.

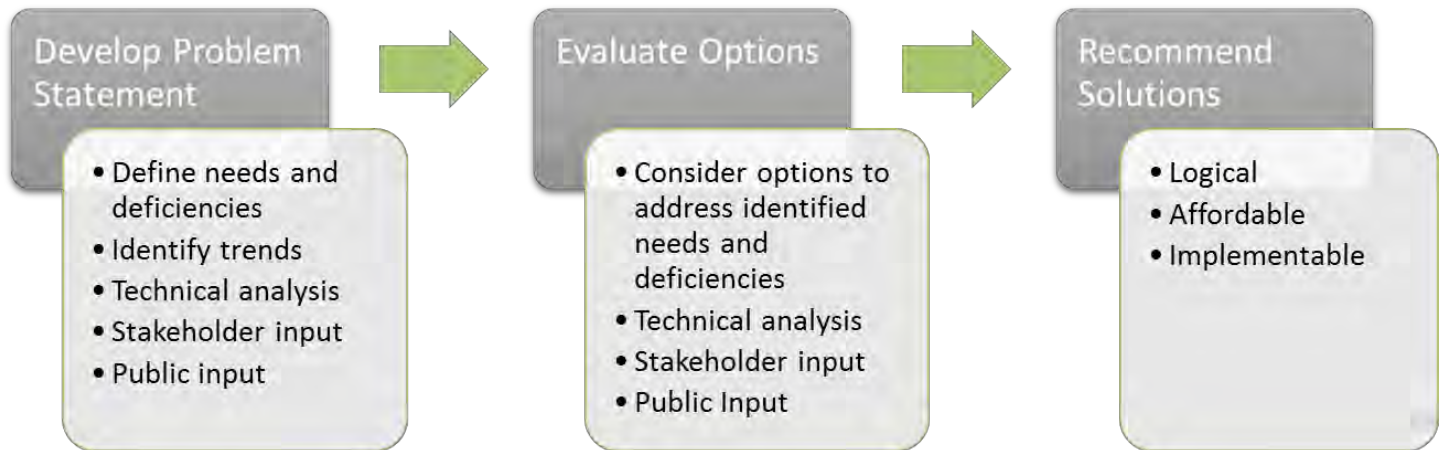


Figure 1: Study Process

The study process involved three main steps:

Develop Problem Statement – The needs and deficiencies in the Maxwell Hill area, specifically relating to cut-through traffic, were clearly identified and defined through field reviews, technical analysis, and stakeholder and public input.

Evaluate Options – Options that address the identified needs and deficiencies were considered and evaluated through technical analysis and then presented to stakeholders and the public for input.

Recommend Solutions – From the technical analysis and input from the public and other stakeholders, logical, affordable, and implementable solutions were recommended.

Stakeholder and Public Involvement

Input was aggressively sought from local residents and stakeholders, which ensured that the study team was well-informed of current conditions and improvement options were well-vetted. The following efforts were undertaken to involve stakeholders and the public in the study process.

Stakeholder Meetings – The stakeholders engaged included local and state representatives who could have the greatest influence on the implementation of recommended improvements and local officials who represent the citizens directly impacted by the recommendations. Members of this stakeholder group included representatives from: Fayette Raleigh Metropolitan Planning Organization (FRM), West Virginia Department of Highways (WVDOT), City of Beckley Police Department, City of Beckley Fire Department, Beckley City Council, Beckley City Staff, Raleigh County, and Raleigh County Emergency Services Authority (RCESA 911). The group met twice over the course of the project. The first meeting was held on June 15, 2016. Members were asked to provide input on the issues and problems with the cut-through traffic in

the Maxwell Hill area as well potential ideas for improvement. On August 16, 2016, the second stakeholder meeting was held to present and discuss five concepts under consideration. Stakeholder meeting summaries are presented in **Appendix A**.

General Public Meetings – Two general public meetings were held to allow local citizens the opportunity to provide ideas and feedback. The meetings were advertised through flyers that were distributed to homes in the Maxwell Hill area and other local businesses, posts on the FRM and City of Beckley websites, and press releases to local news and media outlets. The first public meeting was held on June 15, 2016 to seek public input on current transportation issues in the Maxwell Hill area and ideas for improvements. 30 citizens signed in at the meeting and 13 provided written comments at the meeting or later via email or online survey. A second public meeting was held on August 16, 2016 to provide the public with an opportunity to ask questions and provide written comments on the identified solutions. At this meeting, 28 citizens signed in and seven (7) provided written comments at the meeting or later via email or online survey. Summaries of comments are included in various sections of this report. Public meeting summaries and comment forms are in **Appendix B**.

Existing Conditions

This section summarizes the existing conditions in the Maxwell Hill area and identifies the problems and deficiencies being addressed as part of this study.

Current Travel Routes

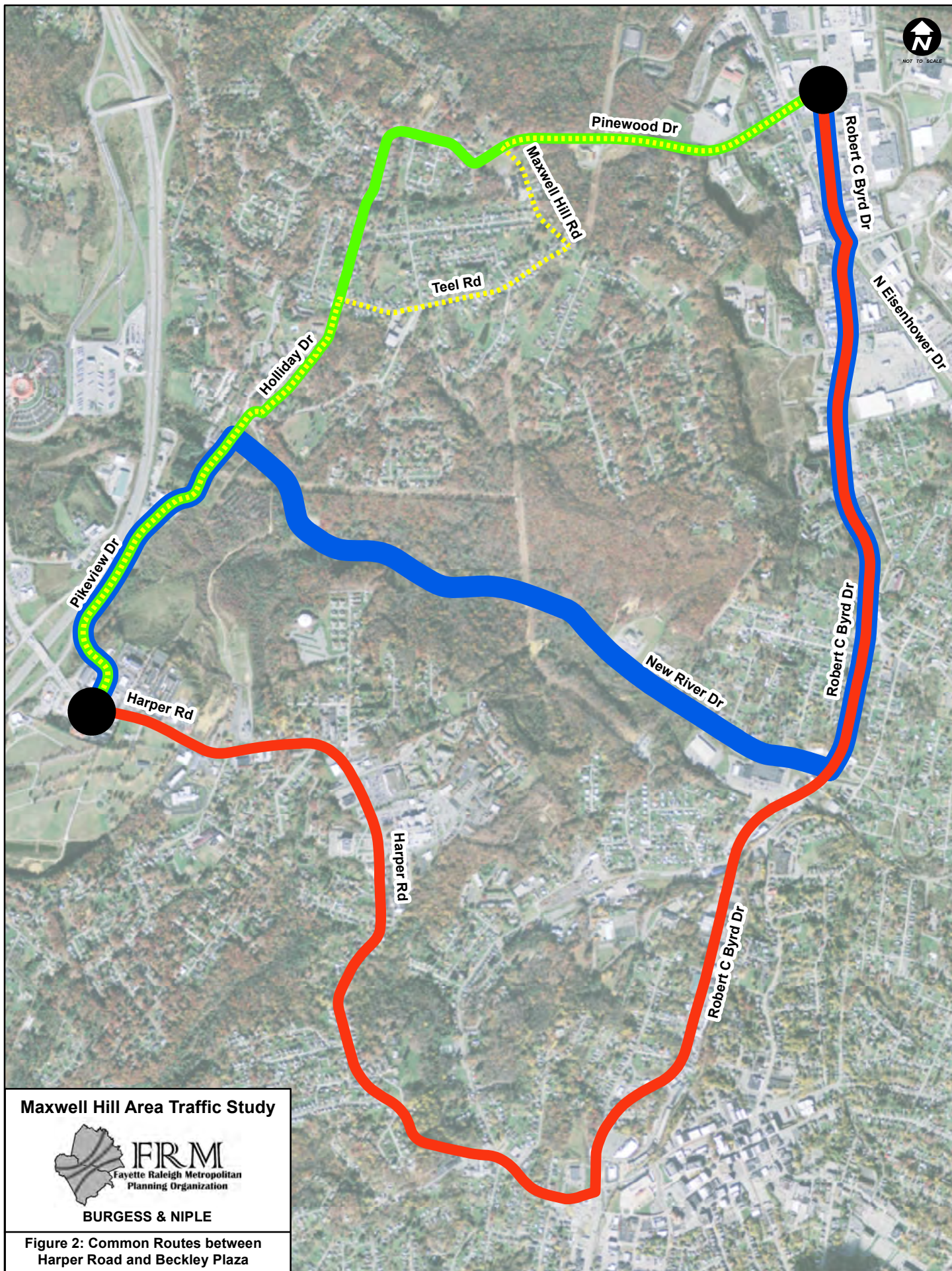
While the potential routes are numerous for travel between Harper Road (WV 3) near the I-64/77 interchange to the Beckley Shopping Center Plaza, this study compares the two most common cut-through routes that use neighborhood streets and the two preferred routes that keep traffic out of the neighborhood. These routes are listed below and illustrated in **Figure 2**:

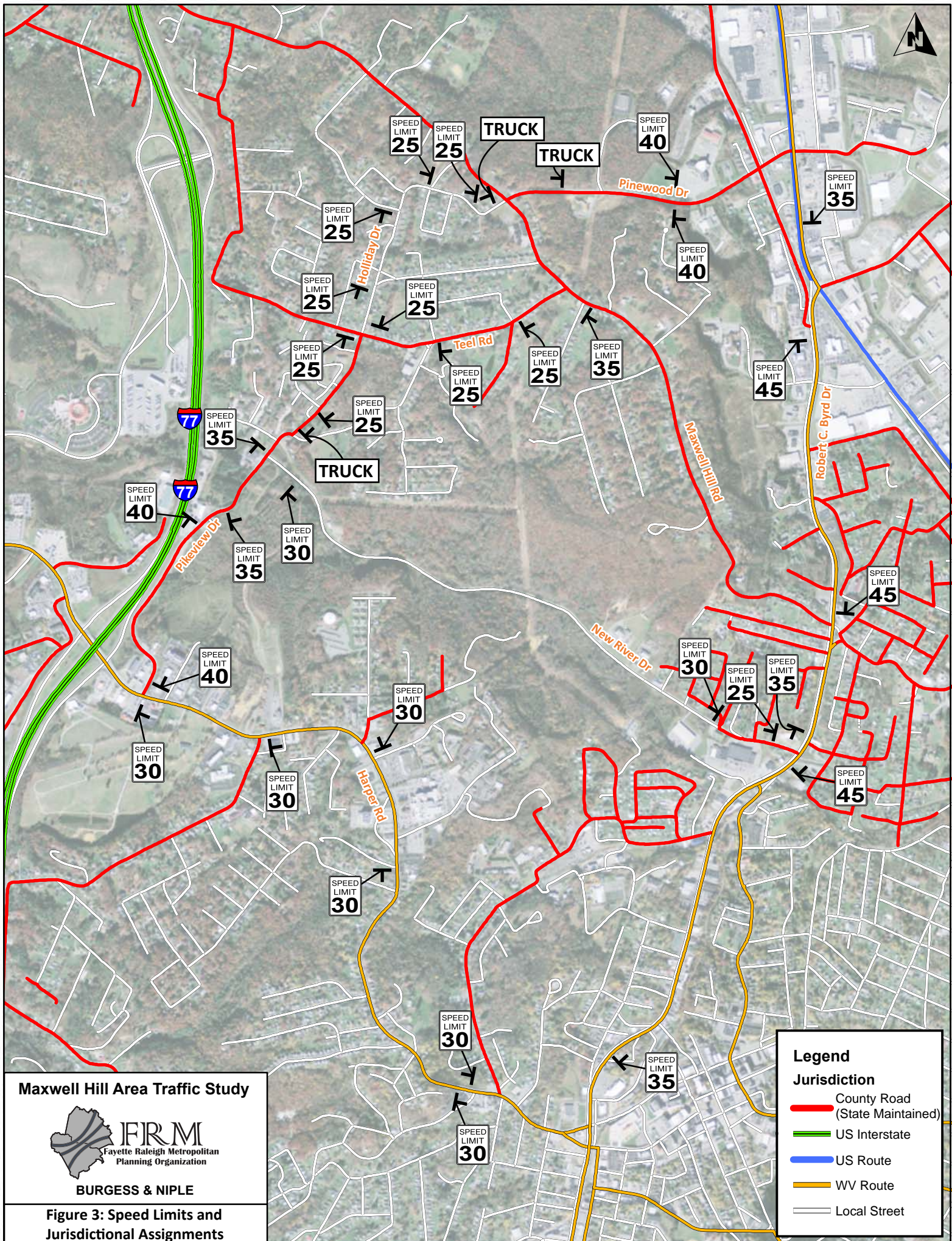
- Harper Road (WV 3) to Robert C. Byrd Drive (WV 16) to US 19 – Red Route
- Pikeview Drive to New River Drive to Robert C. Byrd Drive (WV 16) to US 19 – Blue Route
- Pikeview Drive to Holliday Drive to Teel Road to Maxwell Hill Road to Pinewood Drive – Yellow Route
- Pikeview Drive to Holliday Drive to Pinewood Drive – Green Route

Roadway Characteristics

Field reviews were performed in May and June 2016. Existing roadway characteristics and conditions for each study roadway are summarized below. **Figure 3** illustrates the posted speed limit and the government jurisdictional assignment of each roadway.

Harper Road (WV 3) is a state route that provides direct access to I-64/77 and serves several commercial properties near the interchange. East of the interchange, Harper Road serves shopping developments, including Kroger and others, the Raleigh General Hospital, and surrounding medical office buildings. West of its intersection with Robert C. Byrd Drive, Harper Road provides access to several residential properties and neighborhoods. Throughout the study area, the posted speed limit is 30 mph. Between the interchange and Carriage Drive (near Raleigh General Hospital), Harper Road is three lanes – one travel lane in each direction plus a center two-way left-turn lane. Harper Road is two lanes between Carriage Drive and Robert C. Byrd Drive. The roadway is constructed with approximately 12-foot lane widths and curb and gutter along most of the roadway within the study area.





Robert C. Byrd Drive (WV 16/US 19) is oriented primarily north/south within the study area and provides access to a variety of businesses located between Harper Road and US 19. The posted speed limit is 35 mph south of New River Road and 45 mph north of New River Road. Between Harper Road and Ewart Avenue, Robert C. Byrd Drive is three lanes – one travel lane in each direction with a center two-way, left-turn lane. North of Ewart Avenue to US 19, two travel lanes are provided in each direction separated by a center two-way, left-turn lane. North of the intersection of US 19/Ragland Avenue, Robert C. Byrd Drive continues as WV 16 and US 19 with two travel lanes in each direction with a center two-way, left-turn lane. Direct access to the Beckley Shopping Center Plaza is provided in this section of Robert C. Byrd Drive. 12-foot travel lanes are provided throughout the corridor within the study area.

Pikeview Drive is a two-lane roadway that provides direct access to the residential area of Maxwell Hill from Harper Road.

- From Harper Road to near the West Virginia Division of Highways (WVDOH) building, the posted speed limit is 40 mph. According to available records, Pikeview Drive is a county roadway (state-maintained) in this section with one 12-foot travel lane in each direction and an 8-foot paved shoulder on each side of the roadway.
- Between the WVDOH building and the intersection with Holliday Drive, the posted speed limit is 35 mph. This section of Pikeview Drive is also state-maintained. The travel lanes are approximately 12 feet in width but no shoulder is provided.
- Between Holliday Drive and Lucas Drive, the posted speed limit is 25 mph along this segment of Pikeview Drive, which is a City street and not state-maintained. The travel lanes are approximately 10 feet wide or less in some areas. No shoulder is provided and damage to the edges of the asphalt pavement was observed from the number of heavy vehicles frequently traveling the roadway.

New River Drive is a two-lane roadway that connects Pikeview Drive directly to Robert C. Byrd Drive. The roadway was constructed with 11-foot travel lanes and a posted speed limit of 30 mph. Due to apparent poor roadway base construction, the roadway is bumpy and uneven, which reduces the speed at which vehicles can comfortably travel. A few businesses and houses are served by the roadway, but it is mostly undeveloped. Field observations indicated that the roadway floods during heavy rain events, which may be a deterrent to some drivers using the roadway. The sight distance for New River Drive traffic entering Robert C. Byrd Drive is very limited, so most vehicles avoid turning left onto Robert C. Byrd Drive. Many vehicles were observed cutting through the Ollie's Bargain Outlet parking lot to use the signal at Kanawha Street to access Robert C. Byrd Drive. This inconvenience makes New River Drive a less attractive route for traffic traveling from Harper Road to Robert C. Byrd Drive. Additionally, no route signage exists to encourage the use of New River Drive as a connection between Robert C. Byrd Drive and Pikeview Drive.

Teel Road is also a state-maintained roadway with two narrow travel lanes and no shoulder provided. Serving mostly residential properties, the posted speed limit is 25 mph. The all-way stop intersection with Maxwell Hill Road is very difficult to maneuver even for passenger cars, because of its tight geometry. Specifically, when turning right from Maxwell Hill Road onto Teel Road, a very small radius requires passenger cars to use both lanes on Teel Road to make the turn.

Maxwell Hill Road is a two-lane roadway that provides the Maxwell Hill residential area with another connection to Robert C. Byrd Drive. The posted speed limit in the study area is 35 mph with slightly wider travel lanes provided along this segment than on the other roadways in the Maxwell Hill residential area.

Holliday Drive serves residential properties and connects Pikeview Drive to Pinewood Drive. The two-lane roadway, with narrow travel lanes and no shoulder, is state-maintained from Pikeview Drive to the all-way stop intersection at Teel Road.

The posted speed limit along the entire length of Holliday Drive is 25 mph. At the intersection of Holliday Drive and Pikeview Drive, a sign prohibiting large trucks is posted (see **Figure 4**). Due to the lack of shoulders and the amount of traffic using Holliday Drive, deterioration of the asphalt pavement edge has occurred in many places along the roadway.

Pinewood Drive between Holliday Drive and Maxwell Hill Road has a posted speed limit of 25 mph. Large through trucks are not permitted on this segment of Pinewood Drive as indicated by existing signs (see **Figure 4**) located at the intersection of Pinewood Drive with Maxwell Hill Road. The two-lane roadway is very narrow and without shoulders. The lack of shoulders and high daily traffic volume have resulted in crumbling of the asphalt roadway edges. Pinewood Drive is state-maintained with a posted speed limit of 40 mph from the four-way stop intersection at Maxwell Hill Road to Robert C. Byrd Drive (US 19). Largely undeveloped, this segment of Pinewood Drive provides access to a few businesses and churches. A 12-foot travel lane in each direction with wide paved shoulders is provided along this stretch of Pinewood Drive. Another sign alerting trucks to use an alternate route is posted just east of the Maxwell Hill Road intersection (see **Figure 5**).

Travel Times

Data were collected to measure the travel time of each of the four aforementioned routes (see **Figure 2**). All routes include the intersection of Harper Road with Pikeview Drive and the intersection of US 19 with Pinewood Drive. All four routes were driven during the AM peak period (7-9 AM) and the PM peak period (3-6 PM). The average travel time was recorded and is illustrated for each route in **Figure 6**. Raw travel time data are provided in **Appendix C**. Because the eastbound approach at the intersection of US 19 with Pinewood Drive had a wide variation in delays between runs, the average time to traverse the segment of Pinewood Drive from Market Road to US 19 for all runs was used in the average travel time calculation for each run involving this segment, so that results would not be skewed by this single delay point.

The data shows that the routes through the neighborhood (the green and yellow routes) are faster than the non-neighborhood routes (the blue and red routes), especially the Holliday Drive/Pinewood Drive route. This explains the traveling public's attraction to these routes.

Traffic Counts

Intersection turning movement counts were collected using Miovision technologies video equipment from 7 to 9 AM, 11 AM to 1 PM, and 3 PM to 7 PM at the following intersections:

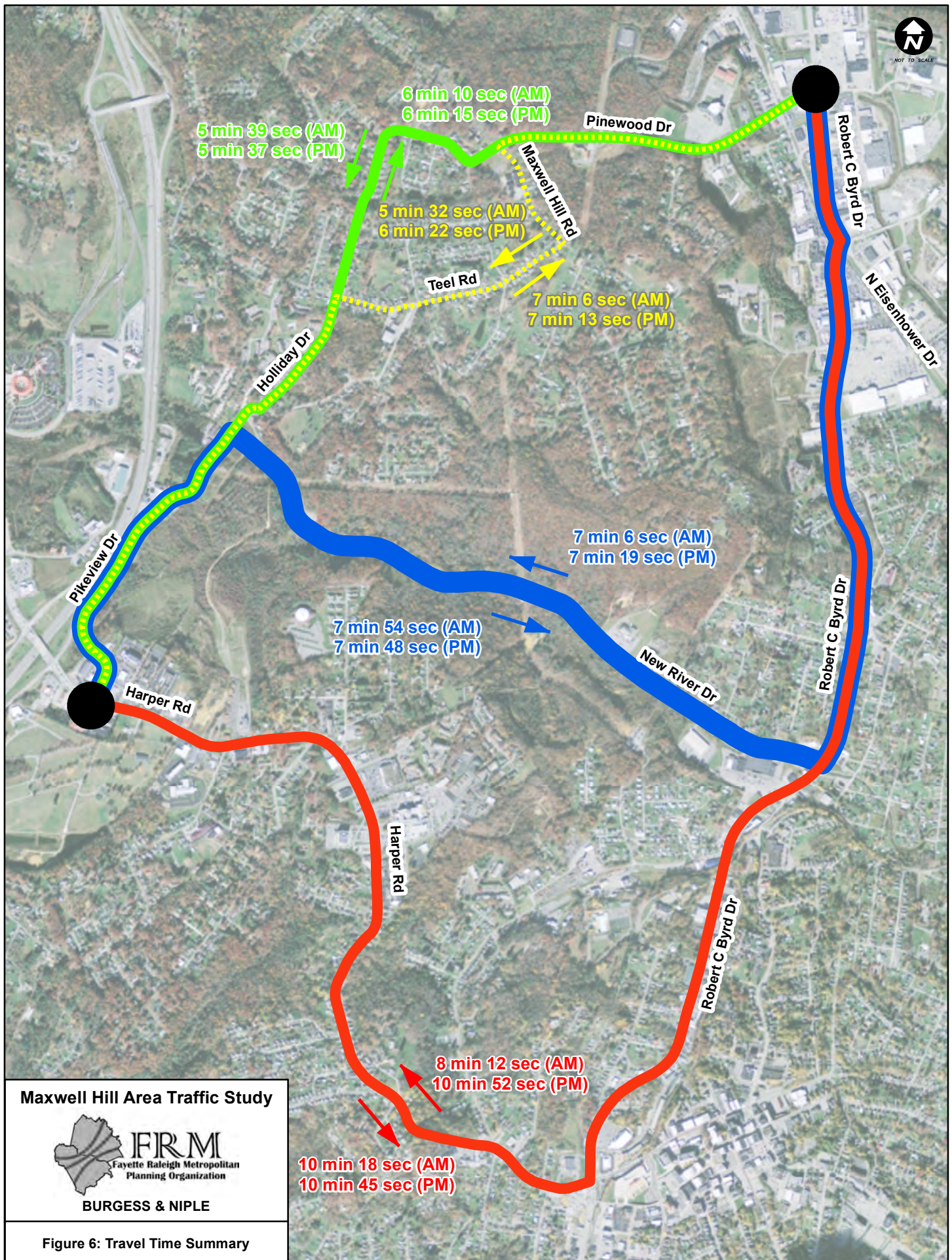
- Harper Road and Pikeview Drive (Peak hours – 7:30 AM to 8:30 AM; 4:30 PM to 5:30 PM)
- Pikeview Drive and New River Drive (Peak hours – 7:45 AM to 8:45 AM; 4:30 PM to 5:30 PM)
- New River Drive and Robert C. Byrd Drive (Peak hours – 7:30 AM to 8:30 AM; 4:15 to 5:15 PM)
- Holliday Drive and Pikeview Drive (Peak hours – 7:45 AM to 8:45 AM; 3:15 PM to 4:15 PM)
- Pinewood Drive and Maxwell Hill Road (Peak hours – 8:00 AM to 9:00 AM; 3:15 PM to 4:15 PM)
- Pinewood Drive and US 19 (Peak hours – 7:30 AM to 8:30 AM; 3:15 PM to 4:15 PM)



Figure 4: Sign Prohibiting Trucks



Figure 5: Sign Encouraging Alternate Routes for Trucks



Additionally, 24-hour roadway counts were collected using Miovision technology on Pinewood Drive north of Teel Road and New River Drive east of Pikeview Drive.

Peak hour traffic counts are illustrated in **Figure 7** while peak period traffic counts (7 to 9 AM and 3 to 6 PM) are provided in **Figure 8**. Raw count data is provided in **Appendix D**.

Cut-Through Traffic Estimates

To quantify the volume of traffic that cuts through the study area, the videos used to collect turning movement counts were reviewed and cut-through vehicles identified and counted. “Cut-through” is defined as traffic that does not originate or is destined to the Maxwell Hill residential area. These cut-through volumes were compared to the total traffic volumes counted during the AM and PM peak periods (7-9 AM and 3-6 PM) to determine the percentage of cut-through traffic compared to the total traffic in the residential areas. **Figure 9** shows the results of the cut-through traffic calculations. Nearly 50% of all traffic in the residential area is cutting through. It is also evident that Pikeview Drive to Holliday Drive to Pinewood Drive (the green route in **Figure 6**) was the most utilized with nearly 90% of the cut-through traffic using this route.

The amount of cut-through traffic is greater than the total traffic using New River Drive, which verifies that traffic prefers to cut through the Maxwell Hill neighborhood area than to use New River Drive.

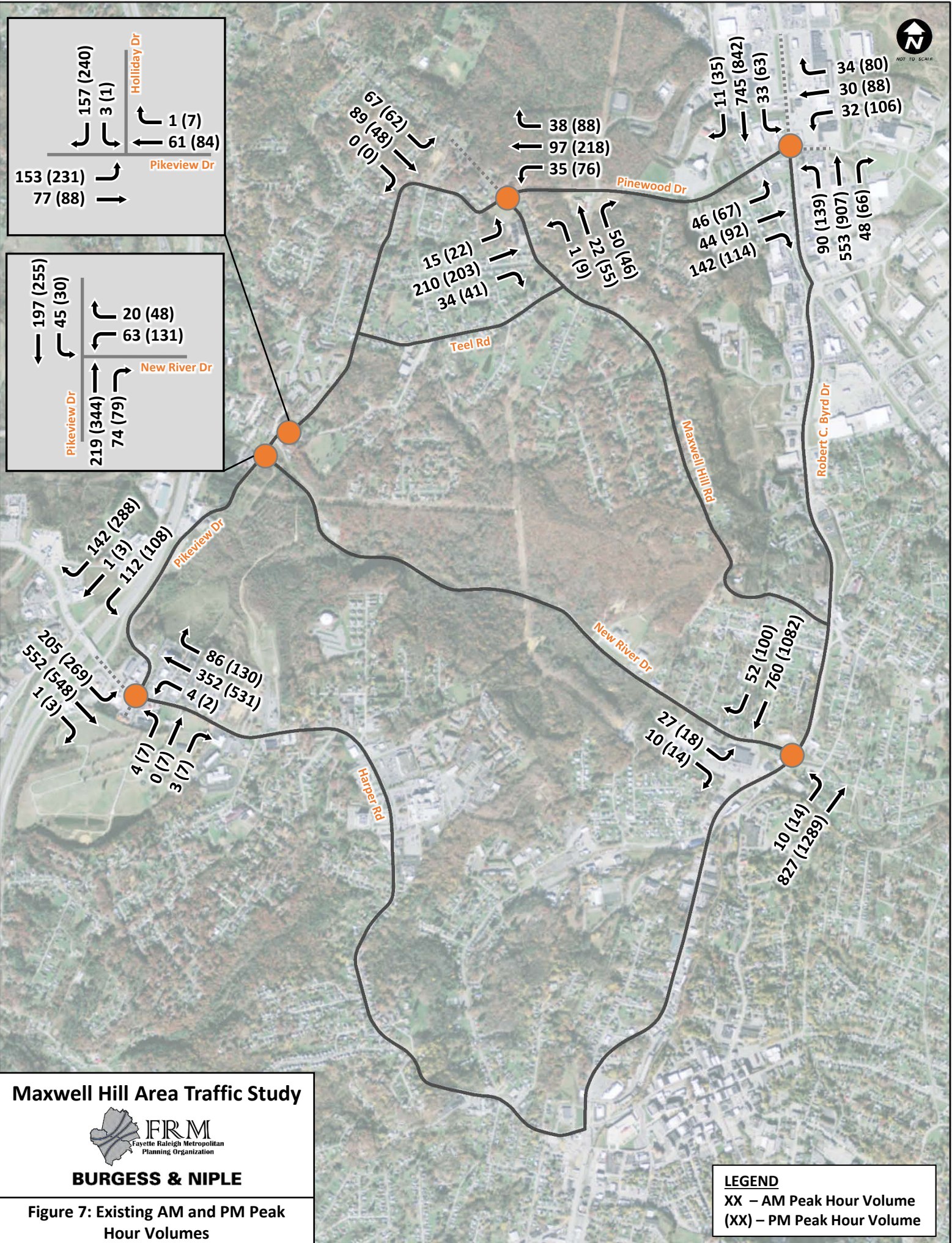
Operational Analysis

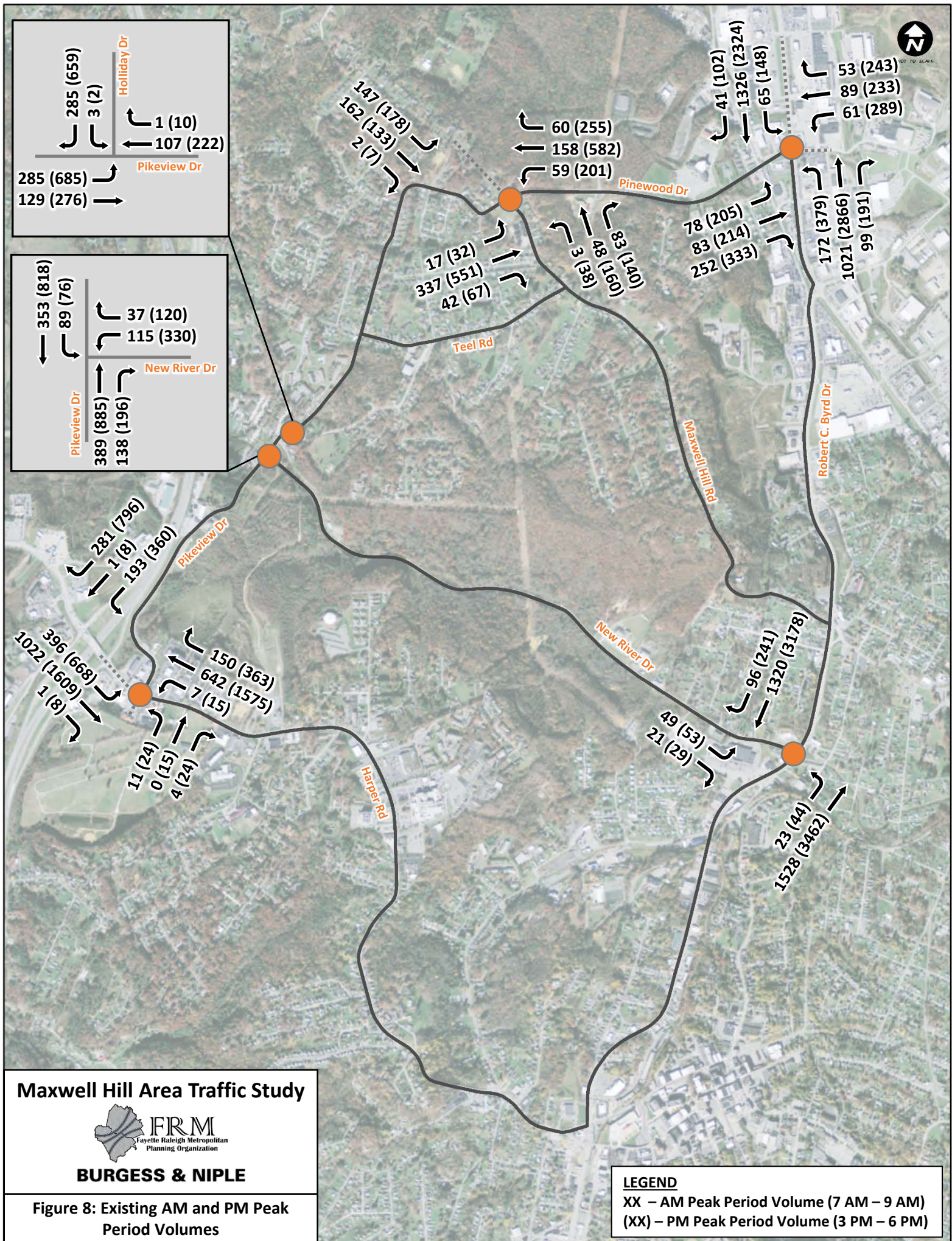
To assess if there are any traffic capacity deficiencies, operational analyses were conducted for the AM and PM peak hours for the following intersections:

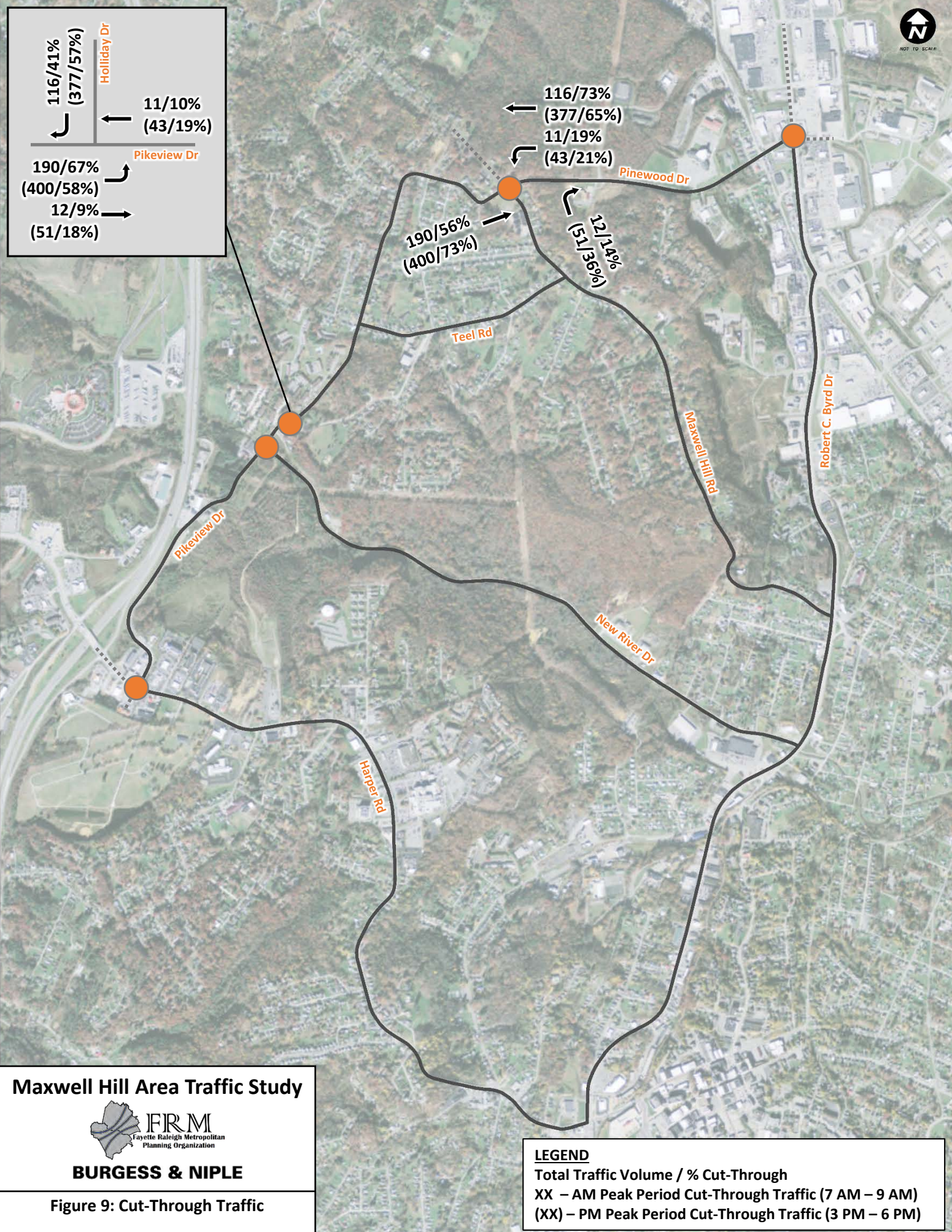
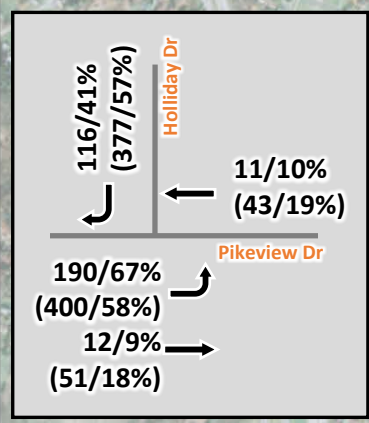
- Harper Road and Pikeview Drive (Signalized)
- Pikeview Drive and New River Drive (Unsignalized)
- New River Drive and Robert C. Byrd Drive (Unsignalized)
- Pinewood Drive and US 19 (Signalized)

Using the *Highway Capacity Software* (HCS) which uses methodologies from the *Highway Capacity Manual* (HCM), the existing capacity and operational conditions of the intersections were evaluated. Results from the analysis are presented in **Table 1** and **Table 2** for the AM and PM peak hours, respectively. Analysis output is provided in **Appendix E**.

With the exception of the southbound right-turn at Pikeview Drive and Harper Road in the PM peak hour, all movements at the four study area intersections operate acceptably at LOS D or better during both the AM and PM Peak hour. The southbound right-turn at Pikeview Drive and Harper Road operates at LOS E in the PM peak hour; however, given the high right-turning volume destined for I-64/77 in the PM peak hour (several of which are likely cut through traffic), it is expected that this movement would operate poorly. As previously discussed, the intersection of New River Drive with Robert C. Byrd Drive is likely underutilized as a result of the lack of sight distance provided for traffic turning off of New River Drive. While the unsignalized intersection operates acceptably with these low volumes, modifications to the intersection that may attract more vehicles could result in worse LOS and delays, especially for traffic on New River Drive.







Maxwell Hill Area Traffic Study



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Figure 9: Cut-Through Traffic

LEGEND

Total Traffic Volume / % Cut-Through
 XX – AM Peak Period Cut-Through Traffic (7 AM – 9 AM)
 (XX) – PM Peak Period Cut-Through Traffic (3 PM – 6 PM)

Table 1: Operational Analysis Results – AM Peak Hour

Harper Road and Pikeview Drive													
	Eastbound (Harper Road)			Westbound (Harper Road)			Northbound (Driveway)			Southbound (Pikeview Dr.)			Int.
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
LOS Delay (s) v/c	A	A		A	B		D			D		D	B 14.1
	5.6	4.8		6.6	10.0		41.1			45.5		48.9	
	0.33	0.42		0.01	0.41		0.03			0.52		0.83	
	A – 5.0			A – 10.0			D – 41.1			D – 47.4			
Pikeview Drive and New River Drive													
				Westbound (New River Dr.)		Northbound (Pikeview Dr.)		Southbound (Pikeview Dr.)				Int.	
				LT	RT	TH	RT	LT	TH				
LOS Delay (s) v/c	--			B		A		A				A 2.6	
	--			13.9		0.0		1.9					
	--			0.18		0.00		0.22					
	--			B – 13.9		A – 0.0		A – 1.9					
New River Drive and Robert C. Byrd Drive													
	Eastbound (New River Dr.)					Northbound (Robert C. Byrd Dr.)		Southbound (Robert C. Byrd Dr.)				Int.	
	LT	RT				LT	TH	TH	RT				
LOS Delay (s) v/c	C		--			A	A	A				A 0.5	
	18.1		--			9.8	0.0	0.0					
	0.13		--			0.01	0.00	0.00					
	C – 18.1		--			A – 0.1		A – 0.0					
Pinewood Drive and US 19													
	Eastbound (Pinewood Dr.)			Westbound (Pinewood Dr.)			Northbound (US 19)			Southbound (US 19)			Int.
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
LOS Delay (s) v/c	D		D	D	C		A	B		A	B		B 17.7
	43.9		48.8	36.6	34.5		8.0	11.1		8.0	13.3		
	0.41		0.82	0.15	0.20		0.20	0.30		0.07	0.39		
	D – 46.9			D – 35.2			B – 10.7			B – 13.1			

Table 2: Operational Analysis Results – PM Peak Hour

Harper Road and Pikeview Drive													
	Eastbound (Harper Road)			Westbound (Harper Road)			Northbound (Driveway)			Southbound (Pikeview Dr.)			Int.
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
LOS	B	A		B	C		C			D		E	C 26.3
Delay (s)	18.5	9.3		11.9	24.4		32.9			35.7		66.3	
v/c	0.74	0.48		0.01	0.75		0.06			0.33		0.92	
	B – 12.3			C – 24.3			C – 32.9			E – 57.8			
Pikeview Drive and New River Drive													
				Westbound (New River Dr.)		Northbound (Pikeview Dr.)		Southbound (Pikeview Dr.)				Int.	
				LT	RT	TH	RT	LT	TH				
LOS	--			C		A		A				A 7.0	
Delay (s)	--			21.4		0.0		8.4					
v/c	--			0.47		0.00		0.28					
	--			C – 21.4		A – 0.0		A – 8.4					
New River Drive and Robert C. Byrd Drive													
	Eastbound (New River Dr.)					Northbound (Robert C. Byrd Dr.)		Southbound (Robert C. Byrd Dr.)				Int.	
	LT	RT				LT	TH	TH	RT				
LOS	C		--			B	A	A				A 0.4	
Delay (s)	24.8		--			11.9	0.0	0.0					
v/c	0.16		--			0.03	0.00	0.00					
	C – 24.8		--			A – 0.1		A – 0.0					
Pinewood Drive and US 19													
	Eastbound (Pinewood Dr.)			Westbound (Pinewood Dr.)			Northbound (US 19)			Southbound (US 19)			Int.
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
LOS	D		D	D	D		B	B		B	B		C 22.6
Delay (s)	53.5		49.8	42.7	38.9		11.0	17.2		11.2	16.7		
v/c	0.71		0.59	0.57	0.45		0.37	0.51		0.19	0.46		
	D – 52.0			D – 40.4			B – 16.4			B – 16.3			

While the eastbound approach at the intersection of New River Drive and Robert C. Byrd Drive operates at LOS C in the AM and PM peak hours, the delays are expected to be much worse if the traffic on New River Drive did not bypass the intersection through Ollie's Bargain Outlet parking lot. The analysis was modified to include this traffic by balancing the volumes along New River Drive between the Pikeview Drive and Robert C. Byrd Drive intersections. Modified analysis results are summarized in **Table 3** with output provided in **Appendix F**.

Table 3: Operational Analysis Results – Modified Volumes at New River Drive and Robert C. Byrd Drive Intersection

AM Peak Hour								
	Eastbound (New River Dr.)			Northbound (Robert C. Byrd Dr.)		Southbound (Robert C. Byrd Dr.)		Int.
	LT	RT		LT	TH	TH	RT	
LOS Delay (s) v/c	D		--	A	A	A		A 1.7
	25.0		--	9.9	0.0	0.0		
	0.42		--	0.02	0.00	0.00		
	D – 25.0		--	A – 0.2		A – 0.0		
PM Peak Hour								
	Eastbound (New River Dr.)			Northbound (Robert C. Byrd Dr.)		Southbound (Robert C. Byrd Dr.)		Int.
	LT	RT		LT	TH	TH	RT	
LOS Delay (s) v/c	E		--	B	A	A		A 1.9
	43.5		--	12.4	0.0	0.0		
	0.57		--	0.05	0.00	0.00		
	E – 43.5		--	A – 0.2		A – 0.0		

With the balanced volumes, the eastbound approach has significant delay and operates unacceptably at LOS E during the PM peak hour. In addition to safety concerns, the delay may be another reason this intersection is avoided and the New River Drive corridor is not frequently used to travel between Harper Road and US 19.

Stakeholder and Public Input

As previously discussed, stakeholder and public inputs were key components of this project. Stakeholder meetings and a general public meeting were conducted to solicit feedback on the current issues and needs in the Maxwell Hill area. Stakeholders and the public expressed similar concerns and issues within the Maxwell Hill area:

- Vehicles speeding through the residential areas
- Large number of vehicles using residential roadways
- Residents have difficulty doing yard work near the road because of the volume and speed of traffic
- Children cannot play in their front yards
- Large number of heavy vehicles (trucks, buses, etc.) using the residential roadways
- Residents have difficulty leaving their driveway due to high traffic volumes and speeds and sight restrictions
- Mailboxes have been hit
- Residents have difficulty walking and crossing the streets because of traffic volumes and speeds
- Cut-through traffic creates noise
- Roadways are very narrow and were not designed to accommodate these traffic volumes or the heavy vehicles
- Due to tight and difficult roadway geometry, vehicles have left the roadway and caused damage to residential properties
- Large number of ATVs and motorcycles that speed through the residential areas or are considerably louder than other vehicles

Evaluation Criteria

Before concepts were identified and screened that address the aforementioned concerns with traffic cutting through the Maxwell Hill area, the following evaluation criteria were established based on input received from stakeholders and residents. These evaluation criteria are used to screen potential concepts and are later used to evaluate the advantages, disadvantages, and tradeoffs of each concept that is identified for further evaluation.

- **Likelihood to deter cut-through traffic** – provides a more attractive/faster route than the residential roadways for traffic traveling between Harper Road and the Beckley Plaza Shopping
- **Level of inconvenience to neighborhood residents** – while deterring cut-through traffic, does not severely inconvenience residents who live in the Maxwell Hill area
- **Decrease in travel speeds** – lowers vehicular travel speeds so residents are safe to walk, cross the street, and play and work in their yards safely
- **Reduction in truck traffic** – significantly reduces or eliminates the number of through trucks using residential roadways
- **Construction cost and feasibility** – feasible and affordable, providing benefit that is in reasonable proportion to the cost

Concept Development and Screening

Starting with a large number of initial ideas for improvements, each potential concept was systematically screened or refined for more detailed analysis. Sources for improvement concepts included stakeholder and public input and the study team's experience and research. At the public meeting held in June 2016, citizens were asked to identify potential solutions to the problems they faced with cut-through traffic in the Maxwell Hill area. **Table 4** summarizes in general terms the most mentioned solutions by the respondents.

Table 4: Public Meeting Comment Responses – Potential Solutions

Proposed Solution	Number of Respondents
Restrict access via dead-end roadways	5
Build a bypass road	5
Speed humps/bumps	5
Increased police presence	5
Reduced speed limit	4
Additional warning and traffic calming signage	4
Encouraged use of New River Drive	4
Redirect/prohibit truck traffic	3
More stop signs	2
Increased fines for speeding	2

Similarly, at the stakeholder meeting, ideas for improvements were solicited. In addition to those listed above, other improvement ideas included converting some residential streets to one-way to deter cut-through traffic.

All of these ideas were compiled into a list for further screening and evaluation. The aforementioned evaluation criteria were used to determine if a concept should be advanced for further refinement and analysis. **Table 5** summarizes all of the potential concepts and the reasons for elimination or advancement for further evaluation.

Table 5: Initial Concept Screening

Concept	Advanced for Further Consideration?	Comments
Restrict access via dead-end roadways	Yes	Low-cost improvement that is likely to significantly deter cut-through traffic, but will cause inconvenience to residents. Results in lower travel speeds and less truck traffic on residential roadways as a result of the indirect route.
Local bypass roads between WV 16 and Harper Road	No	Construction costs and impacts will be significant relative to the limited benefit.
Speed humps/bumps	Yes	Could discourage cut-through traffic by reducing travel speeds, but would cause minor inconvenience to residents. Regulations for speed humps on local and state-maintained roads must be explored.
Increased police presence	No	Unlikely to result in sustainable long-term benefit and is unfeasible with limited police funds and resources
Reduced speed limit	No	Speed limits have little effect on actual vehicle speeds. Studies have shown that reducing posted speed limits will typically decrease average vehicle speeds by one-fourth of the reduction. For example, a reduction of posted speed of 5 mph results in a 1 mph reduction in travel speed. ¹ Safety benefits of reducing the posted speed limit by 10 mph are negligible (reduces crashes by 4%) ² . Without increased enforcement, the reduced speed limit would be ineffective.
Additional warning and traffic calming signage	Yes	Low-cost countermeasure that may encourage drivers to slow down and alert them to children or residents that may be in their yards.
Encouraged use of New River Drive	Yes	Could reduce cut-through and truck traffic at a reasonable cost.
Redirect/prohibit truck traffic	Yes	Could be a very cost effective improvement. The extent to which regulatory signage and law enforcement may be used must be further explored.
More stop signs	No	The <i>Manual on Uniform Traffic Control Devices</i> (MUTCD), the national standard for traffic control devices, has very specific guidelines for the warranting of stop signs which were used to determine that additional stop signs are not needed in this area. According to the Federal Highway Administration (FHWA), unwarranted stop signs create problems at both the intersection and along the roadway by encouraging motorists to drive faster between intersections in order to save time and encouraging stop sign violations.
Increased fines for speeding	No	Requires new legislation and more police enforcement which is limited by funding and resources. Will likely not result in a sustainable long-term solution.
Convert residential streets to one-way	No	In addition to creating an inconvenience for residents, travel speeds could actually increase on the residential roadways as a result of wider travel lanes and curves and terrain that is easier to navigate without oncoming traffic. Will not deter all of the cut-through traffic.

¹ Leaf, W. A., & Preusser, D. F. (1999, October). Literature Review on Vehicle Travel Speeds and Pedestrian Injuries. <http://www.nhtsa.gov/people/injury/research/pub/HS809012.html>

² Parker, M. R. Jr., "Effects of Raising and Lowering Speed Limits on Selected Roadway Sections." FHWA-RD-92-084, (1997)

Improvement Concepts

The following concepts, carried forward from the screening process, were refined and further evaluated as options for improvement.

Concept A – Modified Signage

As previously discussed, one of the identified problems in the area is the lack of adequate signage. While there are signs indicating that the road is unsuitable for large trucks, they are posted in locations that do not give the truck driver enough notice to use a different route. By the time the signs are seen, the truck is already on residential roadways, namely Teel Road or Maxwell Hill Road. The other identified problem was the lack of signage encouraging the use of New River Drive to access Robert C. Byrd Drive to US 19. This concept includes the modification of signage to provide better warning signs for trucks before they are on the residential streets and guide signs to direct through traffic to use New River Drive as illustrated in **Figure 10**. To further draw attention to the truck warning signs, flashing beacons are recommended.

An idea provided by the public was to install more traffic calming signs on the residential streets. One such sign includes a dynamic speed display sign (DSDS) which detects and displays a vehicle's current speed back to the driver. These signs could be placed strategically along the residential roadways including Holliday Drive, Teel Road, or Pinewood Drive in an effort to reduce travel speeds. Based on a study conducted by the Texas Transportation Institute, these DSDS have been shown to reduce travel speeds by as much as 5 mph³. However, the effectiveness of DSDS can decrease over time as drivers become familiar with the sign. Other potential traffic calming signs were considered, but were either non-compliant with the MUTCD or were thought to be less effective than the DSDS.

Concept B – Speed Humps

Speed bumps/humps were one of the most mentioned improvement ideas by citizens at the initial public meeting. A speed hump is a raised area in the roadway pavement surface extending across the travel way. Speed humps differ from speed bumps in that speed humps have a longer traveled length as illustrated in **Figure 11**. Speed bumps are typically found in

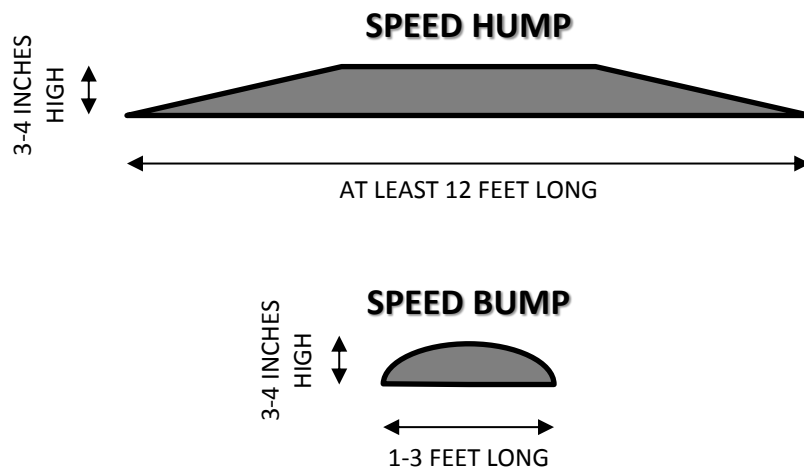


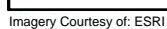
Figure 11: Speed Humps and Speed Bumps

parking lots and along private roadways. Because they can create substantial driver discomfort, are a potential tripping hazard for pedestrians, and are frequently damaged by snow plows, speed bumps are not used on public roadways. In comparison, as a gradually raised portion of pavement, speed humps create a gentle rocking motion but can still be significantly uncomfortable for drivers in vehicles traveling at higher speeds making the humps self-enforcing. The speed humps are also more advantageous for bicyclists, pedestrians, and snow plows. Research conducted by the Center for Transportation Research and Education (CTRE) indicates that

speed humps when designed and installed properly, reduce vehicle speeds to 15-20 mph when traversing speed humps and 25-30 mph in between appropriately spaced speed humps⁴.

³ Rose, E. R., & Ullman, G. L. (2003, September). EVALUATION OF DYNAMIC SPEED DISPLAY SIGNS (DSDS). <http://tti.tamu.edu/documents/0-4475-1.pdf>

⁴ Smith, D. E., PE, & Giese, K. L. (1997, September). A Study on Speed Humps. <http://www.ctre.iastate.edu/research/roadhump/>



If speed humps are not installed on all neighborhood roadways, cut-through vehicles will likely divert to roadways without speed humps so their travel times and speeds are not impeded. For this reason, it is proposed that speed humps would have to be installed on all cut-through routes, specifically Holliday Drive, Teel Road, Tolley Drive, and Pinewood Drive as illustrated in **Figure 12** so that traffic does not just shift from one neighborhood roadway to another.

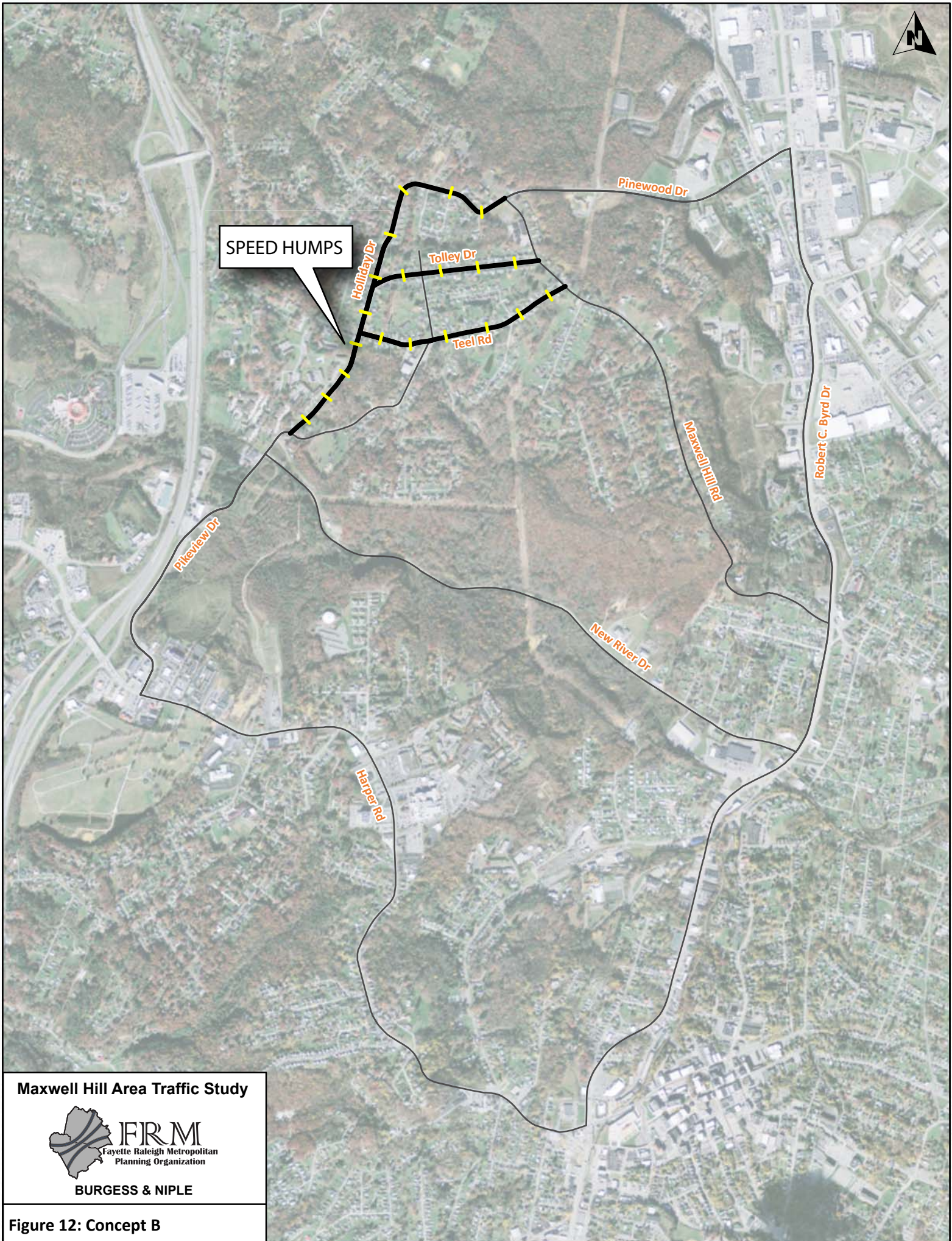
Concept C – Cut off Holliday Drive at Teel Road

Based on travel times and cut-through data collected, the fastest and most-used route between Harper Road and US 19 through the neighborhood consists of Pikeview Drive to Holliday Drive to Pinewood Drive. To discourage the use of this route, Holliday Drive could be cut off just south of Teel Road as illustrated in **Figure 13**. With this concept, cut-through traffic would be rerouted to Lucas Drive and either Teel Road or Tolley Drive to Maxwell Hill Road. It would not be prohibited for cut-through vehicles to use Holliday Drive north of Teel Road; however, that route is far less convenient with Holliday Drive cut off from the existing network. One major disadvantage of this concept is that the majority of residents, not just those directly affected by cut-through traffic, will experience longer travel times to and from their homes as a result of disconnecting the street network. Another disadvantage is longer response times for emergency services.



Figure 14: Road Closure Application with Guardrail

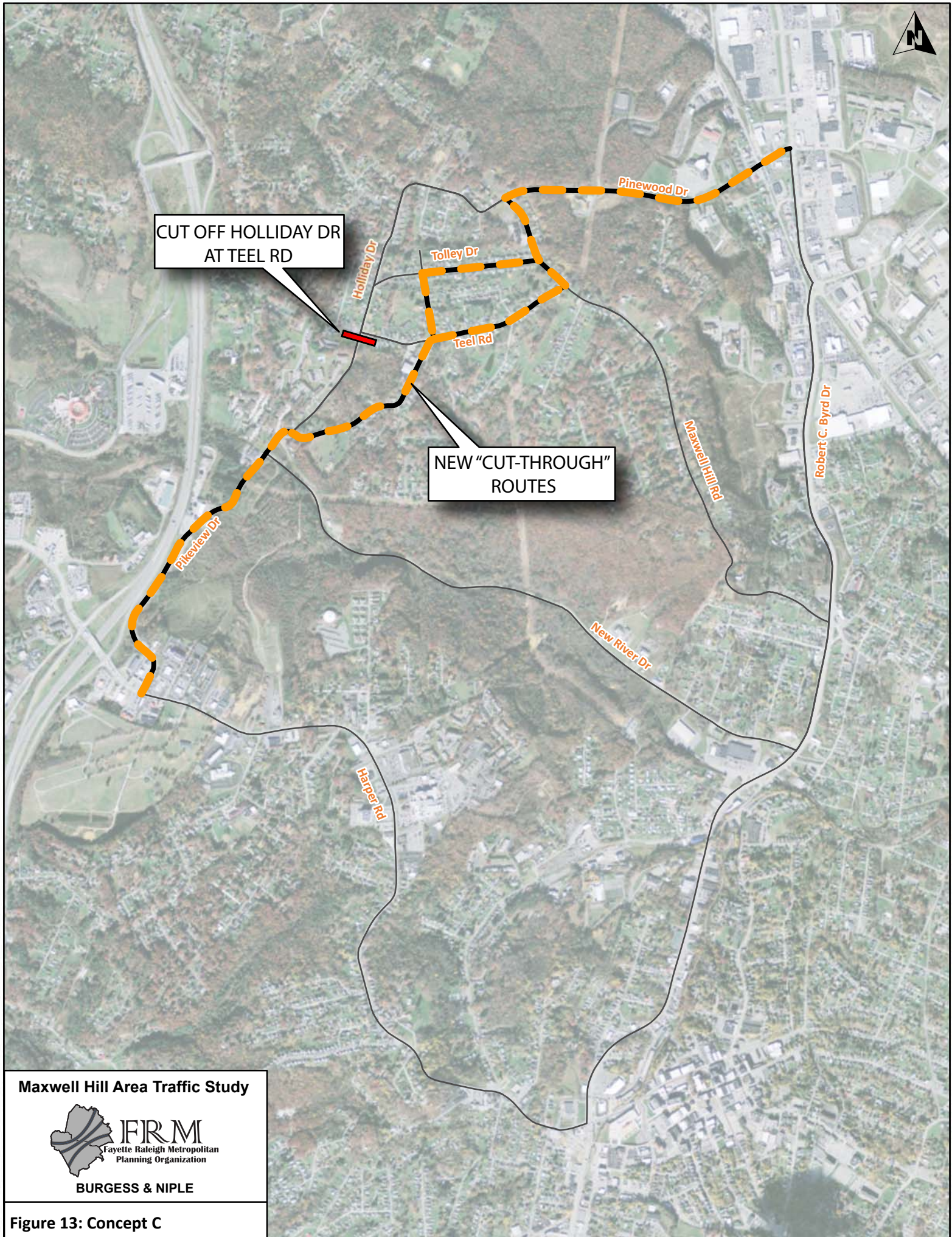
Under this concept, Holliday Drive would be closed between Chert Lane and the driveway to the home at 323 Teel Road. In this area, the pavement would be removed and guardrails would be installed at the end of the paved roadway. An example of such an application is illustrated in **Figure 14**. This type of roadway modification is much less costly than constructing cul-de-sacs at roadway termini.



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Figure 12: Concept B



Concept D – Cut off Holliday Drive at Teel Road, Teel Road at Maxwell Hill Road, and Tolley Drive at Maxwell Hill Road

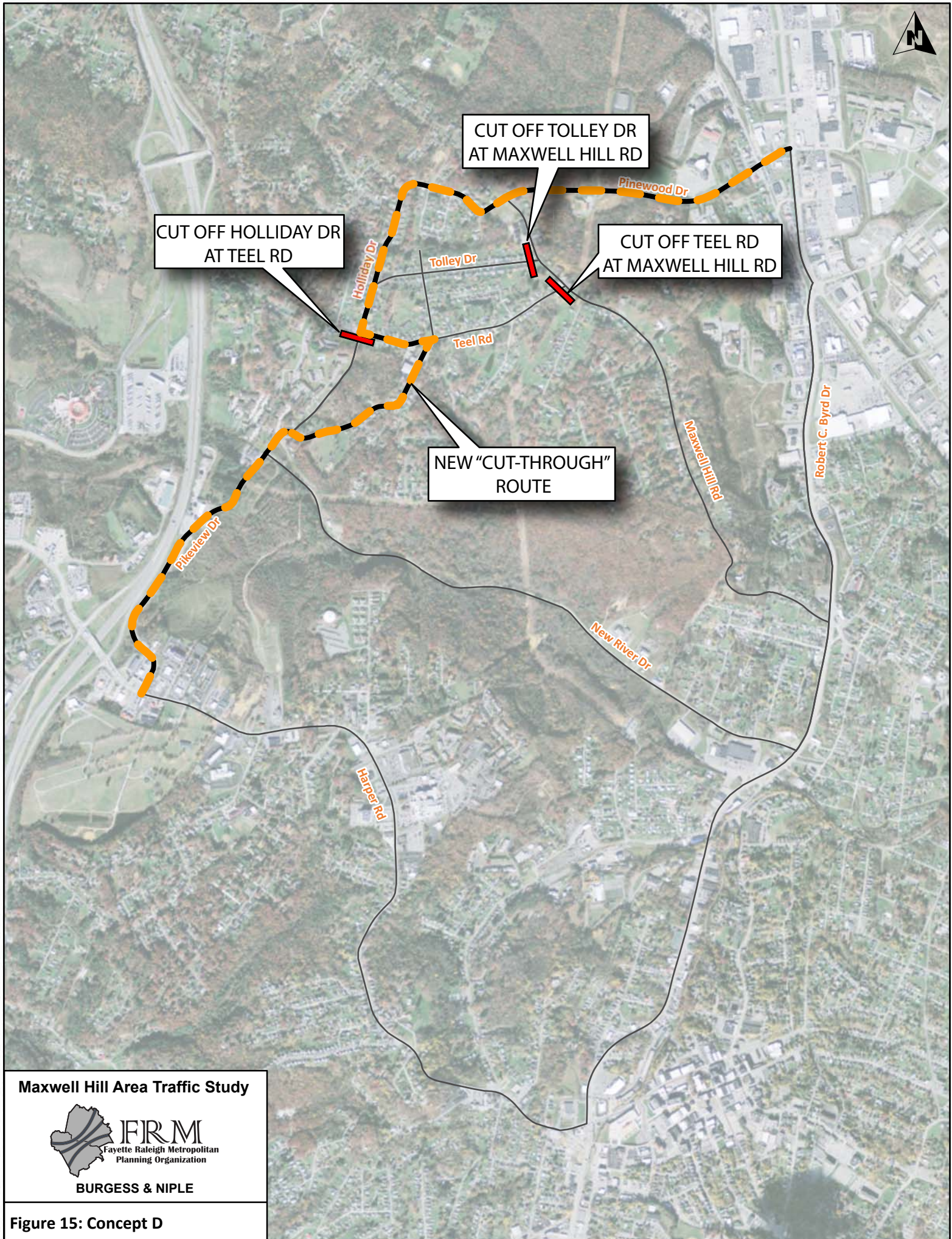
If only Holliday Drive is cut off at Teel Road, cut-through traffic is still able to use the second-fastest cut-through route via Teel Road and Maxwell Hill Road to Pinewood Drive. As a result, traffic volumes would likely increase on Teel Road, Maxwell Hill Road or even Tolley Drive as a result of the displaced traffic. To be truly effective in reducing the amount of cut-through traffic in the neighborhood, additional modifications would likely be needed to the neighborhood network as illustrated in **Figure 15**. By cutting Teel Road and Tolley Drive off west of Maxwell Hill Drive, cut-through traffic would be required to backtrack along most of the route and maneuver intersections with small turning radii. Additionally, cut-through traffic would travel through more stop-controlled intersections than on other routes which will further add to the delay encountered along this route. Similar to Concept C, the majority of residents, not just those directly affected by cut-through traffic, will experience longer travel times to and from their homes as a result of disconnecting the street network.

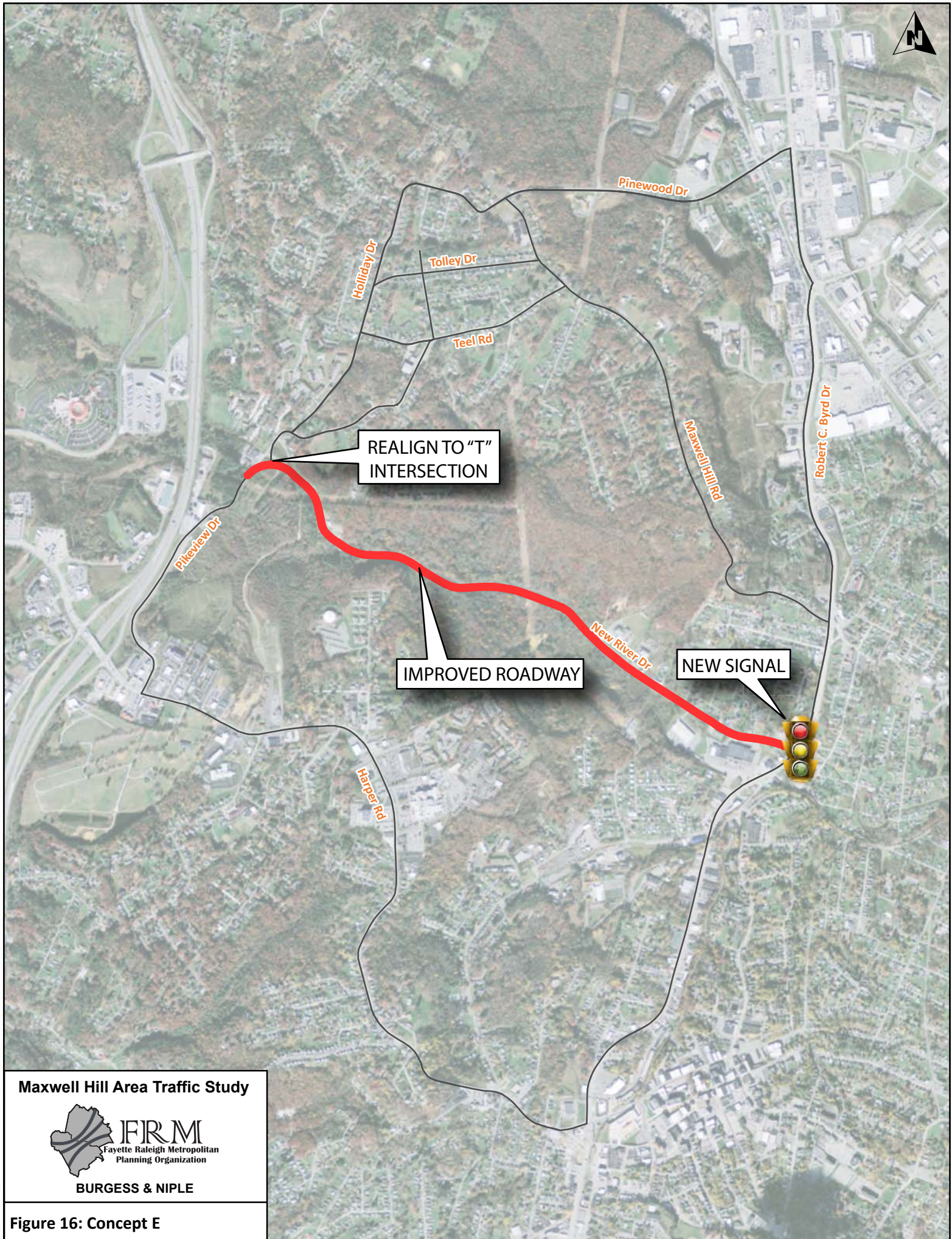
In addition to the modifications proposed in Concept C, a small segment of Teel Road and Tolley Drive west of Maxwell Hill Road would be removed and guardrail installed at the end of the pavement. This type of roadway modification is much less costly than constructing cul-de-sacs at roadway termini.

Concept E – Improvements to New River Drive

With a posted speed limit of only 30 mph, its bumpy pavement, and many curves and grade changes, the comfortable driving speed is low. This results in a longer travel time between Harper Road and US 19 using New River Drive than if the roadway were designed and constructed for higher travel speeds. To encourage more traffic to use this route, this concept includes the following improvements to New River Drive as illustrated in **Figure 16**:

- Realign New River Road at Pikeview Drive – By removing the existing intersection of New River Drive at Pikeview Drive and curving New River Drive into Pikeview Drive, vehicles are encouraged to continue to New River Drive and not use the neighborhood roads to cut-through. Pikeview Drive north of the existing intersection would be realigned to create a “T” intersection with the realigned New River Drive. Cutting through the neighborhood would require a deliberate decision to turn left off of New River Drive when traveling towards US 19 or encountering additional delay on Pikeview Drive to turn right onto New River Drive towards Harper Road.
- Improve New River Drive between Pikeview Drive and Robert C. Byrd Drive – Widening New River Drive to a three-lane cross section (one lane in each direction with a center left-turn lane) in conjunction with other modifications such as improving drainage, flattening curves, constructing shoulders, and stabilizing the pavement subbase for a smoother surface will allow for faster travel speeds and make this route more desirable to cut-through traffic.
- Construct traffic signal at New River Drive and Robert C. Byrd Drive – Assuming vehicles do not use the parking lot at Ollie’s Bargain Outlet to access the signal at Kanawha Street, traffic volumes on New River Drive warrant a signal at the intersection of New River Drive and Robert C. Byrd Drive (see **Appendix G** for calculations). The issue of limited sight distance for vehicles on New River Drive of vehicles approaching southbound from Robert C. Byrd Drive would be addressed with the installation of the signal since drivers would no longer need to judge gaps in traffic with the signal.





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Figure 16: Concept E

However, a new potential sight distance problem may be created if a signal were installed with no other improvements. The problem is created by the curvature in Robert C. Byrd and the roadside slope and vegetation that blocks the view of the intersection for southbound traffic. This is exacerbated by the fact that southbound traffic is on a down-slope, which requires a greater stopping distance for traffic, especially in wet and/or icy conditions. Based on further study, modifications may be required to the slope on the northwest corner of the intersection to improve sight distances. In addition to, or potentially as an alternative to earthwork, flashing warning signs could be installed to alert southbound traffic to the upcoming signal and potentially queued vehicles.

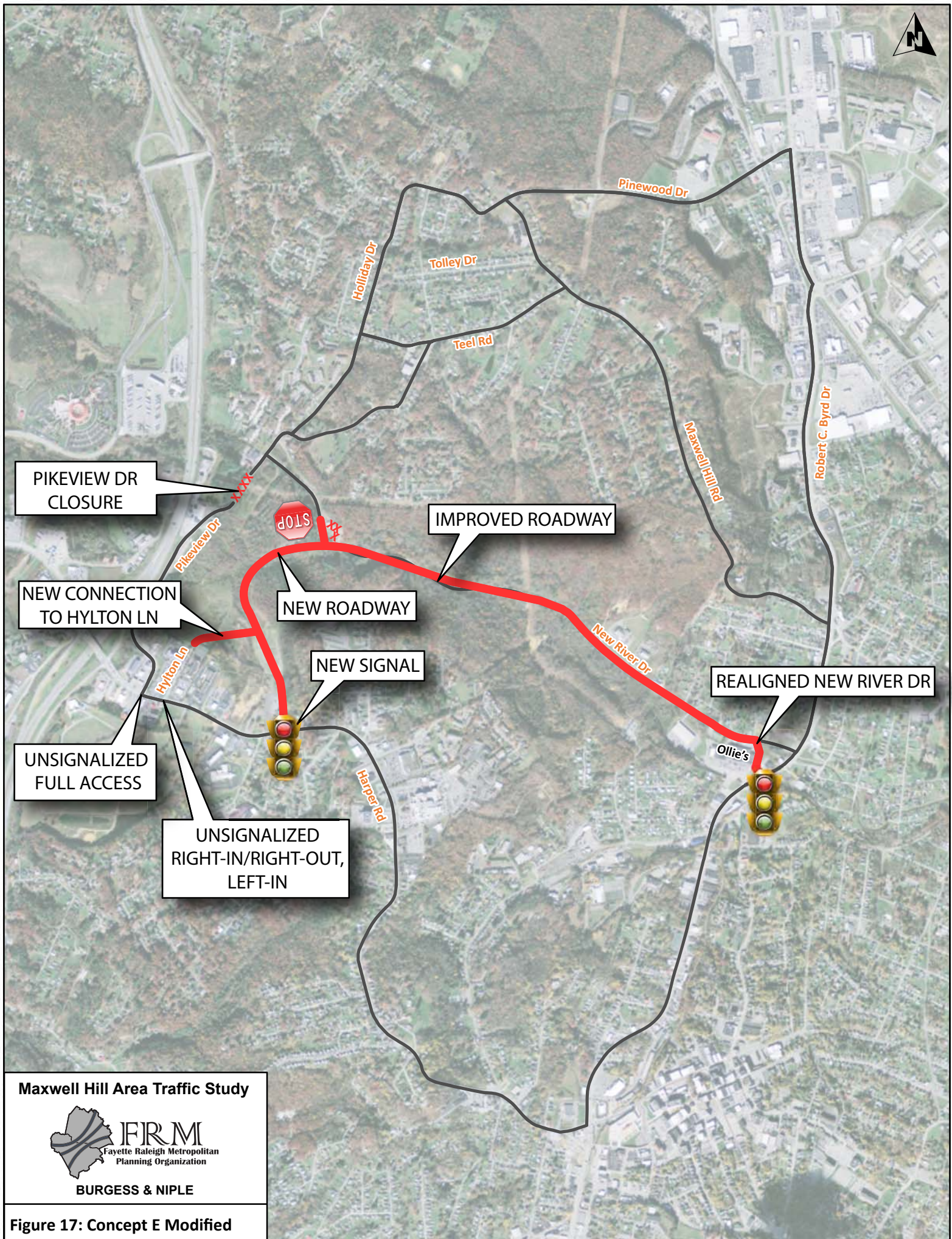
While it is not ideal to have closely spaced traffic signals, there is a distance of over 600 feet between the Kanawha Street and New River Drive intersections, which should allow for the signals to operate acceptably adjacent to one another. Should this recommendation be implemented, the timings for the two signals should be carefully coordinated to ensure queues do not impede intersection operations.

As previously discussed, New River Drive is maintained by the City. As part of this concept, the City and WVDOH could come to a new agreement on roadway maintenance for this area. Teel Road could be transferred back to the City for maintenance since its intended use is for residential traffic while New River Drive could become state-maintained as more traffic will likely use this roadway once it is improved.

Concept E Modified – Improved Roadway Network

After presenting Concept E to the stakeholders and public, stakeholders recommended that the study team coordinate with the owner of the property adjacent to Pikeview Drive and New River Drive. After meeting with representatives from Beaver Coal Company and understanding the future development plans and potential modifications to the roadway network needed for that plan, Concept E was modified to include the following refinements that should result in a more effective solution, that will also help address larger traffic operational problems on Harper Road. Concept E – Modified is illustrated in **Figure 17**:

- *Construct new roadway from Harper Road to New River Drive east of Hylton Lane* – This roadway connection would provide direct access between Harper Road and New River Drive and would also provide a primary access to the undeveloped Beaver Coal property, which in turn, creates an opportunity for a cost-sharing partnership for the new roadway.
- *Cut off Pikeview Drive south of New River Drive and remove signal at Harper Road and Pikeview Drive* – With the new roadway connection, Pikeview Drive can be cut off south of New River Drive, making cutting through the Maxwell Hill neighborhood area less convenient. Under this option, signalization is likely no longer warranted at the Pikeview Drive intersection at Harper Road. This improvement has a significant added benefit of reducing congestion and shortening queues on Harper Road near the I-64/77 interchange. Access to Beckley Fire Department Fire Station Two will still be provided via Pikeview Drive. While the direct route from the fire station to the neighborhood has been cut-off, the proposed improved roadway network would still allow fire trucks to efficiently travel to emergencies without contending with the current narrow roadways, curves, and grade changes.
- *Remove signal at Hylton Lane and Harper Road intersection and provide left-turn outbound access from the new connector roadway* – By extending Hylton Lane to the new connector road, signalized access to the businesses on Hylton Lane can be provided via the new signal on Harper Road. This modification will further improve operations on Harper Road while creating a more connected roadway network. The intersection of Hylton Lane and Harper Road would be modified to accommodate left turns onto Hylton Lane from eastbound Harper Road and right turns to and from Hylton Lane. Only the left-turn from Hylton Lane would be eliminated and relocated to the new signal.



- *Improve New River Drive between the new connector road and Robert C. Byrd Drive* – Widening New River Drive to a three-lane cross section (one lane in each direction with a center left-turn lane) in conjunction with other modifications such as improving drainage, flattening curves, widening lanes and shoulders, and stabilizing the pavement subbase for a smoother surface will allow for faster travel speeds and make this route more desirable to cut-through traffic. As discussed in Concept E, this roadway would be transferred to the state for maintenance in exchange for the City maintaining Teel Road.
- *Realign New River Drive with Kanawha Street Signal* – To eliminate the closely spaced traffic signals in Concept E, and to improve the sight distance to the signal for southbound traffic, New River Drive could be realigned to intersect Robert C. Byrd Drive at the current traffic signal at Kanawha Street. This would require that the property between Ollie’s Bargain Outlet and Rhonda’s Pharmacy be acquired as public right-of-way and New River Drive be reconstructed to align with the existing Kanawha Street signalized intersection. The existing New River Drive between Ollie’s Bargain Outlet and Robert C. Byrd Drive would continue to provide access to existing properties. The intersection of New River Drive with Robert C. Byrd could be modified to only allow right-turn movements from southbound Robert C. Byrd Drive so that the travel time for traffic headed to I-64/77 can be minimized to further enhance this route as an alternative to cutting through the neighborhood.

While it is ideal that New River Drive be upgraded to accommodate faster travel speeds, building the new connection between Harper Road and New River Drive and cutting off Pikeview Drive will likely have a significant impact on reducing cut-through traffic through the neighborhood without improving the remainder of New River Drive. By making these improvements, traffic would be required to backtrack if they wanted to cut through the neighborhood. To reduce initial construction costs and efforts, this connection could be constructed without making improvements to the remainder of New River Drive, which could be pursued in a future phase of this concept, potentially in conjunction with future development in the corridor (cost-sharing opportunity).

Concept Costs

As previously discussed, a critical evaluation metric of the concepts is construction cost. It is important that a feasible and affordable solution is identified and provides a benefit that is in reasonable proportion to the cost. Construction cost estimates for each of the concepts were developed. These construction costs are preliminary in nature to help compare concepts and are not detailed engineering cost estimates. Costs of engineering and design, right-of-way acquisition, utility relocation, or environmental mitigation are not included in the estimates. Cost estimate calculations are provided in **Appendix H**.

- Concept A – Modified Signage: \$57,000
- Concept B – Speed Humps: \$65,000
- Concept C – Cut Off Holliday Drive at Teel Road: \$10,000
- Concept D – Cut off Holliday Drive at Teel Road, Teel Road at Maxwell Hill Road, and Tolley Drive at Maxwell Hill Road: \$25,000
- Concept E – Improvements to New River Drive: \$12,000,000*
- Concept E Modified – Improved Roadway Network: \$16,000,000*

*It is important to note that these concepts can be implemented in phases to reduce the initial costs and to spread the costs over future fiscal years. See **Implementation Plan** in Table 8 (page 19).

Impacts to Travel Time

Another crucial metric used when evaluating improvement concepts was the likelihood to deter cut-through traffic. To better quantify the deterring of cut-through traffic, impacts to travel times were estimated. Data collected through the existing travel times was used when possible, but for new routes, basic speed and distance assumptions were used to estimate resultant travel times for each of the improvement concepts. A summary of the estimated changes to travel times is provided in **Table 6** and **Table 7**. Calculations are provided in **Appendix I**. The route colors correspond to the existing travel time routes illustrated in **Figure 2**. The new routes were created as a result of the existing routes being cut off as part of improvement concepts.

Table 6: Summary of Travel Time Changes for Routes from WV 3 to US 19

	AM Peak Period						
	Existing	Concept A	Concept B	Concept C	Concept D	Concept E	Concept E Mod.
Red Route - WV 3 to WV 16 to US 19	10m 18s	No Change					
Blue Route - Pikeview Drive to New River Drive to WV 16 to US 19	7m 54s	No Change				-20s	-50s
						7m 34s	7m 4s
Green Route - Pikeview Drive to Holliday Drive to Pinewood Drive	6m 10s	No Change	+30s 6m 40s	--	--	No Change	+30s 6m 40s
Yellow Route - Pikeview Drive to Teel Road to Maxwell Hill Road to Pinewood Drive	7m 6s	No Change	+25s 7m 31s	--	--	No Change	+25s 7m 31s
Pikeview Drive to Lucas Drive to Teel Road to Maxwell Hill Road to Pinewood Drive				+60s 7m 10s			
Pikeview Drive to Lucas Drive to Teel Road to Holliday Drive to Pinewood Drive					+80s 7m 30s		
	PM Peak Period						
	Existing	Concept A	Concept B	Concept C	Concept D	Concept E	Concept E Mod.
Red Route - WV 3 to WV 16 to US 19	10m 45s	No Change					
Blue Route - Pikeview Drive to New River Drive to WV 16 to US 19	7m 48s	No Change				-30s	-50s
						7m 18s	6m 58s
Green Route - Pikeview Drive to Holliday Drive to Pinewood Drive	6m 15s	No Change	+40s 6m 55s	--	--	No Change	+40s 6m 55s
Yellow Route - Pikeview Drive to Teel Road to Maxwell Hill Road to Pinewood Drive	7m 13s	No Change	+15s 7m 28s	--	--	No Change	+35s 7m 48s
Pikeview Drive to Lucas Drive to Teel Road to Maxwell Hill Road to Pinewood Drive				+70s 7m 25s			
Pikeview Drive to Lucas Drive to Teel Road to Holliday Drive to Pinewood Drive					+80s 7m 35s		

Table 7: Summary of Travel Time Changes for Routes from US 19 to WV 3





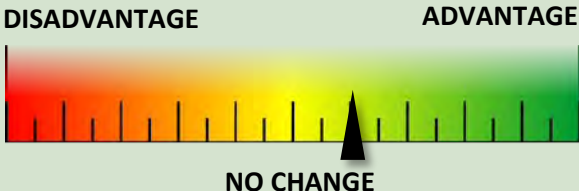
	AM Peak Period						
	Existing	Concept A	Concept B	Concept C	Concept D	Concept E	Concept E Mod.
Red Route - US 19 to WV 16 to WV 3	8m 12s	No Change					
Blue Route - US 19 to WV 16 to New River Drive to Pikeview Drive	7m 6s	No Change				-35s	-85s
						6m 31s	5m 41s
Green Route - Pinewood Drive to Holliday Drive to Pikeview Drive	5m 39s	No Change	+35s	--	--	No Change	+25s
			6m 14s				6m 4s
Yellow Route - Pinewood Drive to Maxwell Hill Road to Teel Road to Pikeview Drive	5m 32s	No Change	+35s	--	--	No Change	+50s
			6m 7s				6m 22s
Pinewood Drive to Maxwell Hill Road to Teel Road to Lucas Drive to Pikeview Drive				+60s			
6m 32s							
Pinewood Drive to Holliday Drive to Teel Road to Lucas Drive to Pikeview Drive				+85s			
				6m 57s			
	PM Peak Period						
	Existing	Concept A	Concept B	Concept C	Concept D	Concept E	Concept E Mod.
Route 1 - US 19 to WV 16 to WV 3	10m 52s	No Change					
Route 2 - US 19 to WV 16 to New River Drive to Pikeview Drive	7m 19s	No Change				-18s	-61s
						7m 1s	6m 18s
Route 3 - Pinewood Drive to Holliday Drive to Pikeview Drive	5m 37s	No Change	+40s	--	--	No Change	+30s
			6m 17s				6m 7s
Route 4 - Pinewood Drive to Maxwell Hill Road to Teel Road to Pikeview Drive	6m 22s	No Change	+35s	--	--	No Change	+25s
			6m 57s				6m 47s
Pinewood Drive to Maxwell Hill Road to Teel Road to Lucas Drive to Pikeview Drive				+50s			
				6m 27s			
Pinewood Drive to Holliday Drive to Teel Road to Lucas Drive to Pikeview Drive				+85s			
				7m 2s			

The concepts have varying effects on travel times using the neighborhood roadways. Concepts that reduce travel time for the New River Drive route or increase travel times for the cut-through routes are more likely to discourage traffic from using neighborhood roadways. With the proposed improvements to New River Drive and the construction of speed humps or disconnecting the roadway network, travel times on New River Drive are similar to the time it takes to cut through the neighborhood.

Overall Concept Evaluation

The concepts were evaluated using the aforementioned criteria developed from stakeholder and public input and existing conditions and needs. The overall evaluation for each concept is summarized in **Figure 18** through **Figure 23**.

Concept A: Modified Signage

Goal	Evaluation
CONSTRUCTION COSTS Low cost to install new static signs. Flashing lights and other dynamic message signs are more costly.	
LIKELIHOOD TO DETER CUT-THROUGH TRAFFIC While signing is likely to encourage more traffic to use New River Drive, especially those drivers not familiar with the area, signage alone will not deter people who frequently use those routes. Without an improvement to the intersection of New River Drive and Robert C. Byrd Drive, it will be difficult to encourage any traffic to use New River Drive even with modified signage.	
LEVEL OF INCONVENIENCE TO NEIGHBORHOOD RESIDENTS Signing will not have any affect on residents.	
DECREASE IN TRAVEL SPEEDS Based on a study conducted by the Texas Transportation Institute, dynamic speed display signs (DSDS) that detect and display a vehicle's current speed back to the driver have been shown to reduce travel speeds by as much as 5 mph ¹ . However, the effectiveness of DSDS have been shown to decrease over time as drivers become familiar with the sign.	
REDUCTION IN TRUCK TRAFFIC With improved truck route signs including flashers and guide signage, a smaller number of trucks, especially large trucks, will use the residential area. However, without a physical deterrent from using that route, it is believed that many trucks, especially those drivers familiar with the area will not use the signed routes.	

¹ <http://tti.tamu.edu/documents/0-4475-1.pdf>

Concept B: Speed Humps

Goal	Evaluation
CONSTRUCTION COSTS Low cost to install (about \$2,500 per speed hump ¹) but can be costly to maintain because of snow plows and complications with street resurfacing.	<p>The evaluation scale for Construction Costs ranges from Disadvantage (red) to Advantage (green). The needle is positioned slightly to the right of the 'NO CHANGE' mark, indicating a slight advantage.</p>
LIKELIHOOD TO DETER CUT-THROUGH TRAFFIC Speed humps would be an annoyance for through vehicles. An adverse effect of installing speed humps on these roadways is the diversion of traffic to other residential routes if speed humps are not installed on all residential roadways in the area. <i>Cut-through time change with Concept B: +15 to 45 seconds</i>	<p>The evaluation scale for Likelihood to Deter Cut-through Traffic ranges from Disadvantage (red) to Advantage (green). The needle is positioned significantly to the right of the 'NO CHANGE' mark, indicating a significant advantage.</p>
LEVEL OF INCONVENIENCE TO NEIGHBORHOOD RESIDENTS While residents can still access their homes, the speed humps may become a nuisance for them to drive and as a result of the added road noise created by them. Another adverse effect of the speed humps is delayed emergency response times. Research provided by the Institute of Transportation Engineers (ITE) shows an approximate delay of between 3 and 5 seconds per hump for fire trucks and up to 10 seconds for ambulances with a patient onboard ² .	<p>The evaluation scale for Level of Inconvenience to Neighborhood Residents ranges from Disadvantage (red) to Advantage (green). The needle is positioned slightly to the right of the 'NO CHANGE' mark, indicating a slight advantage.</p>
DECREASE IN TRAVEL SPEEDS Research conducted by the Center for Transportation Research and Education (CTRE) indicates that speed humps, when designed and installed properly, reduce vehicle speeds to 15-20 mph when traversing speed humps and 25-30 mph in between properly spaced speed humps ³ .	<p>The evaluation scale for Decrease in Travel Speeds ranges from Disadvantage (red) to Advantage (green). The needle is positioned significantly to the right of the 'NO CHANGE' mark, indicating a significant advantage.</p>
REDUCTION IN TRUCK TRAFFIC Speed humps will significantly slow down trucks which is likely to deter trucks from using these roadways; however, they may divert to other residential routes if speed humps are not installed on all residential roadways in the area.	<p>The evaluation scale for Reduction in Truck Traffic ranges from Disadvantage (red) to Advantage (green). The needle is positioned significantly to the right of the 'NO CHANGE' mark, indicating a significant advantage.</p>

¹ http://guide.saferoutesinfo.org/engineering/speed_humps.cfm

² <http://www.ite.org/traffic/hump.asp>

³ <http://www.ctre.iastate.edu/research/roadhump/>



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Figure 19: Concept B Evaluation

Concept C: Cut off Holliday Drive at Teel Road

Goal	Evaluation
CONSTRUCTION COSTS Relatively low costs when this concept is implemented through installation of guardrail, appropriate warning signage, and the removal of pavement. Adding a cul-de-sac would be more costly.	<p>The scale ranges from DISADVANTAGE (red) to ADVANTAGE (green). The needle points to a position slightly left of the NO CHANGE mark.</p>
LIKELIHOOD TO DETER CUT-THROUGH TRAFFIC While some cut through traffic would be deterred from using Pinewood Drive east of Maxwell Hill Road, cut-through traffic would likely divert to Teel Road and Maxwell Hill Road. <i>Cut-through time change with Concept C: +50 to 70 seconds</i>	<p>The scale ranges from DISADVANTAGE (red) to ADVANTAGE (green). The needle points to a position slightly right of the NO CHANGE mark.</p>
LEVEL OF INCONVENIENCE TO NEIGHBORHOOD RESIDENTS With this concept, residents will also not be able to use the route from Pikeview Drive to Teel Road on Holliday Drive. While other routes are available to them, it may cause minor delays for daily activities.	<p>The scale ranges from DISADVANTAGE (red) to ADVANTAGE (green). The needle points to a position slightly left of the NO CHANGE mark.</p>
DECREASE IN TRAVEL SPEEDS Travel speeds may be reduced slightly by adding more turning maneuvers to cut-through trips.	<p>The scale ranges from DISADVANTAGE (red) to ADVANTAGE (green). The needle points to a position slightly left of the NO CHANGE mark.</p>
REDUCTION IN TRUCK TRAFFIC With the increased number of turning maneuvers required, delays for trucks will be increased more than for passenger cars. While this may deter some trucks, the estimated travel time may still be slightly faster than using other routes such as New River Drive in its current condition.	<p>The scale ranges from DISADVANTAGE (red) to ADVANTAGE (green). The needle points to a position slightly right of the NO CHANGE mark.</p>

Concept D: Cut off Holliday Drive at Teel Road, Teel Road at Maxwell Hill Road, and Tolley Drive at Maxwell Hill Road

Goal	Evaluation
CONSTRUCTION COSTS Relatively low costs when this concept is implemented through installation of guardrail, appropriate warning signage, and the removal of pavement. Adding cul-de-sacs would be more costly.	<p>DISADVANTAGE ADVANTAGE</p> <p>NO CHANGE</p>
LIKELIHOOD TO DETER CUT-THROUGH TRAFFIC With the easiest and most direct routes no longer providing connections to Maxwell Hill Road, it is likely that a large amount of cut-through traffic would be deterred. Traffic would be required to backtrack along most of the route and maneuver intersections with small turning radii. Additionally, cut-through traffic will travel through more stop-controlled intersections than on other routes, adding more delays. However, these routes may be slightly faster than New River Drive in its current condition. <i>Cut-through time change with Concept D: +80 to 85 seconds</i>	<p>DISADVANTAGE ADVANTAGE</p> <p>NO CHANGE</p>
LEVEL OF INCONVENIENCE TO NEIGHBORHOOD RESIDENTS Cutting off these routes is likely going to provide a significant inconvenience to residents in their daily travel activities. Additionally, emergency response times are expected to be delayed as a result of the lack of route connectivity.	<p>DISADVANTAGE ADVANTAGE</p> <p>NO CHANGE</p>
DECREASE IN TRAVEL SPEEDS Travel speeds may be reduced slightly by adding more turning maneuvers to cut-through trips.	<p>DISADVANTAGE ADVANTAGE</p> <p>NO CHANGE</p>
REDUCTION IN TRUCK TRAFFIC With the increased number of turning maneuvers required, delays for trucks will be increased more than for passenger cars. While this may deter some trucks, the estimated travel time may still be slightly faster than using other routes such as New River Drive in its current condition.	<p>DISADVANTAGE ADVANTAGE</p> <p>NO CHANGE</p>

Concept E: Improvements to New River Drive

Goal	Evaluation
CONSTRUCTION COSTS Major construction costs compared to other concepts.	<p>DISADVANTAGE</p> <p>ADVANTAGE</p> <p>NO CHANGE</p> <p>The evaluation scale for Construction Costs shows a disadvantage, with the needle pointing to the left of the 'NO CHANGE' mark.</p>
LIKELIHOOD TO DETER CUT-THROUGH TRAFFIC While an improved route is provided for traffic between Harper Road and the Beckley Shopping Center Plaza, these improvements alone are not expected to deter a significant amount of traffic. <i>Travel time change with Concept E: -30 to 50 seconds</i>	<p>DISADVANTAGE</p> <p>ADVANTAGE</p> <p>NO CHANGE</p> <p>The evaluation scale for Likelihood to Deter Cut-through Traffic shows a slight advantage, with the needle pointing to the right of the 'NO CHANGE' mark.</p>
LEVEL OF INCONVENIENCE TO NEIGHBORHOOD RESIDENTS Since no modifications are being made to the residential roadways, this concept adds no inconvenience to residents.	<p>DISADVANTAGE</p> <p>ADVANTAGE</p> <p>NO CHANGE</p> <p>The evaluation scale for Level of Inconvenience to Neighborhood Residents shows no change, with the needle pointing exactly at the 'NO CHANGE' mark.</p>
DECREASE IN TRAVEL SPEEDS No countermeasures are proposed along the residential roadways as part of this concept. Therefore, travel speeds will not be reduced in this area.	<p>DISADVANTAGE</p> <p>ADVANTAGE</p> <p>NO CHANGE</p> <p>The evaluation scale for Decrease in Travel Speeds shows no change, with the needle pointing exactly at the 'NO CHANGE' mark.</p>
REDUCTION IN TRUCK TRAFFIC While trucks are more likely to use the wider, improved New River Drive, without other improvements to reduce the travel times through the residential area, trucks are still likely to use the route that allows them to arrive at their destination in the shortest time.	<p>DISADVANTAGE</p> <p>ADVANTAGE</p> <p>NO CHANGE</p> <p>The evaluation scale for Reduction in Truck Traffic shows a slight advantage, with the needle pointing to the right of the 'NO CHANGE' mark.</p>

Concept E Modified: Improved Roadway Network

Goal	Evaluation
CONSTRUCTION COSTS Major construction costs compared to other concepts. There may be opportunities to partner with local developer to share right-of-way and construction costs.	<p>DISADVANTAGE</p> <p>ADVANTAGE</p> <p>NO CHANGE</p> <p>The evaluation scale for Construction Costs shows a disadvantage, with the needle pointing to the left of the 'NO CHANGE' mark.</p>
LIKELIHOOD TO DETER CUT-THROUGH TRAFFIC The improved roadway in conjunction with the modified roadway network is likely to encourage cut-through traffic to use New River Drive. The modified roadway network will discourage cut-through traffic from using neighborhood roadways because of the additional travel time and distance. <i>Travel time change with Concept E Modified: -50 to 80 seconds</i>	<p>DISADVANTAGE</p> <p>ADVANTAGE</p> <p>NO CHANGE</p> <p>The evaluation scale for Likelihood to Deter Cut-Through Traffic shows an advantage, with the needle pointing to the right of the 'NO CHANGE' mark.</p>
LEVEL OF INCONVENIENCE TO NEIGHBORHOOD RESIDENTS The closure of Pikeview Drive will create a minor inconvenience to neighborhood residents. However, access will be still be provided to Harper Road.	<p>DISADVANTAGE</p> <p>ADVANTAGE</p> <p>NO CHANGE</p> <p>The evaluation scale for Level of Inconvenience to Neighborhood Residents shows a disadvantage, with the needle pointing to the left of the 'NO CHANGE' mark.</p>
DECREASE IN TRAVEL SPEEDS No countermeasures are proposed along the residential roadways as part of this concept. Therefore, travel speeds will not be reduced in this area.	<p>DISADVANTAGE</p> <p>ADVANTAGE</p> <p>NO CHANGE</p> <p>The evaluation scale for Decrease in Travel Speeds shows a disadvantage, with the needle pointing to the left of the 'NO CHANGE' mark.</p>
REDUCTION IN TRUCK TRAFFIC Trucks are likely to use the modified roadway network and improved New River Drive roadway because it should be faster and easier to use than neighborhood roadways.	<p>DISADVANTAGE</p> <p>ADVANTAGE</p> <p>NO CHANGE</p> <p>The evaluation scale for Reduction in Truck Traffic shows an advantage, with the needle pointing to the right of the 'NO CHANGE' mark.</p>

Recommendations and Implementation Plan

Based on a comprehensive evaluation of the potential improvement concepts, the following improvements are recommended.

Near to Short-Term Improvements

The following improvements are recommended to be pursued immediately.

- Modify signage (Concept A) – While travel times are not affected by this concept, advanced signage may deter trucks from using the neighborhood roadways by providing adequate warning to take alternate routes. The signing may also encourage more traffic to use New River Drive, especially those drivers not familiar with the area. With the implementation of dynamic speed display signs (DSDS), travel speeds through the neighborhood should be reduced. In addition to the low construction costs, there are very minimal impacts to adjacent properties and the modified signing improvements should be fairly easy to implement.
- Provide signalization for New River Drive traffic at Robert C. Byrd Drive – As discussed for Concepts E and E Modified, there are two alternatives for signalizing New River Drive. The preferred alternative is to acquire right-of-way between Ollie's Bargain Outlet and Rhonda's Home Pharmacy to align New River Drive with the existing Kanawha Street intersection. The second alternative is to provide a signal at the existing New River Drive and Robert C. Byrd Drive intersection with modifications made to the side slope on the northwest corner of the intersection to improve sight distances. To supplement the encouragement provided by the signs to use New River Drive, it is critical that signalization is provided at Robert C. Byrd Drive so that traffic is not deterred from using the route because they cannot comfortably turn left onto Robert C. Byrd Drive. Preliminary estimates indicate that costs are similar for signalizing either location. The costs for a new signal including all of the equipment and the modifications to the side slope are similar to the right-of-way and roadway and signal modification costs associated with realigning New River Drive with the existing Kanawha Street intersection.

Medium to Long-Term Improvements

It is recommended that WVDOH and local agencies immediately initiate the design for the improvements described for *Concept E Modified* (Figure 17) and a cost sharing agreement with the Beaver Coal Company. While this is the most costly concept, it has the greatest potential to reduce cut-through traffic through the neighborhood without significantly impacting local residents, and additionally provides significant benefits to traffic flow and safety on Harper Road. In conversations with the developer and owner of the property containing the proposed connector road, right-of-way would likely be donated for construction of a public roadway. Additional agreements regarding the WVDOT and the developer sharing construction costs could also be made to benefit both involved parties.

Should an agreement between the WVDOT and developer be unattainable, Concept E is recommended. While this option does not completely prohibit cut-through traffic from using Pikeview Drive, the improved New River Drive should attract more traffic than the neighborhood roadways.

It is recommended that WVDOH and the City of Beckley make a roadway maintenance agreement for Teel Road and New River Drive. With improvements, New River Drive is expected to carry significantly more traffic than Teel Road. Therefore, it is recommended that Teel Road be maintained by the City of Beckley and New River Road be state-maintained.

If after New River Drive is improved, traffic is still cutting through the neighborhood, Concepts B, C, and D can be further explored. These options were not immediately recommended because of the collateral impacts they had to local residents. Because of delayed emergency response times and created nuisances, speed humps were not favored by many residents,

especially if to be effective, speed humps were required on every neighborhood roadway. However, speed humps could be implemented later if shorter term measures are not effective.

Cutting off portions of roadways would be effective in reducing or eliminating cut-through vehicles, but would be a significant inconvenience to all residents in the neighborhood, and would only benefit those who are directly impacted by the current cut-through traffic. Additionally, emergency service response times and access to fire hydrants would also be adversely affected. Thus, it is not recommended that cutting off streets be considered at this time.

Implementation Plan

Table 8 summarizes the recommended plan of action to implement the recommendations of the study:

Table 8: Implementation Plan

Improvement	Implementation Timeline	Estimated Cost Range	Responsible Agency(ies)
Improved Signage (Concept A)	<ul style="list-style-type: none"> Initiate immediately Construct within 1 year 	\$50,000 - \$100,000	WVDOH and City of Beckley
New traffic signal at New River Drive and Robert C. Byrd Drive or realign New River Drive (see Concept E)	<ul style="list-style-type: none"> Initiate immediately Construct within 2 years 	\$750,000 - \$1,250,000	WVDOH and City of Beckley
<ol style="list-style-type: none"> Close Pikeview Drive south of existing New River Drive intersection Remove signal at Pikeview Drive Construct new roadway connection from Harper Road through Beaver Coal property to connect to New River Drive 	<ul style="list-style-type: none"> Immediately initiate cost sharing agreement with Beaver Coal Company Construct within 3 years 	\$4,500,000 - \$5,000,000	WVDOH, City of Beckley, Beaver Coal Company
Improve New River Road for higher traffic speeds	<ul style="list-style-type: none"> Initiate after funding for new connection through Beaver Coal Company property is secured Construct when funding is identified – target within 5 years Pursue private/public funding partnership from property owners/developers on New River Drive 	\$8,500,000 - \$9,000,000	WVDOH
Exchange maintenance responsibility for New River Drive and Teel Road between City of Beckley and WVDOH	<ul style="list-style-type: none"> Initiate immediately 	None	WVDOH and City of Beckley
Construct roadway connection from Hylton Drive to new roadway through Beaver Coal Company property.	<ul style="list-style-type: none"> Construct as part of private development – primarily private funding 	\$1,000,000 - \$1,500,000	Beaver Coal Company, City of Beckley
Install speed humps (Concept B)	<ul style="list-style-type: none"> If <i>Concept E Modified</i> improvements are not pursued or are expected to take more than 4 years to implement, then install speed humps per Concept B 	\$50,000 - \$100,000	City of Beckley