

# TRAFFIC ACCESS STUDY

ROAD CONNECTION OF  
RAINBOW ROAD AND THOMPSON ROAD

*Montgomery County, Maryland*



**Department of Public Works and  
Transportation**

Submitted By

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**MAY, 2008**

**Proposed Road Connection of  
Rainbow Road and Thompson Road**

Montgomery County, Maryland

**TRAFFIC ACCESS STUDY**

Montgomery County Department of  
Public Works and Transportation



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## **1. INTRODUCTION**

At the request of Montgomery County Public Works and Transportation, a traffic study has been conducted by Jacobs Engineering to determine the traffic impacts of connecting two local roads, Rainbow Drive and Thompson Road, in the neighborhood of Good Hope in Cloverly of Montgomery County, Maryland. This report includes traffic and land use data collection, traffic analysis, road connection study, suggested traffic operations, roadway design alternatives and related discussion. The detailed studies are described in the following sections.

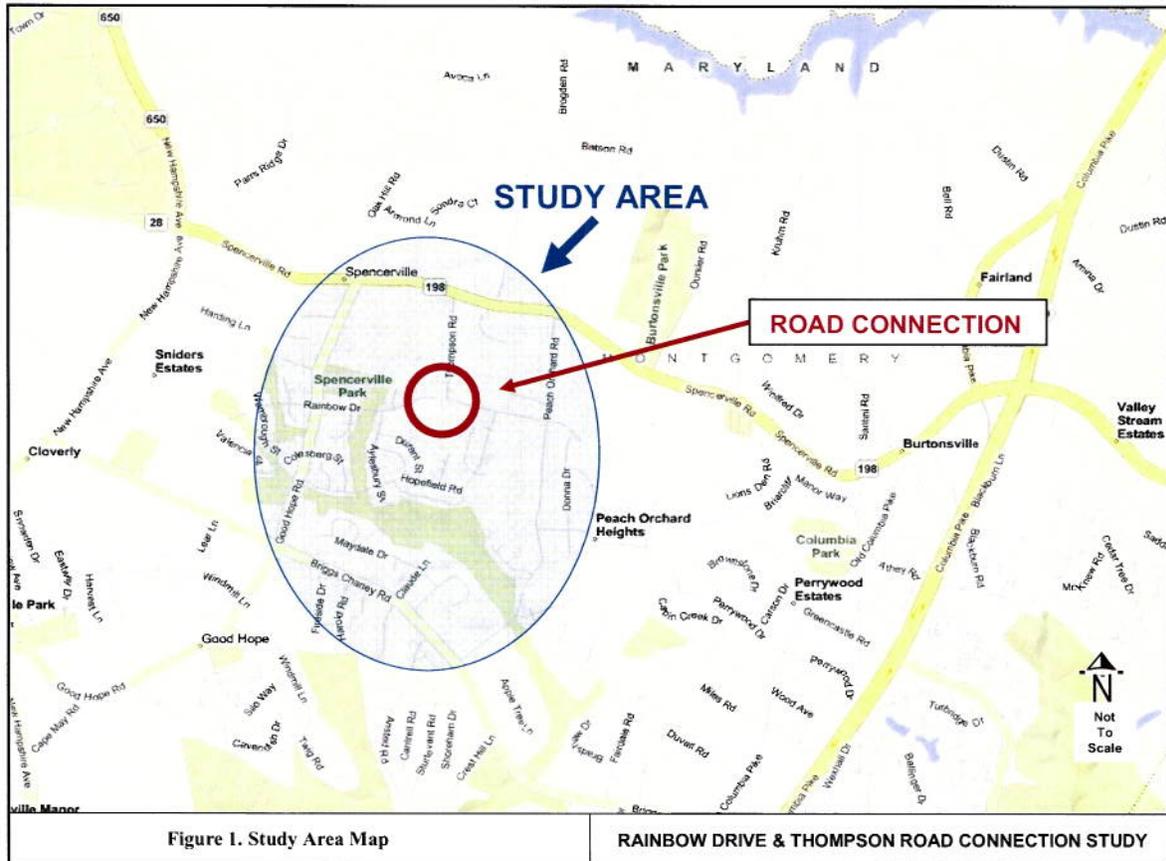
## **2. STUDY AREA AND BACKGROUND INFORMATION**

Rainbow Drive and Thompson Road are located at Cloverly, the east of Montgomery County. The study area is bounded by Spencerville Road, Peach Orchard Road, Good Hope Road and Briggs Chaney Road. The study area map is illustrated in Figure 1.

The neighborhood is called Good Hope managed by Good Hope Estates Civic Association. Briggs Chaney Middle School (BCMS) as a major trip generator, is located by southern side of Rainbow Drive in adjacent to Thompson Road. BCMS is a grade 6-8 educational facility. The study area is mainly residential with single family detached houses. While most of the study area is residential, there is a post office and a car service garage located on the south side of Spencerville Road between Thompson Road and Peach Orchard Road. Spencerville Road and Briggs Chaney Road are the major east/westbound roadways that provide roadway capacities commute and local traffic.

Rainbow Drive is a local road with east/west direction crossing Good Hope Road. It provides traffic from Good Hope Road the local access towards school and residential houses. Thompson Road starting north from Spencerville Road and connecting southeast to Peach Orchard Road serves local access for traffic from the two roads.

Figure 1. Study Area Map



For purpose of the study, full investigation has been conducted on population, school, and community. The detailed population growth, school enrollment, student distributions and related data can be found in Appendix A.

The 1997 Cloverly Master Plan recommended that Thompson Road and Rainbow Drive be connected to improve the roadway network redundancy and interconnectivity. The connection of Rainbow Drive and Thompson Road was described as a more cohesive traffic network for people driving, riding pedal bikes, and walking. A bikeway with designated signage is also proposed, alongside the segment of Rainbow Drive and Thompson Road that are to be joined. Primarily, this connection is recommended to improve the flow of traffic to and from Briggs Chaney Middle School.

However, concerns were expressed by the Good Hope Civic Association (GHCA) that the connection would attract more trips and draw non-local travelers cutting through the neighborhood. The GHCA also believes that direct through route would cause more people to speed and create unsafe conditions for drivers, pedestrians and local residents. See Appendix B for GHCA letter.

The following studies will evaluate the existing traffic conditions and compare with impact brought by the roadway connection. The analyses will be conducted from traffic engineering basics by considering a variety of land use and traffic factors. Also the potential alternatives will be explored with the discussions of pros and cons.

### **3. EXISTING CONDITIONS**

As first step of exploring the impacts of roadway connection of Rainbow Drive and Thompson Road, general traffic surveys were conducted on the existing roadways and intersections in the study area. This section will discuss the current roadway network, such as roadway geometries, configurations, traffic control devices, traffic volumes and traffic operation (level of service) of related roadways and intersections.

#### **ROADWAYS AND INTERSECTION CONDITIONS**

To have a general idea of roadway network conditions, a few major roads and intersections within the study area were investigated as below:

- **Spencerville Road (MD 198)** serves as major commuting roadway through the study area. Spencerville Road is classified as a major highway with two lanes for both directions, bikeway and rural streetscape, east-west across the north side of the study area.
- **Briggs Chaney Road** is a two lane road that runs southeasterly from New Hampshire Avenue to Howard County. Briggs Chaney Road has the similar

roadway configurations, one lane each direction but no bikeway and is bounded study area at south side.

- **Good Hope Road** is a north/south directional primary two-lane road that starts at Spencerville Road in the north and continue past Briggs Chaney Road on west side of the study area.
- **Peach Orchard Road** is a primary north-south two lane roadway that begins in the north at Spencerville Road and ends at Briggs Chaney Road.
- **Spencerville Road at Peach Orchard Road.** This intersection is not signalized, but does have flashing hazard beacon facing each approaching leg of the intersection. Spencerville Road has three lanes approaching the intersection from the east and west – an exclusive left turn, a through, and a through/right turn lane. The north leg is Cedar Ridge Church Road and approaches the intersection with a shared left, right and through lane.
- **Spencerville Road at Good Hope Road.** This intersection is also not signalized intersection. Spencerville Road has two lanes approaching the intersection from the east – an exclusive left turn and a through lane and two lane approaching from west, a through and right turn lane. Good Hope Road crosses from south. The stop control is place at Good Hope Road approach while Spencerville Road having the free flows.
- **Rainbow Drive at Good Hope Road.** This intersection is a 4 way stop control with crosswalk at south leg of Good Hope Road. Rainbow Drive is east/west directional and has an approaching and receiving lane of both legs. Good Hope Road forms north and south legs of the intersection and a divided approaching and receiving lane.
- **Thompson Road at Spencerville Road.** This is a minor T intersection with stop sign control at Thompson Road approach from south. No left or right turn storage from Spencerville Road to Thompson Road.

Figure 2 illustrates the above described roadways and intersections. The detailed condition diagram and site photos can be found in Appendix C.

Figure 2. Major Roadway and Intersections Condition Diagrams

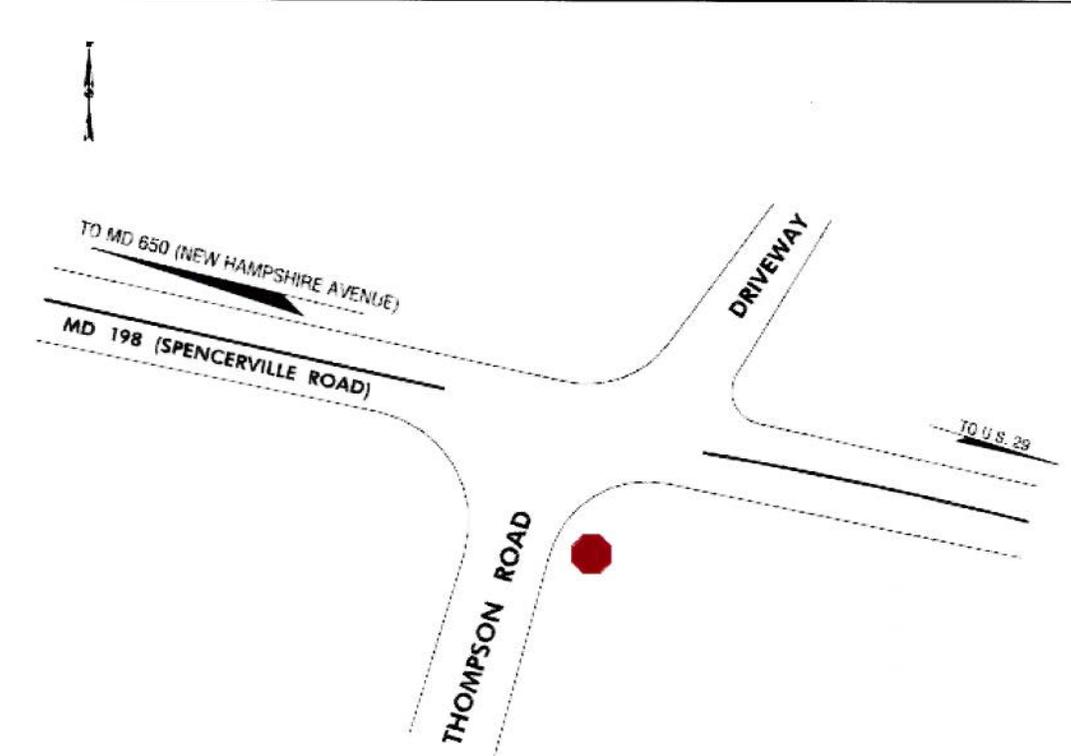
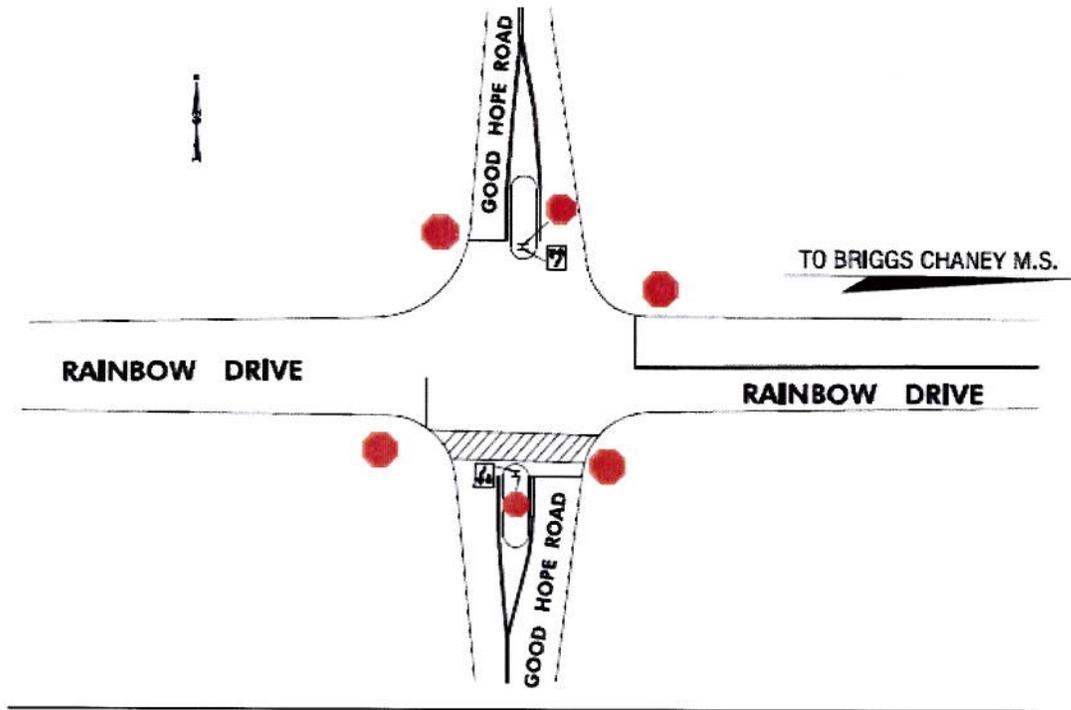
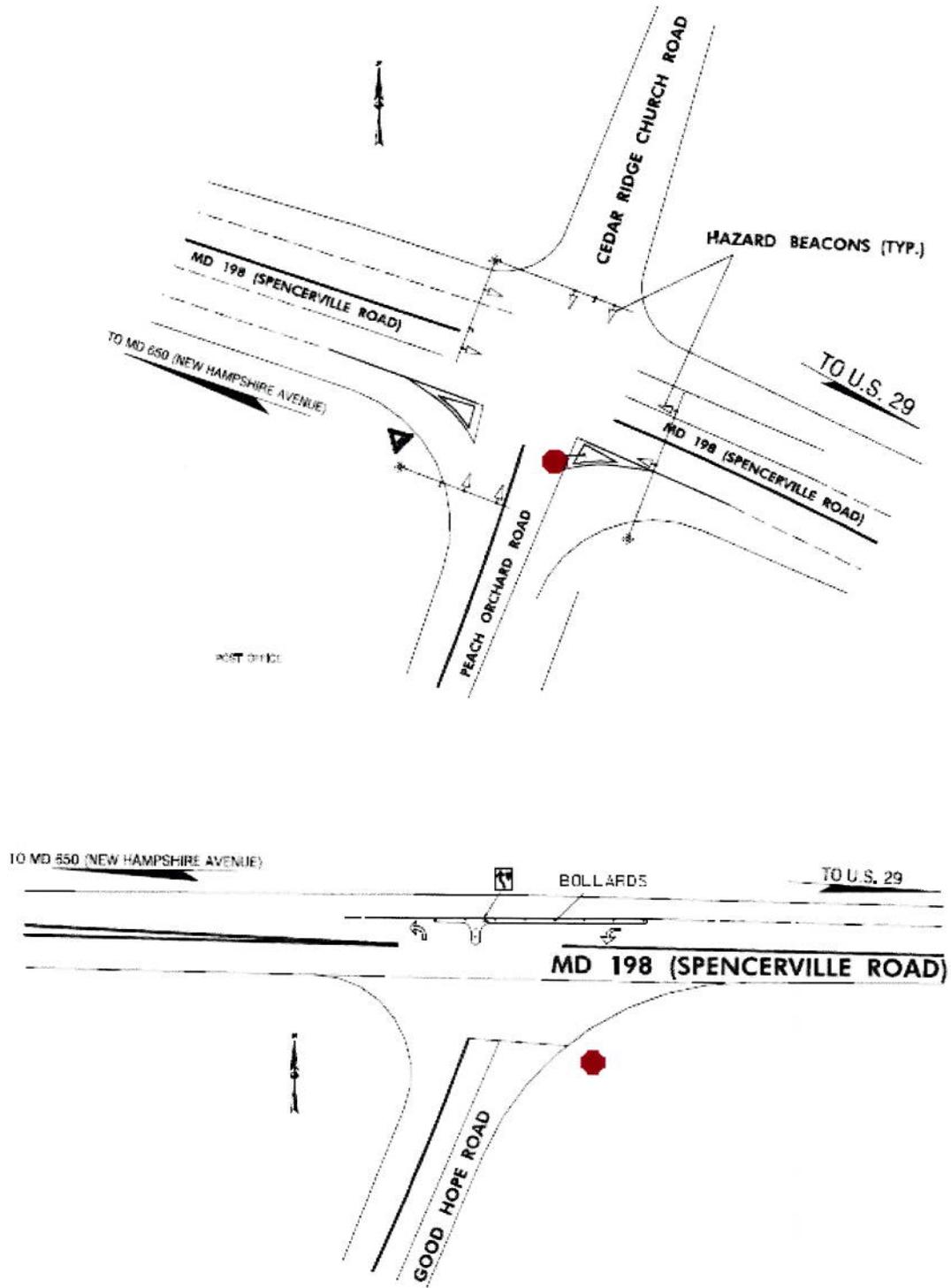


Figure 2. Major Roadway and Intersections Condition Diagrams (Continued)



## TRAFFIC DATA

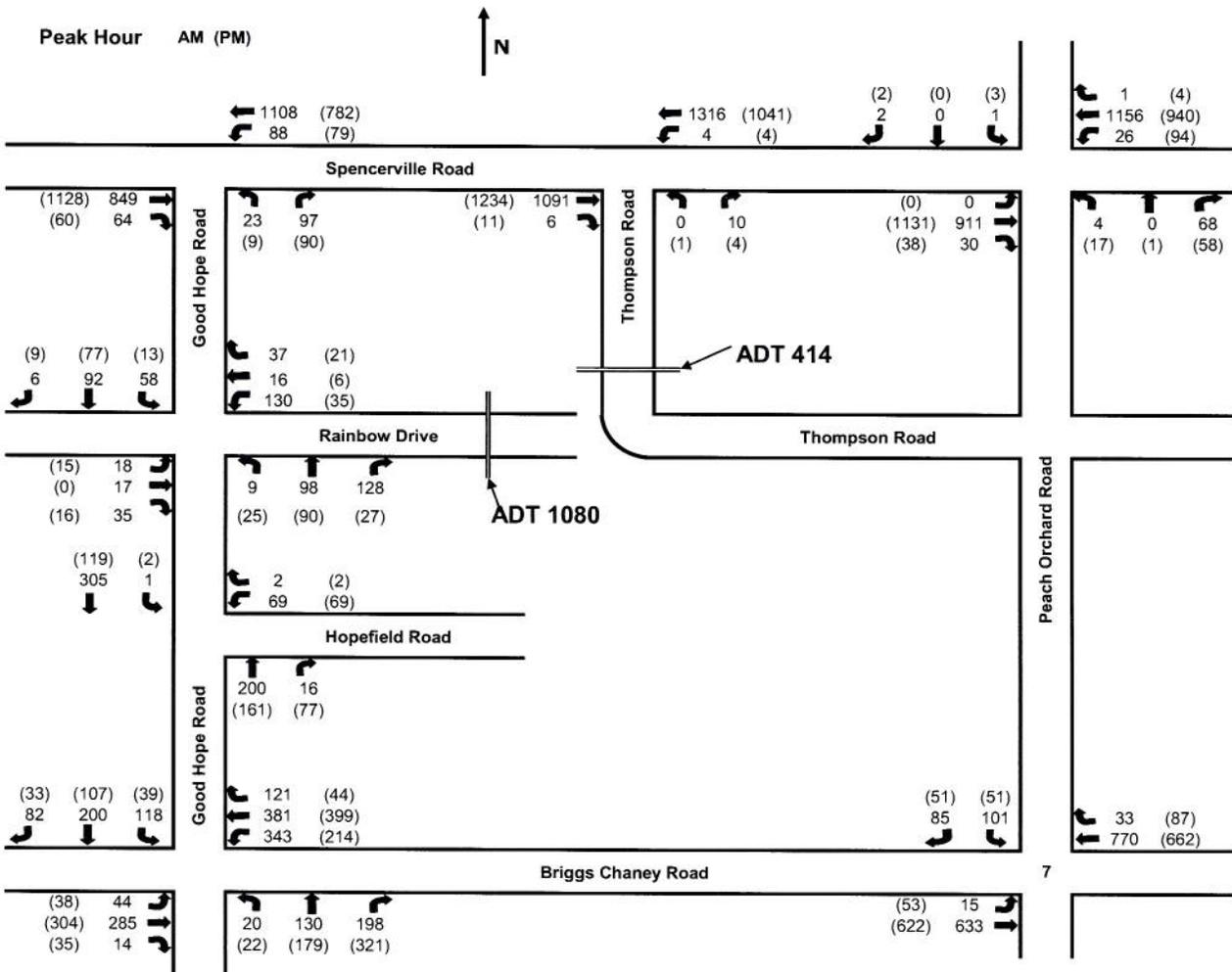
A full week's 24 hour tube count for Rainbow Drive and Thompson Road was conducted Wednesday, April 2, 2008 to Tuesday April 8, 2008. Two tube counters were placed approximately 120 feet west of the entrance to Briggs Chaney Middle School and approximately 200 feet north of the bend of Thompson Road in the proposed road connection area. The tube counts recorded daily traffic volume along Rainbow Drive and Thompson Road. The daily traffic was approximately 1,080 and 414 vehicles Rainbow Drive and Thompson Road, respectively. During the AM peak hour, the traffic volume reached 407 vehicles on Rainbow Drive.

The adjacent intersection traffic turning movement counts were also collected for the AM and PM peak hours between 6:30 AM to 9:30 AM and 4:00 PM to 7:00 PM at:

- ***Spencerville Road (MD 198) and Peach Orchard Road***  
(Counted on Wednesday, January 30, 2008).
- ***Spencerville Road (MD198) and Thompson Road***  
(Counted on Wednesday, January 30, 2008).
- ***Spencerville Road (MD198) and Good Hope Road***  
(Counted on Thursday, January 31, 2008).
- ***Good Hope Road and Rainbow Drive***  
(Counted on Tuesday, January 29, 2008).
- ***Good Hope Road and Hopefield Road***  
(Counted on Tuesday, January 29, 2008).
- ***Briggs Chaney Road and Good Hope Road***  
(Counted on Thursday, Thursday, January 31, 2008).
- ***Briggs Chaney Road and Peach Orchard Road***  
(Counted on Wednesday, April 16-17, 2008).

The peak hours turning movements and average daily traffic on Rainbow Drive and Thompson Road were presented in Figure 3. The detailed data can be found in Appendix D.

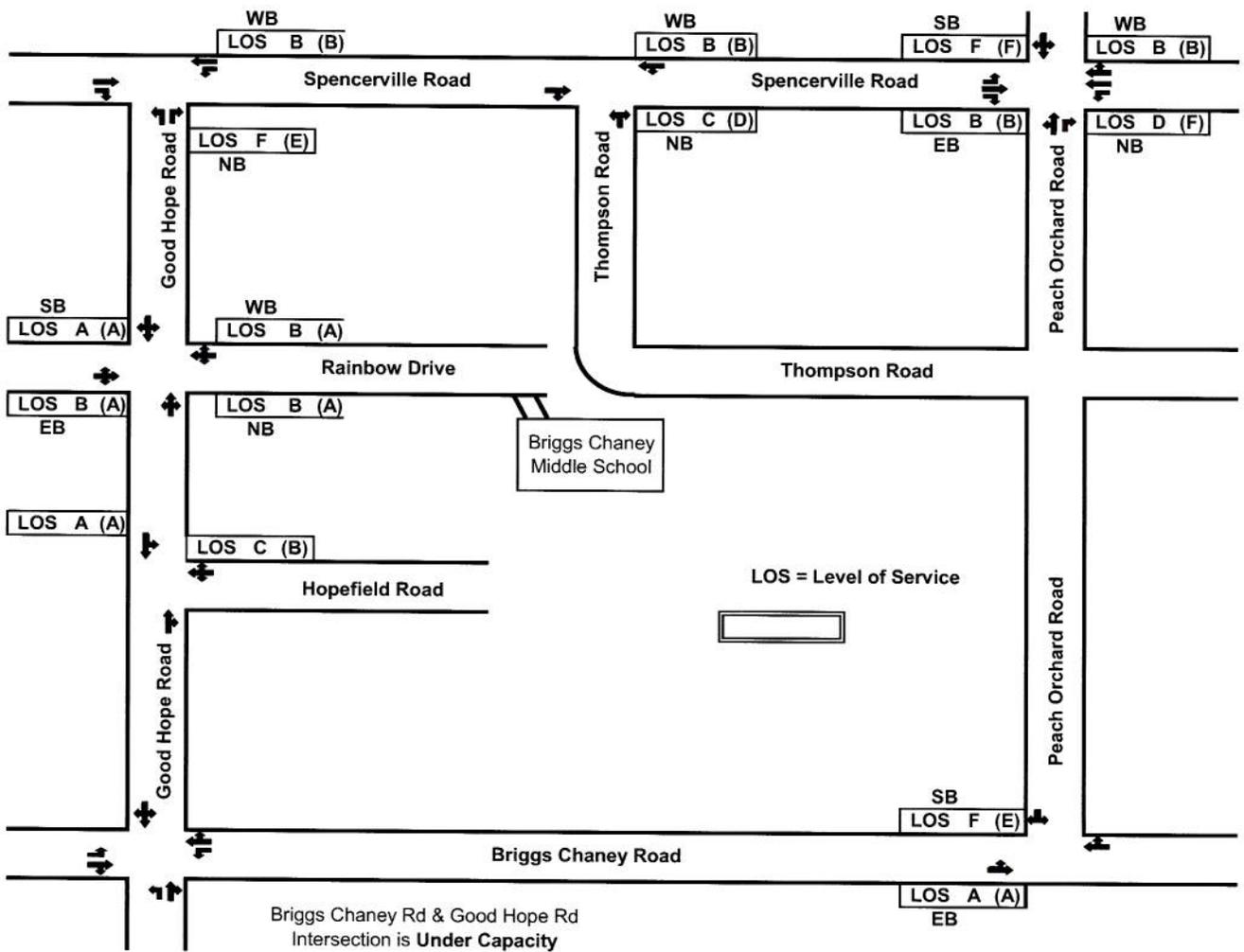
**Figure 3. Traffic Volumes within Study Area**



### ROADWAY CAPACITY

Based on roadway and intersection configuration and traffic volumes, we applied the procedures in the Highway Capacity Manual to obtain the capacity and level of services of intersections within the study area. By using the HCS+ traffic simulation package, we analyzed the peak hour traffic operations at those intersections and presented the results in Figure 4 below.

Figure 4. Peak Hour Level of Services – AM (PM)



The Figure 4 indicated current traffic status at those intersections. The side streets crossing Spencerville Road had difficulties to make left turns during the peak hours. All the other intersections are currently running at satisfactory level.

#### **4. ROAD CONNECTION ANALYSIS**

##### **TRAFFIC OPERATION AFTER ROAD CONNECTION**

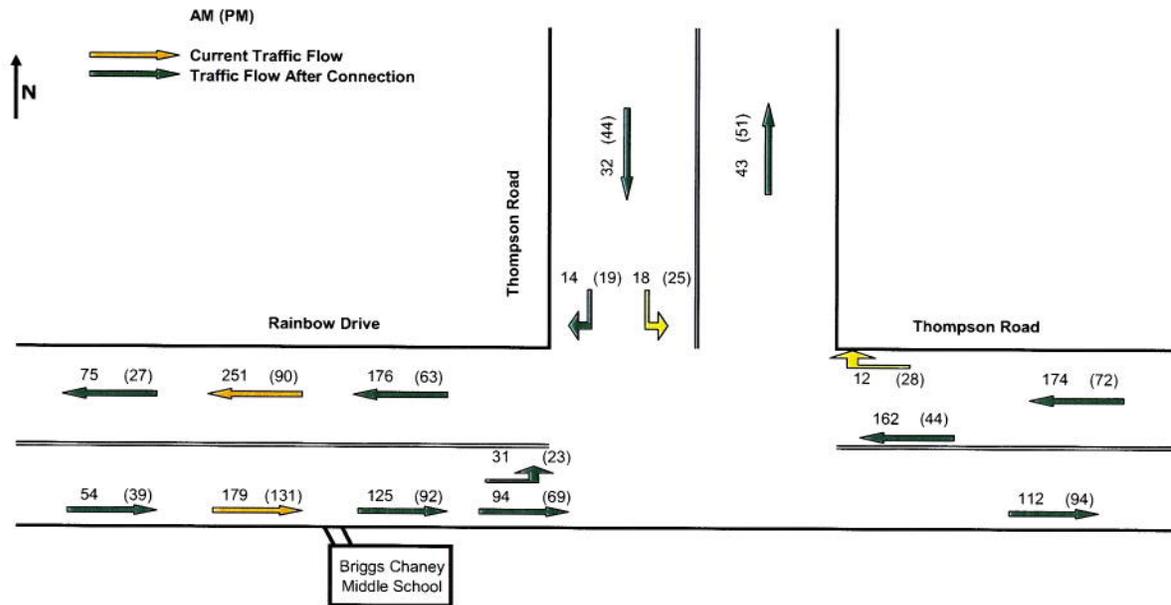
The road connection of Rainbow Drive and Thompson Road will form a new intersection. It will be a T intersection or roundabout with west leg of Rainbow Drive, north and east legs of Thompson Road. The traffic operation at this intersection would be an indicator of immediate traffic impact of the road connection.

After the connection, traffic volumes along Rainbow Drive and Thompson Road would be distributed differently from their current levels. Rainbow Drive would no longer be a dead end road. A proportion of traffic would use the connection to and from east through the connection. Considering Briggs Chaney MS the main trip generator and attraction in this area, the trip distribution towards connection has been estimated based on the school trips split between those from west and east.

The school bus survey was conducted. There are currently 80% students coming from east side of school and rest from west. Therefore up to 80% school traffic would be likely using the connection to and from east. Since the trips will be using the road connection would be a mix of local and school trips, a reasonable estimate would be less than 80% of existing traffic volume along Rainbow Drive. The other factors that would determine the use of road connection include travel time and access capabilities. Given the existing roadway network and residential densities around the area, we assume 70% of existing Rainbow Drive traffic would use the road connection to and from east.

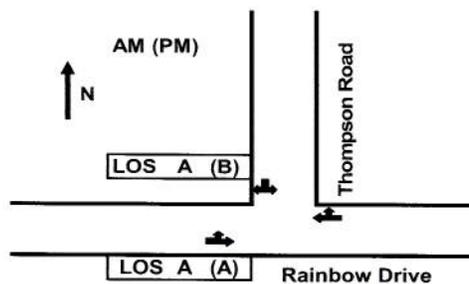
From traffic volume collected along Rainbow Drive and Thompson Road, we re-distributed eastbound and westbound traffic volumes accordingly as shown in Figure 5.

**Figure 5. Peak Hour Traffic Distribution after Road Connection**



The road connection of Rainbow Drive and Thompson Road would not generate or attract more trips but only redistribute traffic flows. The connection is expected to reduce traffic volume along Rainbow Drive and to increase along Thompson Road. The newly formed intersection of Rainbow Drive and Thompson Road would be an indicator of traffic impact brought by the connection. Therefore we conducted a HCS capacity analysis for this intersection and obtain the results as Figure 6 below.

**Figure 6. Peak Hour Level of Service after the Connection**



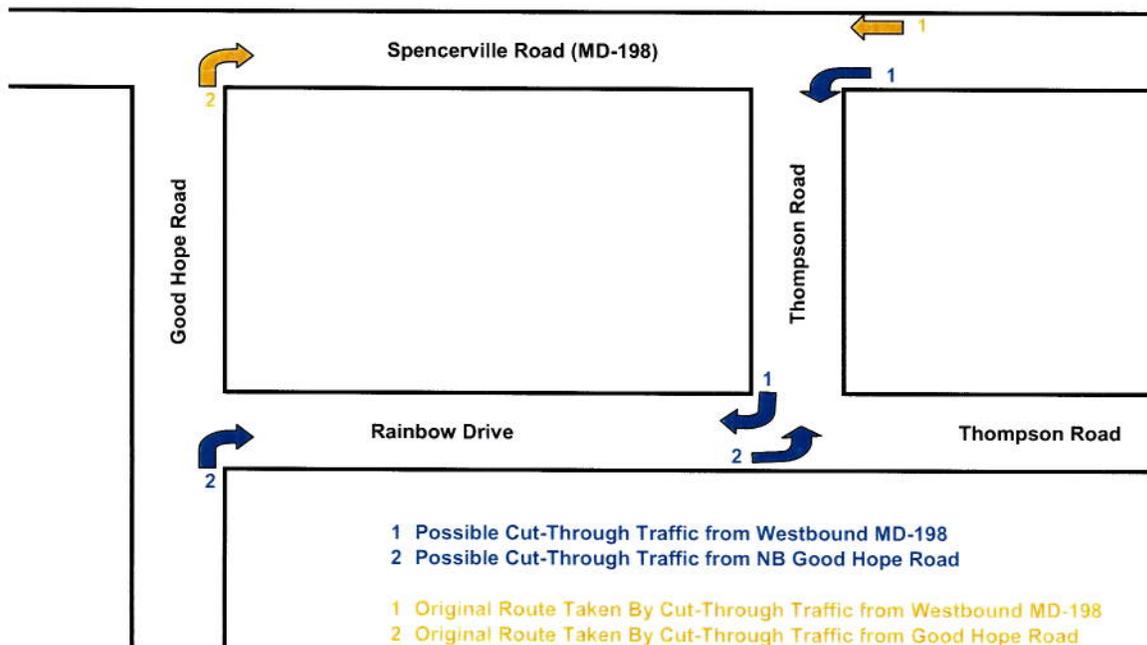
As the analysis results shown, the intersection operates at LOS A and carries no significant impact after the road connection.

### CUT-THROUGH TRAFFIC SCENARIOS

This section will discuss the possible cut-through traffic and their traffic impacts due to the road connection of Rainbow Drive and Thompson Road.

The road connection would provide southwest and northeast bound paths crossing Spencerville Road and Good Hope Road. Based on the roadway network layout, two scenarios will be studied for possible cut-through traffic impact. The first scenario would be westbound Spencerville Road traffic using Thompson Road and Rainbow Drive as an alternative path toward to southwest direction. The other scenario would be northbound Good Hope Road traffic using Rainbow Drive and Thompson Road towards northeast direction. See Figure 7.

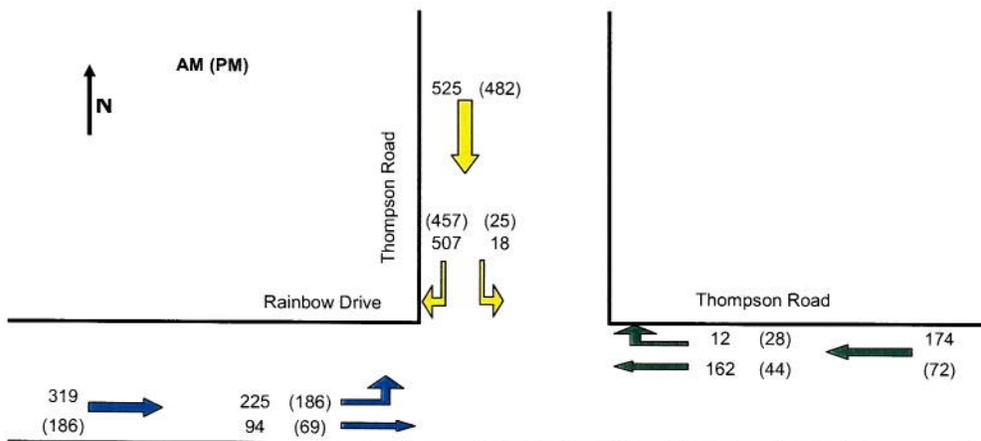
**Figure 7. Possible Cut-Through Traffic Flows after the Connection**



The cut-through traffic from WB MD 198 should be those vehicles whose travel time would be less by using Thompson/Rainbow Road. This situation occurs only when downstream WB MD 198 has a traffic jam or incident. To estimate the cut-through traffic volume, we assume the volume would be part of WB through vehicles that divert to left turns. When left turn volume exceed certain level that the intersection operation will be failed. Based on current intersection operation, the LOS would reach F when left turn volume increases to 507 vehicles. Therefore those 507 vehicles would be considered as maximum cut-through traffic for the scenario (colored orange in Figure 7). Similarly, the second scenario would be traffic diverted from NB Good Hope Road. The NB Good Hope Road vehicles may use Rainbow Drive and Thompson Road when further north downstream traffic stuck. Part of NB Good Hope Road through traffic would turn right onto Rainbow and continue east and then north. The maximum volume should not exceed the existing right turn volume from Good Hope to MD 198 (colored blue in Figure 7).

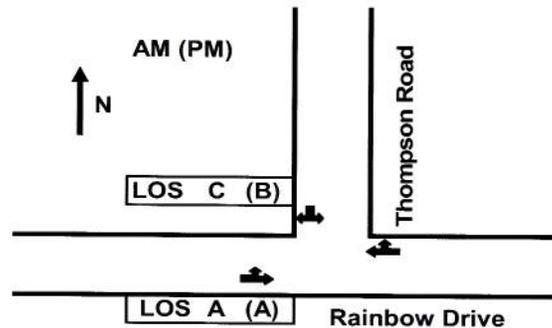
Considering traffic impact of the two cut-through scenarios we estimated the “worst” or highest traffic volume at the connection intersection, i.e., assuming the two cut-through occurring at the same time. The volumes of eastbound left turn and southbound right turn would significantly increase, presented in Figure 8.

**Figure 8. Peak Hour Traffic Volumes on Cut-Through Scenarios**



Based on the cut-through traffic volumes, we conducted capacity analysis and obtained the level of services as shown in Figure 9 below.

**Figure 9. Peak Hour Level of Service with Cut-Through Traffic**

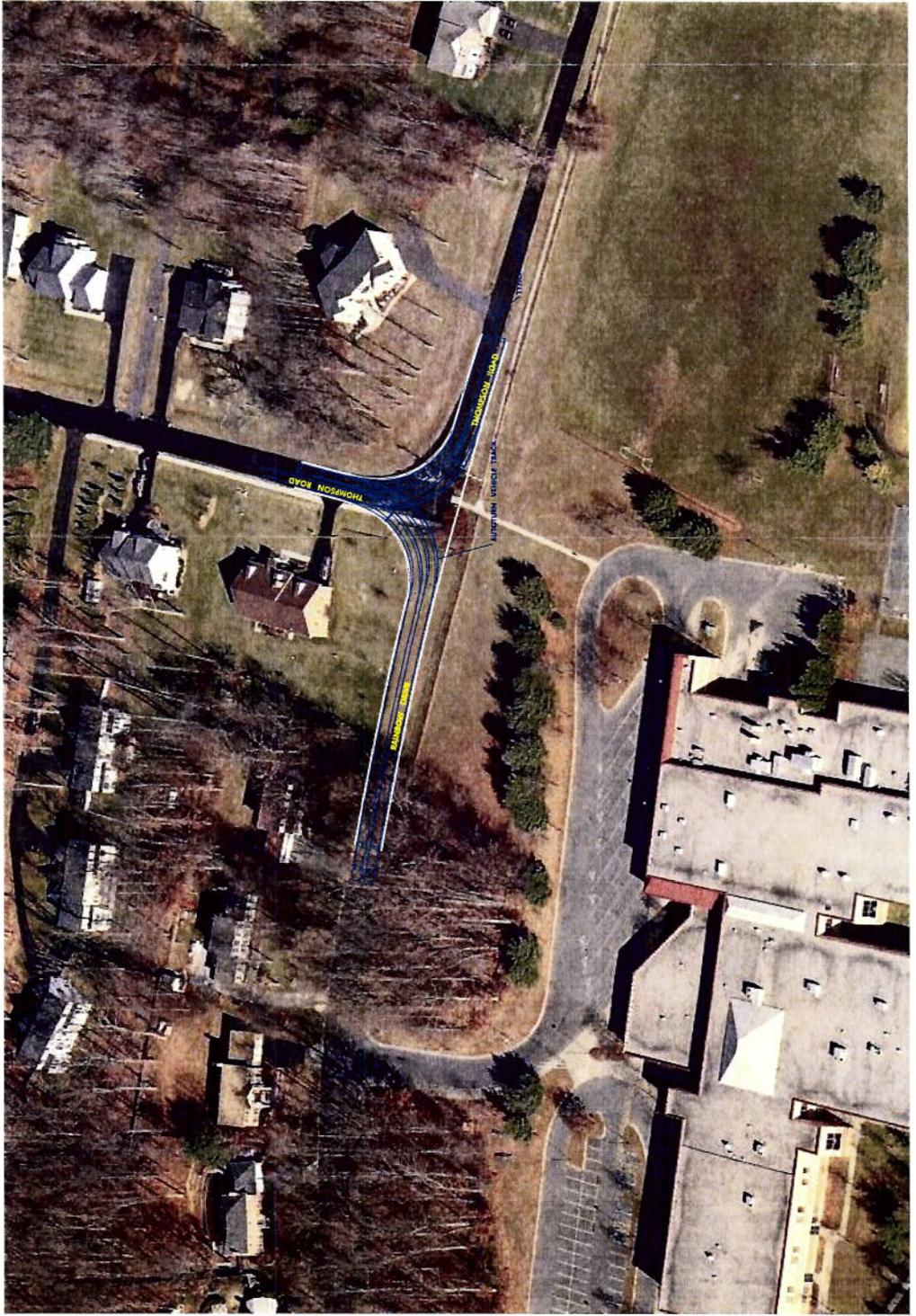


The worst LOS could drop to C during the AM peak hour while operate at LOS B in PM peak hour. Overall, the intersection would operate at satisfactory conditions under cut-through traffic impact. All the HCS capacity analysis can be found in Appendix E.

### THE CONNECTION LAYOUT AND ROUNDABOUT OPTION

The road connecting length between Rainbow Drive and Thompson Road is about 220 feet. The north side of Rainbow Drive and Thompson Road are residential houses. The south side of is the property of Briggs Chaney Middle School (BCMS). The preliminary design choices for the connection would be a regular T intersection or a roundabout illustrated in Figure 10 and Figure 11. The T intersection and roundabout have been laid out by considering school bus activities in this area, the turning radii of T intersection and roundabout have been set to accommodate vehicles with length of 45 feet (a regular school bus length).

In comparison of T intersection, roundabout would provide adequate capacity of carrying peak hour traffic, safer operation, less conflict points, effective on maintaining low speed, more pedestrian friendly but is more expensive to build and takes more land.



NOTES

CURB RADIUS - 75 FT  
 EXISTING LANE WIDTH - 12'  
 PROPOSED LANE WIDTH - 15'

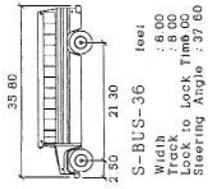


FIGURE 10 - CONCEPTUAL LAYOUT OF ROAD CONNECTION AS A T - INTERSECTION



## **THE ELIGIBILITY OF ACCESS RESTRICTION**

To consider the possibility of access restriction due to the road connection, the eligibility of access restriction has been evaluated based on the Montgomery County Executive Regulation 17-94 AM, "Through Traffic Volume Access Restrictions in Residential Areas". The threshold average daily traffic of 400 vehicles would trigger further roadway access restriction study. In this case, both Rainbow Drive and Thompson Road are currently experiencing light traffic volume and do not fall in the category of access restriction evaluation. However, further evaluation may be required after the road connection of Rainbow Drive and Thompson Road.

## **5. RESULTS, RECOMMENDATIONS AND DISCUSSIONS**

Through the above data collection and traffic analyses our findings and some recommendations are discussed as followings:

- The existing conditions of study area are currently operated at satisfactory level in terms of travel time and delays. Few problematic spots occurred at side streets turning onto the major road of Spencerville Road during the peak hours.
- Briggs Chaney MS is a major trip generator and attraction for local trip along Rainbow Drive. The school has after school including weekend activities. The survey conducted showed not significant traffic generated by such activities.
- The road connection of Rainbow Drive and Thompson Road would provide access capability for local residents and travelers from Spencerville Road southwest towards Good Hope Road and vice versa.
- .The road connection would divert part of existing Rainbow Drive traffic towards east to Thompson Road. Rainbow Drive traffic would have significantly dropped and Thompson Road traffic moderately increased. Without considering possible cut-through traffic the road connection will not cause traffic problem at adjacent area. The roadway and intersection in the road connection area will operate at LOS A.
- By considering possible cut-through scenarios, the traffic impact due to the connection would also be not significant. Given the worst cut-through scenario, the

LOS of connection intersection would be LOS C in AM peak and LOS B in PM peak hour.

- The conceptual road connection would be a regular T intersection or a mini-roundabout. Both conceptual layouts would take extra land in the connecting area with more land acquisition may need for roundabout. The roundabout is considered as better choice for traffic operation and safety.

## 6. REFERENCES

*MUTCD 2003 - Manual of Uniform Traffic Control Devices.* US Department of Transportation, Federal Highway Administration, US Government Printing Office, D.C., 2003.

*A Policy on Geometric Design Of Highways and Streets.* American Association of State Highway and Transportation Officials. Washington, D.C., 2001.

*Manual of Transportation Engineering Studies.* Institute of Transportation Engineers. Washington, D.C., 2000.