

A Traffic Impact Study for the  
**Bealeton, Opal and Remington Service District Plans**  
**Fauquier County, Virginia**

Prepared for:  
Fauquier County Board of Supervisors

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February 18, 2010

## **Table of Contents**

<b>A. Introduction</b>	4
1. Traffic Impact Study Purpose	
2. Study Area	
3. Existing and Proposed Uses	
4. Existing Roadways	
5. Planned Improvements	
<b>B. Analysis of Existing Conditions (2007)</b>	6
1. Peak Hour Traffic Volumes (PM)	
2. Capacity Analyses and Levels of Service	
3. Model Calibration	
<b>C. Trip Generation</b>	8
<b>D. Traffic Distribution and Traffic Assignments (TMODEL2)</b>	8
<b>E. Analysis of Build-out Conditions (2030) with the Bealeton Connector</b>	8
<b>F. Build-Out Conditions (2030) without the Bealeton Connector (Route 28 Bypass)</b>	10
<b>G. Recommended Road Network Improvements</b>	11
1. Major Network Improvements	
2. Other Network Improvements	
<b>H. Conclusions</b>	16
<b>I. Exhibits:</b>	
<a href="#">Exhibit 1:</a> Adopted Bealeton – Opal – Remington Service District Plan; Southern Fauquier Long-Range Transportation Plan	18
<a href="#">Exhibit 2:</a> Bealeton-Opal-Remington Service Districts Public Road Functional Classifications	19
<a href="#">Exhibits 3-5</a>	
Exhibit 3: Geometric Design Standards for Residential and Mixed Use Subdivision Streets (GS-SSR), Table 1 – Curb and Gutter Section	20
Exhibit 4: Geometric Design Standards for Residential and Mixed Use Subdivision Streets (GS-SSR), Table 2 – Shoulder & Ditch Section	21
Exhibit 5: Geometric Design Standards for Residential and Mixed Use Subdivision Streets (GS-SSR), Table 3 – One-Lane (One Way) Subdivision Streets	22

**TABLE OF CONTENTS**

<b>Topic</b>	<b>Page</b>
<a href="#"><u>Exhibits 6-11</u></a>	
Exhibit 6: Mixed Use Street (Major: 2001-4000 ADT)	23
Exhibit 7: Mixed Use Street (Minor: 2001-4000 ADT)	24
Exhibit 8: One Way Street	25
Exhibit 9: Residential Street	26
Exhibit 10: Minor Residential Street (under 2000 ADT)	27
Exhibit 11: Alley	28
<b>J. Figures:</b>	
<a href="#"><u>Figure 1:</u></a> Bealeton-Opal-Remington Service District Boundary	29
<a href="#"><u>Figure 2:</u></a> Traffic Analysis Zones (TAZ's)	30
<a href="#"><u>Figure 3:</u></a> Land Uses (Existing Conditions 2007, Build-Out 2030)	31
<a href="#"><u>Figure 4:</u></a> Intersections Analyzed (2007) & (2030)	32
<a href="#"><u>Figure 5:</u></a> Lane Geometry and Levels of Service (Existing Conditions)	33
<a href="#"><u>Figure 6:</u></a> Intersections PM Peak Hour Volumes (Existing Conditions)	34
<a href="#"><u>Figure 7:</u></a> Calibration Results	35
<a href="#"><u>Figure 8:</u></a> TMODEL2 PM Peak Hour Roadway Link Volumes (2007)	36
<a href="#"><u>Figure 9:</u></a> TMODEL2 PM Peak Hour Roadway Link LOS (2007)	37
<a href="#"><u>Figure10-A:</u></a> TMODEL2 PM Peak Hour Roadway Link Volumes (2030)	38
<a href="#"><u>Figure10-B:</u></a> TMODEL2 PM Peak Hour Roadway Link Volumes without the Bealeton Connector (2030)	39
<a href="#"><u>Figure 11-A:</u></a> Intersections PM Peak Hour Volumes (2030 Build-Out Conditions)	40
<a href="#"><u>Figure 11-B:</u></a> Intersections PM Peak Hour Volumes (2030 Build-Out Conditions, without the Route 28 By-Pass)	41
<a href="#"><u>Figure 12-A:</u></a> Lane Geometry and Levels of Service (2030 Build-Out Conditions)	42

## TABLE OF CONTENTS

<b>Topic</b>		<b>Page</b>
<a href="#">Figure 12-B:</a>	Lane Geometry and Levels of Service (2030 Build-Out Conditions without the Route 28 By-Pass)	43
<a href="#">Figure 13-A:</a>	TMODEL2 PM Peak Hour Roadway Link LOS (2030)	44
<a href="#">Figure 13-B:</a>	TMODEL2 PM Peak Hour Roadway Link LOS without The Bealeton Connector (2030)	45
<a href="#">Figure 14:</a>	Build-Out Proposed Improvement (2030)	46
<b>K. Tables:</b>		
<a href="#">Table 1:</a>	Levels of Service and Maximum Queue Lengths (Existing Conditions)	47
		48
<a href="#">Table 2-A:</a>	Levels of Service and Maximum Queue Lengths (2030 Build-out Conditions)	
<a href="#">Table 2-B:</a>	Levels of Service and Maximum Queue Lengths (2030 Build-out Conditions, without Route 28 Bypass)	49
<b>L. Appendix:</b>		
1. <a href="#">TMODEL 2 Definition</a>		50
2. <a href="#">Methodology for the Land Use Analysis</a>		51
3. <a href="#">Level of Service Definitions</a>		52
4. <a href="#">Existing Conditions Synchro Work Sheets</a>		53
5. <a href="#">2030 Build-out Conditions Synchro Work Sheets</a>		54
6. <a href="#">Assigned Roadway Network Capacities</a>		55
7. <a href="#">Roadway Network Sections (Links) LOS</a>		56
8. <a href="#">2030 Build-Out Conditions Synchro Work Sheets (Without Rte 28 By-Pass)</a>		57

## **A Traffic Impact Study for the Bealeton, Opal and Remington Service District Plans**

### **A. Introduction**

The Bealeton, Opal and Remington Service Districts have experienced significant growth in development and associated traffic as a result of the residential building boom permitted in the early 2000's in Fauquier County and adjacent localities. This growth is projected to continue more modestly into the future. The transportation element for these three interrelated and adopted Service District Plans identified road improvements essential to accommodate the planned development for an area that already has a constrained existing road network.

The County commissioned MCV Associates, Inc. to complete a traffic impact analysis (TIA) for the Bealeton, Opal and Remington Service Districts and assess the road network proposed at build-out within the Comprehensive Plan. The TIA used the TMODEL 2 for the overall analysis, and this modeling tool is described as part of Appendix 1. There are other key study objectives that are also outlined below. However, the study was not intended to be multi-modal and does not include air, rail or other public transit modes of transportation.

#### **1. Traffic Impact Study Purpose**

In addition to whether the build-out road network works effectively, there are other reasons for such an assessment. With diminishing state funding for secondary and primary roads, Fauquier County needs to better understand the ramifications of its planning and development efforts on the local public road network. Other than currently constrained state funding for VDOT's 6-Year Primary and Secondary Road Plans, there are realistically few funding options available to Fauquier County for new additions and expansion of its transportation network in locations deemed essential. Examples of these funding sources are: (a) VDOT Revenue Sharing program; (b) New construction completed through the development community; (c) Cash contributions proffered through rezoning applications and earmarked for specific road improvements needed as part of an approved rezoning project; (d) transportation impact fees for specific road improvements as allowed through state enabling legislation (VA Code § 15.2-2317); and (e) special taxing districts for specific facility and/or utilities.

#### **2. Study Area**

The Bealeton, Opal and Remington Service Districts are generally contiguous and, therefore, were analyzed together as a large and interrelated transportation study area (See Figure 1). This analysis was originally based on the land use and the existing transportation network for the year 2004. Due to land use changes and traffic growth in the region, the study was updated in 2008 to reflect current land use, existing transportation network and updated future land use projections.

From 2004 to 2008, Fauquier County expanded these service districts in some areas, affecting traffic model results. As a result, the TMODEL2 was updated to reflect 2008 land use boundaries and densities. The model has been calibrated and tested versus turning movement counts (refer to Figure 7).

The Bealeton, Opal and Remington study area (refer to Figure 1) is generally defined as the area just south of Remington to the area just north of Opal; while the western boundary is just west of Route 29/15 and the eastern boundary is the area just east of Bealeton. Figure 2 illustrates the “traffic analysis zones” (TAZ's) used to define the study area. This area was selected to include specific areas that contribute traffic volumes directly into the system of highways and streets which impact the Bealeton, Opal and Remington study area. All delineated TAZ's are located within Fauquier County.

The modeling area is further defined by internal and external traffic analysis zone numbers. TAZ's 1-82 comprise the zones internal to the service districts, while TAZ's 90 through 99 comprise areas outside current service district boundaries, but within the transportation study area. The external TAZ's are located to represent traffic entering and exiting the internal study area via gateway highways (e.g., U.S. 15/29, Rt. 17, and Rt. 28). TAZ numbers 83 - 89 were skipped to allow for additional TAZ's in future modeling updates. Finally, TAZs are required as part of the TMODEL2 system and are used to define the total traffic impacts.

### **3. Existing and Proposed Uses**

The majority of land uses in the Bealeton, Opal and Remington Service Districts concentrate in residential, industrial, retail and hospitality land uses.

If build-out of the land uses hypothetically were to occur by 2030, Fauquier County could see an increase in residential units by 250%, retail land use by 700% and non-retail (industrial, hospitality, and schools) by 1000%. Figure 3 illustrates 2007 and projected 2030 land uses. However, with the development downturn experienced from 2007 to present, the forecasted uses realistically represent build-out land uses much further out than 2030.

### **4. Existing Roadways**

The system of streets and highways within the study area is illustrated in Figure 4. This map represents the primary and the major secondary roads network in the study area. Most of the roadways in the study area are rural 2-lane highways, mostly un-signalized with the exception of the following intersections:

- Opal Road-Marsh Road / Route 15–17–29;
- Route 17 (Marsh Road) / Route 28 (Catlett Road);
- Route 17 (Marsh Road) / Village Center Drive;
- Route 17 (Marsh Road) / Station Drive.

- Route 28/Independence Avenue & Station Drive
- Route 15-29 / Route 28 (Catlett Road);
- Route 15-29 / Main Street;
- Route 15-29/Route 15-29 (Business).

Note that the signalized intersection on Route 28 with Independence Boulevard and Station Drive occurred after this modeling exercise was completed.

## **5. Planned Improvements**

Improvements that were modeled as part of this TIA for 2030 build-out conditions and are included in the adopted Bealeton, Opal and Remington Service District Plans are as follows:

- Flyover construction from Route 15/29 to Route 17 (Current VDOT 6-Year TIP; construction expected to commence in early 2010);
- Route 29 widened to six lanes and limited access from Opal to Remington;
- Construct a collector road system in Opal in the vicinity of Route 15/17/29 (Service Roads);
- Construct a collector road system (East/West Connector) on the east side of Route 17 to serve future development in the area (White Marsh to Rt. 28). This road would then continue to the east and the south to connect with Route 805;
- Construct a collector road system from Route 661 (Oak Shade Road) to Route 662 (Weaversville Road) and back to Route 17 (East/West Connector; Mintbrook Project vicinity);
- The construction of the “Bealeton Connector” or the “Route 28 Connector” (four lane divided roadway) as a limited access freeway. It would be located south of Bealeton and connect Rt. 17 and Rt. 15/29 with interchanges at Route 17 and Route 29 (vicinity of Lucky Hill Road/Rt. 28);
- Route 28 is downgraded to a collector from its intersection with Route 643 and extending to Route 29; and
- Route 17 from Opal through Bealeton is downgraded to a major collector.

## **B. Analysis of Existing Conditions (2007)**

### **1. Peak Hour Traffic Volumes (PM)**

As part of this study, turning movement counts were conducted at the intersection of Route 15/29 with Opal Road (Rt. 687) and Marsh Road (Rt. 17) during the PM Peak Hour. Turning movement counts data for the year 2007 were obtained at five other intersections from traffic impact studies submitted to the County for development applications. These intersections are:

- Opal Road (Route 687) – Marsh Road (Route 17)/Route 17-15-29;

- Route 17 (Marsh Road) / Route 28 (Catlett Road);
- Route 15-29 / Route 28 (Catlett Road);
- Route 15-29 / Main Street;
- Route 17 (Marsh Road) / Village Drive; and
- Route 17 (Marsh Road) / Station Drive.

In a later section on model calibration, it will be shown that the VDOT existing (2007) roadway counts were utilized in calibrating the existing 2007 TMODEL2.

## **2. Capacity Analyses and Levels of Service**

The Synchro Model was used to analyze the above-mentioned six intersections, and as recommended by VDOT, evaluation of levels of service (LOS) was based on lane groups as shown in Table 1, and Figure 5. All lane groups, approaches and intersections achieved Levels of Service (LOS) D or better, with the exception of one. That underperforming intersection was Route 17 with Route 28 (Catlett Road) which is currently operating at an overall LOS E. Generally, the existing traffic conditions for the base year 2007 can be described as very good. Definitions for LOS are included in Appendix 3; while the Synchro existing conditions output is included in Appendix 4.

## **3. Model Calibration**

2008 household and employment data was used to develop PM peak hour vehicle trips. The peak hour trip figures were distributed between trip origins (e.g., work place) and destinations (e.g., residence). The model assigned PM peak hour vehicle trips; the breakdown of these trips are shown in Figure 6. The PM peak hour volumes were compared with the observed 2007 traffic volumes (turning movement counts as well as VDOT link volumes). PM peak hour volumes were computed using average daily traffic volumes and peak hour/peak direction factors. The comparison of actual counts versus modeled volumes is shown in Figure 7. The results show a Root Mean Square Error (RMSE) of 9 percent and a Correlation of Coefficient R<sup>2</sup> of 0.99. These statistical measures show an excellent accuracy level and the model is presumed to be calibrated.

The roadways were assigned hourly capacity based on their classification (major arterial, minor arterial, collectors and interstate ramps). The assigned capacities are included in Appendix 6. The assigned volumes were divided by the hourly capacities to determine the link volume/capacity ratios. The volume/capacity ratios were converted to link or roadway section levels of service using criteria presented in Appendix 7. The PM peak hour volumes and levels of service are summarized in Figure 8 and Figure 9 respectively. Figure 9 results show that certain roadway sections are operating at LOS D or LOS F during the PM peak hour; some examples are:

- LOS F: Southbound traffic at Rt. 15-17-29/Rt. 17 (north of intersection 1);

- LOS F: Southbound traffic at Rt. 15-29/Rt. 28 (south of intersection 5);
- LOS D: Rt. 15-29 between intersections 5 and 6;
- LOS D: Rt. 28 from its intersection with Oak Shade Road to Rt. 15-29 (intersection 5); and
- LOS D: on Rt. 17/Rt. 28 south beyond Route 28 (Intersection No. 2) and south beyond Bealeton Road (Intersection No. 4).

### **C. Trip Generation**

The trip generation for the existing (2007) and build-out (2030) models were computed internally by the TMODEL2 using ITE (Institute of Transportation Engineers) trip rates and the household and employment land use data by Traffic Analysis Zone (TAZ).

### **D. Traffic Distribution and Traffic Assignments (TMODEL2)**

TMODEL2 software in its traffic distribution utilizes the Gravity Model as the mathematical way of distributing trips between origins and destinations within TAZ's, while assigning different traffic volumes according to the Wardrop Principle<sup>1</sup>.

TMODEL2 handles 3 types of traffic: internal-internal, internal-external, and external to external. Internal-Internal traffic represents trips generated and attracted by the internal zones numbered 1-82 (within the study area), generally using the secondary roadways in the model. Internal-External traffic denote the trips from the three service districts to and from the areas outside the study area, usually using the major collectors and arterial roadway system, such as Routes 17, 28, 15, 602, and similar roadways. External-External traffic represents trips that are driving through the three districts without being generated in the three service districts. These trips will generally use the major arterials, such as Routes 17, 28, 15/29.

### **E. Analysis of Build-out Conditions (2030) with the Bealeton Connector**

Once the model was calibrated to replicate the existing conditions within an acceptable level of accuracy, it was then used to forecast future traffic. The year 2030 was selected as the forecast year to represent full build-out of the study area. Realistically, it is expected that this build-out will occur much further into the future for these areas due to the actual pace of development this County has experienced in the past. Nevertheless, the data needed herein for developing PM peak hour traffic forecasts include the future transportation network and the future land use data for that forecast year.

The growth in residential development and employment (in terms of square feet of

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<sup>1</sup> At equilibrium, the average journey time is minimum. This implies that each user behaves cooperatively in choosing their route to ensure the most efficient use of the whole system. Traffic flows satisfying Wardrop's second principle are generally deemed "system optimal".

development) in the study area was provided by Fauquier County's Department of Community Development. The growth in jobs was estimated by converting the non-residential development potential into jobs by using industry standards (in terms of square feet per employee). Growth factors for the external areas were developed based on regional dynamics. The 2030 total households and employment data by TAZ's are both presented in Figure 3. As expected in the forecasted build-out year, significant growth is expected; for example, households are projected to increase from 3,237 residential units in 2007 to 8,419 in 2030.

The TMODEL2 model was run for the 2030 PM peak hour using the transportation network identified in Figure 4 and the land use data shown in Figure 3. The model-assigned PM peak hour link volumes for build-out conditions are shown in Figure 10-A which includes the Bealeton Connector. As noted in Figure 10-A, the highest volumes (5,231 trips) are projected on southbound Route 15/17/29, just north of the Route 17 split. The southbound volume (PM Peak) on Route 17, for example, from Opal to Covingtons Corner Road (Rt. 663) is projected to be 2,706 vehicles and 1,982 vehicles from Rt. 663 to the east/west Connector. The turning movements at some of the critical intersections were extracted from the model and are presented in Figure 11-A for the analysis that included the Bealeton Connector. The assumed intersection lane configurations are also shown in Figure 12-A.

The Synchro Model was used to estimate intersection levels of service for the 2007 selected intersections and four additional intersections for a build-out scenario at 2030. The subsequent analysis assumed the existence of the proposed "Bealeton Connector" which is proposed as a 4-lane (with a median) limited-access highway connecting Route 17 to Route 15-29. Its primary purpose was to provide a link between these two federal highways and growing regional traffic volumes.

The computed intersection levels of service are presented in Figure 12-A as well as Table 2-A. The individual worksheets for each intersection are included in Appendix 5. The results show that the Route 28/Route 17 intersection improves to an overall LOS C due to the "Bealeton Connector". Two other intersections analyzed, Route 15-29/Main Street and Route 15-29/Route 29 (Business), are projected to operate at an overall LOS F. The other intersections along Route 656 (Remington Road) are projected to operate at levels of service ranging from LOS A to LOS D.

The roadways were assigned hourly capacity based on their classification (major arterial, minor arterial, collectors and interstate ramps), as in the existing conditions. The assigned capacities are included in Appendix 6. The assigned volumes were divided by the hourly capacities to determine the link volume/capacity ratios. The volume/capacity ratios were converted to link or roadway section levels of service using criteria presented in Appendix 7. The resultant link levels of service are shown in Figure 13-A. The results show that all of Route 15/17/29 is projected to operate at LOS F in the southbound direction, with northbound directions under LOS F, north of Opal and south of Rt. 15-29 and Rt. 29 (Business). Due to the added network roads and connectivity at build-out, Rt. 28 links have LOS A to C, except southbound

volumes from Oak Shade Road to Rt. 15-29 which are projected to be LOS D; while Route 17 has projected link LOS of D, E and F.

**F. Build-Out Conditions (2030) without the Bealeton Connector (Route 28 Bypass)**

MCV also developed a year 2030 model with the build-out land-uses and no “Bealeton Connector” (4-lane divided roadway, limited access). Appendix 8 provides Build-Out Conditions Synchro Work Sheets (No Bealeton Connector). The referenced connector is part of a proposed long-term and overall system improvement shown in Figure 14. This complicated project has three discrete segments: (1) a new minor arterial road in the vicinity of Route 643 (Meetze Road) extending just above the Warrenton-Fauquier Airport; (2) connection of this minor arterial to a limited access highway extending south to an interchange location with Route 17; and finally (3) a limited access connector from Route 17 west to an interchange with Route 15-29 just north of Remington. This exercise is to assess and determine the impact on the roadway network if these three segments were removed and their added system capacity unavailable at the time of build-out.

The results summarized in Table 2-B, Figures 11-B, 12-B and 13-B demonstrate the resulting network levels of service impacts. The elimination of the “Bealeton Connector” contributed the following example impacts at the build-out scenario:

- Major capacity deterioration occurred along primary roads (Route 28, and Route 17) and secondary streets (e.g., Routes 656 and 655);
- Route 656 intersections with Lucky Hill Road, Meadville Drive and Church Street originally had projected LOS D, C, A respectively (refer: Table 2-A) and without the connector transition to LOS F, E and F (refer to Table 2-B);
- North of the Route 656 intersection with Lucky Hill Road, Figure 13-A (with the connector) projects link LOS E (southbound) and LOS C (northbound); below the referenced intersection a LOS F (southbound) and LOS C (northbound) is projected. Without the connector, Figure 13-B projects LOS F for the latter links, except northbound to the intersection (LOS D);
- With the exception of the Route 17/Village Center Drive intersection (LOS A), all other Route 17 intersections were projected to change from LOS C to E (Rt. 17/28) and LOS B to C (Rt. 17/Station Drive) without the connector (see Tables 2-A and 2-B);
- PM Peak Hour Link analysis for the Route 17 stretch from Rt. 15-19 south of Rt. 805 demonstrates that: (a) With the connector (Figure 13-A): northbound (NB) links operate at LOS E and D, while the southbound (SB) links are projected to operate at LOS D and F; (b) Without the connector (Figure 13-B): NB links operate at LOS E and F, while the SB links are projected to be operating at LOS E and F; and

- Route 28 degrades dramatically without the connector, with all southbound links rated with LOS F and northbound links primarily either LOS D or E. With the connector, links north of Bealeton were LOS A and B; while to the south, all movements were either LOS C or D.

## **G. Recommended Road Network Improvements**

New VDOT construction for statewide primary and secondary road improvements has been severely curtailed. As a result, future development within Fauquier County will be required to shoulder these costs through either the funding or actual construction of both safety and capacity improvements to mitigate their impacts.

The secondary road improvements needed in the Bealeton – Opal – Remington Service Districts to meet current and build-out development requirements realistically will need to be achieved through a combination of sources, for example: developer construction or cash contributions (e.g., covering the engineering design, r-o-w, utility relocations and construction), future VDOT secondary road funding, County/VDOT revenue share projects, special taxing districts, and possibly transportation impact fees. Changes in future VDOT secondary road funding formulas are expected with local government targeted with more maintenance and safety enhancement responsibilities.

If the County chooses to pursue the implementation of impact fees for the Service Districts, then such fees will need to be developed consistently with state regulatory requirements (Virginia Code §15.2-2317) and be subject to the Board of Supervisors' public hearing and adoption process. However, it needs to be stated in clear terms that transportation impact fees represent a constrained source of revenue suitable only for smaller scale construction projects in a jurisdiction with a modest growth rate such as Fauquier County. In areas of slower development rates, receipt of revenues from impact fees will be variable annually and directly affected by developing projects with proffered rezoning applications already approved, local market and growth conditions.

### **1. Major Network Improvements:**

Major network improvements modeled herein and actions required to support the planned build-out envisioned in the adopted Bealeton – Opal – Remington Service District Plans are listed below. These road improvements are also reflected in the adopted Comprehensive Plan. More information regarding these improvements is included within the transportation element of the referenced service district plans. Pedestrian accommodation (e.g., sidewalks, cross-walks and bike-paths) is a mandatory component and will be provided as recommended within the Comprehensive Plan, required in County ordinances and specified in VDOT Secondary Street Acceptance Regulations (SSAR) and associated

specifications. Exhibit 1 reflects the locations for the following proposed network improvements:

- a. Complete flyover construction from Route 15/29 to Route 17. This project is included for construction commencement in the current VDOT 6-Year Primary Road Transportation Improvement Program in FY 2009. Actual construction is expected to start in early spring 2010 (Exhibit 1: Location J);
- b. Construct a parallel and interconnected collector/service road system in Opal on both sides of Route 15/17/29 (vicinity from Lees Mill Road – Rt. 651 to Fayetteville Road – Rt. 844).

The Opal Service District is a planned business center area that needs a coordinated upgrade for both its land use and transportation plans, with future business development uses oriented and related to a service road network. This complex effort will require significant public/private focus in the development of clear and practical form and development design standards for the business community to follow. The Service District boundaries may also require adjustment to offer more effective land use relationships with street and service road network alignments and extensions. The planning effort needs to recognize that the Opal area is a major cross-roads location where significant vehicular and truck freight volumes converge. Therefore, it becomes critical that access management, land use and zoning be linked and effectively coordinated.

As a first step, the County and VDOT have initiated a Public Service Road Study (Consultant: HNTB) that will establish realistic alignments for service roads, extensions of existing streets, future realignment options of Opal Road to the Route 15-29 flyover, access management guidelines, as well as the staging of engineering design and improvements. The study includes an important public outreach element to involve existing businesses and property owners in the development of alignment options. Expectations are that the completed study recommendations will be integrated into the Opal Service District Plan through the County's established public review and adoption process.

The second step could result from a VDOT Urban Development Area (UDA) grant. The Board of Supervisors will need to authorize a portion of the VDOT grant for completing the land use plan upgrade for the Opal Service District as generally described previously. If authorized, both land use and transportation efforts will need to be synchronized quickly;

- c. Downgrade the section of Rt. 17 from Opal to Bealeton to a major collector (Vicinity of Rt. 663 – Covingtons Corner Road to Rt. 805 – Bealeton Road). This action requires implementing the long-term network enhancements outlined in this overall recommendations section, as well as completing

companion special land use/access management studies and plans. Such actions are essential to insure this road's capacity and safety is well managed for the competing and different demands imposed through existing and future local and regional through traffic volumes. Planning, design and implementation must be a top County priority for the completion of the surrounding street network envisioned for the Bealeton community. Such action becomes more critical since Route 17 now bisects Bealeton's planned and emerging community core of higher density mixed use residential and business land uses;

- d. Construct the collector road system called the "East/West Connector":
  - 1) Link on the west side of Route 17 extends from Route 28 to Route 661 - Oak Shade Road to Route 662 - Weaversville Road and back to Route 17 (Mintbrook Project vicinity). This link is delineated as "A" and "K" on Exhibit 1; and
  - 2) Link on the east side of Route 17 (e.g., starts in the vicinity of the White Marsh project); it is expected to be a phased road improvement that will eventually extend in the long-term to Rt. 28 and on to Route 805 (east of the Norfolk and Southern Railroad). Refer to Exhibit 1; this link is identified as "B";
- e. Existing Route 28 downgraded to a Collector Roadway from Meetze Road - Route 643 to Rt. 15/29 through the Bealeton area. The eventual "East/West Connector" and Rt. 805 network improvements (due to long-term planned Warrenton/Fauquier Airport and adjacent industrial/employment growth) provide alternative and added capacity options for the distribution of both local and regional traffic. Refer to Exhibit 1; links "C" (Rt. 805) and "D" (minor arterial addition);
- f. From Opal to Culpeper County, a service road network in designated areas needs to be strategically planned and located in order to implement limited access on Route 15-29 in the long-term. Other context sensitive design options are preferred along the Route 15-29 corridor which has also been designated as "The Journey Through Hallowed Ground" (National Register and National Heritage Area Designation from Gettysburg, PA to Monticello, VA), with widening to six lanes representing the last resort option when warranted; and
- g. The construction of the 'Bealeton Connector' (four lane divided roadway) as a limited access freeway. It would be located south of Bealeton and connects Rt. 17 and Rt. 15/29 with interchanges at Route 17 (vicinity south of Morgansburg Road - Rt. 653) and Route 29 (vicinity of Lucky Hill Road/Rt. 28). The proposed corridor is illustrated in Exhibit 1 and delineated as "E".

This 4-mile leg of the proposed facility will require significant funding to complete the requisite historic and environmental study (NEPA compliance), roadway design, corridor acquisition ( $\pm$  160 foot r-o-w width), utility relocations, and road construction including the essential bridge crossings over the existing railroad network and 100-year floodplain. Construction costs (2007 Dollars) alone were estimated to be \$90 million, while right-of-way acquisition and other general task categories mentioned previously would cost an equal or greater amount.

The current reality of funding for such a facility is exceptionally remote for the requisite special studies, design, permitting and construction, unless deemed critical due to regional travel and freight volumes at the state level. Even then an alternative and willing funding sources would have to be found; e.g., a toll road option.

With that portentous situation, the County needs to place priority in the additions and improvements to the secondary network as outlined next within this study, the Comprehensive Plan, and the VDOT 6-Year Improvement Program. The LOS conditions represented in Figure 13-B without the Bealeton Connector (Route 28 Bypass) illustrate an emergent network combination of existing and new roads needing both short and long-term attention in order to avoid significant congestion problems.

## **2. Other Network Improvements:**

There are smaller scale and local network improvements critical to providing more connectivity in these Service Districts, enhanced traffic distribution, traffic calming design, pedestrian access and maintaining future possibilities for public bus transit services. Such improvements will assist the overall network to function more efficiently, provide expanded access and more choices for local residents in the long-term. These improvements are appropriate in such areas where the County historically has intended to focus its more compact urban development area or town-scale business and residential development in the future.

Included and integral to the overall design of these network improvements will be sidewalks/multi-use paths, bicycle accommodations, pedestrian crossings all focused on pedestrian access, safety and attractiveness for walking, as well as providing the essential connectivity to shopping areas, neighborhoods, parks, schools, libraries and other public facilities.

Examples of the secondary road improvements that need to be implemented are as follows:

- a. Complete Bealeton's circumferential "North-South Ring Road" system. This internal and interconnected public street network is critical for local traffic and takes advantage of existing and proposed street extensions that run

parallel to U.S. 17. Completing this internal road system is critical to the residential and business core of this planned town center and provides multiple access points for local residents to reach their homes, schools, parks, employment, shopping and other service needs. These are shown as links “F” and “G” in Exhibit 1.

- Link F is called in the Bealeton Plan “Church Street” and connects back to Route 17 and Station Drive in the vicinity of Schoolhouse Road (Cedar Lee Middle School area); and
  - Link G includes Station Drive and Independence Avenue (Liberty High School and Grace Miller Elementary School campuses) and connects to the East/West Connector (Link “B”).
- b. Replace the Route 28 Bridge over Bowens Run (east of the Meadowbrooke and Fox Meade subdivisions). This structure needs to be replaced and upgraded for pedestrian accommodation and added lanes (location delineated as link “H” in Exhibit 1);
  - c. Implement traffic calming design and options in the Bealeton and Remington area where practical. Consider roundabout design as the primary choice at intersections: (1) along Rt. 28 (e.g. with Oak Shade Road, Schoolhouse Road or Southcoate Village Drive); (2) East/West Connector (extension from Rt. 17)/Weaversville Road (Rt. 662); and (3) Rt. 662/Oak Shade Road (Rt. 661), or other secondary road intersections that meet signal warrants;
  - d. Provide Weaversville Road (Rt. 662) and Oak Shade Road (Rt. 661) secondary road priority attention. With the expected growth in the Bealeton and Remington Service Districts, these two public streets will need more consideration regarding safety and capacity improvements as part of the VDOT 6-Year Secondary Road Improvement Program to accommodate increased local volumes;
  - e. Complete the planned interconnection between Rt. 661 and Rt. 28. Principal improvements are to be completed due to proffered commitments through the approved Fox Meadow rezoning (Exhibit 1, Location “K”); and
  - f. Study the feasibility for an elevated crossing of the Norfolk & Southern Railroad allowing the link connection from Lucky Hill Road to Confederate Boulevard in the Remington area. The Comprehensive Plan has envisioned historically a new road link extending from The Meadows subdivision, located on Lucky Hill Road (Rt. 655), to Remington Road (Rt. 656) and then connected to Confederate Boulevard in the Lees Glen subdivision. Such a crossing provides a key east-west connection lacking in the Remington area; however, it is both an expensive and complex project that requires coordination and acceptance through Norfolk and Southern and with VDOT,

as well as be grade-separated to clear the railroad. Some of the right-of-way has already been obtained through approved subdivisions. (Refer to Exhibit 1 and Location “I”.)

Exhibit 2 presents the functional classification for roads located within the three service districts. Other than the east/west connector, most of the secondary network enhancements will fall within the local streets category. The Comprehensive Plan encourages the more neo-traditional and traffic calmed street designs, with homes and businesses located more closely to the streets, complete with well-conceived pedestrian access locations for sidewalks, bikeways, crosswalks. The more specific VDOT “Mixed Use Subdivision” street standards are included in Exhibit 3-5 (curb and gutter section; shoulder and ditch section; and one-way). In addition, the County’s illustrative and typical street sections are provided in Exhibits 6 through 11 for locations in the Bealeton, Opal and Remington Service Districts where more compact, or “town-scaled”, business and residential development is planned, designated and expected in the long-term.

Finally, to insure a more comprehensive view has been taken regarding the future ramification of any road network improvement change from what is covered herein, the County TIA (TMODEL 2) or similar studies prepared or approved through VDOT by a private developer must be completed. The County wants to insure the network efficiencies, capacity and safety are carefully monitored in times of public, fiscal constraints and modest community growth.

## **H. Conclusions**

The TMODEL2 results, as presented in the above sections, describe the existing conditions in the County roadway network. The model was calibrated to a good level of accuracy to predict the traffic conditions in the year 2030.

Generally and even with the Bealeton Connector, the overall network with the improvements recommended in this study can handle the projected 2030 traffic in a satisfactory manner. However, key primary road link locations along Route 15/17/29, Route 15/29 and Route 17 are still projected to have unacceptable LOS F ratings. A more balanced transportation system in the future, including public transportation and other modes, could help alleviate the traffic volumes to an extent. However, the county and state will need to address the complex capacity, local-regional volume and safety issues along these federal highways in the long-term. There are no easy solutions and paths.

The adopted Comprehensive Plan and this study outline key primary and secondary road network improvements that need to be planned, funded and constructed due to expected development and external traffic volume growth. Some of these larger scaled improvements may be delayed far into the future or never constructed, such as the Bealeton Connector, due to fiscal constraints, changes in area-wide development or combinations of other factors.

Nevertheless, this model can also be used to evaluate development proposals in the service districts and determine their impacts on the public roads. Depending upon the build-out year of the specific development proposals, intermediate year analysis can be conducted through the TMODEL2 system. Intermediate year land use data and a transportation network will be needed to evaluate development proposals, to see how they will impact the network and identify the associated mitigation costs or improvements that need to be borne by the developer.

Finally, this model also needs to be updated periodically to reflect existing residential and business development conditions, revised traffic growth rates and other factors that reflect changes in traffic volume characteristics and distribution, economic conditions, and substantive changes in the Comprehensive Plan or the public street network. At a minimum, it should be updated every five years during the overall update process for the Bealeton-Opal-Remington Service District Plan as required by the Virginia Code.