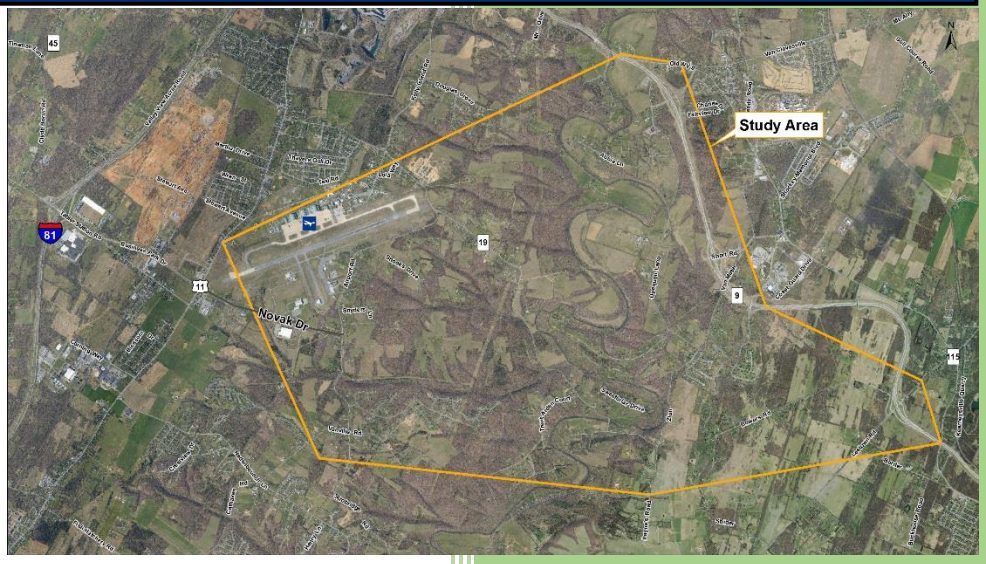
# Final Connector Study Report

February 2018

# Novak Drive Connector Study




Prepared for:

Hagerstown/Eastern Panhandle MPO and

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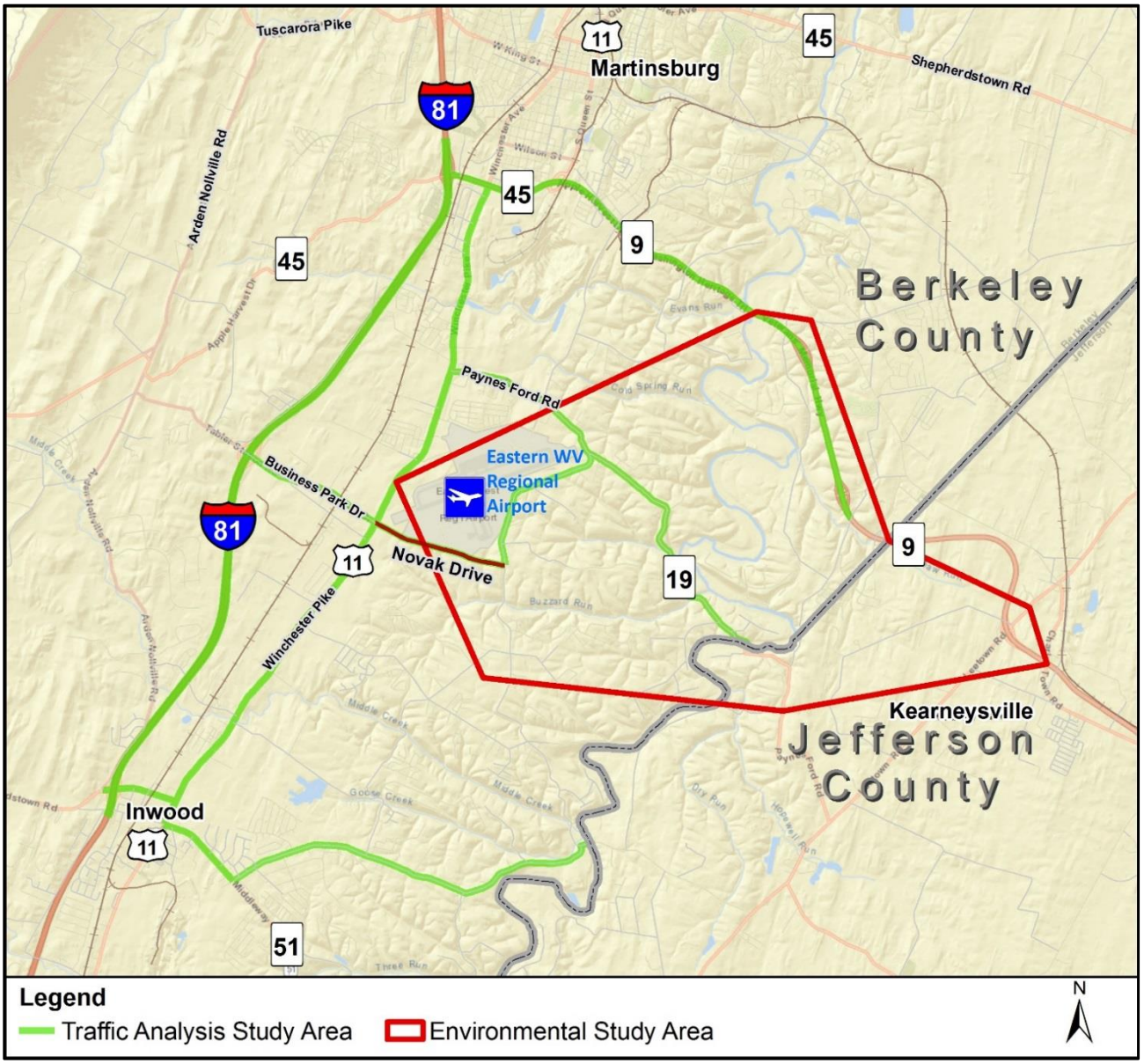
# 1 INTRODUCTION

The Hagerstown/Eastern Panhandle Metropolitan Planning Organization (HEPMPO), in conjunction with West Virginia Department of Transportation Division of Highways (WVDOH), is evaluating the need for a new access road between WV 9 and Novak Drive within Berkeley and Jefferson Counties, West Virginia. The new access road would provide additional access to the Tabler Station area while reducing traffic on local roads and promoting economic development in the region.

The project is located south of Martinsburg, near the Eastern West Virginia Regional Airport, as illustrated on **Figure 1**.

**Figure 1: Project Study Area Map**



Michael Baker International (Michael Baker) has been retained by the West Virginia Department of Transportation Division of Highways (WVDOH) and the Hagerstown/Eastern Panhandle Metropolitan Planning Organization (HEPMPO) to prepare a Connector Study. The objective of this study is to identify planning considerations and environmental features in the Environmental Study Area prior to the project entering the Preliminary Design and National Environmental Policy Act (NEPA) phase of the project development process. Early identification of significant social and environmental features within proposed alternative corridors can assist the project development team in the identification and early screening of alternatives prior to the project reaching a more advanced point in the Preliminary Design/NEPA process where detailed analysis and changes can become more time consuming and costly.

This study summarizes the following elements of the Novak Drive Connector as it moves from the Planning phase to the Preliminary Design / NEPA phase:

- Project History
- Planned / Proposed Development
- Project Goals and Vision
- Alternative Corridors
- Affected Environments
- Agency/Stakeholder Coordination
- Public Workshop
- Preliminary Alternatives Comparison

The results of the study will provide guidance on the project needs, feasibility and recommendation for moving the project forward.

# 2 PROJECT HISTORY

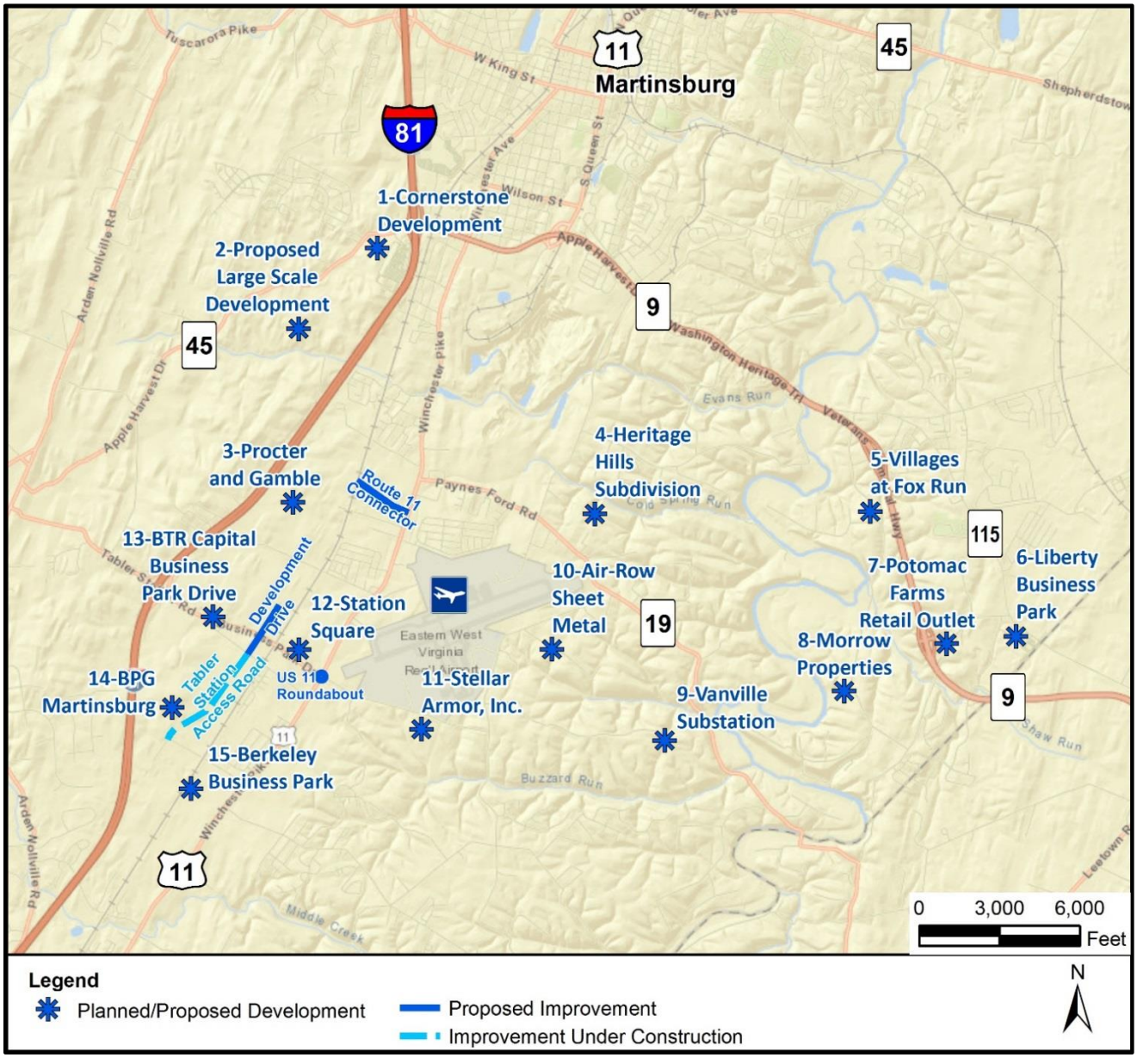
A combination of planned and proposed developments within the region and results from the *WV 45 Traffic Operations and Safety Study,* completed by WVDOH in February 2016, identified a potential need for an additional connection between WV 9 and I-81 south of Martinsburg in addition to improvements along WV 45. The *WV 45 Traffic Operations and Safety Study* identified severe congestion issues along WV 45 between the Blue Ridge Community and Technical College campus and New York Avenue, including the I-81 interchange south of Martinsburg. The referenced stretch of WV 45 is one of the most congested in the area, with traffic often becoming gridlocked. Additional congestion is expected due to traffic generated from planned/proposed development along Business Park Drive, including Procter and Gamble's new manufacturing plant off Business Park Drive at the I-81 interchange, expected to be open in 2019. Procter and Gamble is expected to significantly increase auto and truck traffic at that interchange and on Business Park Drive. By extending Novak Drive to WV 9, transportation agencies in the region speculated that congestion on WV 45 might be relieved by diverting east-west traffic on WV 9 between Martinsburg and Charles Town to the new access road. It would also provide commercial traffic a direct access between I-81 and the industrial parks in Jefferson County.

The project is not yet on the region's Long-Range Transportation Plan (LRTP) or the Transportation Improvement Program (TIP) which programs projects for the next four years, but would need to be added to these plans if the project moves forward.

# 3 PLANNED AND PROPOSED DEVELOPMENT

Several developments have been planned/proposed in the area as shown on **Figure 2** and described below. Developments for which there are approved traffic studies the executive summaries are included in **Appendix A**. The complete traffic studies can be found on the Berkeley County Planning Commission website at http://www.berkeleycountycomm.org/planning/.

**Figure 2: Planned and Proposed Development**



## 1. Cornerstone Development

The proposed Cornerstone Development is located next to The Commons on the south side of WV 45 and the west side of I-81. The current development plans include a mixed use commercial and residential development. A 111-room Hilton Garden Inn opened in November 2016 and additional development plans include a 50-room motel, a 92-unit apartment complex and a 4,200 square-foot restaurant developed in phases.

## 2. Proposed Large Scale Development with CR 32 / WV45 Connector Road

A proposed large-scale mixed use commercial development is located along a potential connector road that will provide a north-south connection between County Road 32 and WV 45 on the east side of I-81. No plans have been submitted to the Berkeley County Planning Department.

## 3. Procter & Gamble

The proposed Procter & Gamble 458-acre site is located along Business Park Drive, northeast of the I-81 / Tabler Station Road interchange. The current development plans include a manufacturing facility which will employee up to 1,100 individuals with full build-out in 2025. The proposed site access is on Development Drive with a new truck access along Business Park Drive east of the Business Park Drive / Tabler Station Drive intersection to allow more direct access to the I-81 corridor for truck efficiency.

## 4. Heritage Hills Subdivision

The proposed Heritage Hills subdivision is located on the north side of Paynes Ford Road and east side of Kelly Island Road. The proposed development is residential with 237 single family homes and 142 townhome units.

## 5. The Villages at Fox Run

The proposed residential development, the Villages at Fox Run, is located on Opequon Lane about half mile south the intersection with WV 9. The approximately 3.5 acres will be subdivided for construction of 25 townhome units. In 2015, a request to extend the vested plat was denied by the Berkeley County Planning Department.

## 6. Liberty Business Park

The Liberty Business Park development is located on Short Road, near the intersection with WV 115. In 2007, the Berkeley County Planning Department approved plans to expand the development to Coast Guard Road on approximately 12.1 acres for additional office and retail spaces.

## 7. Potomac Farms Retail Outlet

The Potomac Farms Retail Outlet is located on Short Road, about one-quarter mile north of the WV 9 Short Road interchange. The development is a retail outlet for the bulk distributor of mulch, topsoil and rock. In 2017, the development proposed to expand the current operations from the southeast quadrant of the Short Road interchange to the northeast quadrant.

## 8. Morrow Properties

The proposed Morrow Properties development is located on Opequon Lane, approximately 1.6 miles from the intersection with WV 9. The proposed development is residential with 332 single family homes on 223 acres. The development has no vested plats and no activity since late 2005.

## 9. Vanville Substation

A proposed substation located about 0.3 miles west of Paynes Ford Road (WV 19), southeast of the intersection of Paynes Ford Road and Airport Road and northwest of the intersection of Paynes Ford Road and Trent Arden Court near Vanville. The new 200 foot by 250 foot substation is proposed to be built on 7.3 acres. A public hearing was held in December 2016 in regards to approval of the final plans.

## 10. Air-Row Sheet Metal

The proposed Air-Row Sheet Metal, LDU is located on Snook's Lane off of Airport Road. The plans include two new fabrication and manufacturing buildings with a combined size of 4,500 square feet to be completed in two phases. In 2005, preliminary plans were approved by the Berkeley County Planning Department.

## 11. Stellar Armor, Inc.

Stellar Armor purchased twenty-one (21) acres at the Eastern West Virginia Regional Airport's Business Park located on the south side of Novak Drive.

## 12. Station Square

The proposed Station Square is located north of Business Park Drive and west of US 11. The property is being developed by the Berkeley County Development Authority (BCDA) and currently has the initial road infrastructure of two legs of Technology Drive constructed from US 11 to Business Park Drive. The concept plans include a two-phase, 28.5 acre, mixed use development with a new street parallel to Business Park Drive between Enterprise Way and Technology Drive. The plans propose to develop the site as fifteen (15) individual parcels with either employment, industrial, or retail uses. Short-term development is expected by 2019 with full build-out by 2030.

## 13. BTR Capital Business Park Drive (aka Tabler Station Mixed Use)

The proposed BTR Capital Business Park Drive is a 5.1 acre mixed use development located along Business Park Drive near the Business Park Drive / Tabler Station Drive intersection. The concept plans include a convenience store with gas station, a hotel, and two fast food restaurants with drive-thru service, and a non-fast food restaurant. The proposed development will be built in stages with full build-out in 2025. Site access is proposed via a new north leg of the Business Park Drive / Tabler Station Road intersection.

## 14. BPG Martinsburg

The proposed BPG Martinsburg is located along Corning Way near the proposed Development Drive extension, which is planned to connect the existing terminus of Development Drive at Tabler Station Road to Corning Way. The property is being developed by Martinsburg Investors, LLC and is expected to be fully built-out in 2025. The site is currently comprised of undeveloped land with plans to build two warehouses with a combined size of 1,654,600 square feet. Access to the site is proposed via four unsignalized site driveways along the Development Drive extension, with two driveways on either side of Development Drive.

## 15. Berkeley Business Park

The proposed Berkeley Business Park is located in the southwest quadrant of the US 11 and Corning Way intersection, with a new site entrance located across from Nadenbousch Lane along US 11. The property is being developed by Shockey Properties and is expected to be fully built-out in 2025. The site is currently comprised of

one large manufacturing building with plans to build two new manufacturing buildings with a combined size of 500, 000 square feet.

Several improvements to infrastructure have been planned or completed including:

- US 11 Connector for access to Procter & Gamble
- Development Drive
- US 11 roundabout at Business Park Drive
- Tabler Station access road

# 4 GOALS AND VISION

At the outset of the project, the study team met with stakeholders in the study area to introduce them to the project and receive input on the project goals and objectives. Based on this collaboration, the identified goals and objectives of the study are:

Mobility Goal: Improve access between WV 9 and the airport area / I-81 while alleviating congestion on area roadways.

**Objectives Include:**

- Reduce traffic on WV 45 by providing an alternate access to I-81
- Provide additional access to the Tabler Station area
- Improve multimodal connectivity by facilitating improved transit service, bicycle/ pedestrian accommodations and access to the Eastern West Virginia Regional Airport

Safety Goal: Improve the level of safety for motorists in the study area.

**Objectives Include:**

- Reduce truck traffic along WV 45 and other major arterials by providing an alternate route
- Divert traffic away from or make improvements to high crash locations
- Improve bicycle / pedestrian safety by providing appropriate accommodations

Economic Development Goal: Support planned development and promote future growth in the area.

**Objectives Include:**

- Provide additional access to the Tabler Station area
- Promote growth in downtown Martinsburg through congestion relief on WV 45 and highway signage for downtown Martinsburg
- Promote freight growth by providing improved access to I-81

Environmental Goal: Protect and preserve the environment in the Study Area.

**Objectives Include:**

- Minimize impacts to the Opequon Creek and other environmental and cultural resources
- Preserve the rural character of the area by appropriately controlling access
- Minimize noise impacts by avoiding sensitive locations
- Improve air quality by reducing traffic congestion

# 5 SAFETY AND TRAFFIC ANALYSIS

## 5.1 Safety Analysis

WVDOH crash data, as obtained and used for the HEPMPO long range transportation plan, was used to assess current safety issues within the Traffic Study Area, shown on **Figure 3**. The data covers reported vehicle crashes between January 1, 2014 and December 31, 2016 (3 years). **Table 1** summarizes crashes by injuries/fatalities, surface condition, light condition, type of collision, and road segment.

**Figure 3: Traffic Study Area**

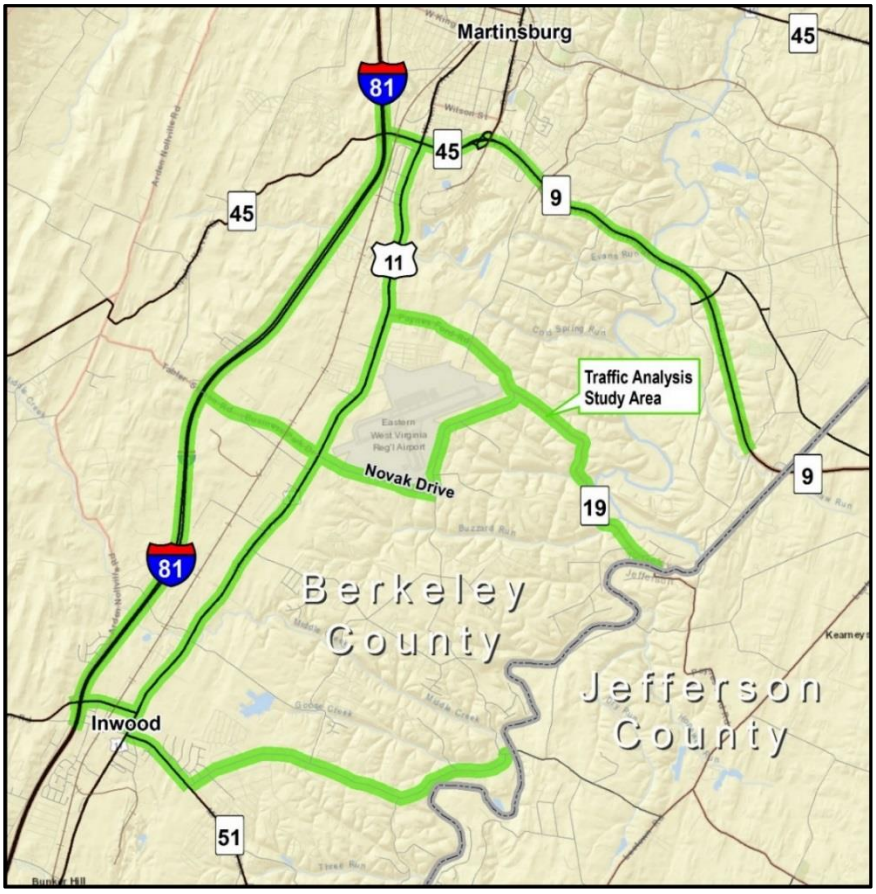


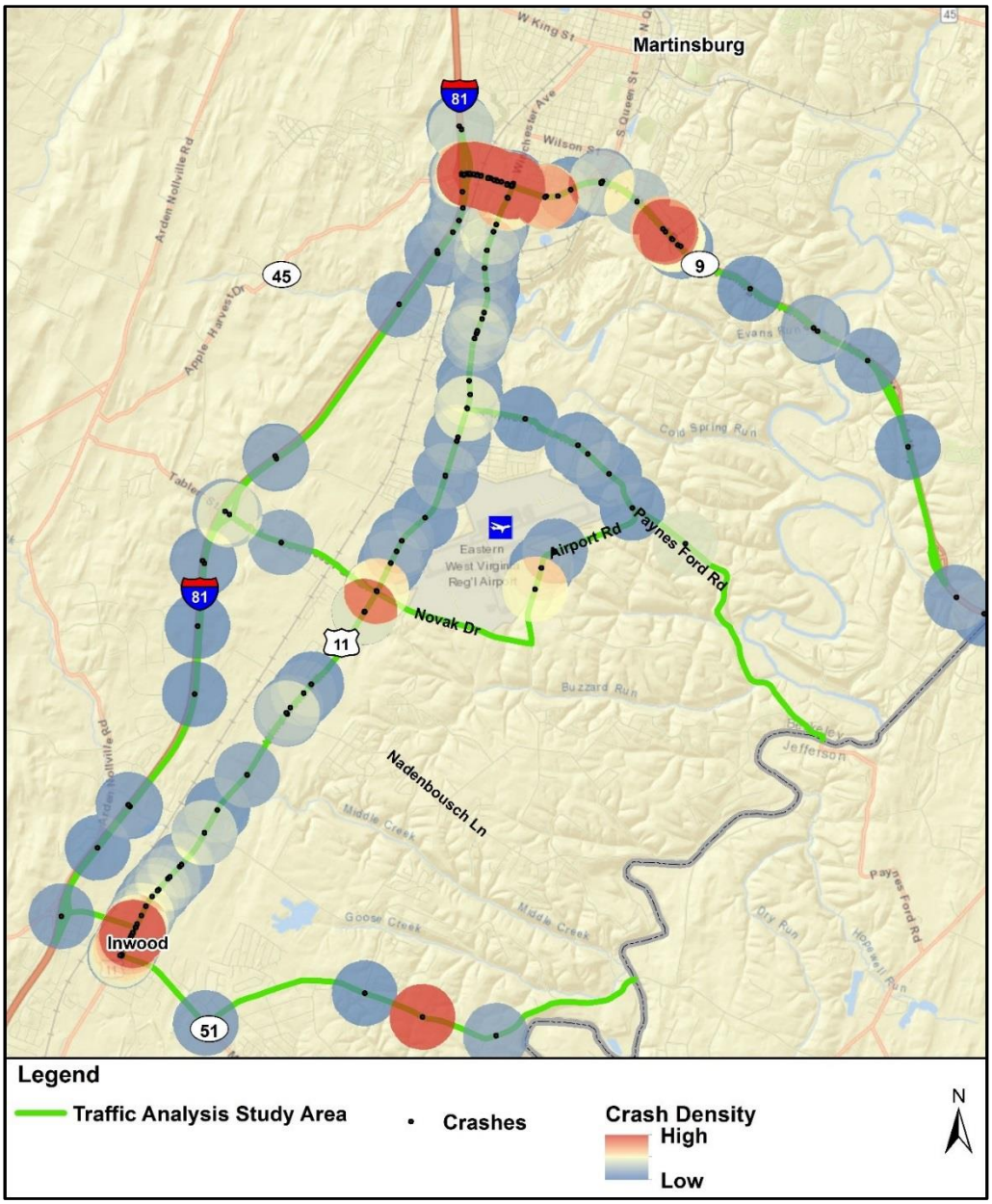
**Table 1: Crash Summary for Traffic Study Area**

| | 2014 | | 2015 | | 2016 | | 2014 - 2016 Average | |
|---|---|---|---|---|---|---|---|---|
| | Count | Percent | Count | Percent | Count | Percent | Count | Percent |
| **Total** | 124 | - | 177 | - | 173 | - | 158.0 | - |
| Crashes with Injuries | 28 | 22.6% | 44 | 24.9% | 35 | 20.2% | 35.7 | 22.6% |
| Number of Injuries | 44 | - | 64 | - | 50 | - | 52.7 | - |
| Crashes with Fatalities | 1 | 0.8% | 1 | 0.6% | 0 | 0.0% | 0.7 | 0.4% |
| Number of Fatalities | 1 | - | 1 | - | 0 | - | 0.7 | - |
| **By Surface Condition** | | | | | | | | |
| Dry | 111 | 89.5% | 147 | 83.1% | 141 | 81.5% | 133.0 | 84.2% |
| Slippery | 13 | 10.5% | 30 | 16.9% | 32 | 18.5% | 25.0 | 15.8% |
| **By Light Condition** | | | | | | | | |
| Day | 95 | 76.6% | 124 | 70.1% | 132 | 76.3% | 117.0 | 74.1% |
| Darkness | 26 | 21.0% | 49 | 27.7% | 35 | 20.2% | 36.7 | 23.2% |
| Dusk or Dawn | 3 | 2.4% | 4 | 2.3% | 6 | 3.5% | 4.3 | 2.7% |
| **By Type of Collision** | | | | | | | | |
| Rear End | 49 | 39.5% | 50 | 28.2% | 65 | 37.6% | 54.7 | 34.6% |
| Angle | 38 | 30.6% | 58 | 32.8% | 52 | 30.1% | 49.3 | 31.2% |
| Single Vehicle | 18 | 14.5% | 38 | 21.5% | 31 | 17.9% | 29.0 | 18.4% |
| Sideswipe | 16 | 12.9% | 24 | 13.6% | 21 | 12.1% | 20.3 | 12.9% |
| Head-On | 3 | 2.4% | 7 | 4.0% | 4 | 2.3% | 4.7 | 3.0% |
| **By Road** | | | | | | | | |
| WV 45 | 47 | 37.9% | 62 | 35.0% | 57 | 32.9% | 55.3 | 35.0% |
| US 11 | 49 | 39.5% | 50 | 28.2% | 57 | 32.9% | 52.0 | 32.9% |
| WV 9 | 4 | 3.2% | 26 | 14.7% | 22 | 12.7% | 17.3 | 11.0% |
| WV 51/7 | 7 | 5.6% | 11 | 6.2% | 11 | 6.4% | 9.7 | 6.1% |
| I-81 | 9 | 7.3% | 10 | 5.6% | 9 | 5.2% | 9.3 | 5.9% |
| County Route 19 | 4 | 3.2% | 5 | 2.8% | 5 | 2.9% | 4.7 | 3.0% |
| County Route 19/1 | 3 | 2.4% | 5 | 2.8% | 6 | 3.5% | 4.7 | 3.0% |
| County Route 32 | 1 | 0.8% | 8 | 4.5% | 4 | 2.3% | 4.3 | 2.7% |
| County Route 34 | 0 | 0.0% | 0 | 0.0% | 2 | 1.2% | 0.7 | 0.4% |

Between 2014 and 2016, the selected roads within the Traffic Study Area averaged 158 crashes per year with a peak of 177 crashes in 2015. During the same time, over 22 percent of the crashes involved injuries, including two crashes with fatalities. The crashes primarily occurred during daylight hours and on dry pavement with over 80 percent involving multiple vehicles.

Crashes were primarily concentrated along US 11 and WV 45, with the highest concentration of crashes occurring on WV 45 between I-81 and US 11, as illustrated in **Figure 4**.

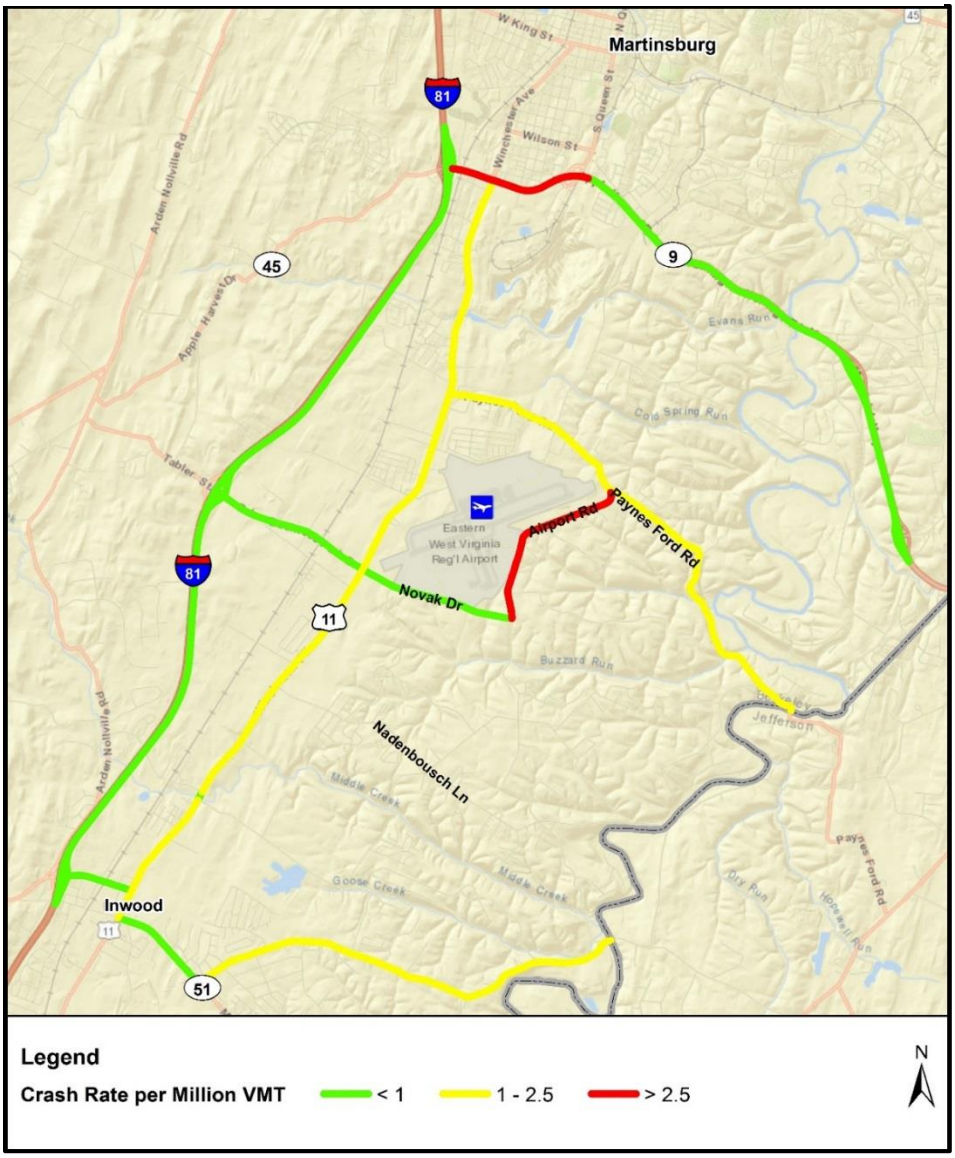
**Figure 4: Crash Density Map**



Other locations of higher crash density include WV 9 east of Queen Street, US 11 at Novak Drive, US 11 in Inwood, and Sulfur Springs Road (WV 51/7) east of Inwood. While having the highest traffic volumes within the Traffic Study Area, less than 6 percent of crashes occurred along Interstate 81.

**Table 2** provides the crash rate per million vehicle miles of travel (VMT) for the major routes within the Traffic Study Area and **Figure 5** shows the routes color coded by crash rate. WV 19/1 (Airport Road) between Novak Drive and WV 19 has the highest crash rate of any road segment within area, with a rate of 5.37 crashes per million VMT, over double the West Virginia statewide average of 2.50 crashes per million VMT[1]. The next highest crash rate is along WV 45 between I-81 and WV 9, with a rate of 4.07 crashes per million VMT.

**Figure 5: Crash Rate Map for Key Routes within Traffic Study Area**




[1] See Table 1: http://www.transportation.wv.gov/communications/Documents/WestVirginiaStrategicHighwaySafetyPlan.pdf

**Table 2: Crash Rate Calculations for Key Routes within Traffic Study Area**

| Road | Number of Crashes | Crash Rate (per Million VMT) |
|---|---|---|
| WV 19/1 | 14 | 5.37 |
| WV 45 | 156 | 4.07 |
| US 11 (Novak Drive to WV 51) | 81 | 2.22 |
| US 11 (WV 45 to Novak Drive) | 73 | 1.47 |
| County Route 51/7 | 29 | 1.28 |
| County Route 19 | 14 | 1.26 |
| WV 9 | 52 | 0.38 |
| I 81 (Ramps for WV 45 to WV 32) | 19 | 0.08 |
| I 81 (WV 32 to WV 51) | 8 | 0.04 |
| Novak Drive | 0 | 0 |

**Table 3** shows the crash rate per million entering vehicles (MEV) for selected intersections within the Traffic Study Area and **Figure 6** shows the intersections color coded by crash rate. Generally, the following classes are used to categorize intersection crash rates:

- Average < 1.5 crashes per MEV
- Above Average > 1.5 crashes per MEV
- Significantly Above Average > 2.0 crashes per MEV

While all of the intersections have average crash rates, the two intersections with the highest crash rates are WV 45 / US 11 (Winchester Ave) and WV 45 / Foxcroft Ave, with crash rates of 0.92 and 0.77 respectively. The four WV 45 intersections were also analyzed for the WV 45 in Martinsburg, *Traffic Operations and Safety Study* (2015), which used crash data for the period from January 1, 2011 to December 31, 2013. As shown below, the 2014-2016 crash rate for all four intersections is lower than the crash rate for the previous 3 years.

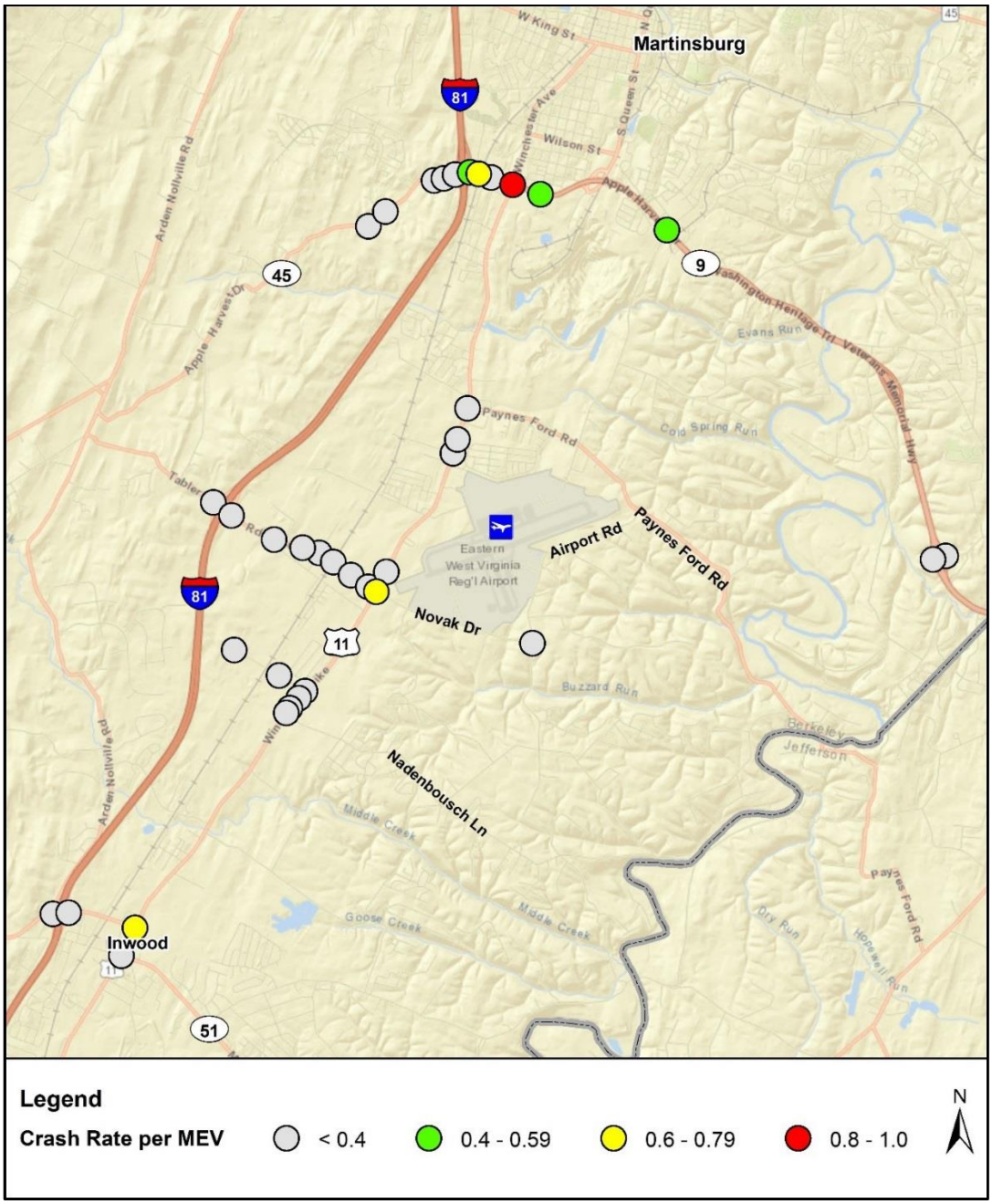
**Table 3: Intersection Crash Rate Calculations within Traffic Study Area**

| Intersection | Number of Crashes | Entering Vehicles Daily | Crash Rate (Per Million Entering Vehicles) | Crash Rate (From WV 45 Study) |
|---|---|---|---|---|
| WV 45 and US 11 | 48 | 47536 | 0.92 | 1.31 |
| WV 45 and Foxcroft Ave | 34 | 40186* | 0.77 | 1.58 |
| US 11 and WV 51 (North) | 15 | 21041 | 0.65 | - |
| US 11 and Novak Drive | 11 | 15983* | 0.63 | - |
| WV 9 and Royal Crest Drive | 21 | 35212 | 0.54 | - |
| WV 45 and I 81 NB Ramps | 21 | 36387 | 0.53 | 0.88 |
| WV 45 and New York Ave | 15 | 33766* | 0.41 | 0.44 |

** Vehicles Entering Intersection was calculated using Peak Hour counts, not AADT*

Based on the above data, a new roadway connection extending Novak Drive to US 11 may reduce traffic on WV 45 (Martinsburg) and WV 51 (Inwood) supporting improvements to safety within the region. However, specific intersection and roadway design improvements may be required at the Novak Drive and US 11 intersection and on Airport Road to ensure that these locations continue to operate at acceptable safety levels.

**Figure 6: Crash Rate Map for Intersections within Traffic Study Area**



## 5.2 Existing Traffic Analysis

A highway capacity analysis was conducted for the base year (2015) for the No-Build Alternative using available traffic volume data from approved Traffic Impact Studies (TIS) within the Traffic Study Area. Additionally, manual traffic counts were taken at the on/off ramps of WV 9 at Short Road and the intersection of Airport Road and Novak Drive. **Appendix B** contains existing traffic volume data.

The Novak Drive synchro model was developed using Synchro Version 9.1. Synchro reports are in **Appendix B**. Using a combination of Google Maps, Google Streetview, and Bing maps, the lane configurations for each intersection within the Traffic Study Area were determined. For signalized intersections a peak hour factor of 0.90 and a heavy vehicle percentage of 2% were assumed. Per WVDOH the following traffic signals are coordinated (intersection numbers refer to Table 4 and Figures 7 and 8, below):

- Intersections 5, 6, 7, 8, and 9
- Intersections 28 and 29
- Intersections 30 and 31

The intersection level of service (LOS) was determined using Highway Capacity Manual (HCM) 2010 methodologies. **Table 4** and **Appendix B** summarizes the LOS for each location by direction and overall. Each of the signalized intersections operate at an overall LOS D or better in the AM and PM peak period, with the exception of WV 45 at the intersection at Foxcroft Avenue and New York Avenue (Intersections 6 and 9) in the PM peak period and US 11 at WV 51 (Intersection 28) in the PM peak period. For the existing year, 2015, each of the unsignalized intersection operates at LOS D or better in the AM and PM peak period, with the exception of two intersections along US 11 at the intersection at Technology Drive and Nadenbousch Lane (Intersections 15 and 27) in the PM peak period. **Figures 7** and **8** show the intersection locations color coded by LOS for AM and PM, with LOS A through C shown in green, LOS D in yellow and LOS E and F in red.

**Table 4: Existing LOS Summary**

| ID | North/South | East/West | Control Type | EB | WB | NB | SB | Overall |
|---|---|---|---|---|---|---|---|---|
| 1 | Blue Ridge CC Driveway | WV 45 | Stop | | A (A)* | A (A) | | |
| 2 | Klee Drive | WV 45 | Stop | A (A)* | | | B (B) | |
| 3 | Retail Commons Parkway | WV 45 | Signal | A (B) | A (B) | B (B) | | A (B) |
| 4 | I-81 SB Ramps | WV 45 | Signal | F (C) | A (A) | | C (D) | D (C) |
| 5 | I-81 NB Ramps | WV 45 | Signal | B (A) | B (A) | E (D) | | C (A) |
| 6 | Foxcroft Avenue | WV 45 | Signal | A (C) | B (F) | D (D) | D (F) | B (E) |
| 7 | Lowes/Sheetz Driveway | WV 45 | Signal | A (A) | A (A) | E (F) | E (D) | A (C) |
| 8 | US 11 | WV 45 | Signal | B (B) | B (B) | D (D) | D (D) | C (C) |
| 9 | New York Ave | WV 45 | Signal | A (A) | B (B) | D (F) | D (F) | A (E) |

| ID | North/South | East/West | Control Type | EB | WB | NB | SB | Overall |
|---|---|---|---|---|---|---|---|---|
| 10 | WV 9 NB Ramps | Short Rd | Stop | A (A)* | | B (A) | | |
| 11 | WV 9 SB Ramps | Short Rd | Stop | | - | | - | |
| 12 | Airport Rd | Novak Drive | Stop | A (A) | | A (A)* | | |
| 13 | US 11 | Paynes Ford Road | Signal | - | B (C) | A (A) | A (A) | A (A) |
| 14 | US 11 | Martha Drive | Stop | B (D) | | A (A)* | | |
| 15 | US 11 | Technology Drive | Stop | B (E) | | A (A)* | | |
| 16 | US 11 (Winchester Ave) | Business Park Drive / Novak Drive | Signal | B (B) | D (C) | B (C) | B (D) | B (C) |
| 17 | Enterprise Way | Business Park Drive | Stop | A (A)* | | | B (B) | |
| 18 | Technology Drive | Business Park Drive | Stop | A (A)* | | | A (B) | |
| 19 | Development Drive | Business Park Drive | Stop | A (A)* | A (A)* | B (B) | A (C) | |
| 20 | Tabler Station Road | Tabler Station Road / Business Park Drive | Stop | | A (A)* | B (B) | | |
| 21 | I-81 NB Ramps | Tabler Station Road | Signal | A (A) | B (B) | C (C) | | B (B) |
| 22 | I-81 SB Ramps | Tabler Station Road | Signal | B (B) | A (A) | | D (C) | B (B) |
| 23 | BBP Driveway | Corning Way | Stop | A (A)* | | | A (A) | |
| 24 | US 11 | Corning Way | Stop | B (C) | | A (A)* | | |
| 25 | US 11 | BBP North Site Driveway | Stop | B (C) | | A (A)* | | |
| 26 | US 11 | BBP South Site Driveway | Stop | B (B) | | A (A)* | | |
| 27 | US 11 | Nadenbousch Lane | Stop | | C (F) | | A (A)* | |
| 28 | US 11 | WV 51 | Signal | D (F) | D (D) | B (E) | D (F) | C (F) |
| 29 | US 11 | True Apple Way / WV 51 | Signal | D (D) | C (C) | B (E) | A (C) | C (D) |
| 30 | I-81 NB Ramps | WV 51 | Signal | A (B) | A (B) | C (D) | | A (B) |
| 31 | I-81 SB Ramps | WV 51 | Signal | B (D) | A (B) | | C (D) | B (D) |

** – HCM approach control delay too large*

**Figure 7: Existing AM LOS**

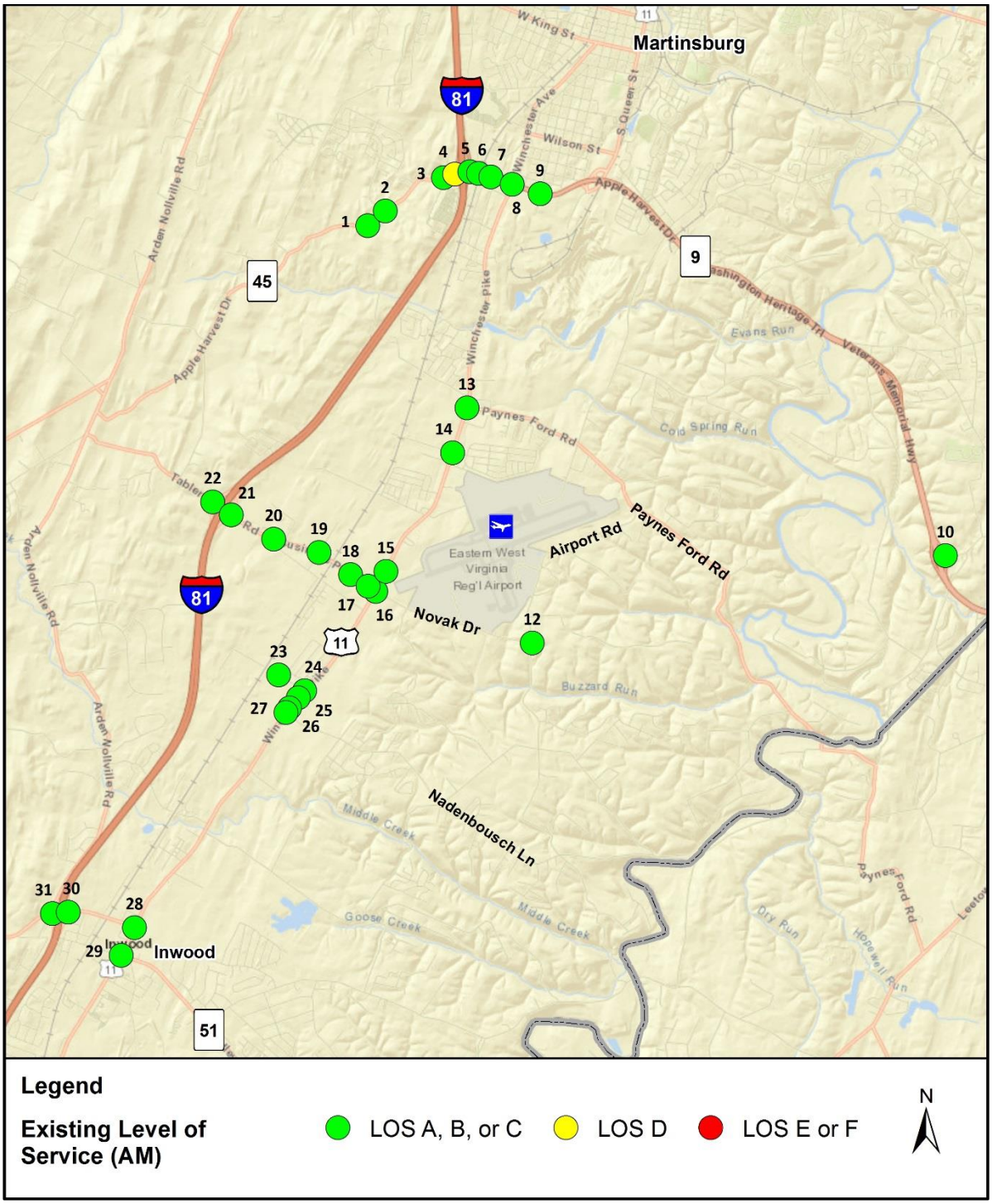
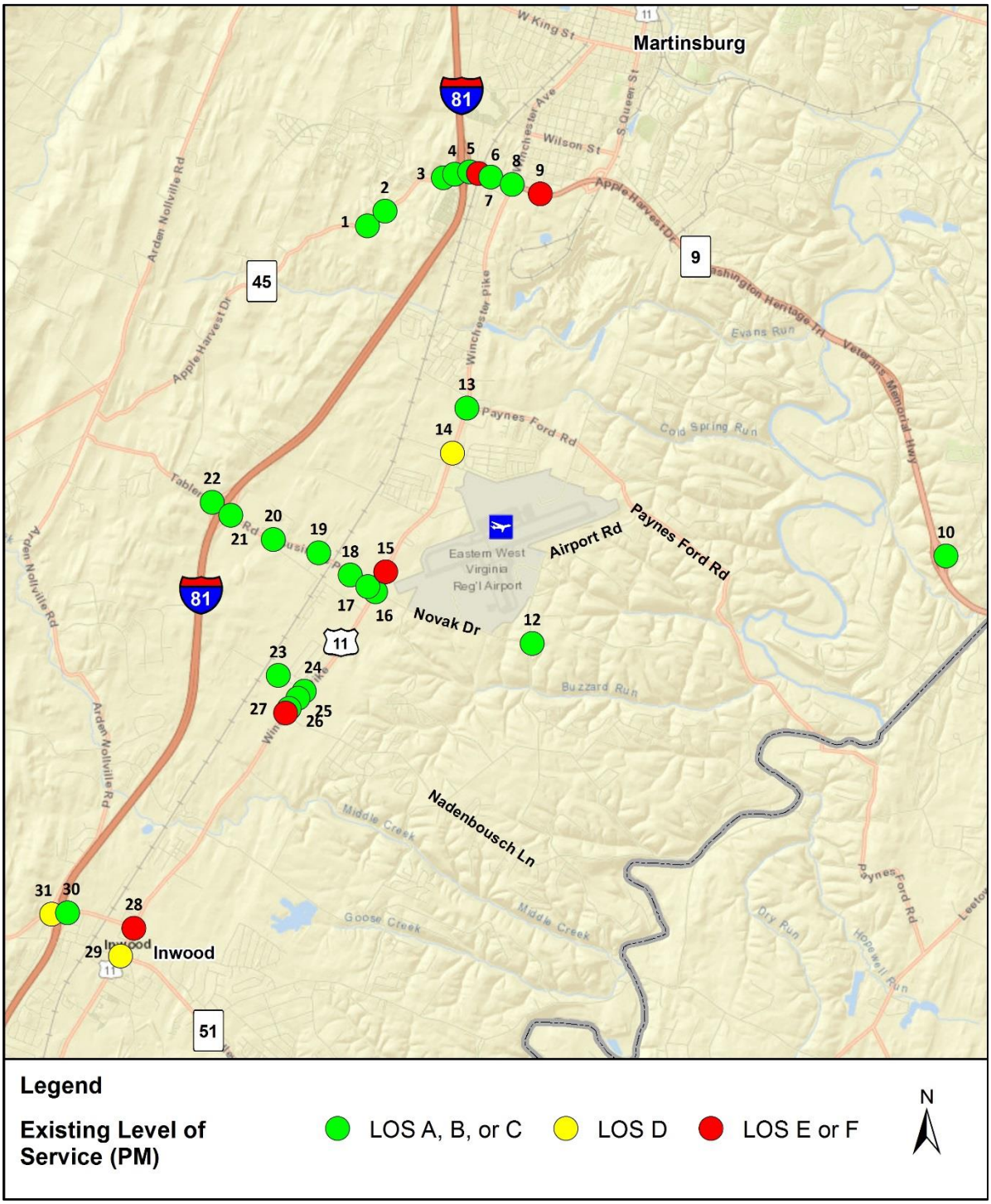


**Figure 8: Existing PM LOS**



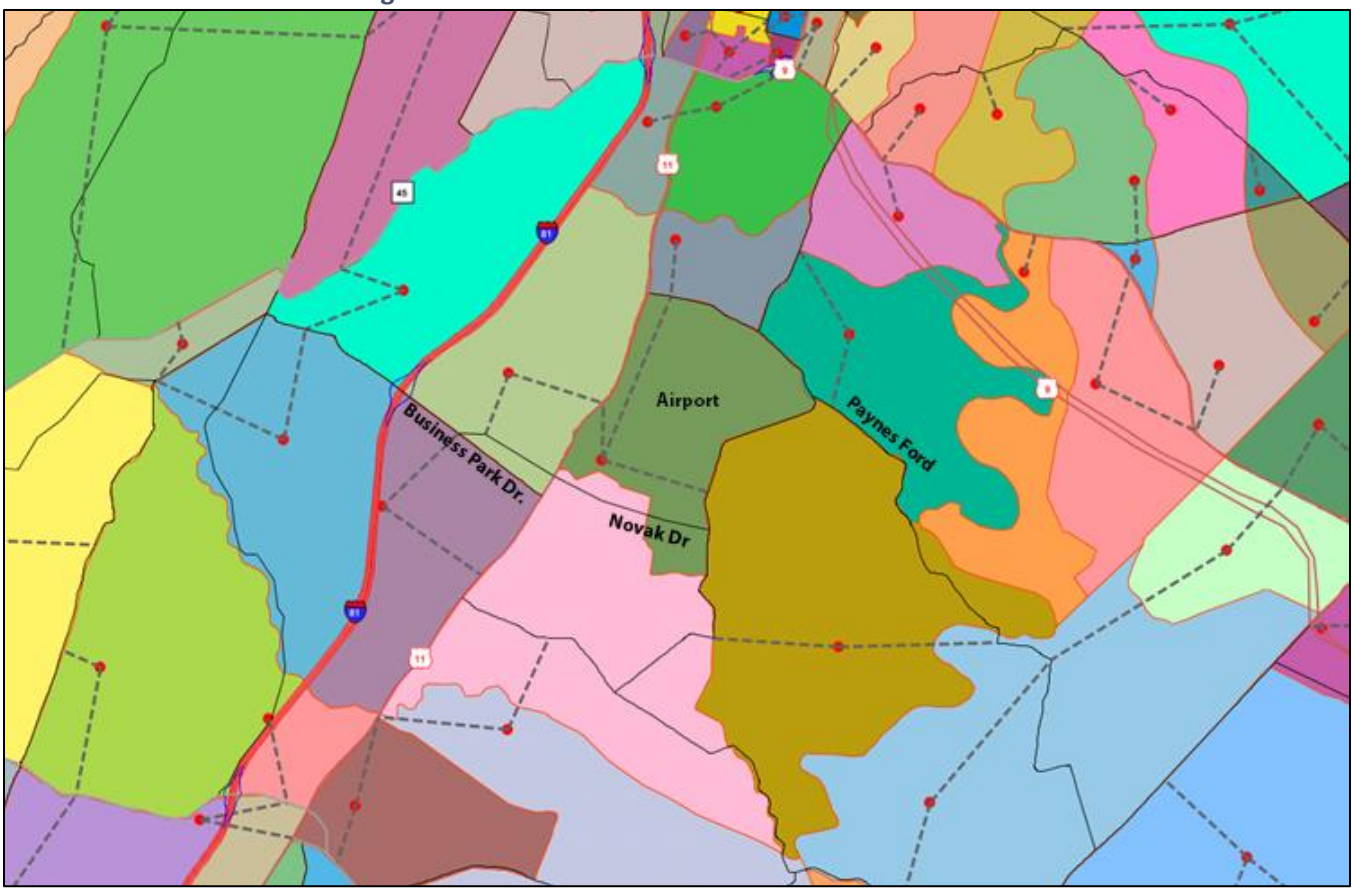
## 5.3 Traffic Forecasting and Diversion Analysis

The HEPMPO regional travel demand model was used to develop traffic forecasts for roadways and intersections within Traffic Study Area. The modeling assessment included an estimation of the traffic volumes and diversions for the three Novak Drive Connector preliminary alternative corridors. The preliminary alternative corridors were developed by the study team in collaboration with the project stakeholders. The corridors are described in detail in Section 6, below. These traffic forecasts were used as a basis for more detailed intersection delay and level-of-service analyses as described in Section 5.4.

The regional travel model used for this study is consistent with the version used for the development of HEPMPO's current long-range transportation plan (Direction 2040). The model encompasses Washington County in Maryland, as well as Jefferson and Berkeley Counties in West Virginia. It follows a traditional three-step process incorporating trip generation, trip distribution, and traffic assignment. As such, the model estimates vehicular trips based on forecasted socioeconomic data, assigns those trips to origin and destination (O-D) locations within the region, and assigns the trips to the roadway network considering the impact of traffic congestion during peak travel periods.

As illustrated in **Figure 9**, the model is made up of a highway network and traffic analysis zones (TAZs). Vehicle trips are generated from a single point (centroid) within each TAZ based on estimates of current and future households and employment.

**Figure 9: Travel Model Network and Zone Structure**



**Travel Model Application Process**

The travel forecasting analyses included several key process steps as highlighted in **Figure 10**. These steps included updates to the regional travel model to improve operation in the Traffic Study Area and to reflect the latest highway network and land use characteristics. Model application focused on the estimation of traffic volumes for each Novak Drive Connector preliminary alternative and the associated diversions from other existing roadways. Forecasted traffic volume growth and diversions were extracted from the model and applied to existing traffic count data to ensure a more accurate assessment of traffic operations and transportation needs.

**Figure 10: Steps in Producing Travel Forecasts**


Modifications to the travel model included updates to the TAZ and roadway network to ensure consistency with current land use and roadway conditions. The modifications included the disaggregation of several TAZs to improve model performance. Roadway attributes including the number of lanes were updated to reflect funded projects in the region's Transportation Improvement Program (TIP). The projects included capacity improvements on portions of WV 51, US 11 and WV 45. The inclusion of these projects served as an additional scenario to evaluate the benefits of the Novak Drive Connector preliminary alternatives in addition to the improvements already planned on WV 45 and WV 51.

Although the regional model included forecasts of households and employment, these forecasts were revised to reflect the potential detailed development plans as described in Section 3. For this study, the travel model reflects a "build-out" scenario where each of the locations are fully developed based on the proposed plans. The key developments include Procter and Gamble, Cornerstone Development, BTR Capital Business Park Drive, BPG Martinsburg, Berkeley Business Park, Inwood Bypass Retail Center, Heritage Hills Subdivision, and Station Square.

Each of the three (3) preliminary alternative corridors (Section 6) were coded to the travel model. For this planning-level study, specific design specifications have not been determined. For modeling purposes, the roadway was coded as a Rural Minor Arterial with 4 travel lanes, and a speed limit of 50 mph. At-grade intersection control is assumed at Opequon Lane (WV 9/17) and Paynes Ford Road (WV 19). The modeling of a four-lane roadway provides an estimate of the maximum traffic volume that may be attracted from other regional roads.

The travel demand model was executed for the scenarios shown in **Table 5**. These scenarios provide a range of forecasted traffic volumes and associated diversions based on the land use and other completed transportation projects.

**Table 5: Travel Model Scenarios for Each Novak Drive Connector Alternative**

| Scenario Number | Roadway Project Assumption | Land Use Assumption | Novak Connector Alternatives Modeled | Assessment Role |
|---|---|---|---|---|
| 1 | Current Roadway Network | 2017 (Current) | No Alternatives Included | Baseline scenario for which future analyses can be compared to |
| 2 | | | Alt 1,2,3 | Impacts and diversions if project constructed in near future |
| 3 | | 2040 (Projected) | No Alternatives Included | No-Build scenario to determine future corridor needs |
| 4 | | | Alt 1,2,3 | Provides high estimate of Novak Drive Connector traffic projection |
| 5 | Completion of WV45, WV51, & US11 Projects | 2017 (Current) | Alt 1,2,3 | Provides low estimate of Novak Drive Connector traffic projection |
| 6 | | 2040 (Projected) | Alt 1,2,3 | Impacts and diversions with future land use and other projects completed |

**Travel Model Analysis Results**

The travel model process produces an "assigned" highway network containing projected traffic volumes for each roadway segment. **Figure 11** illustrates a comparison of the future 2040 traffic volumes to the 2017 baseline in the Traffic Study Area. The map highlights areas of traffic volume growth assuming no transportation projects are completed (e.g. using the existing highway network). The forecast runs include the regional growth in the MPO long-range plan, Procter and Gamble full-build out, and other proposed development in the vicinity of Business Park Drive. Local roads in the Traffic Study Area are forecast to have significant increases in traffic volumes. These include Kelly Island Road, portions of Paynes Ford Road, Airport Road and Leetown Road. Many trips to Business Park Drive divert onto Kelly Island Road to avoid the current traffic congestion on WV 45.

**Figure 12** highlights the projected daily two-way traffic volumes for each Novak Drive Connector preliminary alternative for the defined land use and project scenarios. Alternative 2 connecting existing Novak Drive to WV 9 at the Short Road interchange provides the highest projected traffic volume of the three preliminary alternatives due to the alignment's shorter distance and travel time. The completion of other transportation projects including the capacity improvements at WV 45, WV 51 and US 11 affect the projected traffic volumes for each Novak Drive Connector preliminary alternative. Generally, these projects result in lower traffic volumes since the improved travel times at those locations negate some travelers from diverting to the new roadway.

The current modeling results are not definitive on whether a two-lane or four-lane roadway will be needed. The connector could be designed as a four-lane roadway and initially built as two-lanes and subsequently widened to four-lanes when needed.

**Figure 11: Projected Traffic Volume Growth (2017-2040) Assuming Existing Network**

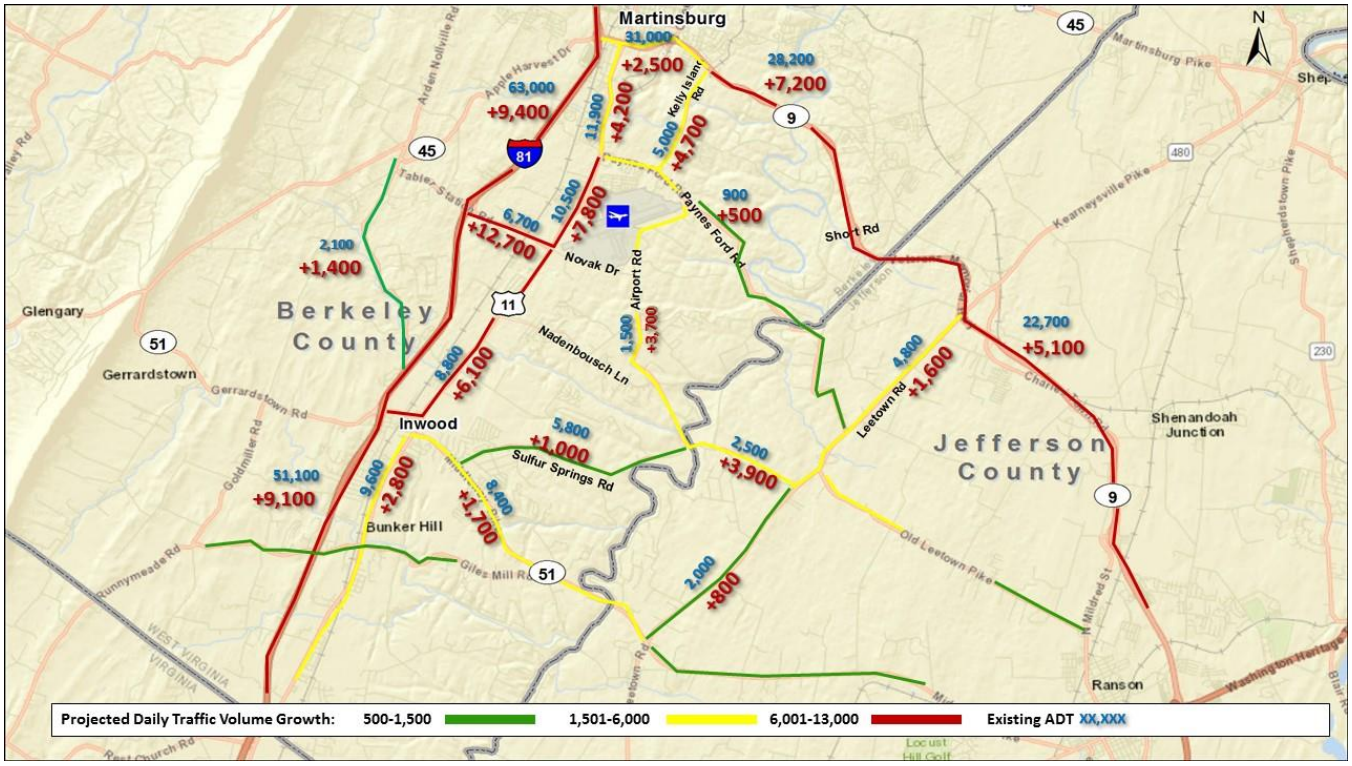



**Figure 12: Projected Daily Traffic Volumes on the Novak Drive Connector Preliminary Alternatives**

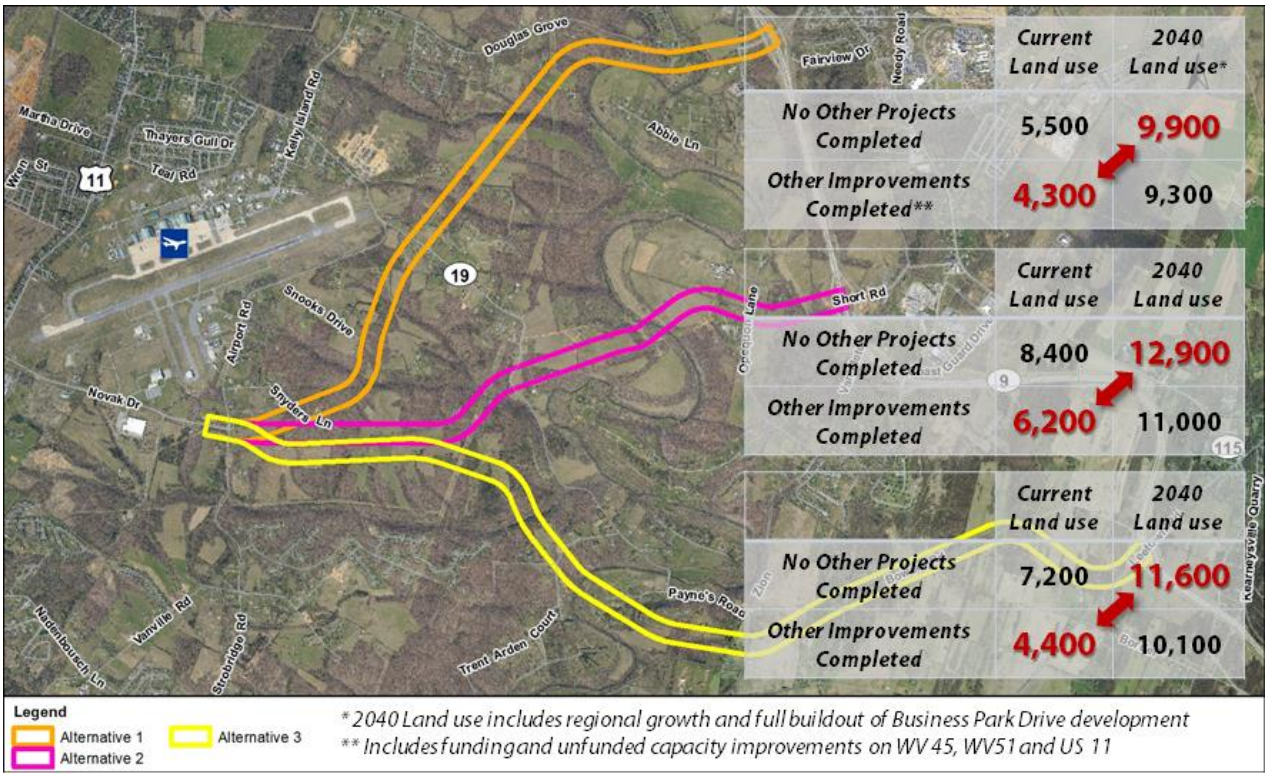
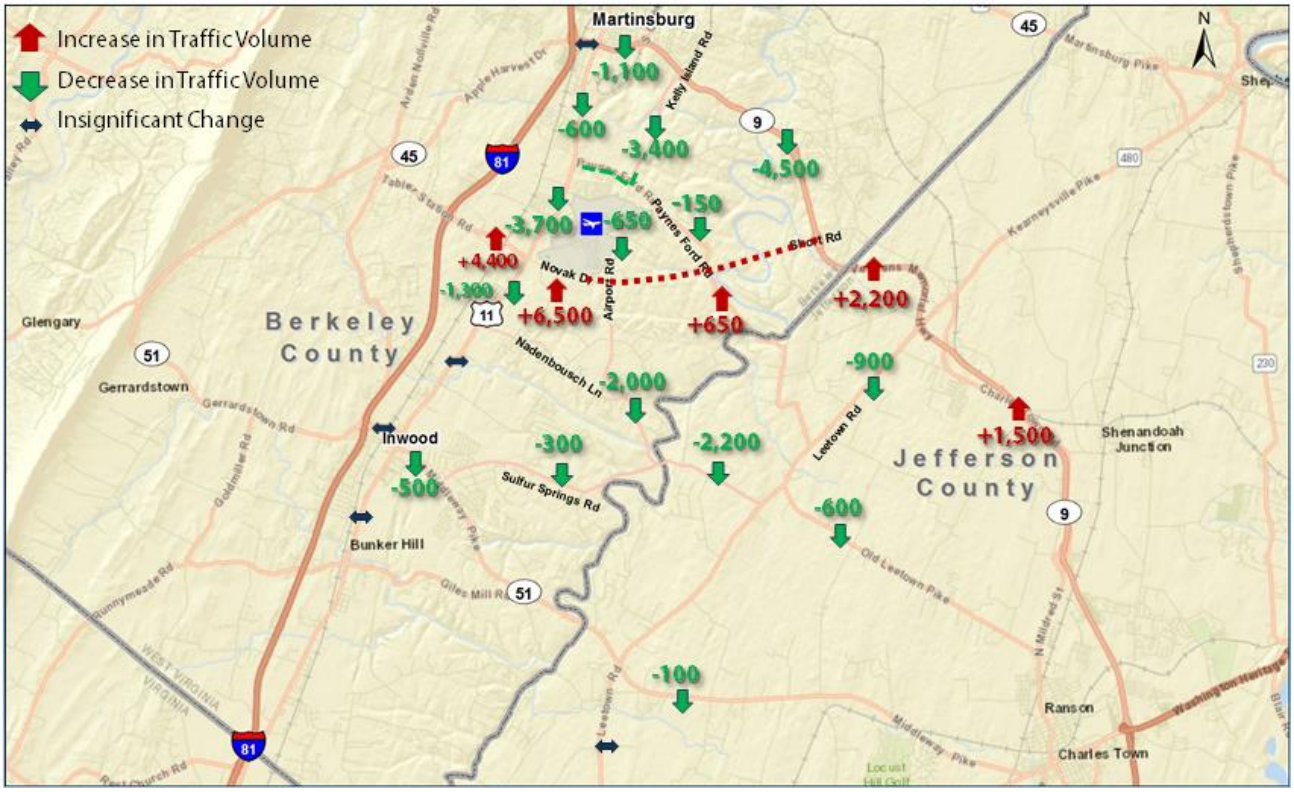


**Figure 13** summarizes the diversions associated with the Novak Drive Connector Alternative 2 under the scenario where other transportation projects are assumed completed and land use is fully built out (2040). The diversions indicate that the Novak Drive Connector reduces traffic on:

- local roadways accessing Business Park Drive developments
- WV North of Short Road through Kelly Island Road intersection
- Kelly Island Road through intersection with US 11

However, the project is not anticipated to have significant impacts on the traffic volumes at WV 45/I-81 (Martinsburg) or WV 51/I-81 (Inwood). As such, the Novak Drive Connector may not be considered as a surrogate to other improvements at those locations.

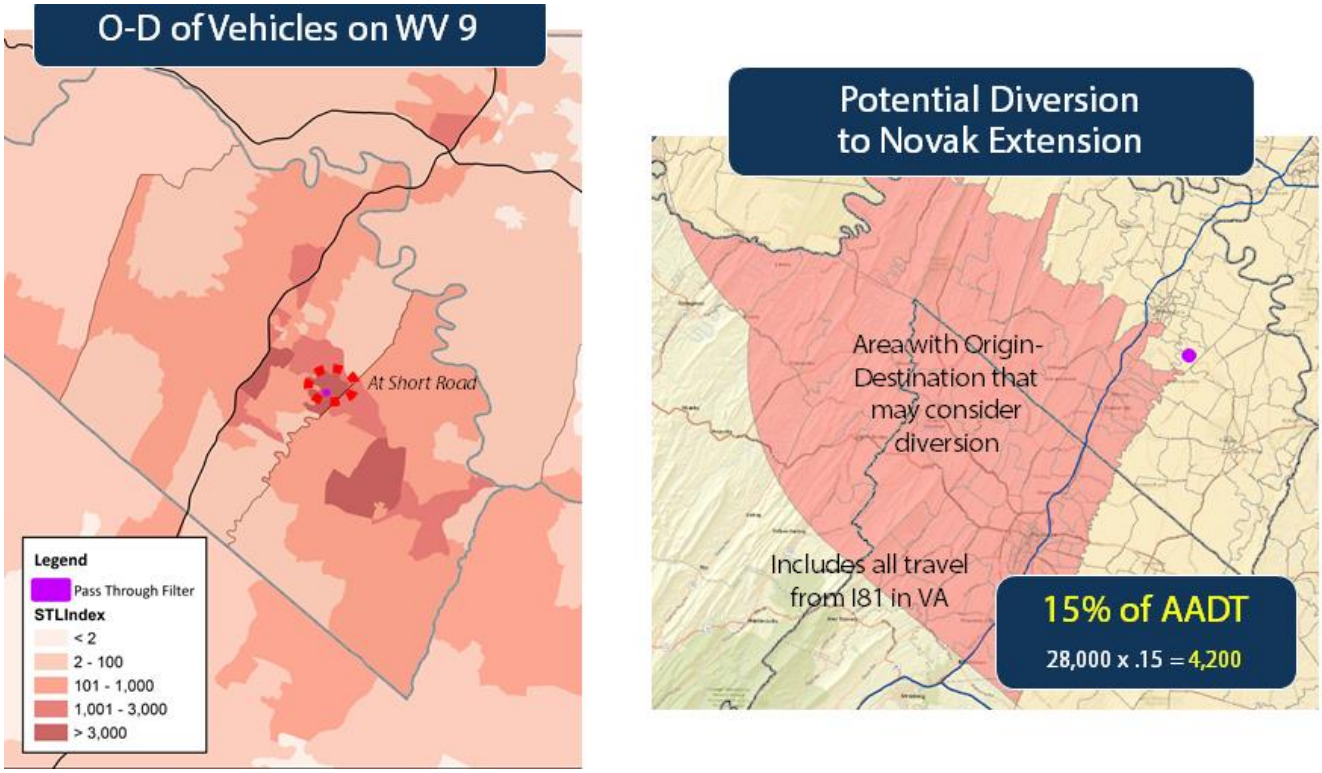
**Figure 13: 2040 Daily Volume Diversion (Alternative 2)**
**(Assuming Other Improvements Completed and 2040 Land Use)**




To further evaluate travel model results and give a visual insight as to who would use the new connector, an origin-destination assessment was conducted using GPS data from StreetLight Data, Inc. as purchased by the HEPMPO. StreetLight provides information on vehicle mobility patterns based on GPS and mobile devices including phones and connected cars. This data has been used by the HEPMPO to assess vehicle and truck movements within the region.

**Figure 14** illustrates the results of the origin-destination assessment of those travelers using WV 9 near the Short Road interchange. Based on origins or destinations south or west of the Traffic Study Area, assumptions were made on the possible numbers of vehicles that may divert to the new Novak Drive Connector. The results indicate that approximately 15% of the traffic may decrease their travel times by using the new roadway. When multiplied by the existing traffic counts, the estimated volume on the Novak Drive Connector is approximately 4,200 vehicles per day. This may be serve as a minimum traffic volume as it assumes existing land use. This estimate is consistent with some of the lower range estimates from the regional modeling and therefore supported the results from the modeling.

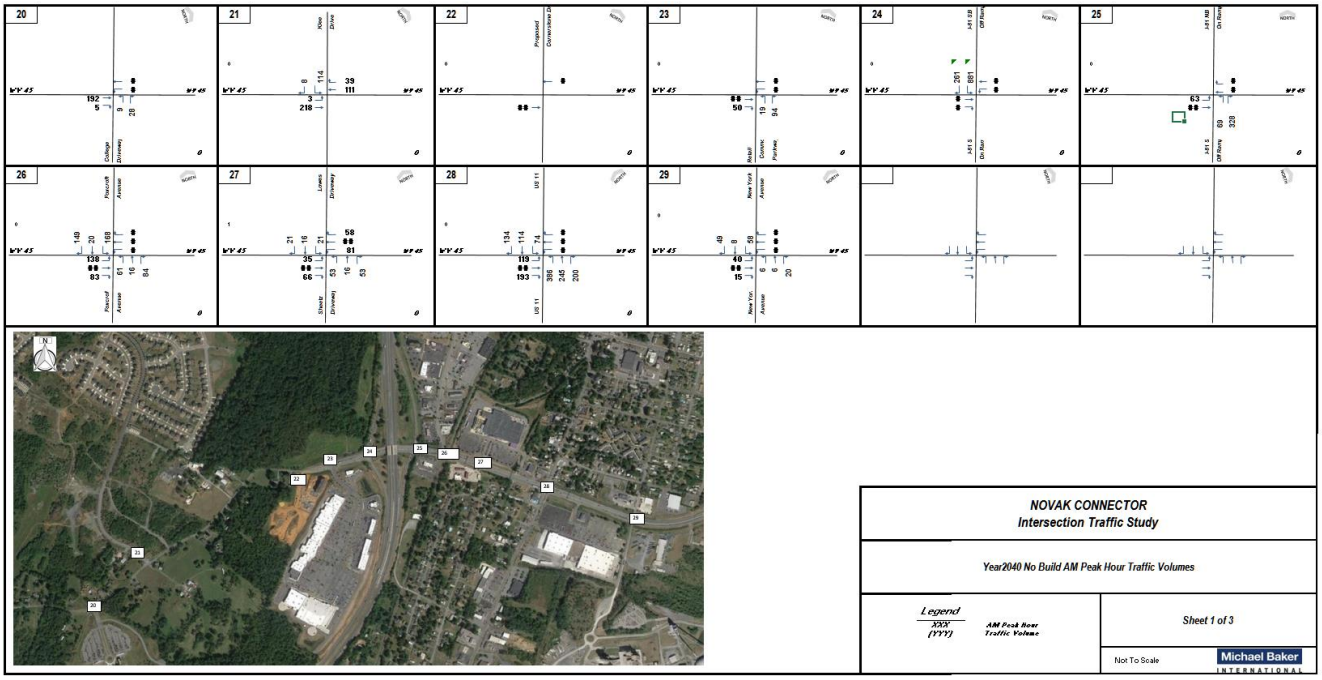
**Figure 14: Estimated Diversions and Novak Drive Connector Volume Using 2016-2017 GPS Data**




**Travel Model Post Processing for Intersection Analyses**

The travel model estimates were used to develop growth rates that were applied to existing traffic count data at key intersections throughout the Traffic Study Area. Procedures were conducted to forecast the intersection turning movement counts for these future conditions with and without the Novak Drive Connector roadway. The turning movements were summarized for each intersection as illustrated in **Figure 15.** The results were then used to conduct more detailed intersection capacity analyses at each location. The results of the intersection analyses are provided in Section 5.4.

**Figure 15: Estimated Diversions and Novak Connector Volume Using 2016-2017 GPS Data**




## 5.4 Future Traffic Analysis

A highway capacity analysis was conducted for the future (2040) condition utilizing a Synchro network model. A 2040 No Build scenario was developed using the base year (2015) scenario Synchro file. The vehicular volumes were updated to account for growth over time. The intersections along WV 45 were adjusted (intersections 3 through 9 and were modelled as a coordinated signal system with a 130 second cycle length. Additionally, the intersections were modified to match the lane configurations proposed in *WV 45 Traffic Operations and Safety Study (February 2016)*. Other signalized intersection cycle lengths were determined using the cycle length optimization tool within Synchro. For all signalized intersections, splits were initially optimized using the built-in tool, and further refined manually, aiming to balance the worst north-south approach delay with the worst east-west approach delay. The intersection LOS was determined using Highway Capacity Manual (HCM) 2010 methodologies. **Appendix B** contains future traffic volume data and Synchro reports.

A 2040 Build scenario, with a two-lane road connecting intersections at WV 9 at Short Road and Novak Drive at Airport (Intersections 11 and 12) along Novak Drive was also modelled using the same principles as the 2040 No Build. To accommodate the proposed connection, Novak Drive at Airport Road (Intersection 12) was updated from a two-way stop controlled intersection to a coordinated signal with additional turning lanes. Additionally, a through lane was added for the westbound approach at WV 9 at Short Road (Intersection 11) in addition to turning movements being added. A potential roundabout at US 11 / Business Park Drive was also analyzed. **Table 6** and **Appendix B** summarizes the LOS by location for the future No-Build and Build condition. The table shows LOS for both the AM and PM peak periods. Additionally, LOS for two-way stopped control intersections, was determined using the worst approach or turning movement LOS.

**Figure 16** and **17** shows the intersection locations color coded by PM LOS for the No-Build and Build scenario, with LOS A through C shown in green, LOS D in yellow and LOS E and F in red.

In the 2040 No-Build condition fourteen (14) locations are expected to operate at an overall LOS D or better with three (3) locations operating at a LOS E and thirteen (13) locations operating a LOS F, in the PM peak period. In the 2040 Build condition fifteen (15) locations are expected to operate at an overall LOS D or better with three (3) locations operating at a LOS E and thirteen (13) locations operating a LOS F, in either the AM or PM peak periods.

The 2040 No Build and 2040 Build scenarios were both mitigated to improve the overall intersection LOS to D or better, where feasible. The 2040 No Build file and 2040 Build file were each copied, and traffic control as well as geometric modification were considered to improve the LOS. The Mitigation improvements for each intersection are summarized in **Appendix B**. The 2040 No Build with mitigation LOS results are twenty-seven (27) D or better, zero (0) E, and three (3) F, in either the AM or PM peak periods. Similarly, the 2040 Build with mitigation LOS results are twenty-nine (29) D or better, zero (0) E, and two (2) F, in either the AM or PM peak periods.

**Table 6: Future No-Build and Build LOS Summary**

| ID | North/South | East/West | Control Type | Future | EB | WB | NB | SB | Overall |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Blue Ridge CC Driveway | WV 45 | Stop | No-Build | - | A (A)* | B (B) | - | - |
| | | | | Build | - | A (A)* | B (B) | - | - |
| 2 | Klee Drive | WV 45 | Stop | No-Build | A (A)* | - | - | B (C) | - |
| | | | | Build | A (A)* | - | - | B (C) | - |
| 3 | Retail Commons Parkway | WV 45 | Signal | No-Build | A (D) | D (C) | D (C) | - | C (C) |
| | | | | Build | B (D) | A (C) | B (D) | - | B (D) |
| 4 | I-81 SB Ramps | WV 45 | Signal | No-Build | C (A) | C (C) | - | C (E) | C (D) |
| | | | | Build | C (C) | D (B) | - | C (E) | C (D) |
| 5 | I-81 NB Ramps | WV 45 | Signal | No-Build | A (C) | E (B) | E (F) | - | D (B) |
| | | | | Build | A (B) | F (C) | E (E) | - | D (C) |
| 6 | Foxcroft Avenue | WV 45 | Signal | No-Build | E (F) | E (F) | E (F) | E (F) | E (F) |
| | | | | Build | E (F) | D (F) | E (F) | E (F) | D (F) |
| 7 | Lowes/Sheetz Driveway | WV 45 | Signal | No-Build | A (A) | A (A) | E (E) | E (E) | A (A) |
| | | | | Build | A (A) | A (A) | D (E) | E (E) | A (A) |
| 8 | US 11 | WV 45 | Signal | No-Build | D (F) | B (E) | D (E) | D (E) | D (E) |
| | | | | Build | D (F) | D (E) | D (E) | D (E) | D (E) |
| 9 | New York Ave | WV 45 | Signal | No-Build | A (C) | C (D) | D (D) | D (D) | B (C) |
| | | | | Build | A (C) | A (B) | E (E) | E (E) | A (C) |
| 10 | WV 9 NB Ramps | Short Rd | Stop | No-Build | A (A)* | - | B (B) | - | - |
| | | | | Build | A (A)* | - | E (D) | - | - |
| 11 | WV 9 SB Ramps | Short Rd | Stop | No-Build | - | - | - | - | - |

| ID | North/South | East/West | Control Type | Future | EB | WB | NB | SB | Overall |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Build | - | A (A)* | - | C (C) | - |
| 12 | Airport Rd | Novak Drive | Stop | No-Build | B (B) | - | A (A)* | - | - |
| | | | | Build | A (B) | A (B) | B (B) | A (B) | A (B) |
| 13 | US 11 | Paynes Ford Road | Signal | No-Build | - | E (F) | E (F) | B (D) | D (F) |
| | | | | Build | - | D (F) | E (F) | B (C) | D (E) |
| 14 | US 11 | Martha Drive | Stop | No-Build | F (F) | - | B (B)* | - | - |
| | | | | Build | F (F) | - | B (B)* | - | - |
| 15 | US 11 | Technology Drive | Stop | No-Build | D (F) | - | A (B)* | - | - |
| | | | | Build | F (F) | - | A (B)* | - | - |
| 16 | US 11 (Winchester Ave) | Business Park Drive / Novak Drive | Signal | No-Build | F (F) | F (F) | F (F) | F (F) | F (F) |
| | | | | Build | F (E) | F (F) | F (F) | F (F) | F (F) |
| 17 | Enterprise Way | Business Park Drive | Stop | No-Build | B (B)* | - | - | D (F) | - |
| | | | | Build | C (C)* | - | - | F (F) | - |
| 18 | Technology Drive | Business Park Drive | Stop | No-Build | B (C)* | - | - | B (F) | - |
| | | | | Build | C (C)* | - | - | C (F) | - |
| 19 | Development Drive | Business Park Drive | Signal | No-Build | F (F) | F (F) | E (E) | F (F) | F (F) |
| | | | | Build | F (F) | F (F) | E (E) | F (F) | F (F) |
| 20 | Tabler Station Road | Tabler Station Road / Business Park Dr | Signal | No-Build | B (C) | B (F) | D (F) | D (F) | C (F) |
| | | | | Build | B (C) | B (F) | D (F) | D (F) | C (F) |
| 21 | I-81 NB Ramps | Tabler Station Road | Signal | No-Build | B (A) | E (F) | E (F) | - | D (E) |
| | | | | Build | E (C) | E (F) | E (F) | - | E (F) |
| 22 | I-81 SB Ramps | Tabler Station Road | Signal | No-Build | E (C) | F (B) | - | F (D) | F (B) |
| | | | | Build | F (D) | F (D) | - | F (D) | F (D) |
| 23 | BBP Driveway | Corning Way | Stop | No-Build | A (A)* | - | - | B (B) | - |
| | | | | Build | A (A)* | - | - | B (B) | - |
| 24 | US 11 | Corning Way | Stop | No-Build | F (F) | - | B (B)* | - | - |
| | | | | Build | F (F) | - | B (B)* | - | - |
| 25 | US 11 | BBP North Site Driveway | Stop | No-Build | C (F) | - | A (B)* | - | - |
| | | | | Build | C (F) | - | A (B)* | - | - |
| 26 | US 11 | BBP South Site Driveway | Stop | No-Build | C (B) | - | A (B)* | - | - |
| | | | | Build | D (B) | - | A (B)* | - | - |
| 27 | US 11 | Nadenbousch Lane | Signal | No-Build | - | F (F) | E (E) | C (C) | E (E) |
| | | | | Build | - | F (F) | E (F) | C (C) | E (E) |
| 28 | US 11 | WV 51 | Signal | No-Build | F (F) | D (D) | E (F) | F (F) | F (F) |

| ID | North/South | East/West | Control Type | Future | EB | WB | NB | SB | Overall |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Build | F (F) | D (D) | F (F) | F (F) | F (F) |
| 29 | US 11 | True Apple Way / WV 51 | Signal | No-Build | D (F) | F (F) | F (F) | F (F) | F (F) |
| | | | | Build | D (F) | F (F) | F (F) | F (F) | F (F) |
| 30 | I-81 NB Ramps | WV 51 | Signal | No-Build | A (B) | B (D) | D (D) | - | B (C) |
| | | | | Build | A (B) | B (C) | D (D) | - | B (C) |
| 31 | I-81 SB Ramps | WV 51 | Signal | No-Build | C (D) | C (C) | - | D (E) | D (D) |
| | | | | Build | D (D) | D (B) | - | D (D) | D (D) |

** Value shown is for mainline left turn at TWSC intersections*

**Figure 16: Future No-Build PM LOS**

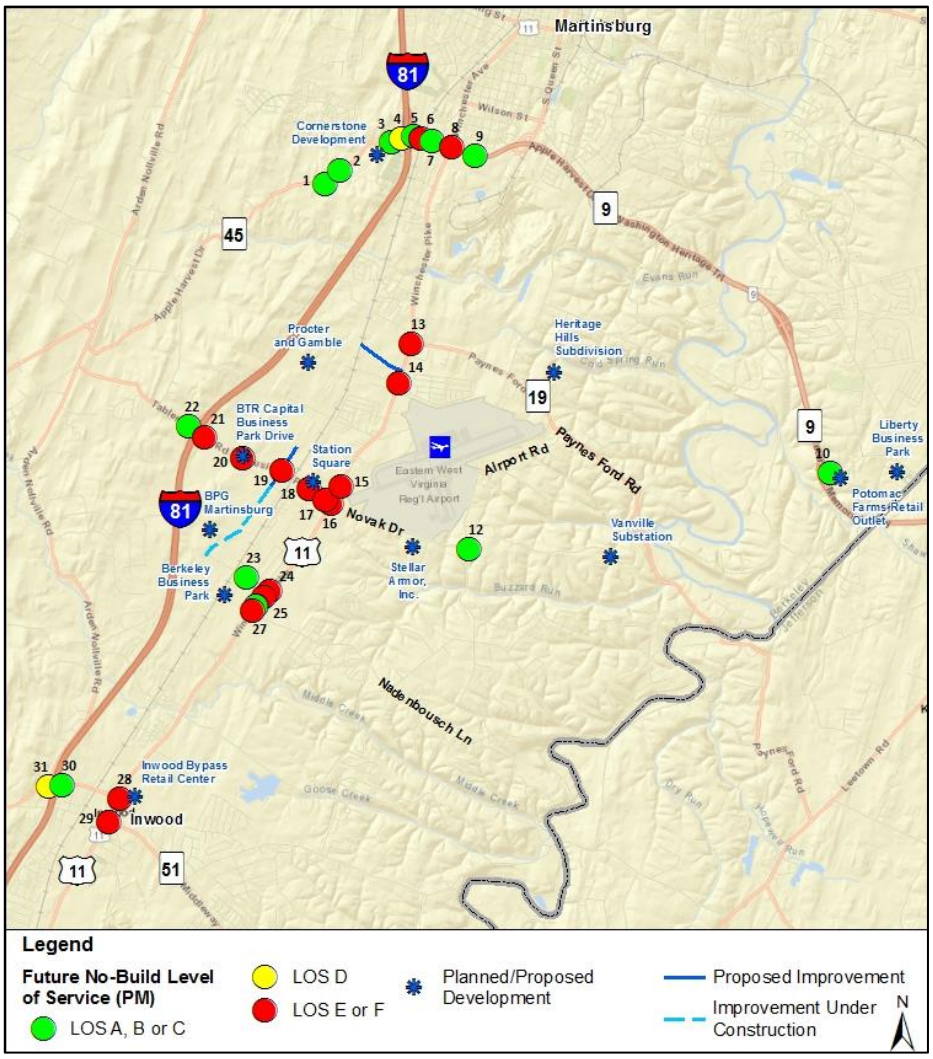
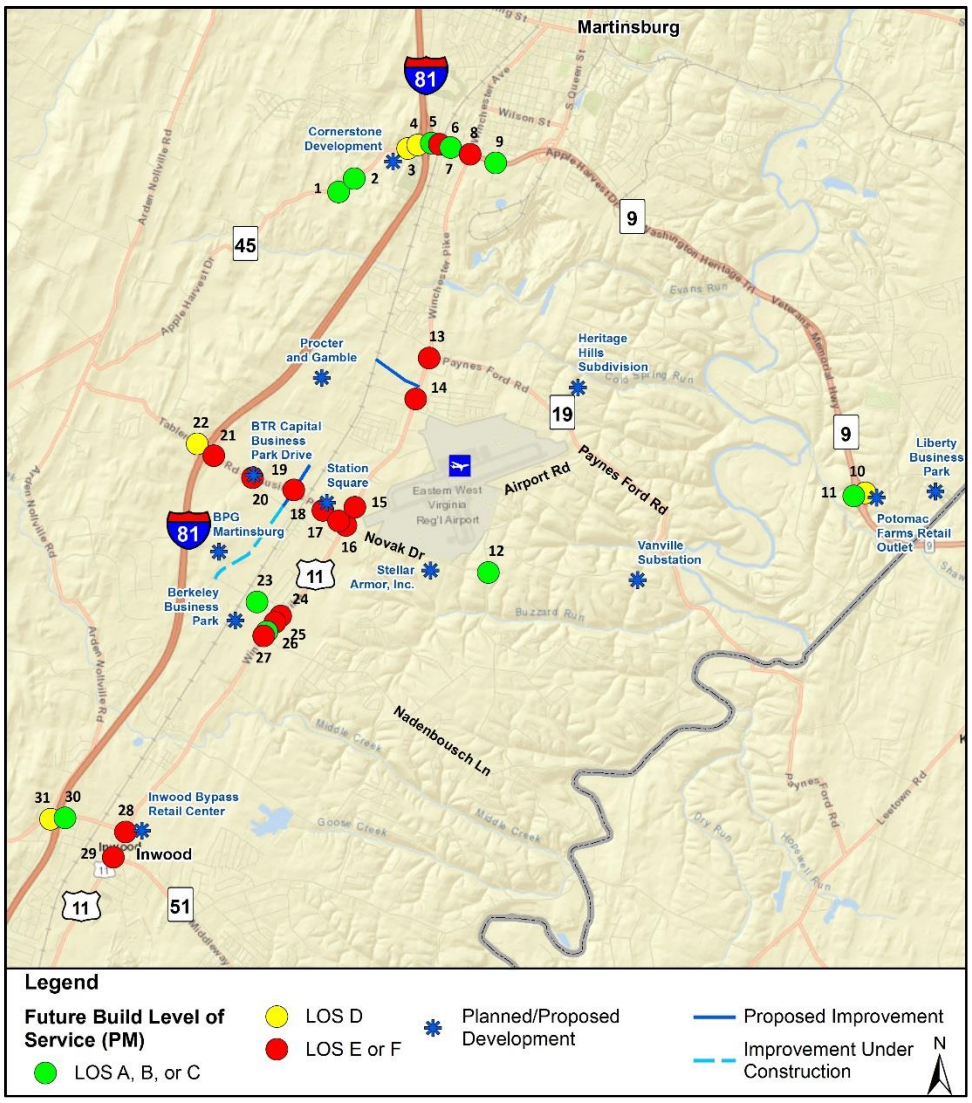


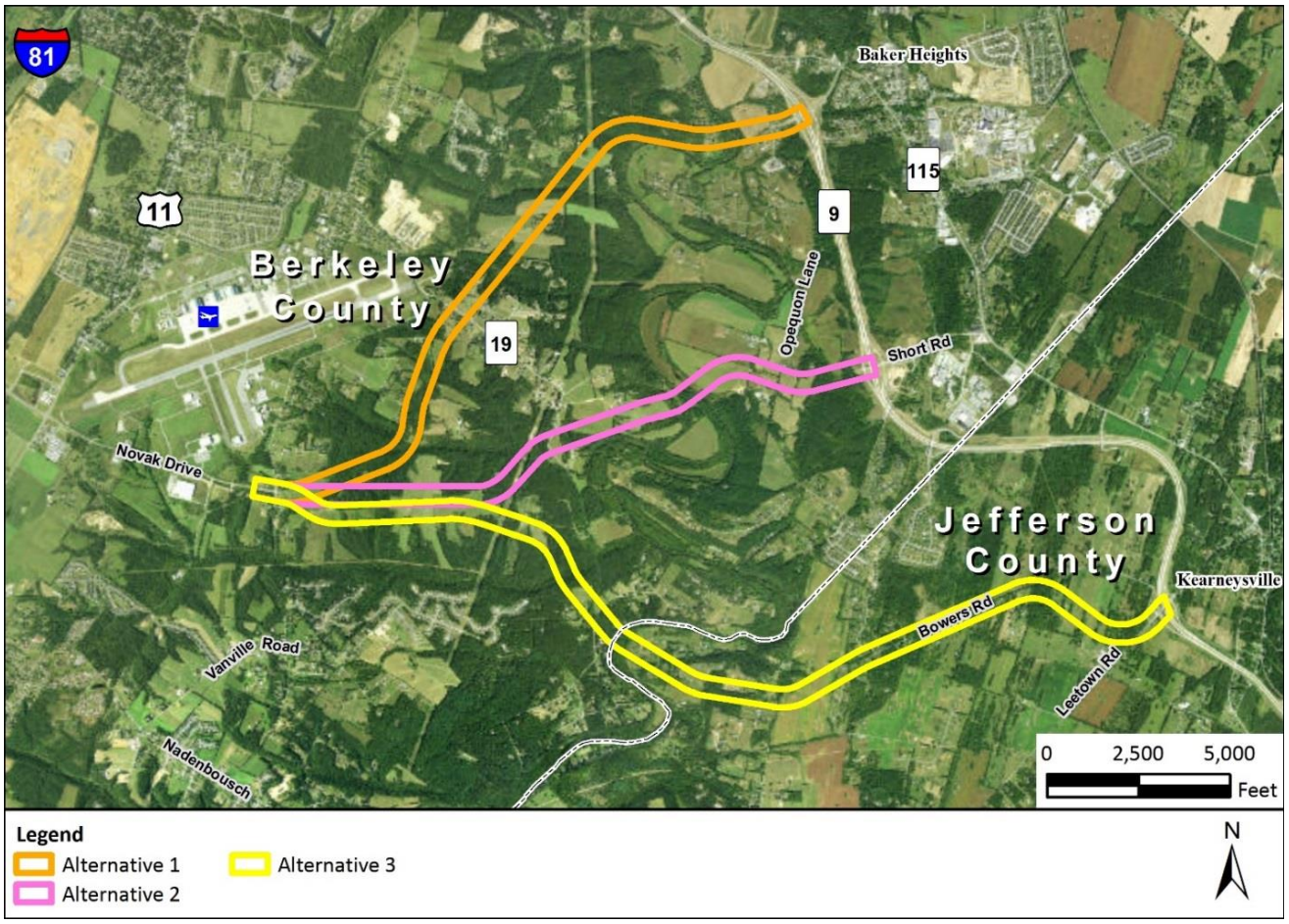
**Figure 17: Future Build PM LOS**




# 6 ALTERNATIVE CORRIDORS

Three (3) conceptual build alternatives and a No-Build Alternative are being considered for the Novak Drive Connector Study. For this planning-level study, specific design specifications have not been determined. It is anticipated that the connector would be built initially as a two-lane roadway with the potential to widen to a four-lane roadway based on future need. For this study, 500-foot wide corridors were evaluated as shown on **Figure 18**. A possible roadway centerline and profile was developed within each proposed corridor for the purpose of establishing the engineering feasibility of a roadway within the corridor and to form the basis of a conceptual cost estimate and high level potential environmental impacts of each preliminary draft alternative corridor.

**Figure 18: Preliminary Alternative Corridors**




## 6.1 No-Build Alternative

The No-Build Alternative assumes that a new road connection between Novak Drive and WV 9 would not be constructed and serves as the baseline against which the other alternatives are compared. Improvements would focus on addressing traffic congestion at key intersections within the study corridor including Novak Drive and US 11. The No-Build Alternative represents the transportation system as it exists, or as it would exist after completing program and projects currently funded or being implemented.

## 6.2 Alternative 1

Alternative 1 is a new roadway connection from Novak Drive to WV 9 at the existing Opequon Lane / Baker Heights interchange. The alignment is approximately 5.0 miles long, extending northeast from Novak Drive to the existing WV 9 Opequon Lane interchange with a bridge over the Opequon Creek and at-grade intersections with major roadways while minimizing conflicts with environmental and historic resources to the extent possible.

## 6.3 Alternative 2

Alternative 2 is a new roadway connection from Novak Drive to WV 9 at the existing Short Road interchange. The alignment is approximately 3.4 miles long, extending east from Novak Drive to the existing WV 9 Short Road interchange with a bridge over the Opequon Creek and at-grade intersections with major roadways while minimizing conflicts with environmental and historic resources to the extent possible.

## 6.4 Alternative 3

Alternative 3 is a new roadway connection from Novak Drive to WV 9 at the existing Kearneysville / Leetown interchange. The alignment is approximately 5.4 miles long, extending southeast from Novak Drive to the existing WV 9 Kearneysville interchange with a bridge over the Opequon Creek, at-grade intersections with major roadways and upgrade of Bowers Road approaching the Kearneysville Interchange while minimizing conflicts with environmental and historic resources to the extent possible.

## 6.5 Preliminary Cost Estimate

A preliminary cost estimate was developed for each of the three (3) 500-foot preliminary alternative corridors using a two-lane typical section. **Table 7** summarizes the preliminary costs include preliminary engineering, final design, construction and contingency. Roadway construction unit cost per mile and bridge construction unit cost per square foot of bridge were obtained from WVDOH and are based on actual construction costs on similar projects. Preliminary engineering is calculated at 4% of construction, final design is calculated at 6% of construction and a contingency cost of 20% of engineering and construction are included and based on industry standards for planning level studies. Right-of-Way and utility costs are not included in the estimates and would be estimated during the Preliminary Design / National Environmental Policy Act (NEPA) phase

**Table 7: Cost Estimate (2017$)**

| Phase | Unit Costs | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|---|
| **Preliminary Engineering** | 4% of Construction | $ 855,200 | $ 651,200 | $ 849,600 |
| **Final Design** | 6% of Construction | $ 1,282,800 | $ 976,800 | $ 1,274,400 |
| **Construction*** | | | | |
| Roadway | $2M per mile | $ 9,860,000 | $ 6,680,000 | $ 10,680,000 |
| Bridge | $400 per sq ft | $ 11,520,000 | $ 9,600,000 | $ 10,560,000 |
| **Contingency** | 20% of Engineering and Construction | $ 4,703,600 | $ 3,581,600 | $ 4,672,800 |
| **TOTAL ESTIMATED COST** | | **$ 28,221,600** | **$ 21,489,600** | **$ 28,036,800** |

** does not include Right-of-Way and Utility Costs*

# 7 AFFECTED ENVIRONMENT

Environmental considerations in transportation planning can lead to a seamless decision-making process that minimizes duplication of effort, promotes environmental stewardship, and reduces delays in project implementation by promoting early coordination. Incorporating identification of environmental resources early in the planning process promotes avoidance / minimization of environmental impacts and early coordination for mitigation. The goal of the Novak Drive Connector Study is to identify known potential impacts that could affect the cost or feasibility of the project during the Preliminary Design / NEPA phase to facilitate the avoidance, minimization or mitigation of those impacts as the project moves forward.

An environmental inventory of social, cultural and natural resources within the Study Area was collected from available secondary sources and input into a Project GIS. The environmental inventory includes:

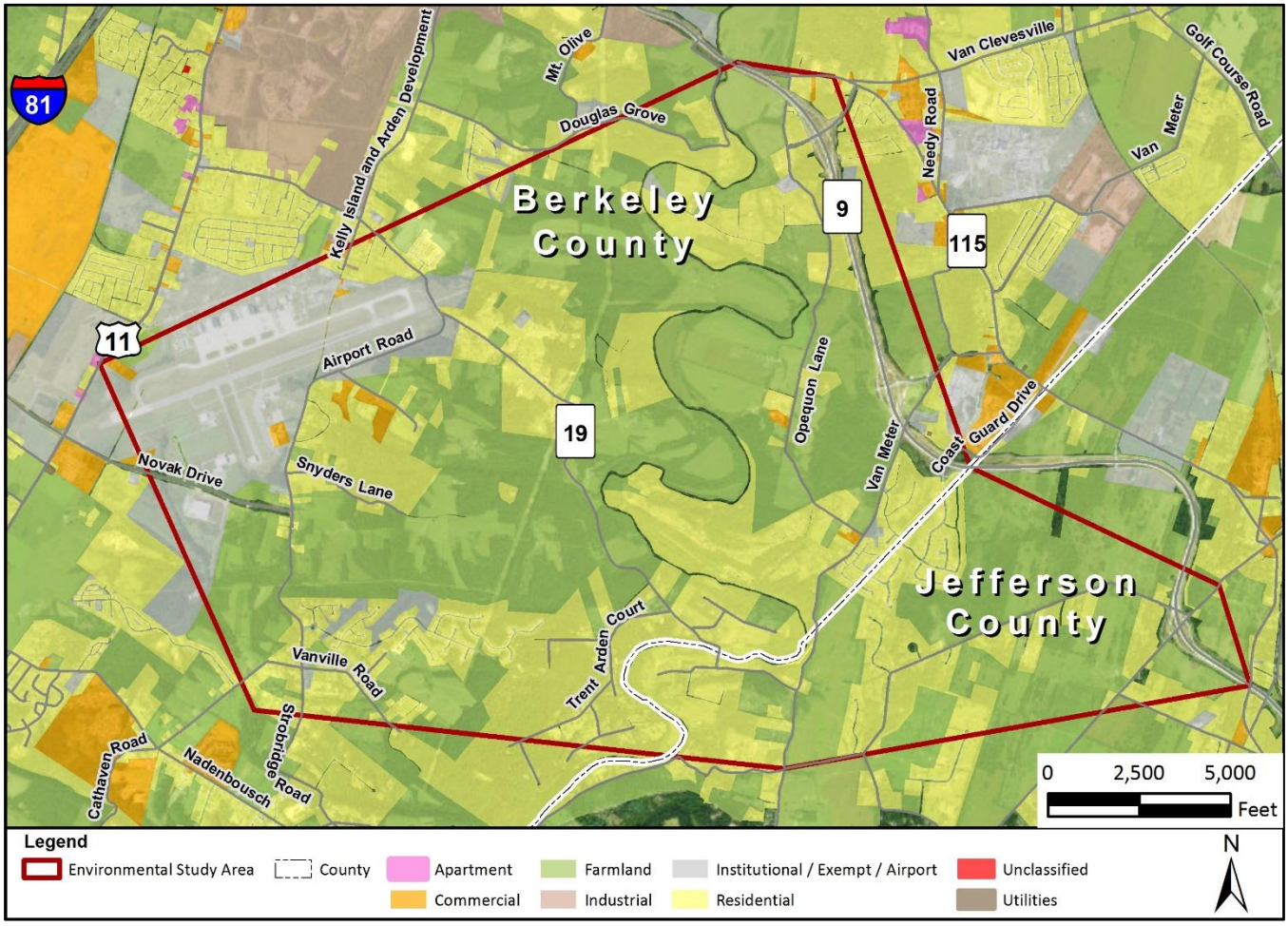
- Land Cover / Land Use
- Protected Farmlands and Farmland Soils
- Air Quality
- Noise
- Water Quality
- Wildlife Resources
- Cultural Resources
- Community Facilities
- Section 4(f) and 6(f) Resources
- Socioeconomics
- Hazardous Materials
- Geology
- Mining
- Pedestrian / Bicycle Accommodations

## 7.1 Land Use / Land Cover

Berkeley County (2016) and Jefferson County (2017) parcel layers were obtained from the county assessors through the HEPMPO. Each parcel layer contains an attribute with the current property classification that was used to identify the existing land use / land cover type.

The Environmental Study Area is primarily farmland and residential with 48% farmland and 31% residential. The remaining portion of the Environmental Study Area is exempt, 19%, which includes the Eastern Regional WV Airport, schools, religious, and other exempt parcels; and commercial, 2%. See **Figure 19** for the Land Use / Land Cover in the Environmental Study Area.

Figure 19: Land Use / Land Cover



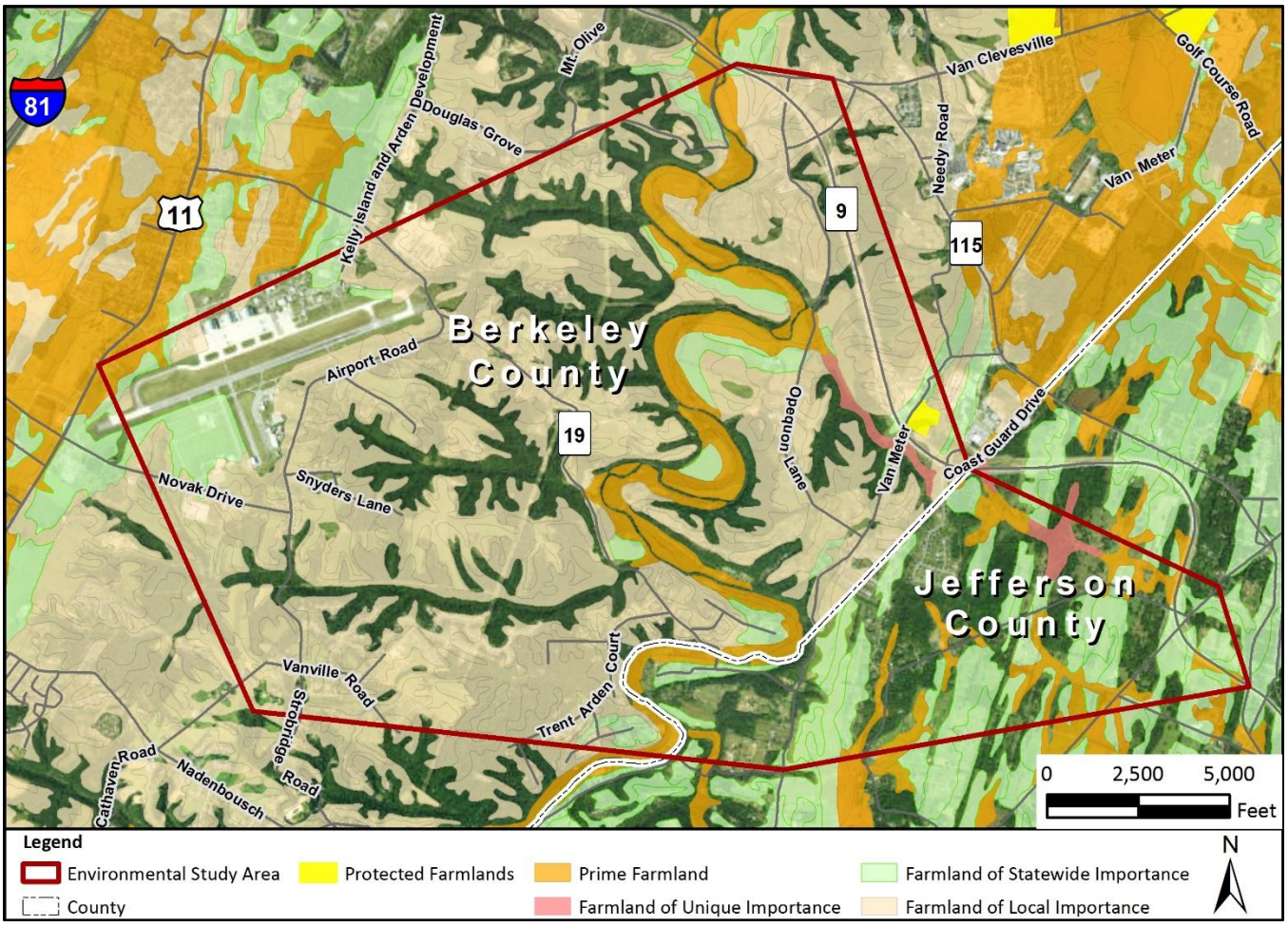

## 7.2 Protected Farmlands and Farmland Soils

### 7.2.1 Protected Farmlands

Protected farmlands (2016) were obtained by HEPMPO from the West Virginia Farmland Protection Authority. The Protected Farmlands data includes easements that are owned by the Farmland Preservation Board along with easements owned by the Land Trust of the Eastern Panhandle and the Potomac Conservancy. The dataset contains public land ownership, management and conservation lands, including voluntarily provided privately protected areas. The lands included in this dataset are assigned conservation measures that qualify their intent to manage lands for the preservation of biological diversity and to other natural, recreational and cultural uses; managed for these purposes through legal or other effective means.

There is one nine-acre Protected Farmland within the Environmental Study Area that is located along Short Road in the southeast quadrant of the WV 9 Short Road interchange. See **Figure 20** for the Protected Farmland.

**Figure 20: Prime and Unique Farmlands**




## 7.2.2 Farmland Soils

Soil tabular and spatial data for Berkeley County (2016) and Jefferson County (2014) were downloaded from Natural Resources Conservation Service (NRCS) Soil Data Mart. The soil map units considered as prime farmland soils, farmland soils of local or statewide importance and unique farmland soils were identified. NRCS defines Prime Farmlands as soils that have the best combination of physical and chemical characteristics to economically produce high yields of agricultural crops when treated and managed according to acceptable farming practices. Farmlands of Unique Importance are defined as land other than Prime Farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to economically produce sustainable high yields of these crops when properly managed.

The Environmental Study Area contains 476 acres of Prime Farmlands or 8% of the Environmental Study Area and are primarily located along the Opequon Creek in Berkeley County and stream beds in Jefferson County. There are 61 acres of Farmlands of Unique Importance or 1% of the Environmental Study Area and are primarily located along Shaw Run in Berkeley and Jefferson Counties. See **Figure 20** for Prime and Unique Farmlands.

Statewide or Locally Important Farmlands are lands that have been identified by state or local agencies for agricultural use, but are not of national importance. Farmlands of Statewide Importance are determined by the State agencies and include areas of soils that nearly meet the requirements for Prime Farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Farmlands of Statewide Importance may include tracts of land that have been designated for agriculture by State law. Farmlands of Local Importance are identified by local agencies and may include tracts of land that have been designated for agriculture by local ordinance.

The Environmental Study Area contains 929 acres of Farmland of Statewide Importance or 11% of the Environmental Study Area and 3,988 acres of Farmland of Local Importance or 48% of the Environmental Study Area. Combined 68% of the Environmental Study Area contains Prime Farmland, Farmland of Unique Importance or Statewide or Locally Important Farmlands. See **Figure 20** for Statewide or Locally Important Farmland Soils.

## 7.3 Air Quality

The 1990 Clean Air Act Amendments (CAAA) requires that a proposed project not cause any new violation to the National Ambient Air Quality Standards (NAAQS), or increase the frequency or severity of any existing violations, or delay attainment of any NAAQS. The EPA established the NAAQS for Carbon Monoxide, Lead, Nitrogen Dioxide, Ozone, Particulate Matter ($PM_{2.5}$ and $PM_{10}$) and Sulfur Dioxide. The State of West Virginia adopted the standards set forth in the NAAQS. The Environmental Protection Agency (EPA) conducts ambient air monitoring for these pollutants at various locations throughout West Virginia. Areas within the state can be divided into attainment, maintenance and non-attainment areas, with classifications based upon the severity of the air quality problems. Attainment areas are areas that meet the National Ambient Air Quality Standards (NAAQS).

The Environmental Study Area is located within Berkeley and Jefferson Counties which are designated as attainment areas under the NAAQS for all criteria pollutants. Berkeley County was formerly designated by EPA as an attainment / maintenance area for the 1997 annual $PM_{2.5}$ NAAQS. The standard has since been revoked (81 FR 58009). Therefore, transportation conformity is not currently required.

## 7.4 Noise

A noise planning study was performed to establish potential noise impacts in accordance with WVDOH Design Directive 253 Noise Analysis and Abatement Guidelines (August 19, 2011) and FHWA noise policy. Potential sensitive receptors within 300 feet of the preliminary alternative corridors were identified through review of aerial photography and available on-line sources. Noise sensitive receptors potentially impacted by the proposed improvements primarily include residential dwelling units. For planning purposes, the FHWA Traffic Noise Model (TNM) was used to conservatively estimate the number of noise sensitive sites that may be impacted as a result of the proposed improvements.

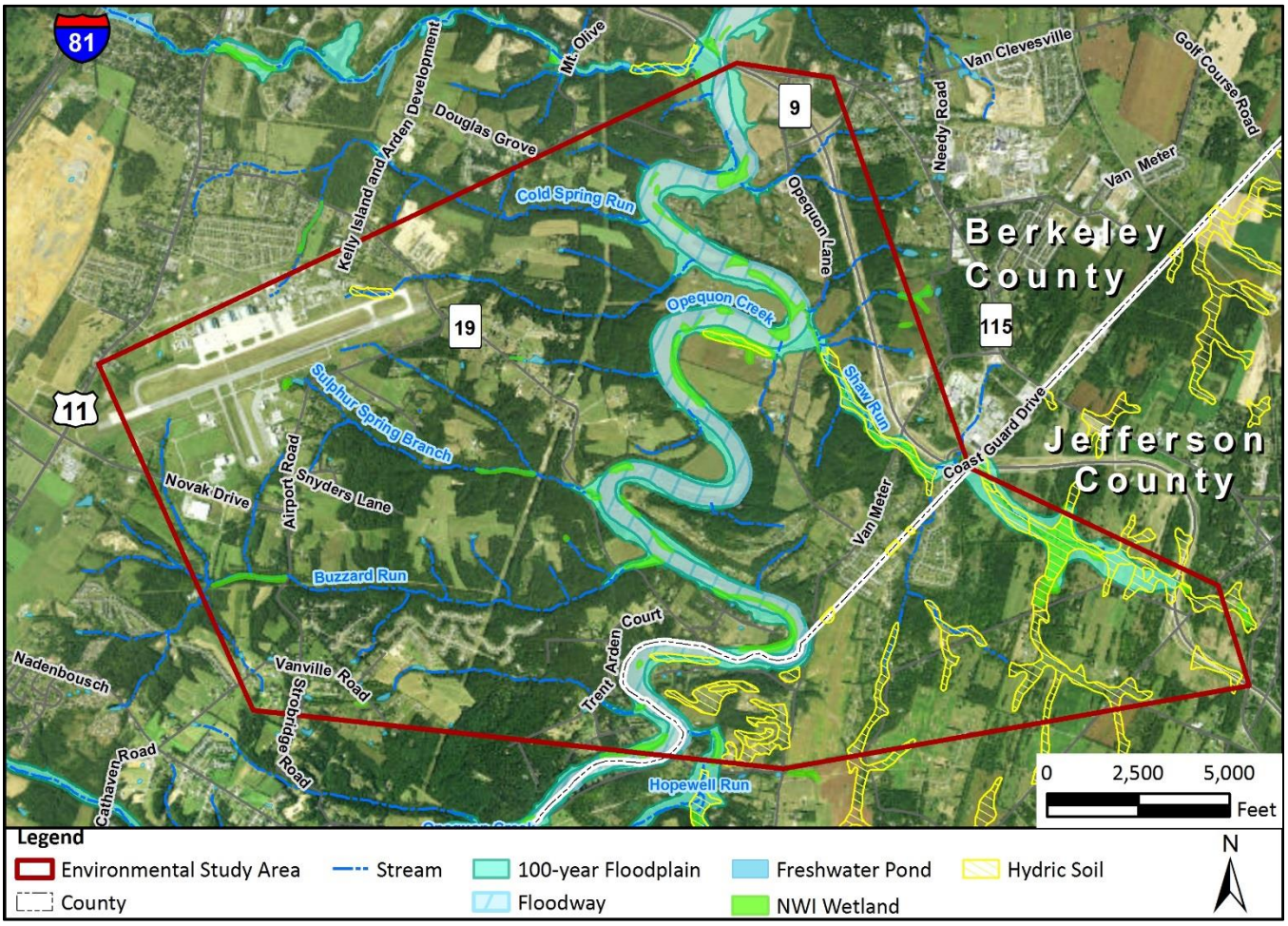
## 7.5 Water Quality

### 7.5.1 Surface Water Resources

National Hydrography Dataset (NHD) Streams and Waterbodies (2016) were downloaded from the United States Geological Survey (USGS) National Map. Six (6) named streams are located within the Environmental Study Area: Buzzard Run, Cold Spring Run, Hopewell Run, Opequon Creek, Shaw Run and Sulphur Spring Branch. Opequon Creek is the longest stream traversing north south through the Environmental Study Area. There are several

unnamed tributaries identified in the NHD dataset that are within the Environmental Study Area and flow from the above-named streams. See **Figure 21** for the stream locations.

**Figure 21: Surface Water Resources**




## 7.5.2 Clean Water Act

The Clean Water Act (1972) requires each state to develop water quality standards to protect all water and to provide a list of impaired streams, per Section 303(d). The West Virginia Department of Environmental Protection (WVDEP) Water Quality Standards (47CRS2), effective July 8, 2016, identifies the standards to comply with the Clean Water Act and controls the amount of pollution entering West Virginia waters and the basis for reducing runoff from rural and urban areas. WVDEP developed a list of streams that are water quality limited and not expected to meet the water quality criteria even after applying technology-based controls, commonly referred to as the 303(d) List. Opequon Creek is the only stream within the Environmental Study Area that appears on this list (See **Table 8**).

**Table 8: West Virginia Department of Environmental Protection Section 303(d) List**

| Stream Name | Stream Code | Criteria Affected | Source | Impaired Size (miles) | Reach Description | Projected TDML Year | 2014 List? |
|---|---|---|---|---|---|---|---|
| Opequon Creek | WVP-4 | Iron (trout) | Unknown | 30.7 | Entire length | 2026 | Yes |

*Source: WV DEP 2016 Section 303(d) List*

Information on natural trout streams within the project area were requested from the West Virginia Division of Natural Resources (WVDNR). The WVDNR Natural Heritage Program responded in a letter dated September 11, 2017, indicating there are no known records of natural trout streams within the project area (see **Appendix C** for correspondence). The results were based on a database search only and do not satisfy other consultation or permitting requirements. Further consultation will be required during the NEPA process.

The WVDEP designates streams that have a "beneficial use", such as public water supply, recreation use or power generation use, taking into consideration the use and value of the water body. Opequon Creek is designated as a Trout Waters (B2) category that provide measures to sustain year-round trout populations.

### 7.5.3 NWI Wetlands

National Wetland Inventory (NWI) wetlands (2016) were downloaded from U.S. Fish and Wildlife Services website. Soil map units designated as Hydric were extracted from the soil tabular and spatial data downloaded from the Natural Resources Conservation Service (NRCS) Soil Data Mart for Berkeley and Jefferson counties. The Environmental Study Area contains 112 acres of NWI Wetlands and 286 acres of hydric soils primarily located along the streams with the area. See **Figure 21** for the location of NWI Wetlands and hydric soils within the Environmental Study Area.

### 7.5.4 Floodplains

National Flood Hazard Layer (NFHL) (2016) was downloaded from the Federal Emergency Management Agency (FEMA) Flood Map Service Center. The Environmental Study Area contains 652 acres of 100-year Floodplain and 847 acres of Floodway. The 100-year floodplain and floodway are associated with Opequon Creek and a 100-year floodplain is associated with Shaw Run. See **Figure 21** for the location of floodplain and floodway within the Environmental Study Area.

### 7.5.5 Chesapeake Bay Watershed

The Environmental Study Area lies within the Chesapeake Bay Watershed, which is the largest estuary in the United States and the third largest in the world. The Chesapeake Bay watershed spans more than 64,000 square miles. It encompasses parts of six states—Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia—and the entire District of Columbia. Approximately eight million acres of land in the Bay watershed are permanently protected from development.

Executive Order 13508, Chesapeake Bay Protection and Restoration, required a Federal Leadership Committee to prepare a strategy for protecting and restoring the Chesapeake Bay. The U.S. Environmental Protection Agency (EPA) and the six states have determined that the key to restoring the Bay's health entails reducing the flow of nutrients (nitrogen and phosphorus) and sediment flowing from the Bay states into the Bay, and have set

maximum amounts for nitrogen, phosphorus and sediment, known as Cap Load Allocations for each of the jurisdictions.

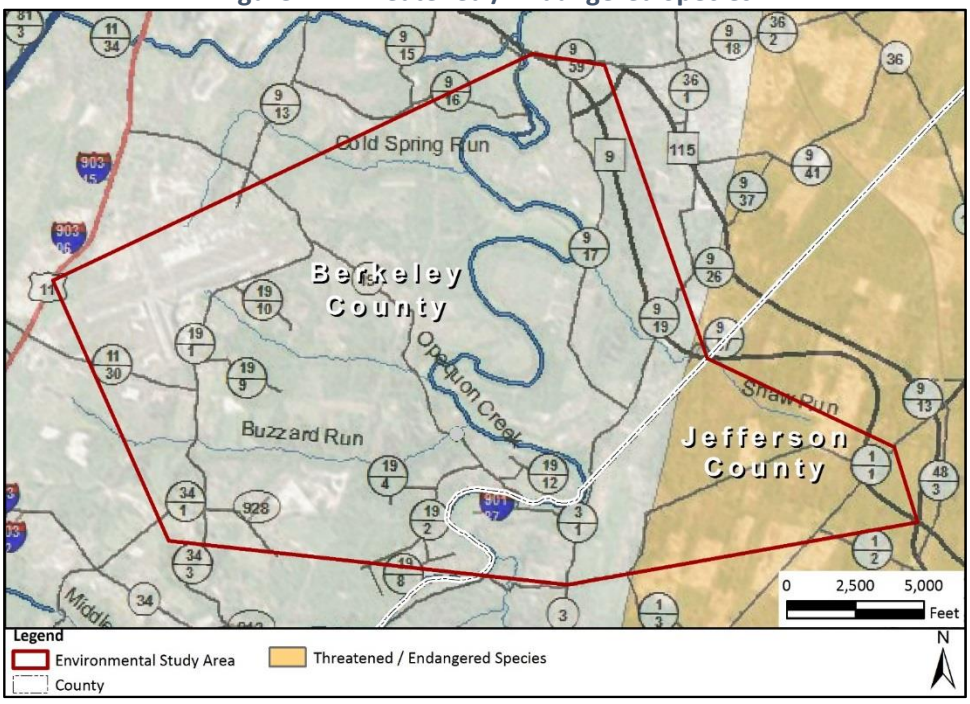
West Virginia's portion of the Chesapeake Bay watershed is the land that drains into the Potomac River and its tributaries and a small area that drains into the James River. Fourteen percent (14%) of West Virginia drains into the Potomac River and on to the Chesapeake Bay. The Chesapeake Bay drainage area in West Virginia includes Berkeley, Grant, Hampshire, Hardy, Jefferson, Mineral, Morgan, Pendleton, and small portions of Preston and Tucker counties. As required by Executive Order 13508, West Virginia developed a Watershed Implementation Plan (WIP) that outlines their strategies to achieve target loads in the areas of wastewater, developed lands and industrial, agriculture, forest and other. During the NEPA process, this plan should be consulted and any appropriate strategies for alternatives still under consideration should be identified if there are any protected lands that may be impacted.

## 7.6 Wildlife Resources

National Wildlife Refuges (2017) were reviewed on the U.S. Fish & Wildlife Services website. Wildlife Management Areas (2017) and National Forest Wildlife Management Areas (2017) were reviewed on the West Virginia Department of Natural Resources (DNR) website. There are no National Wildlife Refuges or Wildlife Management Areas within the Environmental Study Area.

The WVDOH screened the Environmental Study Area using their existing GIS of federally listed Threatened and Endangered Species information. The information is compiled and maintained by the U.S. Fish & Wildlife Service (USFWS), the West Virginia Department of Natural Resources (WVDNR), the West Virginia Division of Highways (WVDOH) and other various federal, state and local entities. The Environmental Study Area is within the range of the federally listed Madison Cave Isopod (Antrolana lira) as shown on **Figure 22**.

**Figure 22: Threatened / Endangered Species**



Additional information on rare, threatened and endangered species and sensitive habitats for the Environmental Study Area was requested from the West Virginia Division of Natural Resources (WVDNR) (2017). A records search was performed by the WVDNR and concluded that there are no known records of any state listed RTE Species with the Environmental Study Area. The records search was the result of a database search and retrieval only. Therefore, the WVDNR record search does not satisfy other consultation or permitting requirements for disturbances to the natural resources of the state.

## 7.7 Cultural Resources

### 7.7.1 Archaeological Resources

Known (previously identified) archaeological sites were obtained through a review of West Virginia Division of Culture and History (WVDCH) Archaeological Site Forms (2016). The records search identified thirty-three (33) previously recorded sites, clustered along WV 9 in the eastern portion of the Environmental Study Area and, in the northwest corner, in the vicinity of the Eastern West Virginia Regional Airport. The known archaeological sites are listed in **Table 9**. Eight (8) prior cultural resource surveys have been conducted within the Environmental Study Area are listed in **Table 10**. Historic preservation law prevents the sites from being shown on a map. As with the archaeological sites, the surveys are clustered around the Eastern West Virginia Regional Airport and along WV 9 on the eastern border of the Environmental Study Area. The greater part of the Environmental Study Area between these margins is completely lacking in terms of prior cultural resource evaluations.

**Table 9: Known Archaeological Sites**

| Site Number | Site Name |
|---|---|
| 46-BY-055 | Hendricks |
| 46-BY-096 | Grant Acres |
| 46-BY-098 | Water Tank Site |
| 46-BY-130 | Stout #9 |
| 46-BY-131 | Van Metre Tenant House |
| 46-BY-132 | Stout #10 |
| 46-BY-133 | Stout #11 |
| 46-BY-134 | Byers #2 |
| 46-BY-135 | Memory Garden #3 |
| 46-BY-136 | Grant #4 |
| 46-BY-137 | Grant #2 |
| 46-BY-138 | Grant #9 |
| 46-BY-139 | Morrow #2 |
| 46-BY-140 | Morrow #3 |
| 46-BY-141 | Morrow #5 |
| 46-BY-142 | Morrow #6 |
| 46-BY-143 | Stout #2 |
| 46-BY-144 | Memory Garden #2 |
| 46-BY-145 | Memory Garden #1 |
| 46-BY-146 | Moats |

| Site Number | Site Name |
|---|---|
| 46-BY-147 | Grant #1 |
| 46-BY-148 | Grant #8 |
| 46-BY-149 | Morrow #1 |
| 46-BY-166 | Shepard and Shewalter (Cemeteries of Martinsburg and Berkeley County, WV) |
| 46-BY-214 | Field Site 1 |
| 46-BY-183 | MLP Bypass |
| 46-JF-48 | AL-14 |
| 46-JF-67 | Paynes Ford |
| 46-JF-68 | No Name on Site Form |
| 46-JF-496 | Battle of Kearnysville |
| 46-JF-251 | Ridgeway #1 |
| 46-JF-252 | Ridgeway #2 |
| 46-JF-253 | Charles Miller #1 |

**Table 10: Previously Conducted Archaeological Surveys within the Environmental Study Area**

| FR Number | Survey Title |
|---|---|
| 90-102-BY | An Archaeological Survey of a Proposed Coast Guard Facility near Baker Heights, Berkeley County, WV |
| 92-142-BY | A Phase I Cultural Resource Reconnaissance of 15 Acres Proposed for the NAVRES Facilities at the Air National Guard Base, Martinsburg |
| 93-1383-BY | Phase I Survey of a 2-Acre Tract at the Martinsburg Airport, Berkeley County, WV |
| 93-909-BY | Phase I Cultural Resources Survey of the Proposed Airport Community Sewage Collection System, Berkeley County, WV |
| 04-306-BY-7 | Cultural Resources Survey 167th Airlift Wing West Virginia Air National Guard Eastern West Virginia Regional Airport, Shepherd Field, Martinsburg, WV |
| 07-993-BY-2 | Abbreviated Technical Report for Phase I Archaeological Survey of Proposed Borrow and Waste Areas, WV 9 Opequon Creek to CR 9/19, Arden District, Berkeley County, WV |
| 13-494-BY-1 | Report Not Available but No Sites Identified |
| 15-477-BY | Phase I Archaeological Survey at the Inwood North Tower Site |

### 7.7.2 Archaeological Probability Areas

A preliminary evaluation of archaeological probability was conducted for the Environmental Study Area, based on a review of topographic features, through an examination of USGS maps and a review of historic maps to locate historic buildings and residences. The majority of the Environmental Study Area, encompassing all alternatives, presents a high probability for encountering subsurface prehistoric archaeological deposits. This estimate is based on environmental factors such as the presence of Opequon Creek and numerous tributaries, as well as an abundance of similar previously identified sites in the area. A high potential for encountering previously unidentified historic archaeological sites also exists based not only on the number of known sites related to historic settlement, but due to a preliminary review of historic records indicating a high degree of activity related to the Civil War throughout the local region.

### 7.7.3 Historic Resources

Individual National Register properties (2017), National Register historic districts (2017) and previously recorded historic resources (2017) were obtained from the West Virginia State Historic Preservation Office (SHPO) Interactive Map Viewer. The Environmental Study Area contains eight (8) individual properties eligible for the National Register (see **Table 11** and **Figure 23**), no historic districts eligible for the National Register and thirty-five (35) previously recorded historic resources (see **Table 12** and **Figure 23).** All of the previously recorded historic resources are Not Eligible for the National Register.

**Table 11: Individual National Register Properties**

| Site ID / Reference # | Historic Name | NR List Date |
|---|---|---|
| 80004422 | Mount Zion Baptist Church | 12/10/1980 |
| 94001297 | Stone House Mansion | 11/21/1994 |
| 04000033 | John VanMetre House | 02/11/2004 |
| 06000170 | Newcomer Mansion | 03/22/2006 |
| 04000029 | Benjamin H Snyder House | 02/11/2004 |
| 72001288 | General Horatio Gates House, "Traveler's Rest" | 11/15/1972 |
| 99000285 | Sunnyside Farm | 03/18/1999 |
| 98001467 | Rellim Farm | 12/04/1998 |

**Figure 23: Historic Resources**

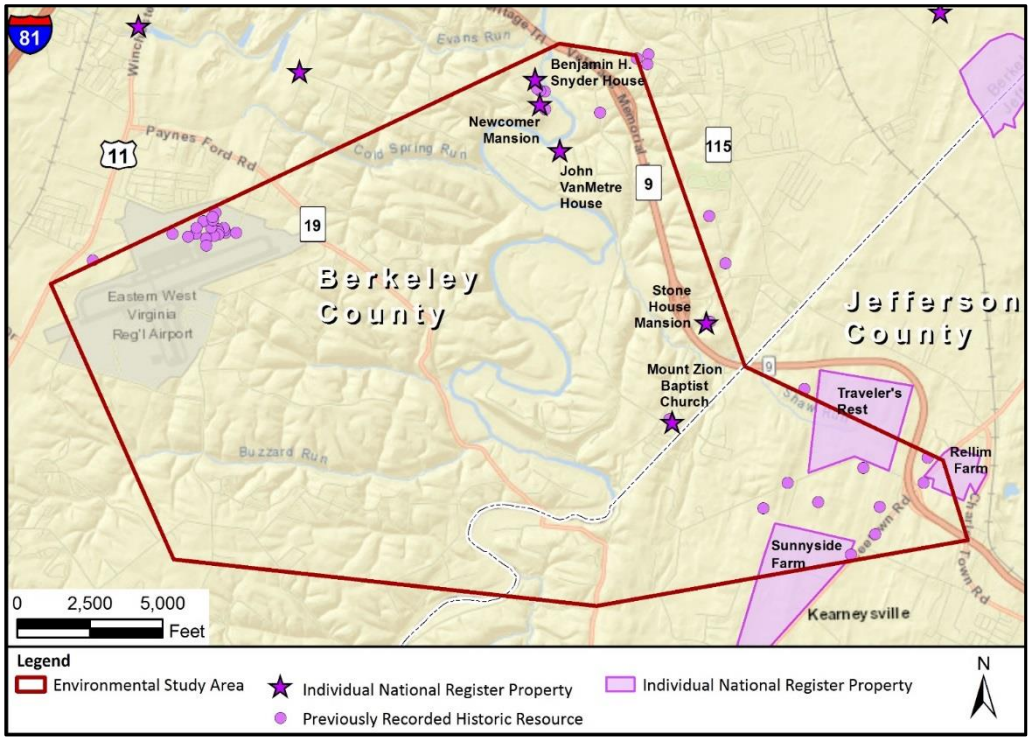


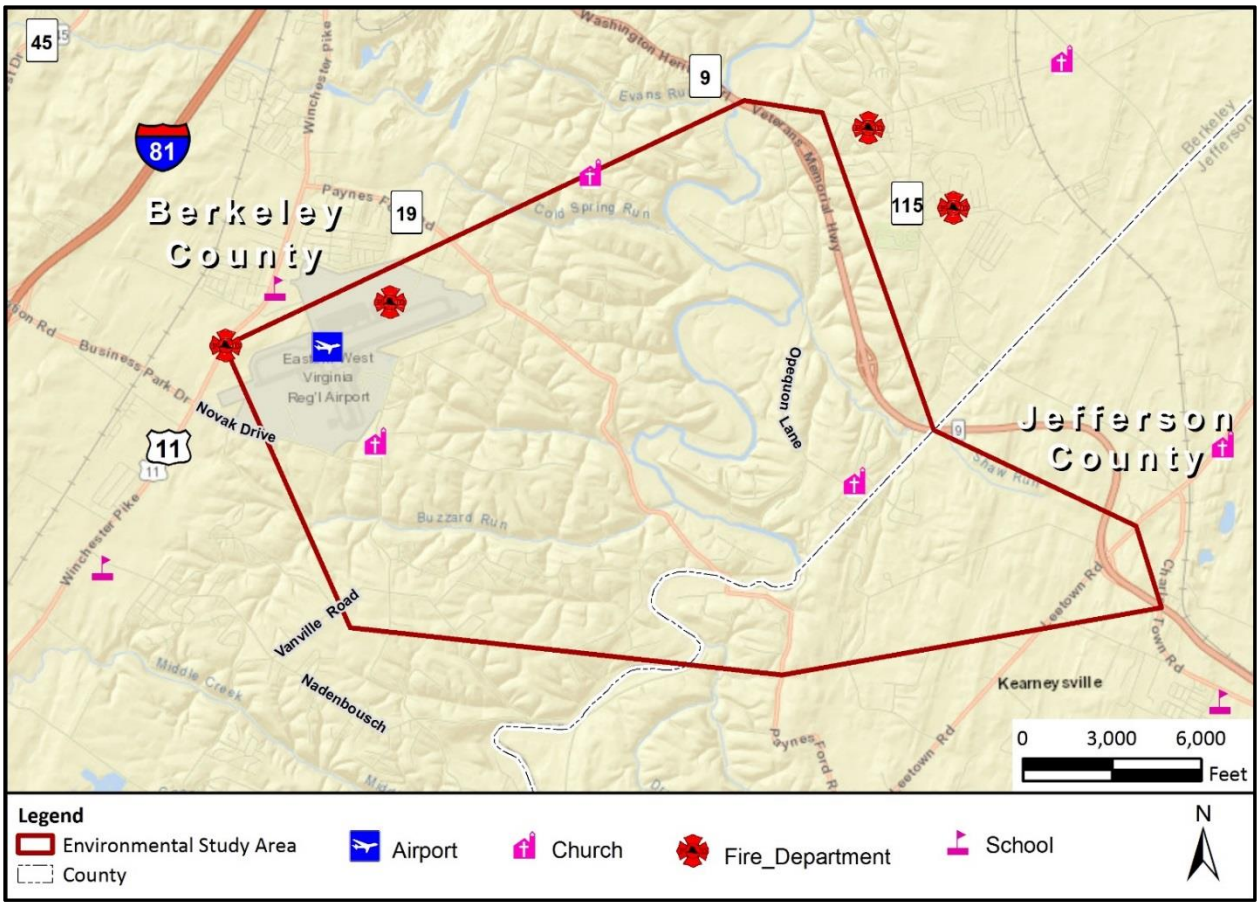
**Table 12: Previously Recorded Historic Resources**

| WVHPI # | NR Eligibility Status |
|---|---|
| BY-0019 | Not Eligible |
| BY-0047 | Not Eligible |
| BY-0065-0103 | Not Eligible |
| BY-0065-0104 | Not Eligible |
| BY-0065-0105 | Not Eligible |
| BY-0065-0106 | Not Eligible |
| BY-0065-0128 | Not Eligible |
| BY-0621 | Not Eligible |
| BY-0622 | Not Eligible |
| BY-0623 | Not Eligible |
| BY-0624 | Not Eligible |
| BY-0625 | Not Eligible |
| BY-0626 | Not Eligible |
| BY-0627 | Not Eligible |
| BY-0630 | Not Eligible |
| BY-0631 | Not Eligible |
| BY-0632 | Not Eligible |
| BY-0633 | Not Eligible |
| BY-0634 | Not Eligible |
| BY-0635 | Not Eligible |
| BY-0636 | Not Eligible |
| BY-0637 | Not Eligible |
| BY-0638 | Not Eligible |
| BY-0639 | Not Eligible |
| BY-0640 | Not Eligible |
| BY-0641 | Not Eligible |
| JF-0078-0111 | Not Eligible |
| JF-0078-0112 | Not Eligible |
| JF-0087 | Not Eligible |
| JF-0088 | Not Eligible |
| JF-0089 | Not Eligible |
| JF-0090 | Not Eligible |
| JF-0091 | Not Eligible |
| JF-0093 | Not Eligible |
| JF-0946 | Not Eligible |

## 7.8 Community Facilities

Schools, places of worship, hospitals, parks, police stations, fire departments, and recreational and public facilities (2016) were obtained from the West Virginia GIS Technical Center and Google Earth. The majority of the Environmental Study Area is rural with few community facilities. There are no known hospitals, parks, police stations or public facilities located within the Environmental Study Area. See **Figure 24** for the community facilities located within the Environmental Study Area.

**Figure 24: Community Facilities**




## 7.9 Section 4(f) and 6(f) Resources

Section 4(f) of the Department of Transportation Act of 1966, as amended (49 U.S.C. 3030) protects public parks, publicly owned recreation areas, wildlife and waterfowl refuges, and historic and/or cultural resources of national, state of local significance from conversion to highway use unless there is no prudent or feasible alternative.

Section 6(f) of the Land and Water Conservation Fund Act of 1965, (Public Law 88-578) prohibits property acquired or developed with assistance under the Act from being converted to other than public outdoor recreation uses without the approval of the Secretary of the Interior.

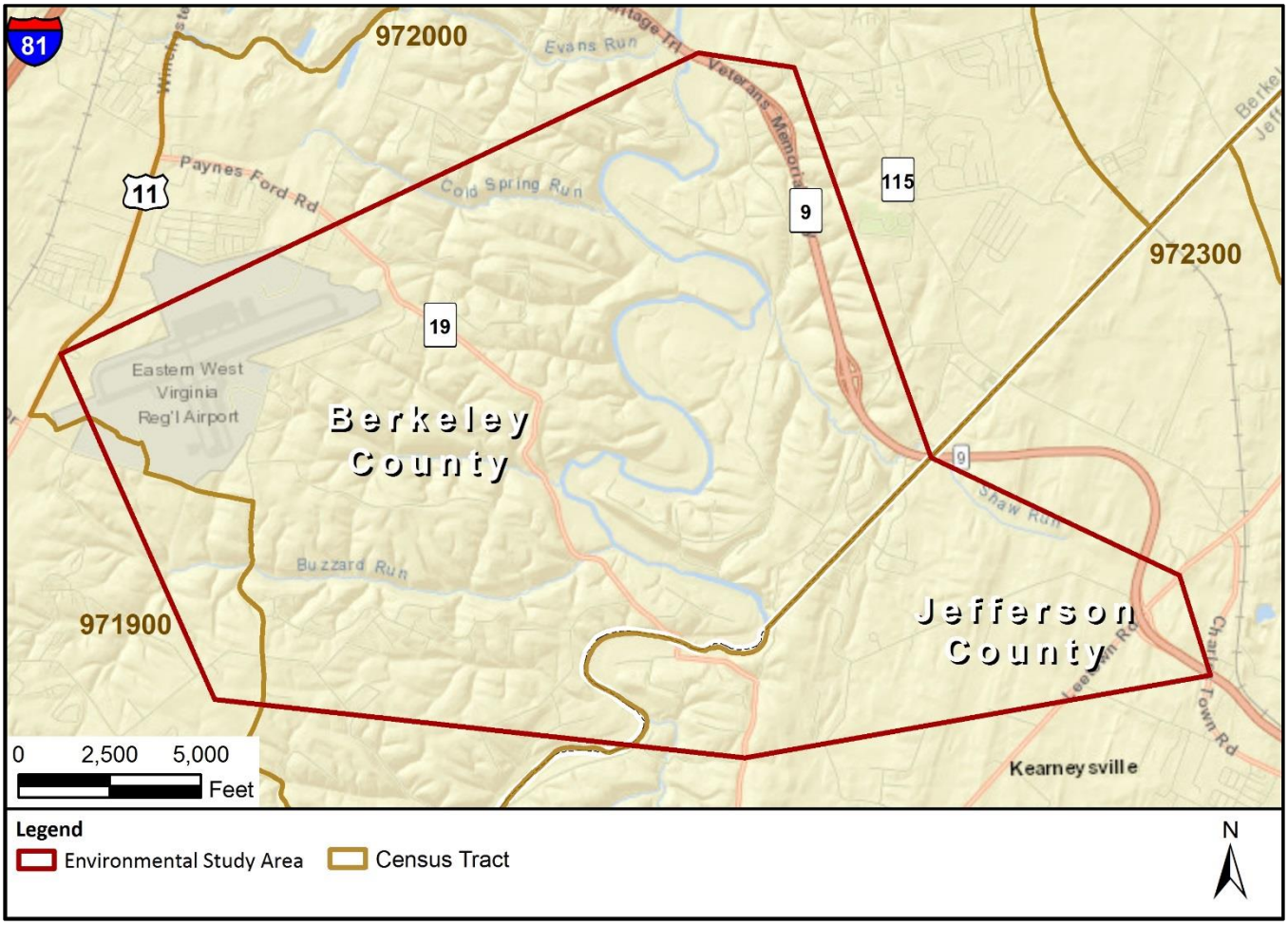
No resources protected by either Section 4(f) of Section 6(f) would be impacted by the No-Build or Build Alternatives.

## 7.10 Socioeconomics

The Environmental Study Area is located within Berkeley and Jefferson Counties in the northeast portion of the West Virginia, south of the city of Martinsburg. The Environmental Study Area is predominantly rural in nature with commercial and industrial growth occurring to the north and west of the Environmental Study Area.

The Environmental Study Area is primarily comprised of two census tracts divided at the county boundary between Berkeley and Jefferson Counties. Census tract 9720 is located within Berkeley County and Census tract 9723 is located within Jefferson County as shown on **Figure 25**.

**Figure 25: Census Tracts**




Race, age, income and language spoken at home were downloaded from the U.S. Census Bureau American Community Survey (2011-2015) to identify any disproportionately high populations within the Environmental Study Area. Below is a discussion of the findings for each of the categories.

### 7.10.1 Demographics

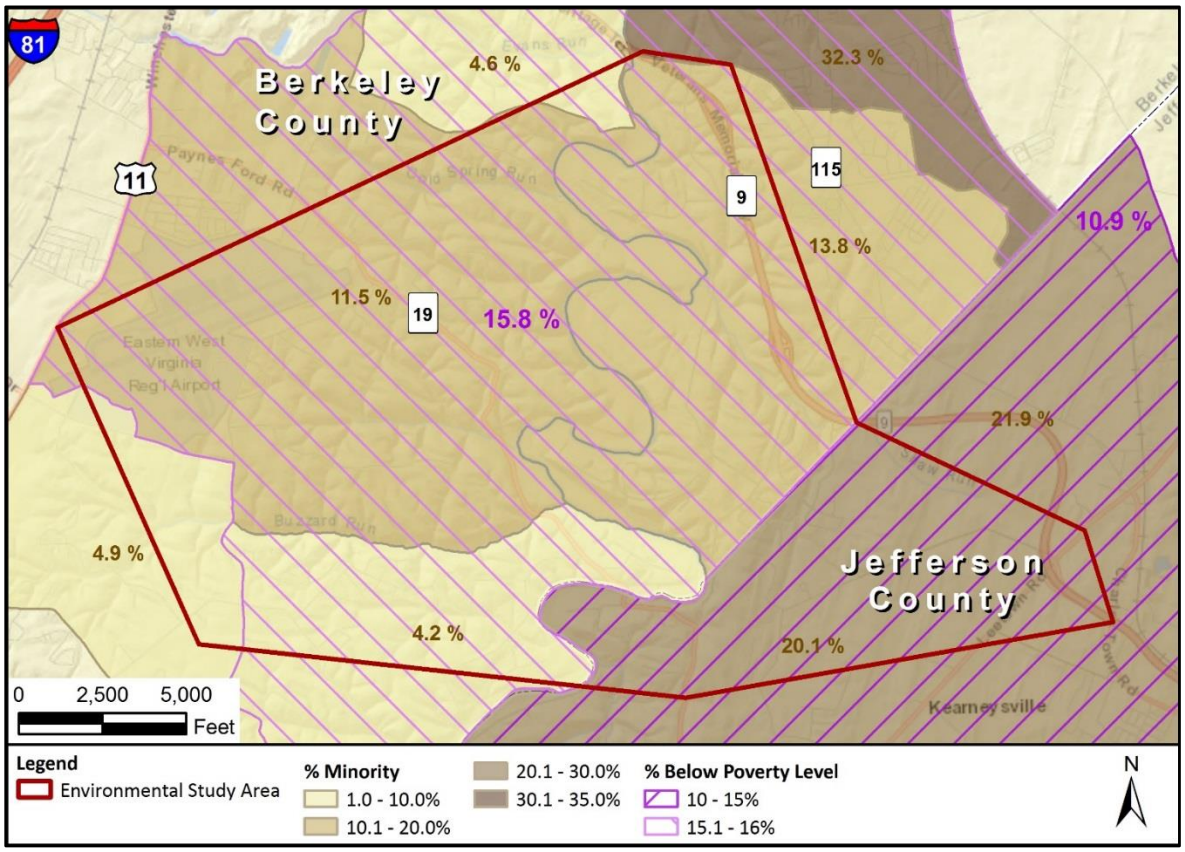
Between 2000 and 2010, the census tracts within the Environmental Study Area experienced a 46% increase in population, with the Census Tract within Berkeley County experiencing the largest increase of 66%. Between 2010 and 2015, a 6% increase in population occurred overall with the Census Tract in Jefferson County experiencing a larger growth of 7% as shown in **Table 13**.

Minority populations larger than the state of average of 6.4% comprise most of the Environmental Study Area with the largest minority population located in Jefferson County. See **Figure 26** for the percentages of minority population by census block within the Environmental Study Area.

**Table 13: Total Population**

| | BERKELEY Census Tract 9720 | | Jefferson Census Tract 9723 | | TOTALS | |
|---|---|---|---|---|---|---|
| Year | Total Population | % Change | Total Population | % Change | Total Population | % Change |
| 2015 | 12,386 | 5% | 4,864 | 7% | 17,250 | 6% |
| 2010 | 11,756 | 66% | 4,516 | 12% | 16,272 | 46% |
| 2000 | 7,075 | - | 4,020 | - | 11,095 | - |

**Figure 26: Environmental Justice**



### 7.10.2 Economic Environment

American Community Survey data (2011-2015) containing information on income by census tract was downloaded from the U.S. Census American Fact Finder website. The median household income within the Environmental Study Area averages above the West Virginia state average of $41,751. Census Tract 9720 within Berkeley County has a median household income of $52,125 and Census Tract 9723 within Jefferson County has a median household income of $69,364.

The percentage of individuals with income below the poverty level within the Environmental Study Area is less than the West Virginia state average of 18%. Census Tract 9720 in Berkeley County has 15.8% below the poverty level and Census Tract 9723 has 10.9% below the poverty level, both less than the state average. See **Figure 26** for percentages of individuals with income below the poverty level by census tract.

### 7.10.3 Language

American Community Survey data (2011-2015) containing information on language by census tract was downloaded from the U.S. Census American Fact Finder website. The percentage of limited English-speaking households within the Environmental Study Area is 0% for both census tracts. The West Virginia state average is 0.3%.

## 7.11 Hazardous Materials

U.S. EPA environmental data (2017) was downloaded from the EnviroMapper website for Berkeley and Jefferson Counties. Remediation Open Dumps (2017) and voluntary remediation sites (2017) were downloaded from the West Virginia Department of Environmental Protection. **Figure 27** shows the hazardous materials within the Environmental Study Area.

- Air Emission Sites

  There are no Air Emission sites located directly within the Environmental Study Area. One (1) site is located to the east of the Environmental Study Area along WV 9 near the Short Road interchange.

- Toxic Release Sites

  There are no Toxic Release sites located within or in the vicinity of the Environmental Study Area.

- Hazardous Waste Sites

  There are three (3) Hazardous Waste Sites located within the Environmental Study Area. All the sites are located near or within the Eastern West Virginia Regional Airport and include WVARNG – Martinsburg Armory, Tiger Aircraft LLC, and Emivest Aerospace Corporation.

- Water Discharge

  There are thirty-five (35) Water Discharge sites located within the Environmental Study Area. Several sites are located near the Eastern West Virginia Regional Airport and the remaining sites are dispersed throughout the Environmental Study Area.

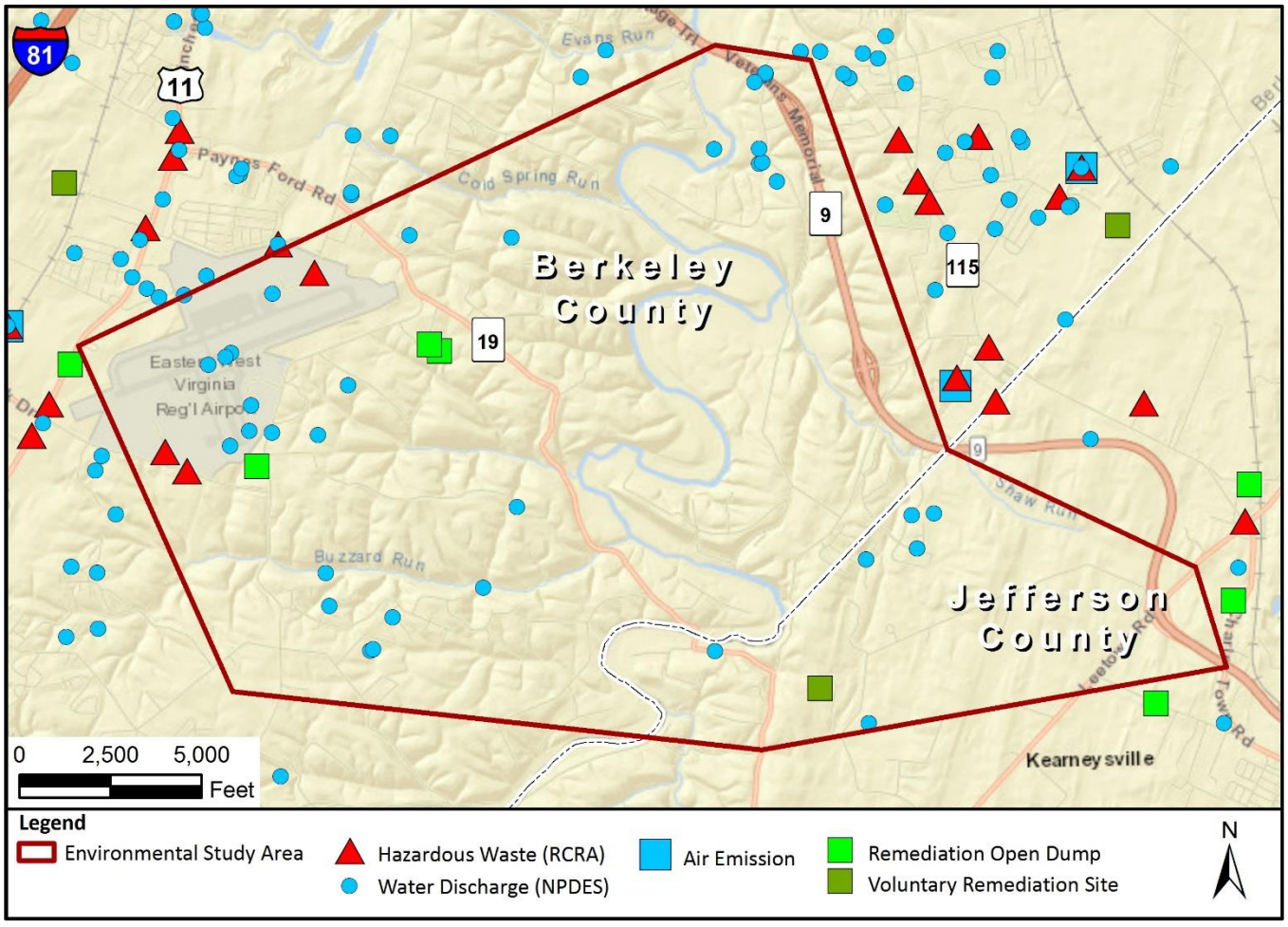
- Remediation Open Dumps

  There are three (3) remediation dumps within the Environmental Study Area. One is located along Airport Road near the Eastern West Virginia Regional Airport and two sites are located along Paynes Ford Road.

- Voluntary Remediation Site

  There is one (1) voluntary remediation site within the Environmental Study Area. The site is located within Jefferson County along Paynes Ford Road.

**Figure 27: Hazardous Materials**




## 7.12 Geology

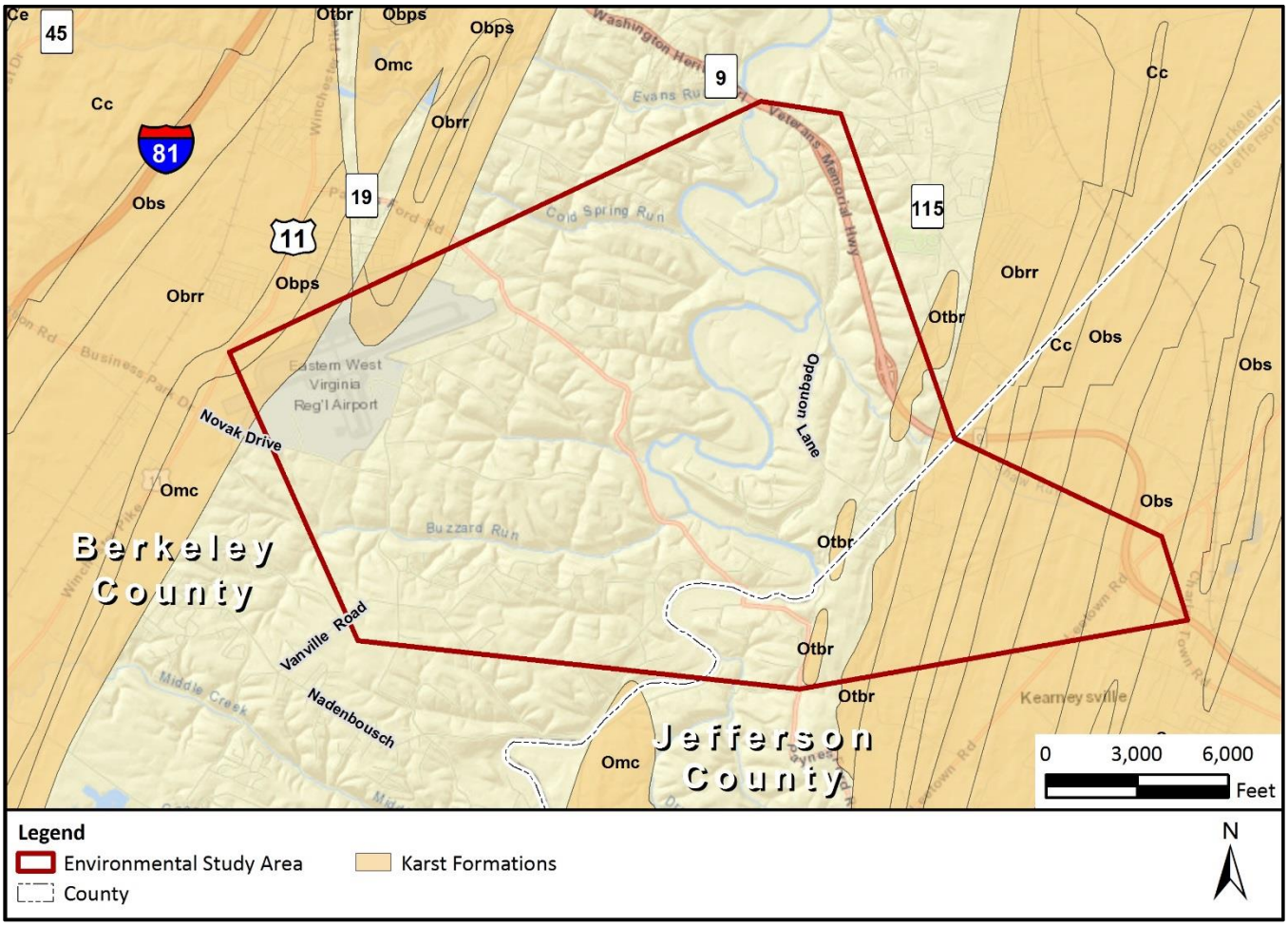
### 7.12.1 Karst

Karst (1968) mapping was downloaded from the West Virginia GIS Technical Center. Karst formations are located predominately within the Jefferson County portion of the Environmental Study Area as shown on **Figure 28**.

## 7.13 Mining

Active Mining Program Geodatabase (2017) was downloaded from the West Virginia Department of Environmental Protection (WVDEP) containing mining permit boundaries, mining limits, valley fills, refuse structures and mining permit locations. There are no active mining permits located within the Environmental Study Area.

**Figure 28: Karst Formations**

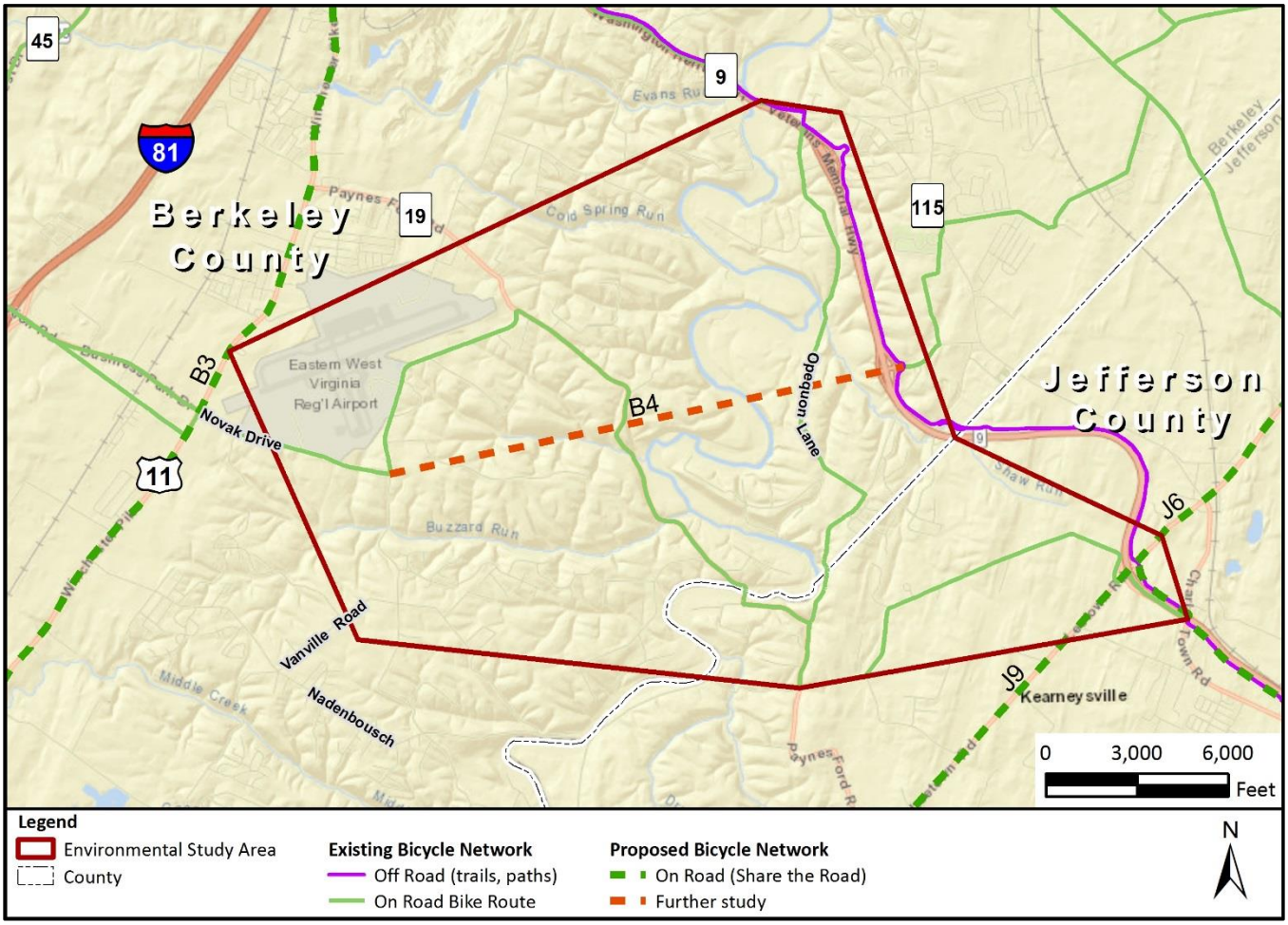



## 7.14 Pedestrian / Bicycle Accommodations

Existing and planned Pedestrian / Bicycle facility information was obtained from the *HEPMPO Regional Bike Study* (2016). Within the Environmental Study Area, there is a dedicated off-road pedestrian / bicycle facility located parallel to WV 9 and extensive on-road bicycle routes that are used for recreational purposes. The HEPMPO

Regional Bike Study recommended a future pedestrian / bicycle facility be included as part of the Novak Drive Connector Study. **Figure 29** identifies the existing and planned pedestrian / bicycle facilities with the Environmental Study Area.

**Figure 29: Pedestrian / Bicycle Accommodations**




# 8 STAKEHOLDER AND PUBLIC COORDINATION

Initial coordination with area stakeholders and the public was undertaken as part of the planning process and will be continued as the project advances into the Preliminary Design / NEPA phase. Coordination included two stakeholder workshops, a web-based survey, and a public workshop.

## 8.1 Stakeholder Workshops

Two stakeholder workshops were held to engage interested stakeholders and to solicit input early in the planning process.

The first stakeholder workshop was held on December 13, 2016 to introduce the project and study process; and solicit input on the study goals and objectives, potential Study Area issues and potential alternative corridors. The meeting was attended by representatives of the City of Martinsburg, Berkeley County Development Authority, Eastern Panhandle Transit Authority, Procter & Gamble, Winchester and Western Railroad, Eastern West Virginia Regional Airport, and the Air National Guard. The attendees identified potential project goals and objectives that

included improving mobility, promoting economic development, improving safety and protecting the environment.

A second stakeholder workshop was held on June 27, 2017 to update the stakeholder on the project status, study goals and objectives, results of the initial safety and traffic analysis and solicit input on the preliminary alternative corridors. There was no consensus expressed for any of the alternatives, but attendees suggested incorporating WVDOH's proposed WV 45 improvements into the analysis. The Eastern West Virginia Regional Airport representative expressed preference for Alternative 1. The attendees generally agreed with the analysis and preliminary alternatives presented.

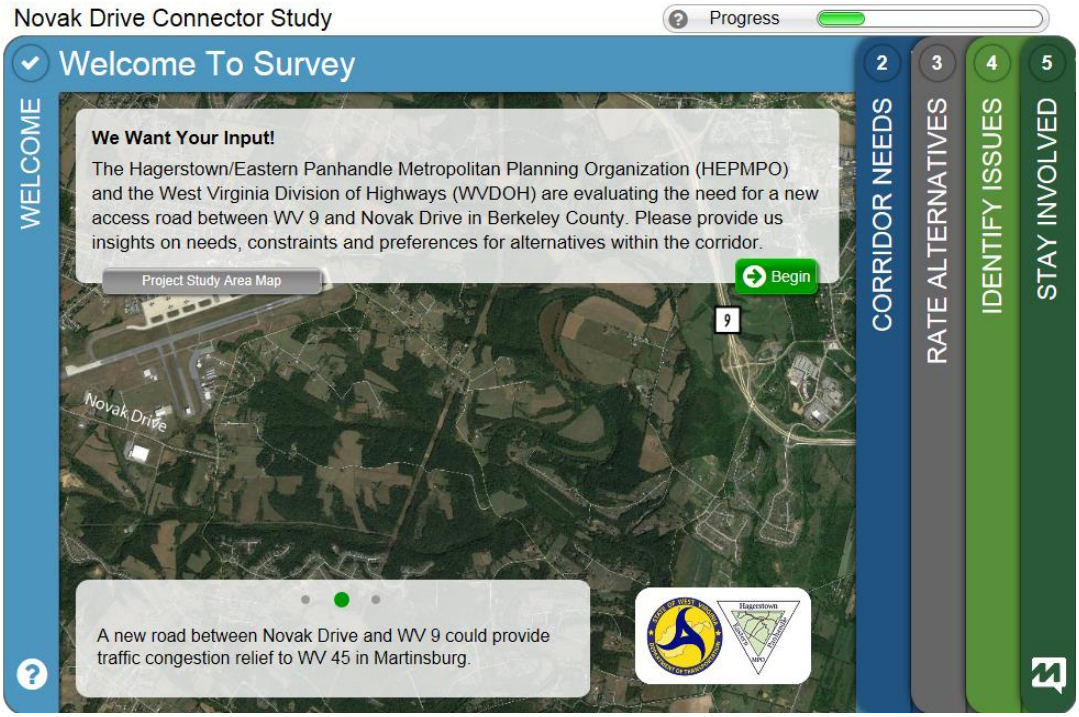
Meeting summaries, including meeting minutes, presentation and sign in sheets, from the stakeholder workshops are included in **Appendix D**.

## 8.2 Web-Based Survey

A web-based survey, hosted by MetroQuest, was available on the internet from June 12th through July 12th to provide stakeholders and the public information about the project and an opportunity to share their insights and recommendations for the project. There were over 370 visitors to the site with about 260 visitors providing significant content.

The survey consists of five (5) survey screens by topic, including Welcome, Corridor Needs, Rate Alternatives, Identify Issues, and Stay Involved as shown on **Figure 30**.

**Figure 30: Web-Based Survey**



### 8.2.1 Corridor Needs

The Corridor Needs screen listed seven (7) transportation needs that corresponded with the Goals and Objectives defined for the project as discussed in Section 4. The Corridor Needs included Mobility, Preserve Rural Character, Traffic Congestion, Economic Development, Transit Service, Transportation Safety and Bike & Pedestrian Access. Responders were asked to rank the most important transportation needs in the Project Study Area from most important to least important. The survey results showed that Preserve Rural Character, Traffic Congestion and Transportation Safety were ranked as the top three needs by the most responders, with Preserve Rural Character ranked as the most important need as shown on **Figure 31**.

**Figure 31: Corridor Needs Results**

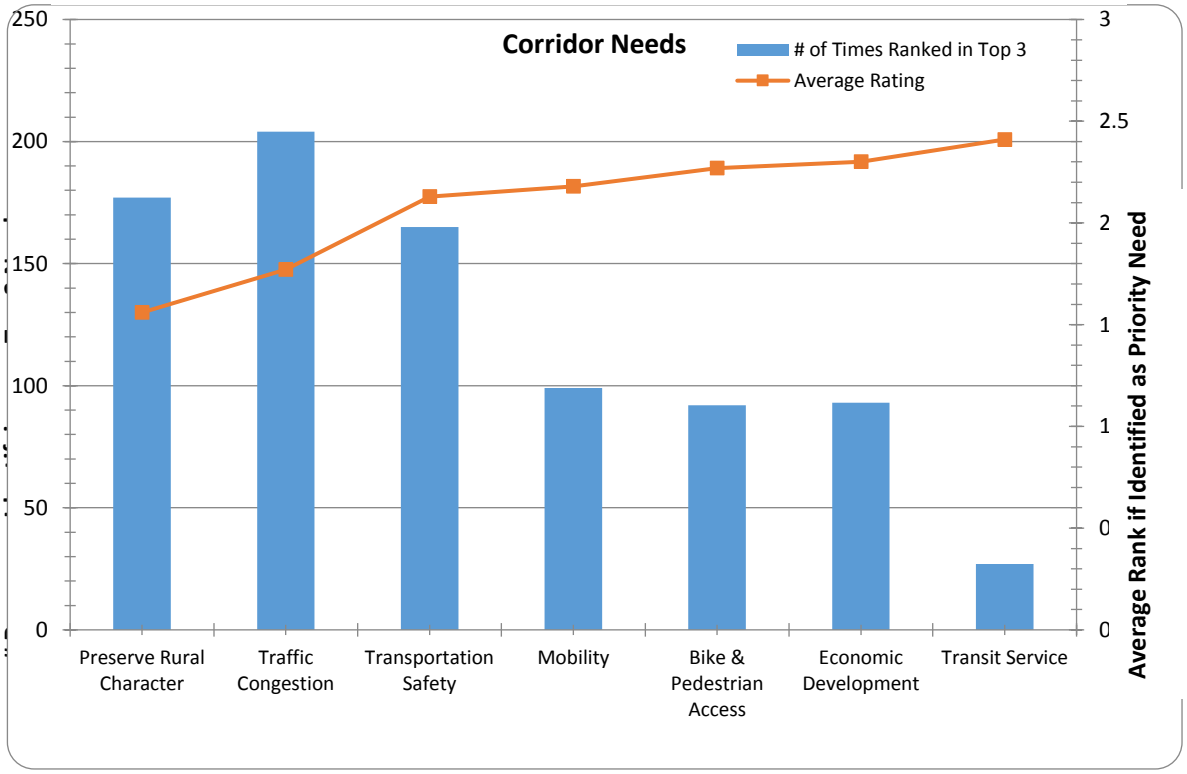



Figure 31: Corridor Needs Results**Average Rank if Identified as Priority Need**

### 8.2.2 Rate Alternatives

The Rate Alternatives screen described each of the four preliminary alternatives, including the No Build, with a map showing the location of each 500-foot corridor. Responders were asked to rate each preliminary alternative with 1 to 5 stars, with 5 stars being the highest ranking. The survey results showed the highest ranked alternative was the No Build, followed by Alternative 2, Alternative 1, and Alternative 3 as shown in the results on **Figure 32**.

Respondents provided over 100 comments in regards to the alternatives with the most of the comments supporting the No Build and the desire to preserve the rural character of the area, limit impacts to farmlands, and suggested making improvements to US 11, WV 45 and I-81 to relieve congestion in lieu of building a new roadway. It should be noted that Novak Drive Connector is proposed as an additional project beyond the improvements already planned on WV 45 and WV 51. Respondents in support of Alternative 1 recommended revisions to the

alignment to follow Airport Road and Paynes Ford Road to reduce potential impacts. **Table 14** summarizes the comments by support or opposition for each of the preliminary alternatives.

**Figure 32: Rank Alternatives Results**

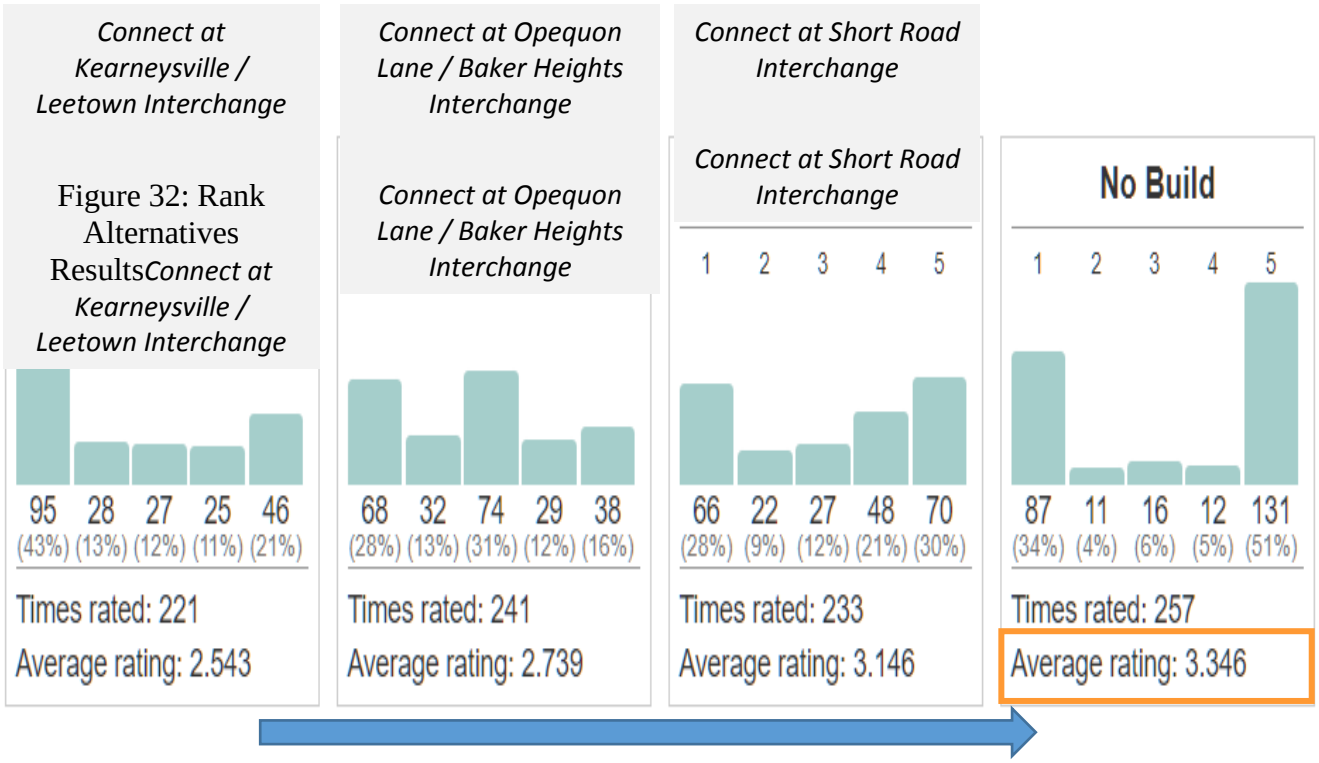


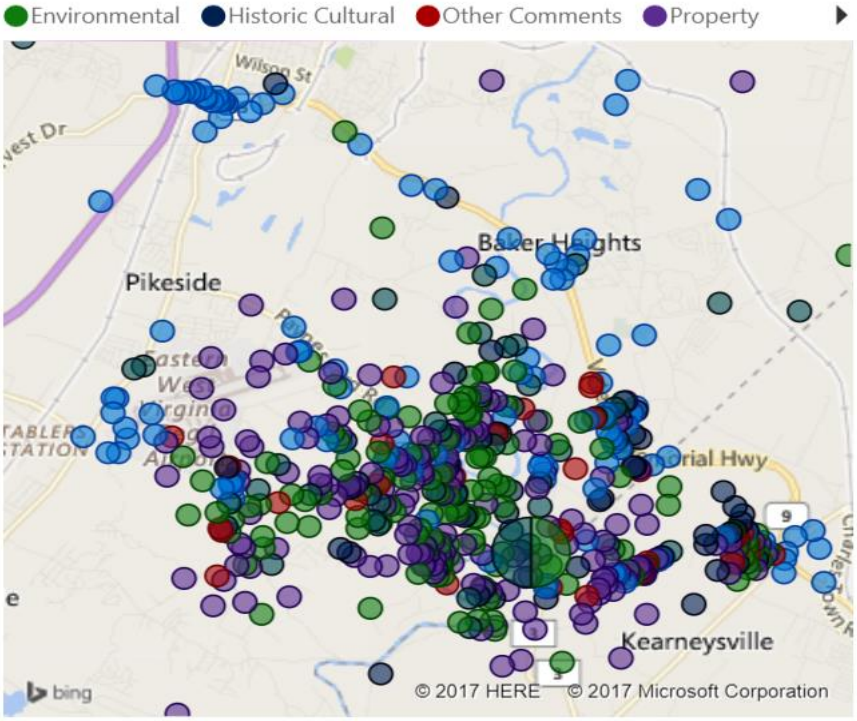

**Table 14: Web-Based Survey Rate Alternatives Comment Summary**

| Alternative | Support | Opposed |
|---|---|---|
| No Build | 16 | 4 |
| Alternative 1 | 9 | 15 |
| Alternative 2 | 17 | 18 |
| Alternative 3 | 7 | 29 |

### 8.2.3 Identify Issues

The Identify Key Issues screen allowed responders to identify key issues within the Study Area by placing markers on specific locations to identify important features and concerns. Environmental, Historic & Cultural, Recreational, Property, Traffic and Other Comment markers could be placed on the map along with a description and comment. Responders placed 596 markers with the largest number being property type markers, followed by Environmental, Traffic, Historic/Cultural, Recreational and Other as shown in the results on **Figure 33**.

**Figure 33: Identify Key Issues Results**




| Category | # Markers |
|---|---|
| Property | 184 |
| Environmental | 148 |
| Traffic | 129 |
| Historic / Cultural | 50 |
| Recreational | 48 |
| Other Comments | 37 |
| **TOTAL** | **596** |

### 8.2.4 Stay Involved

The Stay Involved screen collected information on respondents including age, gender, home zip code and work zip code. Respondent are from eighteen (18) zip codes, primarily within Jefferson and Berkeley Counties, WV and range in age with the majority between 41 and 60 years of age as shown on **Figure 34**. Responders also had the opportunity to enter an email address to stay involved with future updates to the project with146 email addresses collected.

## 8.3 Public Workshop

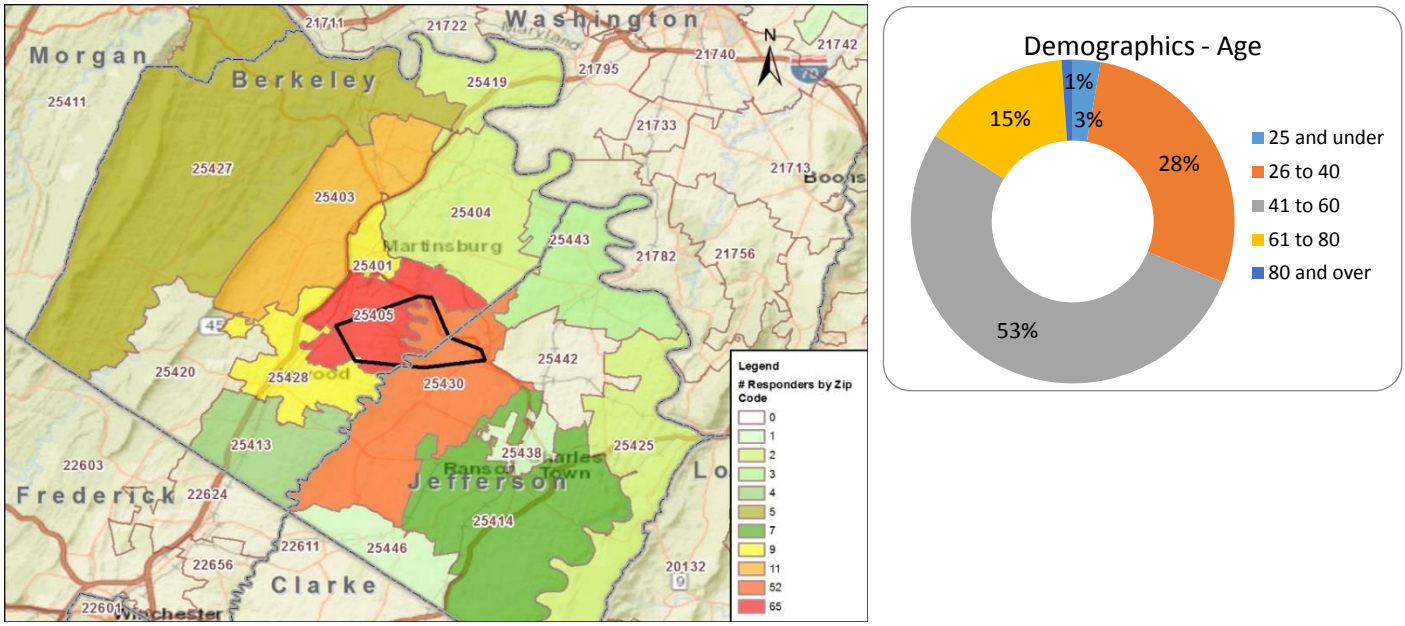
An open forum public workshop was held in Martinsburg on June 27, 2017 to provide information about the study and seek public input. Information on meeting date, location, time and content was publicized in area newspapers. Notifications of the public workshop were advertised in the Journal on June 24th and the Herald on June 15th and 21st. A project flyer announcing the meeting was also sent to one-hundred twenty-nine (129) residents within each of the preliminary alternative corridors in Berkeley and Jefferson Counties. See **Appendix E** for a copy of the newspaper notifications, project flyer mailing and meeting handouts.

The public workshop allowed the public to talk with project representatives and review display boards containing the project goals and objectives, results of the safety and traffic analysis, and the preliminary alternative corridors. Handouts of the display boards were distributed to the attendees. A station was available for attendees to complete the Web-Based survey along with a station to complete a comment form.

Over fifty (50) people attended the public workshop and twenty-four (24) comment forms were received at the workshop. Public concern with all the preliminary alternatives was the proximity to and potential loss of personal

property. The majority of the attendees supported the No Build alternative and expressed concern over impacts to large farm tracts and the preserving the rural character of the area.

**Figure 34: Respondents Demographic Results**




## 8.4 Comment Form

A comment form was available at the Public Workshop and also on the WVDOH website to solicit public input on the study and the preliminary alternative corridors. Thirty-six (36) comment forms were received between June 27th and July 28th and three (3) comment letters. The majority of the comments support the No Build alternative, preserving farmlands and the rural character of the area, and recommend less expensive improvements to area roadways in leu of a new roadway. As previously noted the Novak Drive Connector is proposed as an additional project beyond the improvements already planned on WV 45 and WV 51. Several comments supported Alternative 1 but recommended revising the alternative to follow existing Airport Road and Paynes Ford Road to minimize potential impacts and reduce overall cost. Several individuals expressed opposition to Alternative 3 due to the proximity to residential neighborhoods and historic properties located along Bowers Road. **Table 15** summarizes the comments by support or opposition for each of the preliminary alternatives. See **Appendix F** for a table containing the comment form comments received and a copy of the letters received.

**Table 15: Comment Summary**

| Alternative | Support | Opposed |
|---|---|---|
| No Build | 19 | - |
| Alternative 1 | 8 | - |
| Alternative 2 | 2 | 3 |
| Alternative 3 | - | 10 |

# 9 PRELIMINARY SCREENING

## 9.1 Key Project Issues Screening

Key project issues were selected to aid in identifying the conceptual alternatives that represent the best opportunity to minimize the overall cost and impacts to the social, natural and cultural environments. A preliminary screening of the key issues for the three (3) preliminary alternative corridors was prepared. The screening may help to identify any alternatives that are unreasonable so that no alternative(s) will be needlessly carried forward into the NEPA process. The preliminary screening is based on secondary data collected for this study, as described in Section 7. The screening of the secondary data was based on 500-foot corridors and therefore actual impacts could be substantially less. **Table 16** presents the results of the key project issues preliminary screening. See **Figure 35** for an overview of the key issues and the preliminary alternative corridors.

**Table 16: Key Project Issues Screening**

| Key Issue | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| Total Cost (2017 $) | $ 28,221,600 | $ 21,489,600 | $ 28,036,800 |
| Total Length (miles) | 5.0 miles | 3.4 miles | 5.4 miles |
| Bridge over Opequon Creek (feet) | 600 feet | 500 feet | 550 feet |
| Stream Crossings | 6 | 5 | 3 |
| Residential (acres) | 221 acres | 15 acres | 93 acres |
| Farmland (acres) | 143 acres | 327 acres | 214 acres |
| # of Parcels | 84 | 44 | 103 |

### 9.1.1 Alternative 1

Alternative 1 is the most expensive alternative and requires the longest bridge over the Opequon Creek due to the width of the 100-year floodplain at that location. Additionally, this alternative has the largest potential to impact stream crossings. Finally, Alternative 1 has the greatest potential to minimize dissecting large farm tracts and best balances potential residential and farmland impacts.

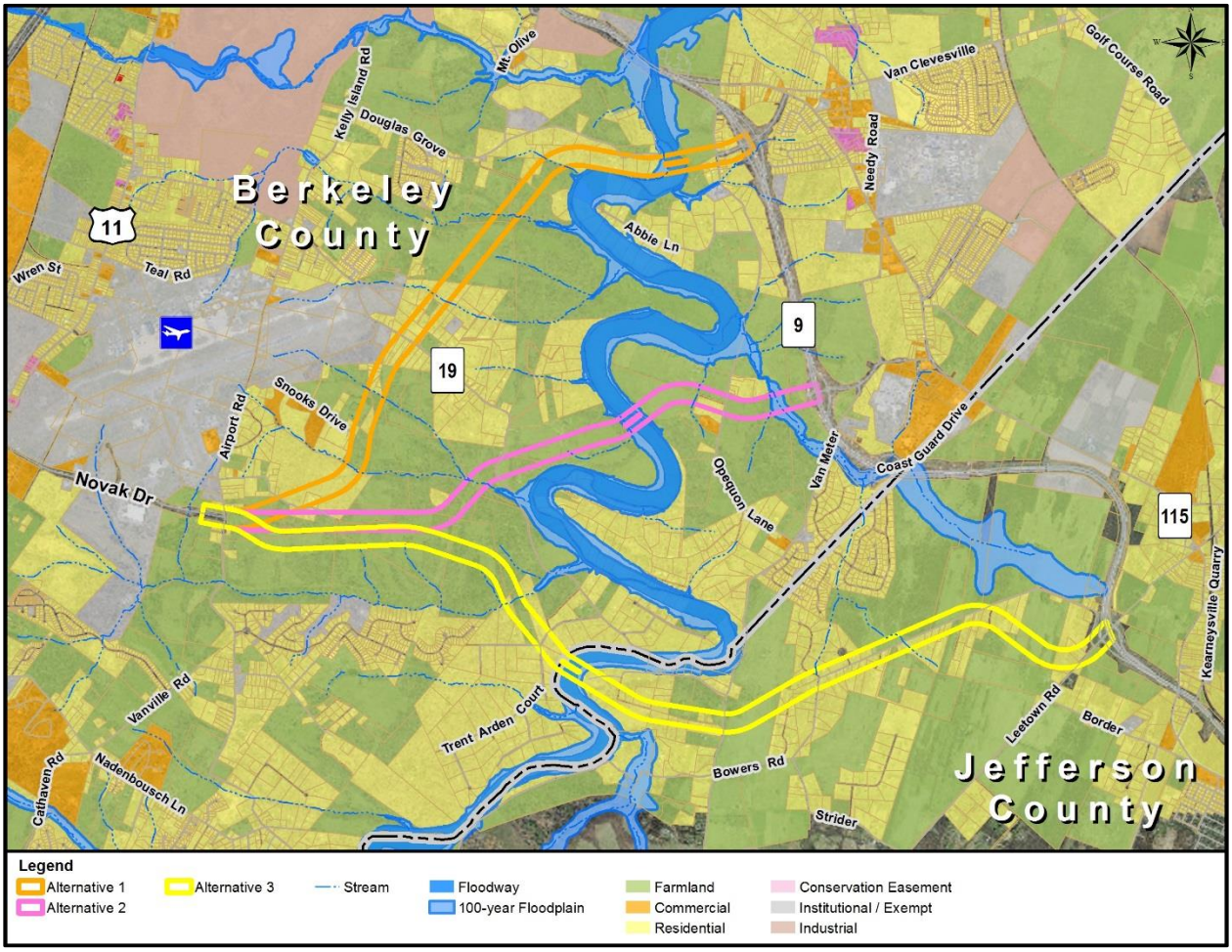
### 9.1.2 Alternative 2

Alternative 2 is the shortest, least expensive alternative and requires the shortest bridge over the Opequon Creek. However, Alternative 2 has the largest potential to dissect large farm tracts with the highest number of farmland acres while minimizing the potential to impact residential neighborhoods.

### 9.1.3 Alternative 3

Alternative 3 is the longest alternative and second most expensive alternative. Additionally, this alternative has the least potential to impact stream crossings. Finally, Alternative 3 has the largest potential to impact residential neighborhoods due to existing development along Bowers Road near the WV 9 Kearneysville interchange.

Figure 35: Key Issues Screening




## 9.2 Additional Resources Screening

Additional resource screening was prepared to identify potential impacts to natural and cultural resources that may require agency coordination and/or technical assessments during the NEPA phase.

### 9.2.1 Farmland Soils

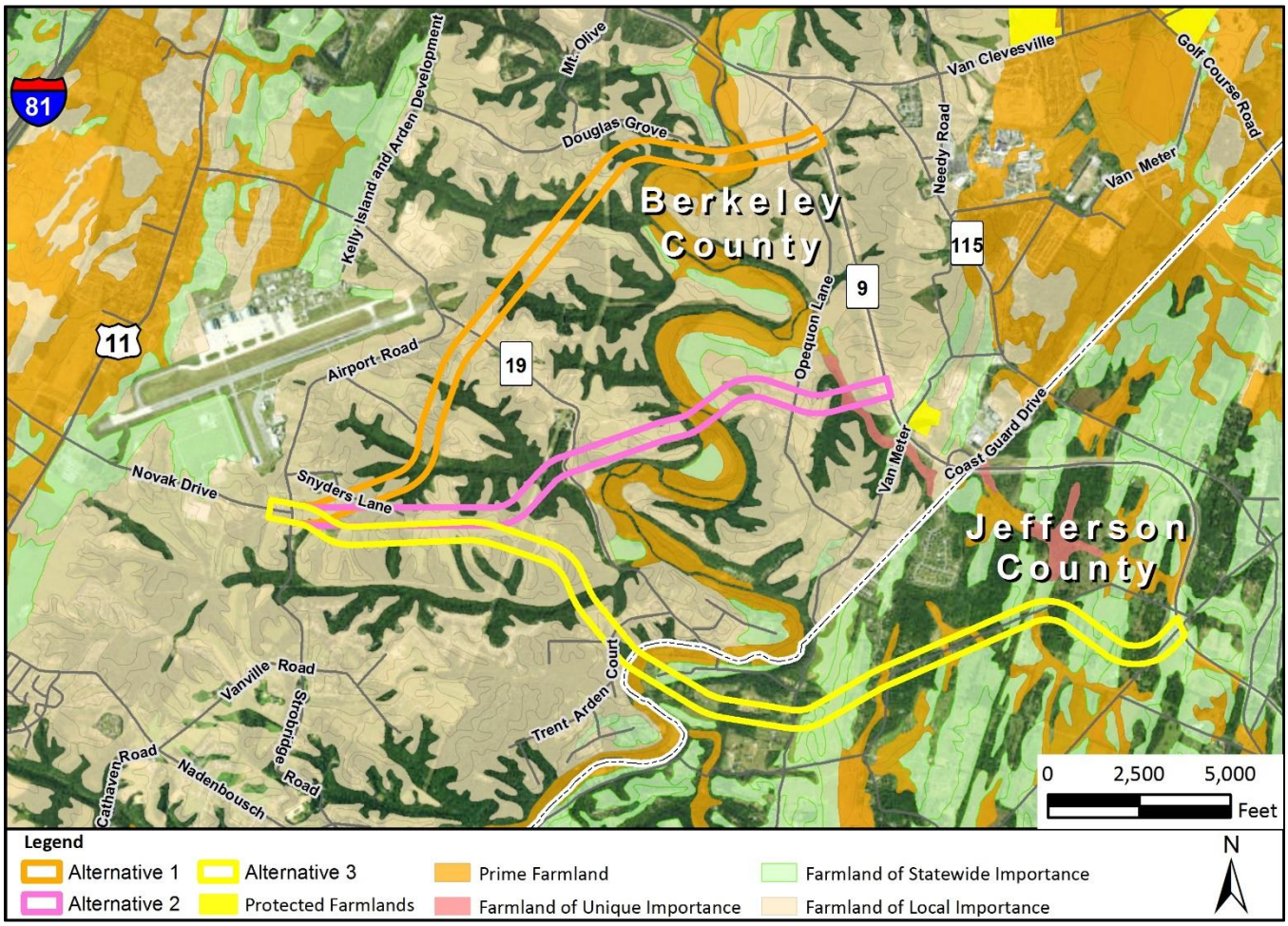
**Table 17** presents the farmland soil impacts for each of the preliminary alternative corridors. All of the preliminary alternatives will impact prime farmland soils and farmland soils of local importance. Alternative 3 has the largest potential to impact prime farmlands while Alternative 1 has the least potential. Overall Alternative 2 has the largest potential to impact all farmland soil types while Alternative 1 has the least potential to potentially impact farmland soils.

**Figure 36** depicts the farmland soils in relation to the preliminary alternative corridors. A Farmland Conversion Impact Rating Form will need to be completed and coordinated with NRCS for review and completion during the NEPA phase. No protected farmlands are impacted by any of the preliminary alternatives.

**Table 17: Farmland Soils (acres)**

| Farmland Soils | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| Prime Farmland Soil | 7.8 | 87.2 | 104.0 |
| Farmland of Unique Importance | - | 29.3 | - |
| Farmland Soil of Statewide Importance | - | 53.9 | 327.2 |
| Farmland Soil of Local Importance | 155.9 | 1,106.5 | 653.1 |
| **TOTAL FARMLAND SOILS** | **163.7** | **1,276.9** | **1,084.3** |

**Figure 36: Farmland Soils**




## 9.2.2 Noise

Noise impacts are determined based on the degree to which the proposed improvements cause noise levels to approach, equal or exceed the established noise level activity category criteria and/or by how much the predicted

sound levels increase over the existing condition as a result of the proposed improvements. The noise planning analysis evaluated sound levels for each of the three (3) preliminary alternative corridors for the 2040 design year. The results of the planning analysis are indicative of predicted straight-line road to receptor highway traffic sound level emissions with no elevation changes and no intervening building, tree or terrain shielding. The impacts for each of the preliminary alternatives do not reflect potential displacements.

The noise analysis determined that receptors located within sixty (60) feet of the proposed improvements are predicted to experience a sound level that approaches, equals or exceeds the 66 dBA criteria. Receptors located within 160 feet of the proposed improvements are predicted to experience an increase of 15 or more dBA over the existing condition.

The potential number of sensitive receptors that equal or exceed the noise criteria for residential receptors are presented in **Table 18**. All of the sensitive receptors are residential dwelling units. Alternative 3 has the largest number of potential impacts while Alternative 2 has the least potential for noise impacts. A detailed noise analysis will be required during the NEPA process to evaluate possible substantial noise criteria impacts and receptors approaching, equaling or exceeding the noise level criteria. If noise impacts are predicted, a mitigation analysis will be required during the NEPA process to determine if noise abatement measures are required for any of the impacted sites.

The potential number of sensitive receptors where a substantial increase in noise would occur due to the proposed improvements are presented in **Table 18**. All of the sensitive receptors are residential dwelling units. Alternative 3 has the largest number of potential impacts while Alternative 2 has the least potential for noise impacts.

**Table 18: Number of Potential Design Year (2040) Noise Impacts**

| Noise Analysis | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| Sensitive Receptors Equaling or Exceeding the Noise Criteria ≥ 66 dBA | 13 | 4 | 28 |
| Sensitive Receptors with Substantial Noise Increase Criteria ≥ 15 dBA | 16 | 5 | 16 |
| Total Number of Impacts | 29 | 9 | 44 |

### 9.2.3 Water Resources

Streams

**Table 19** presents the total length of streams in miles impacted by each of the 500-foot wide preliminary alternative corridors. All of the preliminary alternatives will cross Opequon Creek. Alternative 3 will have the least impact on Opequon Creek and Alternative 2 will have the greatest impact. All of the alternatives propose to bridge the crossing of Opequon Creek which will minimize the direct impact. Several named streams and unnamed

tributes will be impacted by all of the preliminary alternatives. Alternative 1 has the greatest potential and Alternative 3 has the least potential to impact streams.

**Figure 37** shows the streams in relation to the preliminary alternative corridors. Consultation for the Clean Water Act Section 404 permit and the Section 401 Water Quality Certification will be required during the NEPA process.

**Table 19: Length of Stream Crossing (feet)**

| Stream Crossing | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| Opequon Creek | 576.7 | 624.2 | 505.3 |
| Buzzard Run | - | - | 513.6 |
| Cold Spring Run | 650.6 | - | - |
| Shaw Run | - | 519.0 | - |
| Sulphur Spring Branch | 529.3 | 608.3 | - |
| Unnamed Tributary 1 | 646.3 | - | - |
| Unnamed Tributary 2 | 527.1 | - | - |
| Unnamed Tributary 3 | 510.9 | 96.5 | - |
| Unnamed Tributary 4 | 510.7 | - | - |
| Unnamed Tributary 5 | - | 507.9 | - |
| Unnamed Tributary 6 | - | 616.4 | - |
| Unnamed Tributary 7 | - | 524.3 | - |
| Unnamed Tributary 8 | - | - | 550.8 |
| Unnamed Tributary 9 | - | - | 165.3 |
| Unnamed Tributary 10 | - | - | 78.6 |
| Unnamed Tributary 11 | - | - | 13.5 |
| **TOTAL LENGTH OF STREAMS CROSSED** | **3,951.6** | **3,496.6** | **1,827.1** |
| **TOTAL # OF STREAMS CROSSED** | **7** | **7** | **6** |

Wetlands

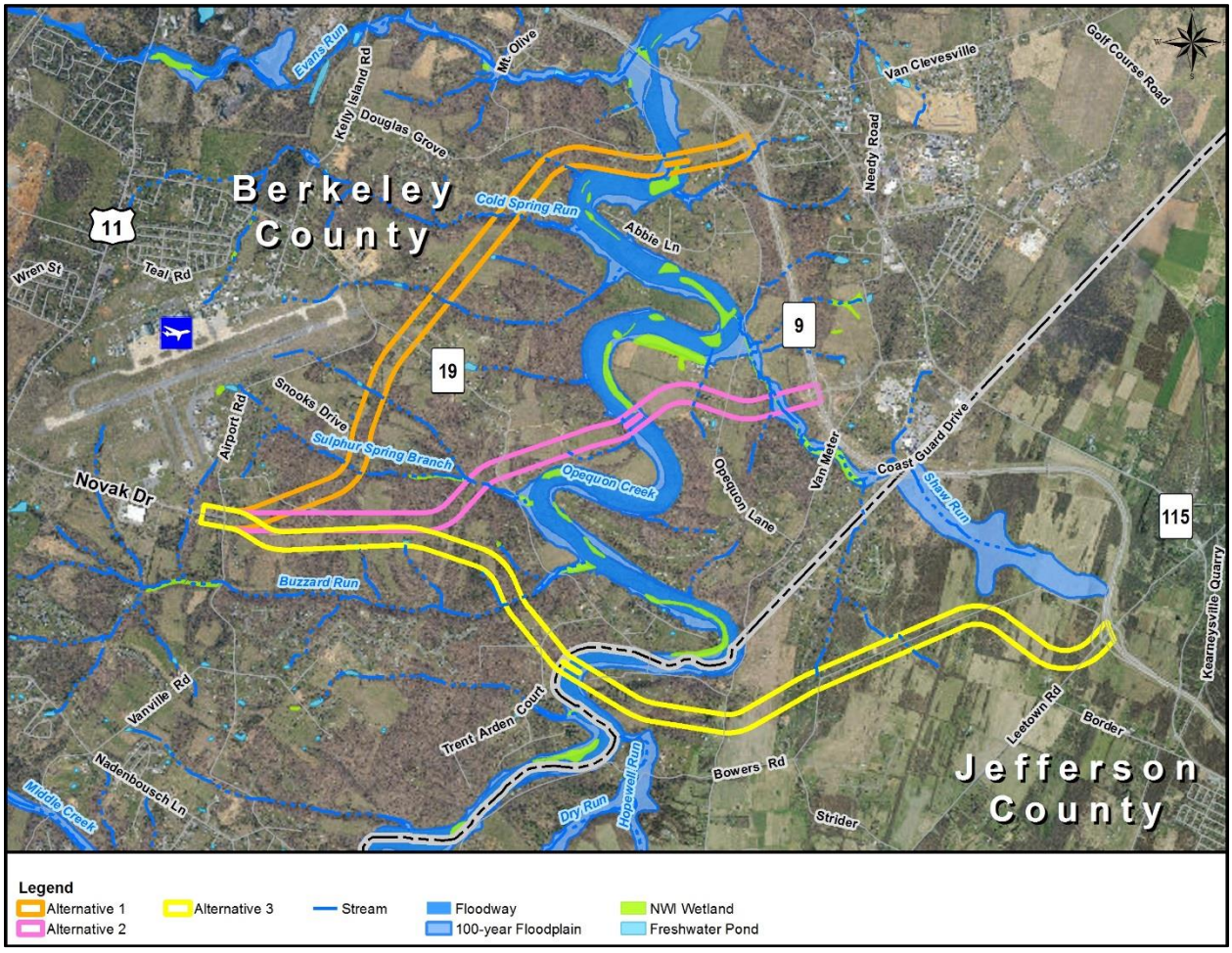
**Table 20** presents potential impacts to wetlands by each of the 500-foot preliminary alternative corridors. All of the preliminary alternatives have the potential to impact wetlands. Alternative 2 has the smallest potential to impact wetlands and ponds while Alternative 3 has the greatest potential.

**Figure 37** shows the wetlands in relation to the preliminary alternative corridors. Consultation for the Clean Water Act Section 404 permit will be required during the NEPA process.

**Table 20: NWI Wetlands and Ponds (# and acres)**

| NWI Wetlands and Ponds | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| Freshwater Forested/Shrub Wetland | 1 (0.72 acres) | 1 (0.24 acres) | 1 (0.41 acres) |
| Freshwater Emergent Wetland | - | 1 (0.24 acres) | 1 (0.74 acres) |
| Freshwater Pond | 2 (0.08 acres) | - | 4 0.78 acres) |

**Figure 37: Water Resources**




## Floodplains

**Table 21** presents the potential impacts to 100-year floodplains and floodways by each of the 500-foot preliminary alternative corridors. All of the preliminary alternatives have the potential to impact 100-year floodplain and

floodway along Opequon Creek but all of the preliminary alternatives propose to bridge the crossing of Opequon Creek which will minimize the direct impact. Alternative 3 has the smallest potential to impact the floodway and 100-year floodplain.

**Figure 37** shows the 100-year floodplain and floodway in relation to the preliminary alternative corridors. Coordination with local floodplain management will be required during the NEPA process.

**Table 21: 100-year Floodplains and Floodway (acres)**

| Flood Type | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| 100-year Floodplain | 6.2 | 13.9 | 3.1 |
| Floodway | 11.2 | 9.4 | 5.8 |

### 9.2.4 Cultural Resources

Archaeology

**Table 22** presents the potential impacts to previously identified archaeological sites by each of the preliminary alternative corridors. Alternative 1 has the most potential to impact identified Archaeological Sites while Alternative 3 has the least potential. Given the general lack of cultural resource investigations in the Environmental Study Area however, the information in **Table 12** is of limited value for a comprehensive discussion of potential impacts within the established preliminary alternatives. The number of archaeological sites for each alternative will reasonably change following a program of systematic subsurface testing. Accordingly, coordination with the SHPO, additional research, and a Phase I Cultural Resources Survey will be required during the NEPA process.

**Table 22: Known Archaeological Site Impacts**

| Archaeology | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| Known Archaeological Site | 2 | 1 | 0 |

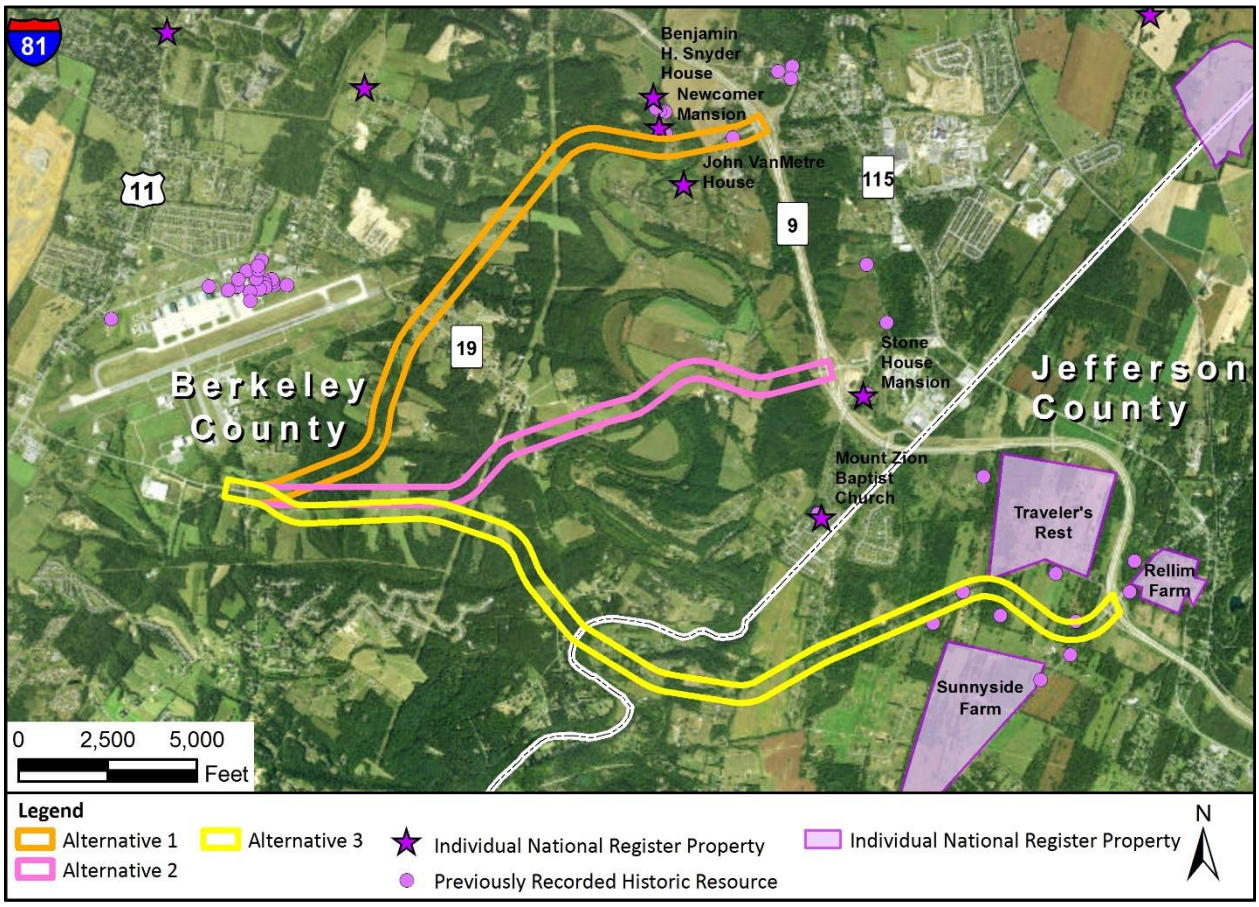
**Historic Resources**

None of the preliminary alternatives impact individual National Register properties, National Register historic districts, or previously recorded historic resources of undetermined or eligible National Register status. Previously recorded historic resources located within the preliminary alternative corridors are not eligible for National Register status. **Figure 38** shows the historic resources in relation to the preliminary alternative corridors. Coordination with the SHPO, additional research, and a Historic Resources Survey will be required during the NEPA process.

### 9.2.5 Wildlife Resources

A USFWS and WVDNR records review was requested for rare, threatened and endangered species or sensitive habitats. WVDNR Natural Heritage Program responded in a letter dated September 11, 2017, that there are no

**Figure 38: Historic Resources**




known records of any state listed Rare, Threatened or Endangered (RTE) Species within the project area (see **Appendix A** for correspondence). The WVDNR Wildlife Resources Section stated that no surveys have been conducted in the area for rare species or rare species habitat and consequently, their response is based on information currently available and cannot be considered a comprehensive survey of the area under review. Further consultation will be required during the NEPA process.

Additionally, based on a WVDOH geographic information system (GIS) preliminary review, the Environmental Study Area is within the range of the federally listed Madison Cave Isopod (Antrolana lira). This isopod is a freshwater crustacean that lives in flooded limestone caves beneath ground surface. Construction in areas previously undisturbed and within karst topography will require additional coordination with the USFWS during the next phase of the Study.

### 9.2.6 Section 4(f) / 6(f) Resources

Section 4(f) protects public parks, publicly owned recreation areas, wildlife and waterfowl refuges, and historic and/or cultural resources of national, state or local significance. There are no public parks, publicly owned recreation areas or wildlife and waterfowl refuges within the Environmental Study Area. Further evaluation of cultural resources will be required during the NEPA process to identify any potential Section 4(f) impacts.

# 10 CONCLUSION

Three (3) preliminary conceptual alternatives and the No-Build Alternative have been identified and initial engineering and environmental review have been done for this study. A summary of the traffic analysis and how the goals and objectives are satisfied is discussed below.

## 10.1 Traffic Analysis

The traffic analysis concluded that in addition to the improvements already planned on WV 45 and WV 51 the proposed Novak Drive improvements will provide significant traffic volume reduction on local roads such as Kelly Island Road and US 11. They do not significantly improve congestion on WV 45 at US 11 and I-81 since traffic is forecast to be avoiding those intersections by using local roads. Additionally, the number of intersections with poor levels of service for the future build does not improve versus the future no-build condition.

Key intersections that are predicted to experience a poor level of service in the Build condition could be mitigated by the addition of turning lanes and in some cases, through lanes. See Appendix B for identified mitigation measures.

## 10.2 Goals and Objectives

The study results show that while some of the major goals and objectives of the study were met, there are some that are not fully satisfied. Specifically, objectives associated with providing access to the Tabler Station area and improving multi-modal connectivity were satisfied with the preliminary alternative corridors. However, objectives associated with reducing congestion and truck traffic along WV 45 were not fully satisfied. Additionally, the environmental goal to preserve the rural character of the area by appropriately controlling access was not fully satisfied. While controlled access will limit development, the preliminary alternatives do not avoid impacting large farm tracts that make up much of the landscape in the area. The following subsections identify the goals and objectives for the study and if the objective was addressed.

### 10.2.1 Mobility Goal:

Improve access between WV 9 and the airport area / I-81 while alleviating congestion on area roadways.

| Objective | Addressed |
|---|---|
| Reduce traffic on WV 45 by providing an alternate access to I-81 | Limited reduction to traffic on WV 45 at US 11/I-81 but significant reduction on local roads such as Kelly Island Road and US 11 |
| Provide additional access to the Tabler Station area | Yes |
| Improve multimodal connectivity by facilitating improved transit service, bicycle/ pedestrian accommodations and access to the Eastern West Virginia Regional Airport | Yes |

### 10.2.2 Safety Goal

Improve the level of safety for motorists in the Study Area.

| Objective | Addressed |
|---|---|
| Reduce truck traffic along WV 45 and other major arterials by providing an alternate route | Limited reduction to traffic on WV 45 at US 11/I-81 but significant reduction on local roads such as Kelly Island Road and US 11 |
| Divert traffic away from or make improvements to high crash locations | Yes, improvements to US 11/Novak Drive but no improvements to high crash locations along WV 45 and WV 51 |
| Improve bicycle / pedestrian safety by providing appropriate accommodations | Yes |

### 10.2.3 Economic Development Goal

Support planned development and promote future growth in the area.

| Objective | Addressed |
|---|---|
| Provide additional access to the Tabler Station area | Yes |
| Promote growth in downtown Martinsburg through congestion relief on WV 45 and highway signage for downtown Martinsburg | Limited congestion relief on WV 45 but highway signage could be added along connector to promote downtown Martinsburg |
| Promote freight growth by providing improved access to I-81 | Yes |

### 10.2.4 Environmental Goal

Protect and preserve the environment in the Study Area.

| Objective | Addressed |
|---|---|
| Minimize impacts to the Opequon Creek and other environmental and cultural resources | Yes, impacts to environmental and cultural resources minimized to the extent possible |
| Preserve the rural character of the area by appropriately controlling access | No, rural character impacted even with controlled access |
| Minimize noise impacts by avoiding sensitive locations | Yes, impacts to sensitive locations minimized to the extent possible |
| Improve air quality by reducing traffic congestion | No |

## 10.3 Alternatives

Based on the traffic analysis, preliminary screening, public comments and the assessment of how well the project goals and objectives were met, the project team suggests the following with respect to the preliminary alternatives:

### 10.3.1 Alternative 1

Comments from the public and the Eastern West Virginia Regional Airport recommend revising Alternative 1 to follow Airport Road and Paynes Ford Road to provide better access to the airport and reduce impacts and construction costs by utilizing the existing roadway network. If the project moves forward, this study recommends reevaluating and refining the alignment of Alternative 1.

### 10.3.2 Alternative 2

Public input identified concerns that Alternative 2 bisects large farm tracts and would negatively affect farm operations. If the project moves forward, this study recommends refining Alternative 2 to minimize or mitigate bisecting farm operations through extensive coordination with land owners and careful consideration of access control.

### 10.3.3 Alternative 3

There were many public comments opposing Alternative 3 due to its proximity to residential neighborhoods. Additionally, Alternative 3 is the longest alternative, does not improve access to the Martinsburg area and is not expected to relieve congestion on area roadways near Tabler Station. If the project moves forward, this study recommends eliminating Alternative 3 from further study.

## 10.4 Next Steps

Future planned development in the area may increase the need for the proposed improvements to address safety and mobility issues. The study recommends that future development be monitored, including the density and locations of the developments, to identify if there may be a need for a future supplemental study or to refine the traffic projections and to reevaluate the proposed improvements.

If the project moves forward, a comprehensive environmental evaluation of potential alternatives will be performed in accordance with the National Environmental Policy Act (NEPA). Adoption of a Preferred Alternative is a task completed during the NEPA process as a result of a complete analysis of the alternatives' satisfaction of the project purpose and need; environmental and socio-economic impacts, public support and project costs.