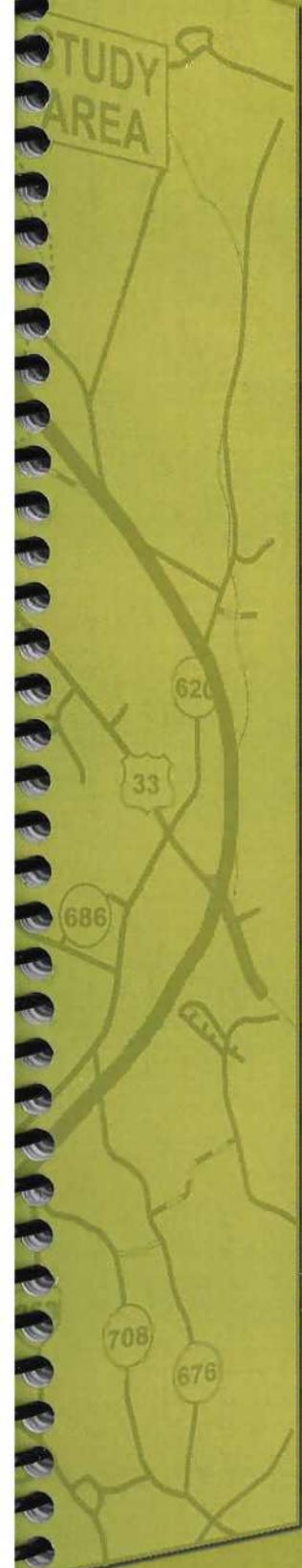


DRAFT ENVIRONMENTAL IMPACT STATEMENT

HARRISONBURG Southeast Connector

**U.S. Department of Transportation
Federal Highway Administration
Virginia Department of Transportation**

**Cooperating Agencies:
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service**



HARRISONBURG SOUTHEAST CONNECTOR LOCATION STUDY

Rockingham County and City of Harrisonburg, Virginia

From: U.S. Route 11

To: U.S. Route 33

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Submitted Pursuant to: 42 U.S.C. 4332(2) (C)

By:

U.S. Department of Transportation

Federal Highway Administration

and

Virginia Department of Transportation

Cooperating Agencies:

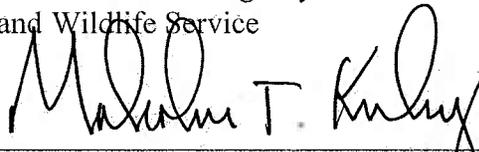
U.S. Army Corps of Engineers

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

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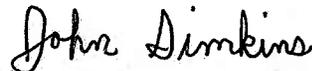
Date of Approval



Chief Engineer
Virginia Department of Transportation

3/23/06

Date of Approval



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This Environmental Impact Statement presents analyses of alternatives to serve identified travel mobility and capacity needs between U.S. Route 11 and U.S. Route 33 in the area southeast of the City of Harrisonburg. Five Candidate Build Alternatives have been evaluated in detail, along with the No-build Alternative. Also presented are the environmental consequences of the alternatives and the coordination efforts with agencies, organizations, and the public.

Comments on this Draft Environmental Impact Statement are due by **MAY 26 2006** and should be sent to Mr. Earl T. Robb at the above address.



SUMMARY

S.1 PROJECT DESCRIPTION AND LOCATION

The Virginia Department of Transportation (VDOT), in cooperation with the Federal Highway Administration (FHWA), is studying alternatives to meet transportation needs in the southeastern Harrisonburg metropolitan area between U.S. Route 11 and U.S. Route 33. **Figure S-1** shows the study area location and boundaries. This study arose out of a perceived need on the part of local officials and legislators for a connector road across the study area between I-81 and U.S. Route 33. Funding for a location study was included in the Virginia Transportation Act of 2000 by the Virginia General Assembly and in the Six-year Improvement Program by the Commonwealth Transportation Board. The study area boundaries encompass a portion of the City of Harrisonburg and a sector of Rockingham County southeast of the city limits that the county's government has designated for development.

S.2 PURPOSE AND NEED

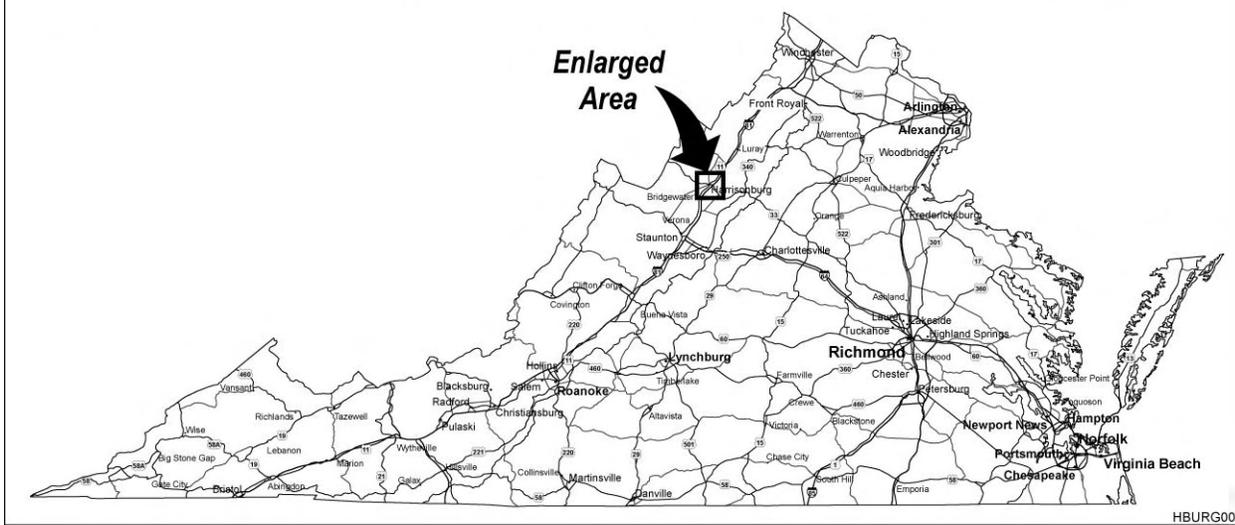
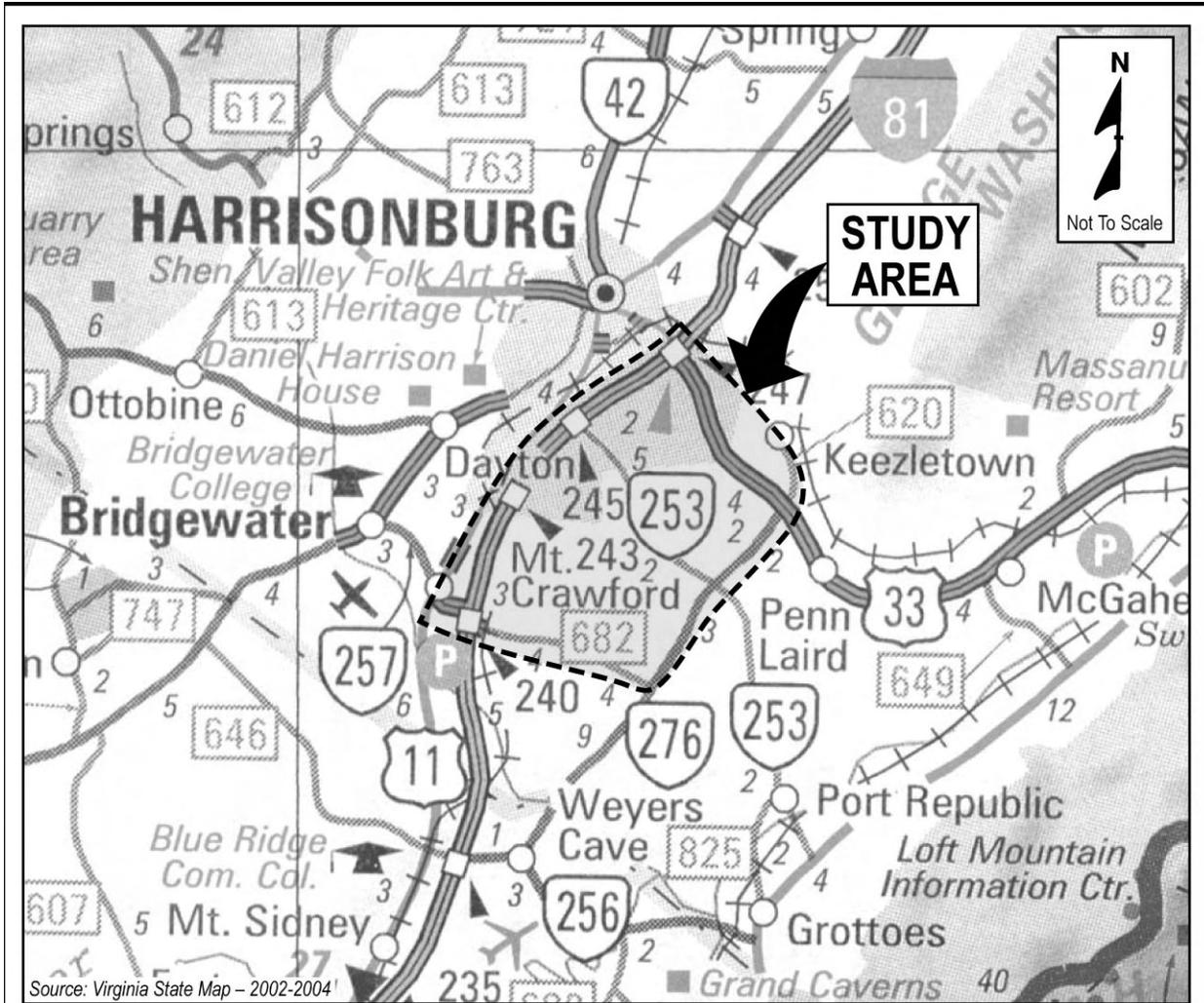
Two principal transportation needs are being considered in this Harrisonburg Southeast Connector Location Study: east-west mobility and accommodation of increasing travel demand arising from existing and future development in the study area.

S.2.1 East-west Mobility

Direct east-west links across the study area to connect major activity centers and major highways are limited. If one envisions Routes 11 and 81 along the west side of the study area and Route 33 along the northeast side of the study area as the legs of an "A," the crossbar of the A is missing. Most existing roads across the study area are secondary roads that are narrow, winding, hilly, and discontinuous - some are dirt roads little more than one lane wide. Travel across the study area from Route 11 or I-81 to Route 33, as well as travel among activity centers in the study area, is hampered by low speeds (because of poor road geometry), stops at intersections, and turns due to discontinuities in the routes. As development continues in the study area, and as the volume of travel among activity centers and major roadways continues to grow, mobility will become increasingly deficient.

S.2.2 Accommodate Travel Demand

While much of the study area is rural farmland today, Rockingham County's comprehensive plan designates most of the study area for residential, commercial, and industrial land uses, and proposes extensions of water and sewer services to serve that growth. Travel demand across the study area will grow along with population growth and development. Existing roads are not adequate to accommodate the expected increases in traffic volumes.



Harrisonburg Southeast Connector
Location Study

STUDY AREA
Figure S-1

S.3 ALTERNATIVES

A wide range of alternatives was considered initially, based on the identified purpose and need, suggestions received from citizens, proposals included in other local and regional planning efforts, and the conditions and constraints of the study area. A screening process was used to identify the alternatives to consider in detail, based on purpose and need, citizen input, environmental concerns, and engineering issues. The alternatives considered in detail include the No-build Alternative and five Candidate Build Alternatives. Combinations of multiple Candidate Build Alternatives also are discussed in this document.

S.3.1 No-build Alternative

The No-build Alternative is not a do-nothing alternative. Rather, it includes all transportation improvements in the study area that are funded for construction in the Harrisonburg-Rockingham Metropolitan Planning Organization's *2030 Transportation Plan* (adopted August 18, 2005) and in VDOT's current Six-year Improvement Program. They include the following:

- Friedens Church Road (Route 682). Reconstruction and realignment of Friedens Church Road to a standard two-lane rural roadway from the I-81 interchange to Route 995 (Koiner Ford Road).
- Stone Spring Road - Erickson Avenue Connector and Stone Spring Extension (Route 726). This series of projects will create a continuous four-lane divided highway from existing Erickson Avenue on the west side of Harrisonburg to the intersection of Port Republic Road (Route 253) and Reservoir Street (Route 710) in Rockingham County on the east side of Harrisonburg. The city portion of the project includes bicycle and pedestrian facilities and reconstruction of the Pear Street railroad crossing.
- Port Republic Road (Route 253). In the city and the county, from Neff Avenue to Boyers Road (Route 704), widen Port Republic Road to four lanes. The city portion of the project will include pedestrian and bicycle facilities.
- East Market Street (Route 33) Improvements. Two projects to improve East Market Street, including six-lane widening from Cantrell Avenue to the existing six-lane section and bicycle, pedestrian, and turning lane enhancements from Cantrell Avenue to the eastern city limits.
- Country Club Road. Add a center left-turn lane to Country Club Road from Linda Lane to Vine Street.
- Transportation System Management (TSM). Conduct an access management study along Route 33 east and coordinate traffic signals along Route 33, Route 11, and Route 253.
- Transit Services. Extend Harrisonburg Transit service to Bridgewater, conduct a regional transit study, and fulfill transit capital needs for bus replacements, transit shelters, and bus maintenance facilities.

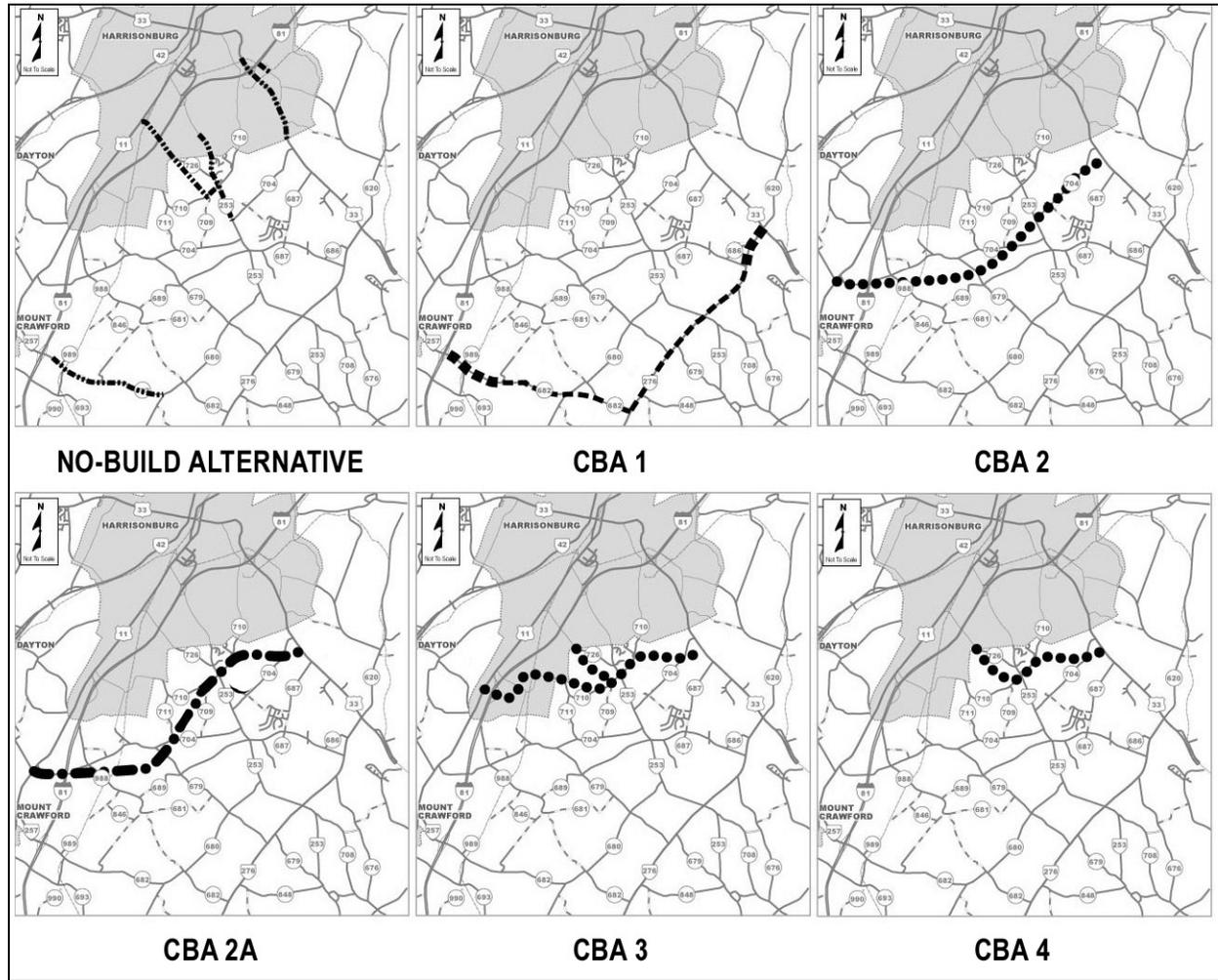
In addition, the No-build Alternative includes transportation improvements proffered by Rockingham Memorial Hospital as part the site approval process for its proposed relocation to a 254-acre site in the north central part of the study area.

S.3.2 Candidate Build Alternatives

The Candidate Build Alternatives (CBA) are summarized in **Table S-1**. **Figure S-2** illustrates them.

**Table S-1
 GENERAL DESCRIPTION OF CANDIDATE BUILD ALTERNATIVES**

	CBA 1	CBA 2	CBA 2A	CBA 3	CBA 4
General Location	Southern portion of study area, follows Rte 682 and Rte 276	Middle portion of study area, Rte 704 vicinity	Middle portion of study area, Rte 704 vicinity	Northern portion of Study Area, Rte 710/704 vicinity	Northern portion of Study Area, Rte 726/710/704 vicinity
From	I-81 at Exit 240, Rtes 257 and 682	U.S. Route 11 south of Rte 704	U.S. Route 11 south of Rte 704	U.S. Rte 11 at Exit 243, I-81 interchange	Route 726 near the Harrisonburg city limits
To	U.S. Rte 33 at Rte 276	U.S. Route 33 south of Rte 704	U.S. Route 33 south of Rte 704	U.S. Route 33 south of Rte 704	U.S. Route 33 south of Rte 704
Cross Section	4 lanes & median from I-81 to Rte 681; 2 lanes from Rte 681 to Rte 276; 2 lanes within existing right of way from Rte 682 to Rte 689; 4 lanes & median from Rte 689 to Rte 33	4 lanes with median	4 lanes with median	4 lanes with median	4 lanes with median
Level of Access Control	Controlled access, except for short limited-access section on new location, access management plan	Controlled access	Controlled access	Controlled access	Controlled access
Planning Corridor Width*	500 feet I-81 to Rte 276; 80 feet along Rte 276 from Rte 682 to Rte 689; 500 feet from Rte 689 to Rte 33	500 feet	500 feet	500 feet	500 feet
Design Corridor Width*	240 feet I-81 to 681; 120 feet 681 to 276; 80 feet along 276 from 682 to 689; 240 feet from 689 to 33	240 feet Rte 11 to Rte 253; 120 feet from Rte 253 to Rte 33	240 feet	240 feet	240 feet
Length of Corridor	8.6 miles	6.2 miles	6.5 miles	6.0 miles	3.1 miles
Right of Way Cost	\$52.8 million	\$67.3 million	\$46.0 million	\$58.7 million	\$17.6 million
(Planning Corridor; assumes worst case, that all land within the planning corridor would be acquired for right of way)					
Right of Way Cost	\$31.2 million	\$31.1 million	\$24.3 million	\$39.4 million	\$10.9 million
(Design Corridor; assumes more realistic scenario, that the design corridor width would be sufficient for construction)					
Engineering/Construction Cost	\$41.4 million	\$47.2 million	\$49.8 million	\$57.1 million	\$24.1 million
Assumed to be the same for the Planning Corridor or the Design Corridor.					
* Environmental consequences of the alternatives were estimated based on "planning corridors" that are wide enough to encompass potential variations in actual alignments and design features and to illustrate the maximum potential impacts of the alternatives. However, a narrower "design corridor" for each alternative derived from generalized cross section templates that more closely represent what the actual "footprint" impacts may be was used to make more refined estimates of impacts.					



Harrisonburg Southeast Connector
Location Study

ALTERNATIVES
Figure S-2

S.3.3 Alternatives Eliminated from Detailed Consideration

Table S-2 lists alternatives eliminated from detailed consideration and reasons for their elimination.

Table S-2
ALTERNATIVES ELIMINATED FROM DETAILED CONSIDERATION

Alternative or Segment(s)	Basis for Elimination
Transportation System Management (TSM) Alternative	"TSM" generally means implementation of relatively low-cost actions to improve efficiency of existing transportation systems. Examples include traffic controls, signal synchronization, turn lanes, parking management, access management, operational modifications, flexible work hours, van pools, transit scheduling, bicycle and pedestrian improvements, modifying driver behavior with incentives, pricing, or restrictions. Although such actions are important elements in the overall transportation plan for any urbanized area, there are none that would meet the identified needs for this study because the

	magnitude of the mobility needs and travel demands cannot be met with such minor actions. However, the Harrisonburg-Rockingham Metropolitan Planning Organization's (HRMPO's) <i>2030 Transportation Plan</i> includes several TSM-type projects in the study area (e.g., signal synchronization and access management along Route 33) that will contribute to the overall efficiency of the system.
Mass Transit Alternative	The population and employment densities and travel behavior within the study area are such that mass transit alone would not satisfy the identified needs. Furthermore, transit services need adequate infrastructure (i.e., roads) to run on. As discussed in Chapter 1, existing roads across the study area are not adequate to serve passenger vehicles, let alone the buses that would be needed to implement transit. Transit services do serve important roles in the overall regional transportation system, but mainly in the more urbanized portions of the region where the James Madison University (JMU) student population comprises a major portion of the ridership. HRMPO's <i>2030 Transportation Plan</i> includes several transit-related projects for the region.
HATS Alternative	This conceptual alignment depicted in the Harrisonburg Area Transportation Study (HATS, the regional transportation plan adopted by local governments prior to the current one) begins at the I-81/Route 257/Route 682 interchange and curves across the southeastern portion of the study area (generally on new location and closely paralleling the county's urban growth boundary), and ends at the intersection of Routes 276 and 33. Investigations early in this study quickly showed that this alternative would have unjustifiable environmental consequences (e.g., major impacts to the Cross Keys Battlefield) and would require massive earthwork and landscape disturbance due to terrain crossed.
A number of preliminary alignment segments at various locations throughout the study area (see Chapter 2 for details)	These segments would not adequately serve the subject travel patterns, would have greater environmental impacts, were less feasible from an engineering perspective, and/or were not supported by citizens.

S.4 ENVIRONMENTAL CONSEQUENCES

Environmental consequences of the alternatives were estimated based on the planning corridors and design corridors identified in Table S-1. **Table S-3** presents the comparative environmental impacts of the alternatives. [Note: impacts for the No-build Alternative were calculated using planning and design corridor widths similar to those used for the Candidate Build Alternatives.]

Table S-3
SUMMARY OF IMPACTS

Impact Category	Corridor	No-build	CBA 1	CBA 2	CBA 2A	CBA 3	CBA 4
Land within corridor (acres)	Planning	410	314	373	386	357	182
	Design	129	131	146	190	178	93
Potential residential relocations	Planning	Not Available	51	93	57	60	19
	Design	Not Available	32	38	26	29	10
Potential business relocations	Planning	Not Available	2	2	2	14	0
	Design	Not Available	2	1	2	12	0
Potential farm displacements	Planning	Not Available	7	3	4	1	1
	Design	Not Available	6	2	3	0	1
Potential nonprofit organization relocations	Planning	Not Available	0	2	0	0	0
	Design	Not Available	0	0	0	0	0
Parks and recreation areas affected	Planning	0	0	0	0	0	0
	Design	0	0	0	0	0	0

Table S-3
SUMMARY OF IMPACTS

Impact Category	Corridor	No-build	CBA 1	CBA 2	CBA 2A	CBA 3	CBA 4
Potential hazardous material sites	Planning	17	9	1	1	11	1
	Design	5	2	0	0	4	0
Prime farmland conversion (acres)	Planning	32	78	42	43	9	1
	Design	10	43	19	20	3	1
Statewide-important farmland conversion (acres)	Planning	99	129	136	145	54	2
	Design	29	39	67	71	23	2
Total farmland conversion (acres)	Planning	131	207	178	188	63	3
	Design	39	82	86	91	26	3
Agricultural and forestal district impacts (acres)	Planning	0	30.8	0	0	0	0
	Design	0	11.2	0	0	0	0
Violations of National Ambient Air Quality Standards	Planning	0	0	0	0	0	0
	Design	0	0	0	0	0	0
Number of sites impacted by noise*	Planning	1*	6	70	29	30	9
	Design	1*	6	70	29	30	9
Stream impacts (linear feet of stream channel)	Planning	1,803	5,313	3,101	3,950	7,698	1,445
	Design	757	2,516	1,655	2,215	4,646	980
Wetland impacts (acres)	Planning	0.07	0.04	1.05	1.41	1.36	0.60
	Design	0.03	0.00	0.43	0.48	0.84	0.08
Floodplain encroachments (acres)	Planning	20	3	15	18	25	0
	Design	8	2	6	8	12	0
Forestland impacts (acres)	Planning	37	8.8	22.1	45.8	42.3	28.9
	Design	10	1.9	9.0	22.7	18.4	12.9
Federally listed threatened or endangered species affected	Planning	0	0	0	0	0	0
	Design	0	0	0	0	0	0
Historic properties affected	Planning	0	2	0	0	0	0
	Design	0	2	0	0	0	0
Historic properties adversely affected	Planning	0	1	0	0	0	0
	Design	0	1	0	0	0	0

* Note: for purposes of the noise analysis, "No-build" refers only to not building the Candidate Build Alternatives, not to the entire No-build Alternative, which includes specific road projects from the regional long-range transportation plan, as described in detail in Chapter 2.

S.5 TRANSPORTATION BENEFITS OF ALTERNATIVES

Each of the Candidate Build Alternatives and potential combinations of the alternatives would provide additional roadway capacity in the study area to support mobility demands and would

support the transportation needs of existing and future development. The analysis of traffic utilization of the alternatives highlights the extent to which each would serve the study area's transportation needs. Alternatives 2A and 3 would be expected to carry the highest average daily traffic volumes in 2030, indicating that they would provide the highest degree of mobility for the study area. On an area-wide basis, Alternative 2A also would provide the highest degree of overall net relief to the study area's congested roadways, providing a substantial benefit to overall mobility. **Table S-4** summarizes the key advantages and disadvantages of each alternative from a traffic and transportation standpoint.

Table S-4
SUMMARY OF KEY TRANSPORTATION ADVANTAGES AND DISADVANTAGES

CBA 1	<ul style="list-style-type: none"> • Low end in terms of regional traffic volume served. • Reduces traffic on congested regional facilities including I-81 & Route 33 (2,000-2,500 vehicles per day). • Also diverts traffic from the south end of Route 253 and Route 704 (1,500-2,500 vehicles per day).
CBA 2	<ul style="list-style-type: none"> • Average traffic served is in the middle of the range for all alternatives (16,200 vehicles per day). • Middle of the range in terms of net reduction of traffic on congested study area roadways. • Reduces traffic on I-81 and Route 33 (north of Route 704), Route 689, Route 682, and Route 276. • Increases traffic on Route 11 south of Route 704 (traffic accessing the new facility) and on Route 33 south of Route 704 (diverted from Route 689).
CBA 2A	<ul style="list-style-type: none"> • Highest average daily traffic volume served. • High in terms of providing relief to congested regional roadways. • Reduces traffic on I-81 & Route 33 (north of Route 704), 689, Route 682, and Route 276. • Increases traffic on Route 11 south of Route 704 (traffic accessing the new facility), on Route 33 south of Route 704 (diverted from Route 689), and on Route 253 and Route 710 for traffic getting to the new facility.
CBA 3	<ul style="list-style-type: none"> • High end in terms of regional traffic served. • Low in terms of reducing traffic on congested facilities. • Reduces traffic on Route 11 south of Route 704, Route 704, Route 11 and I-81 north of where this alternative ties in. • Increases traffic on I-81 south of the project tie-in and on Route 33 south of Route 704. • Substantial localized benefit for Route 33 near I-81.
CBA 4	<ul style="list-style-type: none"> • Mid-level in terms of average daily traffic volume served. • Benefits in terms of reducing traffic on other roadways is the most localized of all alternatives; traffic reductions on Neff Avenue, University Boulevard, East Market Street (Route 33), and I-81 north of Route 253.
Combination Alternative 1 + 4	<ul style="list-style-type: none"> • Combination of close-in CBA 4 and CBA 1 at the edge of the study area results in decreased traffic on almost all other study area roadways. This is reflected in the high ranking in terms of net reduction in congested vehicle-miles in the study area.
Combination Alternative 2 + 4	<ul style="list-style-type: none"> • Similar to Combination Alternative 1 + 4 in diverting traffic from most roadways in the study area. • As with CBA 2, this alternative would provide a high level of relief to I-81; traffic accessing the CBA 2 alignment, however, has the potential to increase congestion on Route 11 south of Route 704 and on Route 33 south of Route 704.
Combination Alternative 1 + 2 + 4	<ul style="list-style-type: none"> • Similar to Combination Alternative 2 + 4, but the addition of the improvements to Routes 682 and 276 of CBA 1 would lessen the pressures on Route 11 south of Route 704 and on Route 33 south of Route 704 that the previous alternative could create.
Combination Alternative 1 + 3	<ul style="list-style-type: none"> • CBA 3 alone is expected to increase traffic volumes on congested I-81 south of Exit 243. This Combination Alternative also would add volumes on congested I-81, but the increases would be lessened by providing the CBA 1 improvements on Routes 682 and 276.

S.6 OTHER MAJOR GOVERNMENTAL ACTIONS IN STUDY AREA

VDOT, in cooperation FHWA, is studying the 325-mile-long I-81 corridor, as described in a recently published Tier 1 Draft Environmental Impact Statement (EIS) (available online at www.i-81.org). The study includes evaluation of transportation needs along I-81, conceptual-level alternatives (including highway and rail) to meet those needs, and potential environmental consequences. For the section of I-81 through the Harrisonburg area, the study indicates that one or two additional lanes (depending on the section) in both directions is needed to provide additional capacity to meet travel demand. The study also identifies a section in Harrisonburg as a location where a corridor on new location may need to be evaluated because of the potential level of impacts associated with widening existing I-81 through a heavily developed area. Although the I-81 study includes portions of the same study area as this Harrisonburg Southeast Connector Location Study, the transportation needs being studied are entirely different and the two studies are separate and independent.

S.7 AREAS OF CONTROVERSY

Some citizens have expressed the view that no new roads should be built within the study area because such new roads would stimulate new and unwanted development, take too much farmland, destroy historic properties, and degrade the rural ambiance. This view is in contrast to others that support the need for transportation facilities to keep pace with ongoing development that is both inevitable and in accordance with the planning and goals of local governments. Public comments generally confirm the principal elements of purpose and need that the study has identified, but also reflect an opinion that these needs not be met with an alternative that would have excessive impacts to the human and natural environments. Also, the public has demonstrated continued and strong support for the improvement of existing roads. These views have been taken into account in developing the Candidate Build Alternatives by:

- Consulting local planning documents to review development goals and policies of local governments.
- Following existing roads where practical without excessive disruption of existing communities.
- Eliminating alternatives on new location through any portion of the Cross Keys Battlefield.
- Minimizing alignments on new location through the portions of the study area that are farther from Harrisonburg.
- Using a reduced two-lane cross section on portions of CBA 1 through areas that are most environmentally sensitive.

S.8 UNRESOLVED ISSUES

S.8.1 Selection of Alternative

After the Location Public Hearing has been held and comments have been reviewed, the Commonwealth Transportation Board (CTB) would select a preferred alternative. Responses to substantive comments on the Draft EIS and documentation of the preferred alternative would be presented in a Final EIS. FHWA's alternative selection decision would be documented in a Record of Decision (ROD). [Should CBA 3 be the preferred alternative, additional operational and engineering analysis for the interchange of CBA 3 at I-81 would have to be conducted before FHWA would issue a ROD.]

S.8.2 Archaeological Investigations

Upon identification of a preferred alternative, detailed archaeological studies will be undertaken to identify all archaeological sites on or eligible for the National Register of Historic Places within the area of potential effects (APE) for the preferred alternative. This work will be conducted in two phases:

- **Phase I** - Conduct field survey by visually inspecting the ground surface and digging test pits by shovel at regularly spaced intervals to identify archaeological sites that have potential for National Register eligibility. All findings and recommendations will be documented in a report and coordinated with the Virginia Department of Historic Resources (VDHR) and other consulting parties as appropriate.
- **Phase II** - For those sites determined to be potentially eligible for the National Register, additional excavations and analyses will be conducted to conclusively establish their eligibility for the National Register. All findings will be documented in a report and coordinated with VDHR and other consulting parties as appropriate.

For archaeological sites that are determined eligible for the National Register, and which cannot be avoided by the preferred alternative and therefore would incur an adverse effect, VDOT and FHWA will undertake additional consultations with VDHR and other consulting parties to develop a Memorandum of Agreement outlining how the adverse effects will be resolved (e.g., through data recovery excavations).

S.8.3 Funding

At this time, there are no identified state or federal funds for the design, right of way acquisition, or construction of any of the Candidate Build Alternatives, except for those portions that overlap elements of the No-build Alternative for which funding is programmed in HRMPO's *2030 Transportation Plan* and VDOT's Six-year Improvement Program.

S.8.4 HRMPO Action

Should any Candidate Build Alternative except CBA 4 be selected by CTB for implementation, HRMPO would need to amend the "2030 [Financially] Constrained Long Range Plan" portion of the adopted *2030 Transportation Plan* to include the selected alternative before FHWA could finalize the Record of Decision for this study.

S.9 OTHER FEDERAL ACTIONS AND PERMITS REQUIRED

Federal and state laws require several permits before construction can proceed. They include:

- Authorizations from the U.S. Army Corps of Engineers pursuant to Section 404 of the Clean Water Act for discharges of fill material into waters of the United States, including wetlands.
- Authorizations from the Virginia Department of Environmental Quality pursuant to Sections 401 (Virginia Water Protection Permit) and 402 of the Clean Water Act for discharges into waters of the United States.
- Authorizations from the Virginia Marine Resources Commission pursuant to Virginia Water Law for encroachments on subaqueous state-owned stream bottoms.
- Should an alternative be selected that would adversely affect historic properties, a Memorandum of Agreement (MOA) to resolve the adverse effects would need to be executed among VDHR, FHWA, and VDOT. The federal Advisory Council on Historic Preservation would be given the opportunity to participate in the development of any such MOA.

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PURPOSE AND NEED

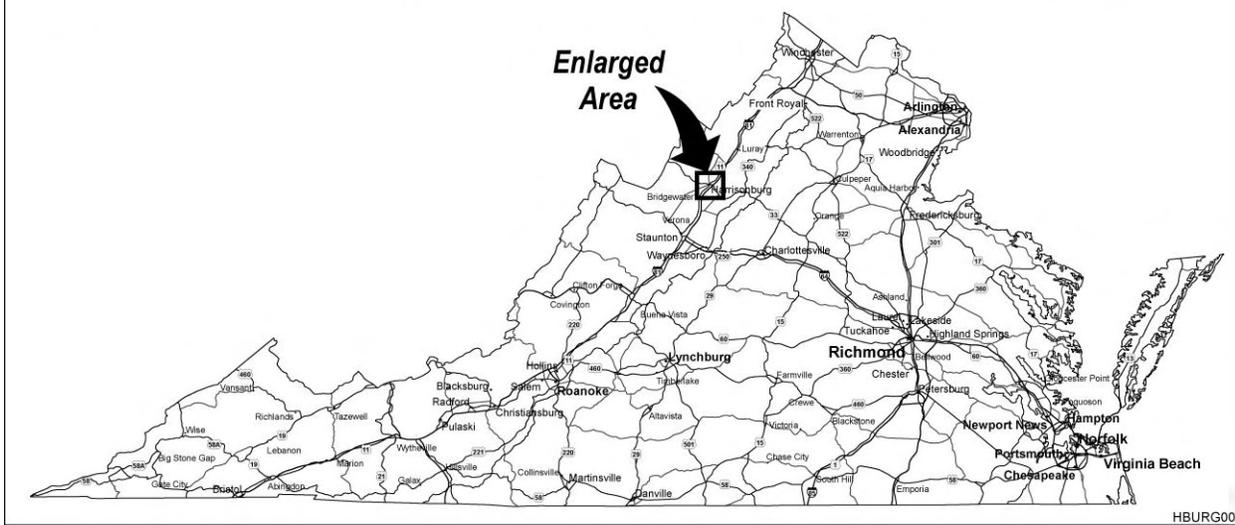
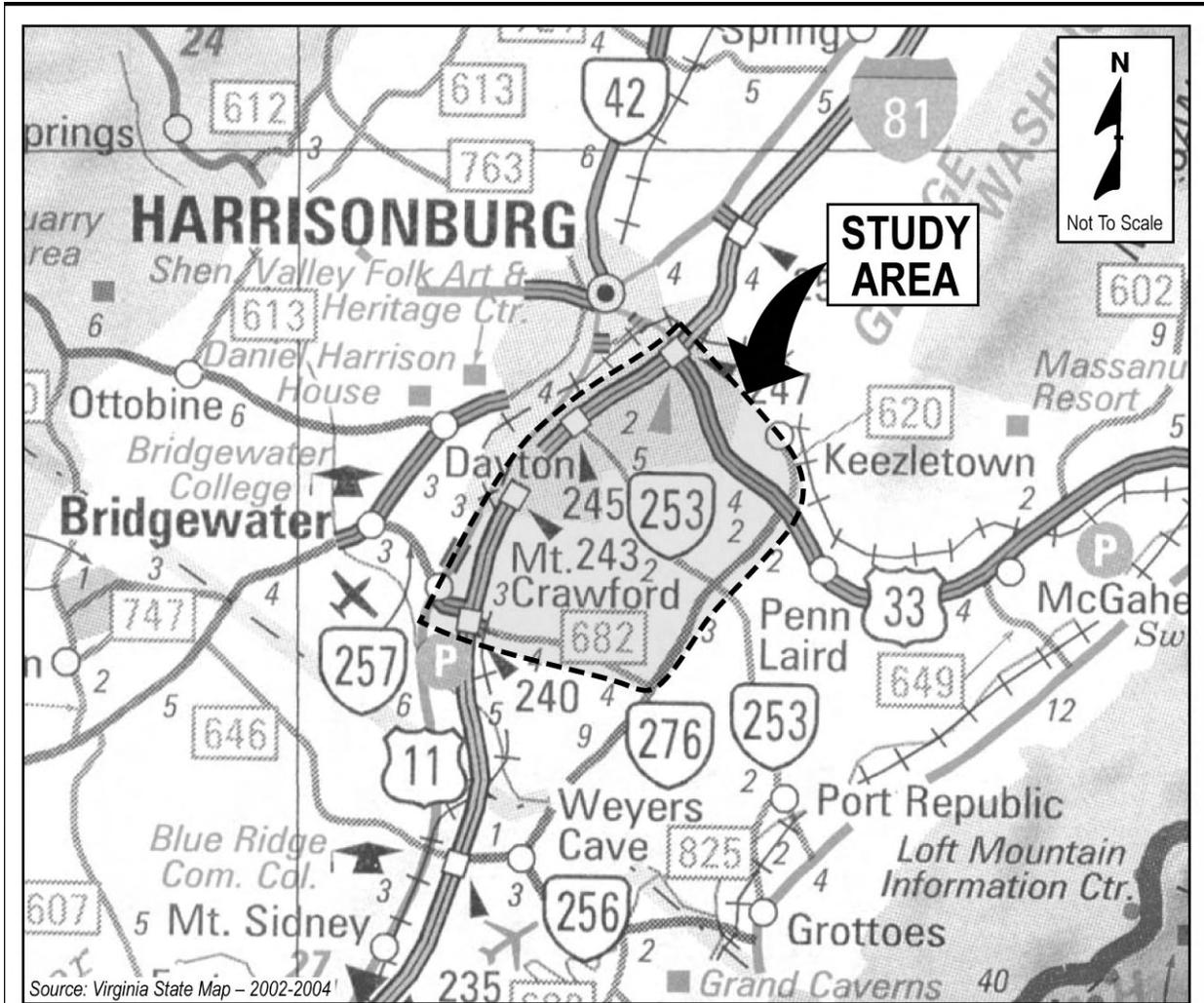
1.1 STUDY AREA

The Virginia Department of Transportation (VDOT), in cooperation with the Federal Highway Administration (FHWA), is studying transportation problems and potential solutions in the southeastern Harrisonburg metropolitan area between U.S. Route 11 and U.S. Route 33. **Figure 1-1** shows the study area location and boundaries. These boundaries are based on the transportation needs to be addressed in the study, namely, east-west mobility and accommodation of travel demand arising from development in the study area. The study area boundaries are defined generally by major transportation routes and correlate to boundaries used in local and regional land use and transportation plans. The study area encompasses a small portion of the City of Harrisonburg and a sector of Rockingham County southeast of the city limits that the county's government has designated for development.

The western boundary lies along U.S. Route 11, a major arterial route parallel to and just west of Interstate Route 81 (I-81). Route 11 serves primarily local travel between the Town of Mount Crawford and the City of Harrisonburg and provides access to residential and employment centers along Route 11. I-81 serves both long-distance and local travel (via four interchanges with other roads). The southern boundary lies just south of Route 682, a secondary road connecting I-81 and Virginia Primary Route 276. Route 682 is the southern boundary of the regional study area for the Harrisonburg-Rockingham Metropolitan Planning Organization (HRMPO) and the southern urban growth boundary in the county's comprehensive plan. The eastern boundary lies just east of Route 276, which is the eastern boundary of HRMPO's study area and is just outside the county's urban growth boundary. Lands farther south and east are outside the county's designated urban growth boundaries and therefore are not expected to contribute greatly to increases in travel demand across the study area. The northern study area boundary runs northeast of U.S. Route 33, another major arterial serving towns and cities in the Harrisonburg region and beyond. Lands in the northeast sector between U.S. Route 33 and I-81 north are not designated by the county's government for intensive growth and development.

1.2 HISTORY

This study arose out of a perceived need on the part of local officials and legislators for a connector road across the study area between I-81 and U.S. Route 33. A conceptual alignment for such a connector road was contained in the regional transportation plan, known as the Harrisonburg Area Transportation Study (HATS), developed in the 1990s and adopted by city and county governments. Funding for a location study was included in the Virginia Transportation Act of 2000 by the Virginia General Assembly and in the Six-year Improvement Program by the Commonwealth Transportation Board.



Harrisonburg Southeast Connector
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STUDY AREA
Figure 1-1

1.3 NEEDS

A detailed analysis of transportation needs in the study area has been documented in the *Purpose and Need Technical Memorandum*, which is available for review upon request. The following sections outline the two principal needs to be considered in this Harrisonburg Southeast Connector Location Study: east-west mobility and accommodation of increasing travel demand arising from existing and future development in the study area.

1.3.1 East-west Mobility

Mobility is the ability to travel freely from place to place. It implies relatively unimpeded movement over relatively direct links in the transportation system. Direct east-west links across the study area to connect major activity centers and major highways are limited. **Figure 1-2** illustrates the generalized east-west travel pattern being addressed in this study. If one envisions Routes 11 and 81 along the west side of the study area and Route 33 along the northeast side of the study area as the legs of an “A,” the crossbar of the A is missing. Most existing roads across the study area are secondary roads that are narrow, winding, hilly, and discontinuous - some are dirt roads little more than one lane wide. Travel across the study area from Route 11 or I-81 to Route 33, as well as travel among activity centers in the study area, is hampered by low speeds (because of poor road geometry), stops at intersections, and turns due to discontinuities in the routes. As development continues in the study area, and the number and extent of activity centers continue to grow, and the volume of travel among activity centers and major roadways continues to grow, mobility will become increasingly deficient.

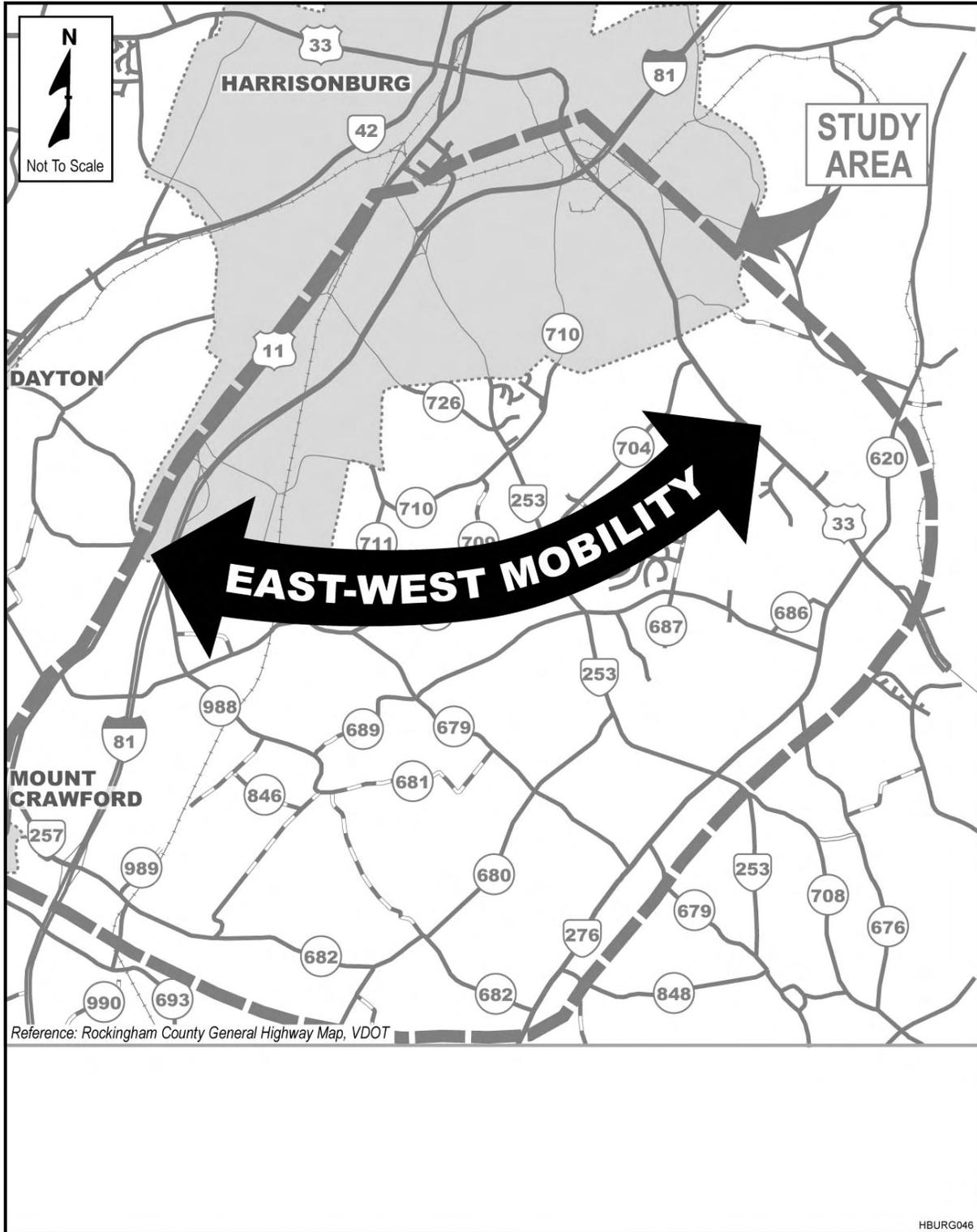
1.3.2 Accommodate Travel Demand

While much of the study area is rural farmland today, Rockingham County’s comprehensive plan designates most of the study area for residential, commercial, and industrial land uses, and proposes extensions of water and sewer services to serve that growth.¹ Section 3.2 in Chapter 3, Affected Environment, of this Environmental Impact Statement provides information on development patterns and planned growth. Agricultural and other undeveloped lands are expected to transform into developed areas. This transformation already has occurred in areas close to Harrisonburg, along principal travel routes, and along some secondary roads. Both population and employment in the study area are forecasted to grow approximately 77% by 2030, and the number of households is expected to grow 120%.² Travel demand across the study area will grow along with population growth and development.

HRMPO’s regional travel model can be used to estimate future traffic volumes on the existing road network. **Figure 1-3** shows these forecasted volumes for the year 2030, along with 2003 volumes to illustrate the expected growth in traffic. Current traffic volumes on Routes 276, 680, 689, 704, and 710 (which generally serve as east-west routes across portions of the study area) crossing an imaginary line running roughly parallel to and just west of Port Republic Road (Route 253) amount to approximately 14,000 vehicles per day. By 2030, that volume is forecasted to grow to approximately 24,000 vehicles per day.

¹ Rockingham County’s planners and Board of Supervisors seek to steer ongoing population growth into areas relatively close to Harrisonburg or other concentrations of existing development that are served by public water and sewer services, rather than have it scattered across the county. *Comprehensive Plan for 2020 and Beyond*, p 2-2.

² Number of households growing more than population because of expected decline in persons per household.



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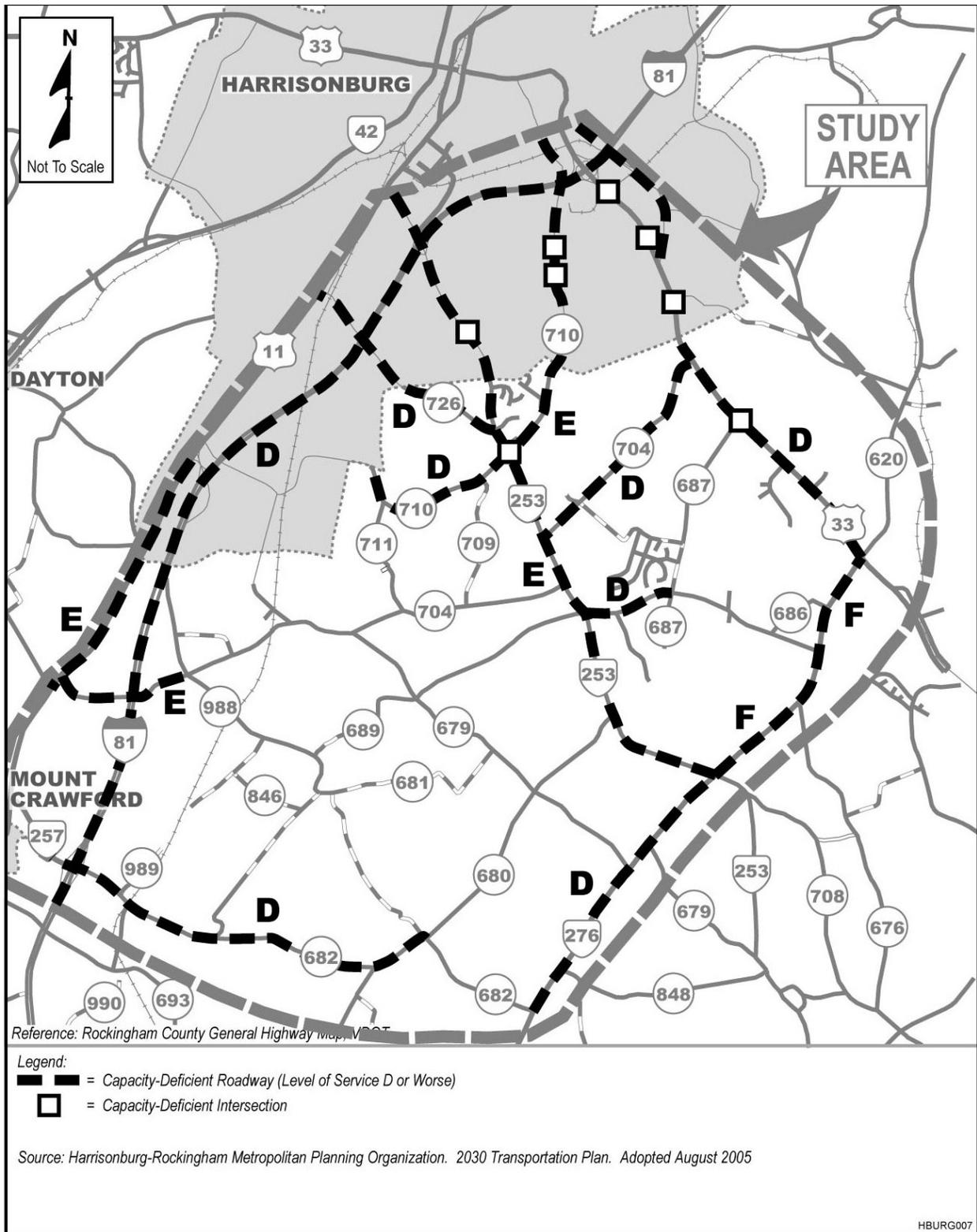
EAST-WEST MOBILITY
Figure 1-2

The capacities of existing roads are not adequate to handle the projected volumes. A highway's capacity (i.e., the volume of traffic the highway can carry) is dependent on its physical configuration, number of lanes, types of traffic controls (e.g., stop lights or stop signs), and other factors. When traffic volumes exceed capacity, traffic flow breaks down, speeds decrease, and delays occur. **Figure 1-4** shows the roads and intersections that have insufficient capacity to handle projected volumes at an acceptable level of service by 2030.³ Some of these deficiencies reflect problems relating more to north-south travel than east-west travel (e.g., on I-81, Route 253, and Route 710 east of Route 253). However, some fraction of these deficiencies can be attributed to the lack of adequate east-west connections between U.S. Route 11/I-81 and U.S. Route 33. Some motorists are using these routes because satisfactory alternative routes are not available to cross the study area. The deficiencies along Routes 682, 276, 704 in the vicinity of I-81, 710 and 726 west of 253, and 689 and 704 east of 253 more directly reflect the lack of adequate east-west routes. HRMPO's *2030 Transportation Plan*, which is the financially constrained long-range transportation plan for the region, prioritizes construction funding for the portion of the plan within the study area to address the deficiencies on Routes 682, 726, 253, and 33 (see Section 2.4, No-build Alternative, discussion in Chapter 2).

1.4 PURPOSE SUMMARY

In summary, the purpose of the Harrisonburg Southeast Connector Location Study is to evaluate alternatives to serve east-west mobility needs and existing and future travel demand in the study area. These needs are attributed to the lack of adequate east-west travel routes connecting principal arterial routes and major activity centers, and to the increasing traffic volumes generated by existing and forecasted development in the study area.

³ Traffic operations on highways are quantified using level of service methodologies from the *Highway Capacity Manual* (HCM). The HCM provides standards used in the traffic engineering profession to rate operations using a scale from A to F, with A representing excellent traffic flow with minimal delays and F representing failure in traffic operations and very high levels of delay. Factors used in estimating levels of service include functional classification of the highway, terrain, truck percentages, lane widths, extent of no-passing zones, number of access points, and amount of delay at intersections. For most of Virginia, including the Harrisonburg region, VDOT considers levels of service **A, B, or C acceptable** and levels of service **D, E, or F deficient**.



Harrisonburg Southeast Connector
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CAPACITY-DEFICIENT ROADWAYS
Figure 1-4

ALTERNATIVES

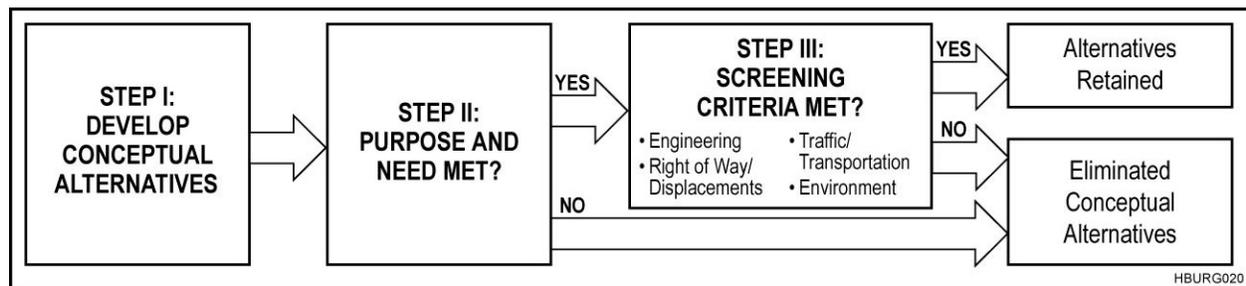
2.1 INTRODUCTION

This chapter presents the range of alternatives evaluated for the study, the process used to identify and screen the alternatives, and comparative discussions of the alternatives that were carried forward for detailed evaluation. The No-action, or No-build, Alternative was retained for detailed study consistent with National Environmental Policy Act regulations and to serve as a baseline for alternatives comparison. A wide range of other alternatives was considered initially, based on the identified purpose and need, suggestions received from citizens, proposals included in other local and regional planning efforts, and the conditions and constraints of the study area. A screening process was used to identify the alternatives to consider in detail, based on purpose and need, citizen input, environmental concerns, and engineering issues. Thus, the range of alternatives considered in detail in the Draft EIS includes the No-build Alternative and five Candidate Build Alternatives. Potential combinations of multiple Candidate Build Alternatives also are addressed in this chapter.

2.2 ALTERNATIVES DEVELOPMENT AND SCREENING

2.2.1 Alternatives Development Process

Figure 2-1 illustrates the step-by-step process used to identify and screen alternatives. This process involved developing a full range of alternatives that potentially could meet the identified transportation needs and then narrowing the options to a set of Candidate Build Alternatives for further consideration. Preliminary alternative concepts were presented at a Citizen Information Meeting held in March 2005. Input received at this meeting was taken into consideration in determining which alternatives were eliminated and which merited further study.



2.2.2 Review of Other Studies and Plans

Several other studies were reviewed to help identify conceptual alternatives that might meet the needs discussed in Chapter 1. The following bullets summarize these other studies; **Figure 2-2** illustrates highway facilities they recommended within the study area:

- The Harrisonburg Area Transportation Study (HATS) was the regional transportation plan prior to adoption of the current plan. It identified deficiencies in transportation mobility and capacity to the year 2015. The study recommended several new or upgraded highways, among them a southeastern bypass connecting the I-81/Route 257/Route 682 interchange with the intersection of U.S. Route 33 and State Route 276.
- In 2000/2001, the Harrisonburg-Rockingham Highway Advisory Committee (HRHAC) comprised of local citizens and community leaders studied transportation needs and alternatives to meet those needs in the study area. The HRHAC recommended a system of new and widened highways referred to as the “506 Plan.”
- Rockingham County’s Board of Supervisors adopted a comprehensive plan in 2004 (*Comprehensive Plan for 2020 and Beyond*), which calls for a transportation system that “will reinforce the pattern of new development” and a “connector road system around Harrisonburg ... to accommodate future traffic demand and provide a safe and efficient means of moving through and around the City[.]”
- The City Council of Harrisonburg similarly adopted a comprehensive plan (*Comprehensive Plan 2004 Update*), which includes implementation of a Master Transportation Plan that coordinates transportation facilities with land uses.
- The Harrisonburg-Rockingham Metropolitan Planning Organization (HRMPO), the regional transportation planning body, adopted a long-range multimodal transportation plan (*2030 Transportation Plan*) in August 2005. This plan replaces the HATS plan. Because the plan is financially constrained based on expected allocations of transportation funding, and because levels of expected funding will not meet all the transportation infrastructure needs in the region, there are relatively few projects in the study area that are currently funded for construction. However, the “Vision Plan” element identifies a number of new or widened roadways in the study area that would be included if adequate funding were available.

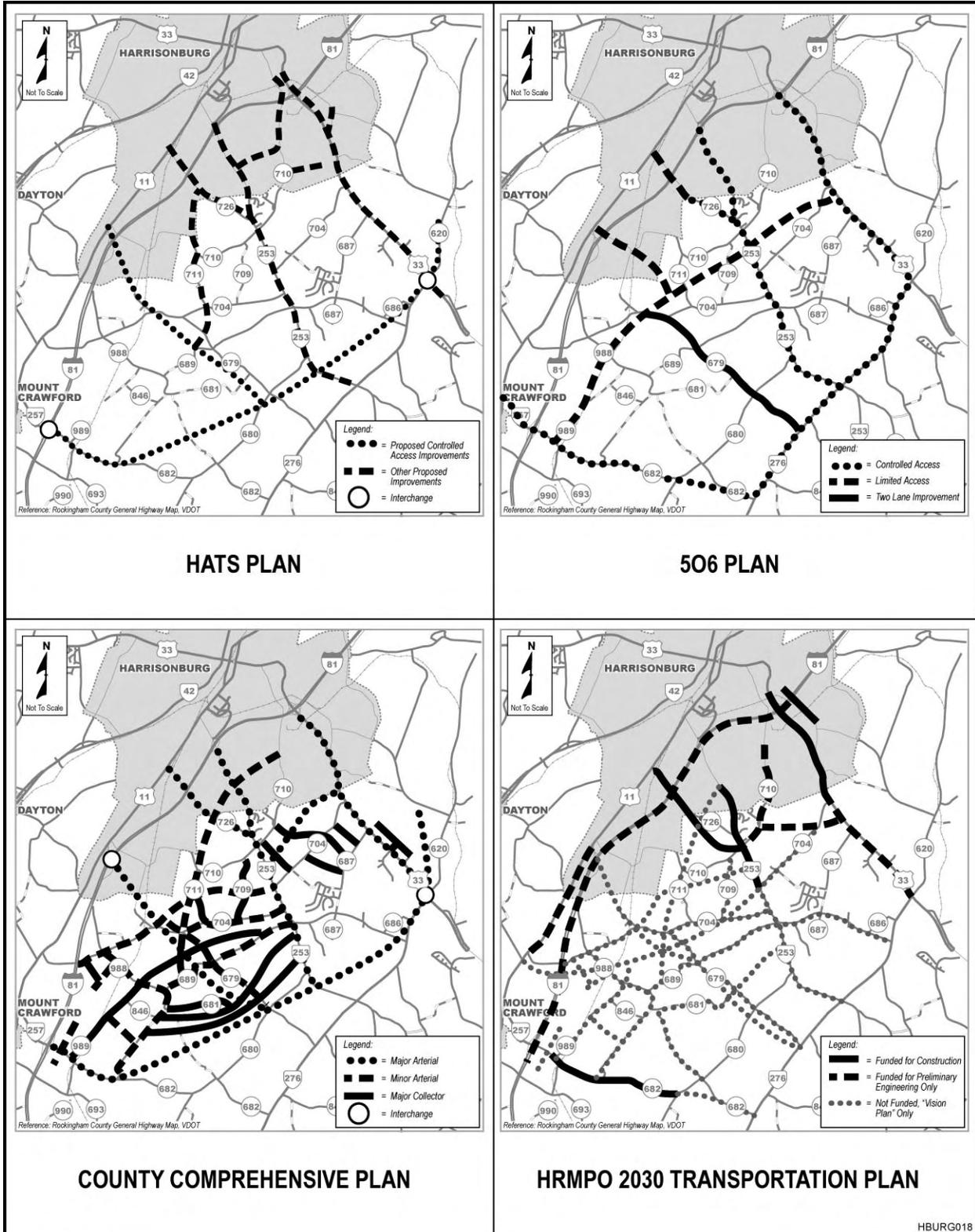
2.2.3 Scoping

The scoping process helped to identify the range of alternatives for study. During scoping, the following issues regarding alternatives were discussed:

- Non-highway alternatives, such as transit.
- Widening existing roads versus building new roads.
- Possible road alignment locations.
- Design criteria, typical cross section options, design features, and levels of access control (e.g., inclusion of bike trails or sidewalks, context-sensitive design, uncontrolled access versus limited access).

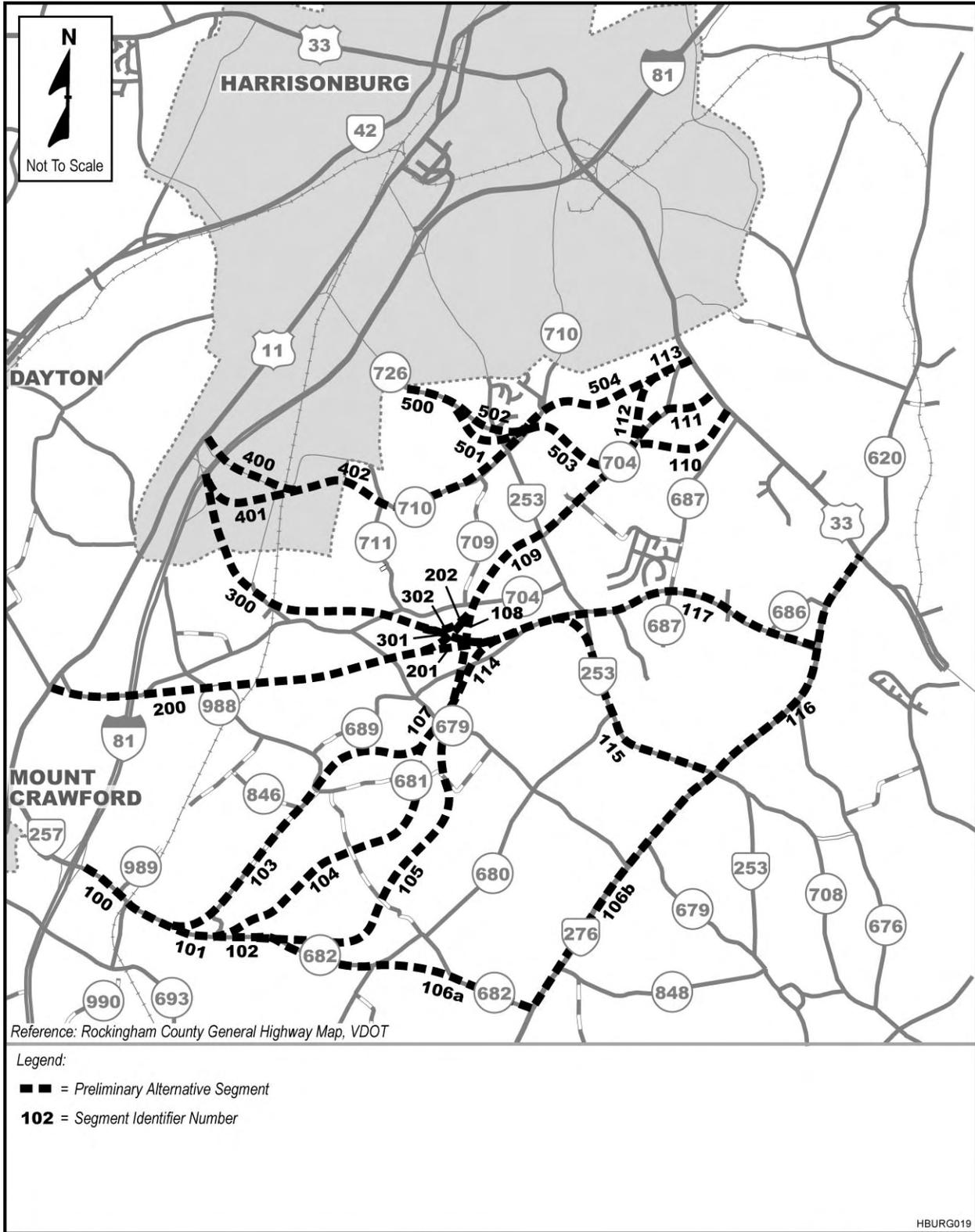
2.2.4 Preliminary Alternatives Development

Using aerial photo-base mapping, overlays of environmental constraints, citizen suggestions, and the results of previous studies, the study team developed preliminary alternative segments (see **Figure 2-3**). By connecting these segments, 37 end-to-end Preliminary Alternatives were possible.



Harrisonburg Southeast Connector
 Location Study

OTHER STUDIES
 Figure 2-2



Harrisonburg Southeast Connector
 Location Study

**PRELIMINARY
 ALTERNATIVE SEGMENTS**
 Figure 2-3

2.2.5 Screening Criteria

After reviewing the preliminary segments with citizens at a March 2005 Citizen Information Meeting, the study team used the criteria in **Table 2-1** to identify which segments to retain, eliminate, or modify:

**Table 2-1
 ALTERNATIVES SCREENING CRITERIA**

Criteria related to purpose and need (see Chapter 1).	1. Improves east-west mobility. 2. Accommodates travel demand.
Criteria related to traffic operations and engineering.	3. Connects to existing roads or land uses at desirable locations; intersection patterns acceptable; constructible without excessive disruption of traffic flow. 4. Design criteria and standards for engineering features (curvature, grades) can be met; amount of earthwork not excessive; access to properties can be acceptably maintained.
Community impacts criterion.	5. Minimizes intrusion into or through neighborhoods; minimizes displacements of homes and businesses.
Historic property impacts criterion.	6. Minimizes impacts to historic properties, particularly the Cross Keys Battlefield.
Other environmental issues criterion.	7. Minimizes impacts to farmland and farming operations, streams and wetlands, and floodplains.
Criterion related to consistency with citizen recommendations and concerns.	8. Reflects citizen recommendations received at citizen information meetings and other sources.

2.3 ALTERNATIVES ELIMINATED FROM DETAILED STUDY

Through the alternatives screening, several concepts and alternatives were eliminated from further consideration and not carried forward in the environmental process for detailed study. **Table 2-2** lists the eliminated alternatives and reasons for their elimination.

**Table 2-2
 ALTERNATIVES ELIMINATED FROM DETAILED STUDY**

Alternative or Segment(s)	Basis for Elimination
Transportation System Management (TSM) Alternative	“TSM” generally means implementation of relatively low-cost actions to improve efficiency of existing transportation systems. Examples include traffic controls, signal synchronization, turn lanes, parking management, access management, operational modifications, flexible work hours, van pools, transit scheduling, bicycle and pedestrian improvements, modifying driver behavior with incentives, pricing, or restrictions. Although such actions are important elements in the overall transportation plan for any urbanized area, there are none that would meet the identified needs for this study because the magnitude of the mobility needs and travel demands cannot be met with such minor actions. However, HRMPO’s 2030 <i>Transportation Plan</i> includes several TSM-type projects in the study area (e.g., signal synchronization and access management along Route 33) that will contribute to the overall efficiency of the system.

**Table 2-2
 ALTERNATIVES ELIMINATED FROM DETAILED STUDY**

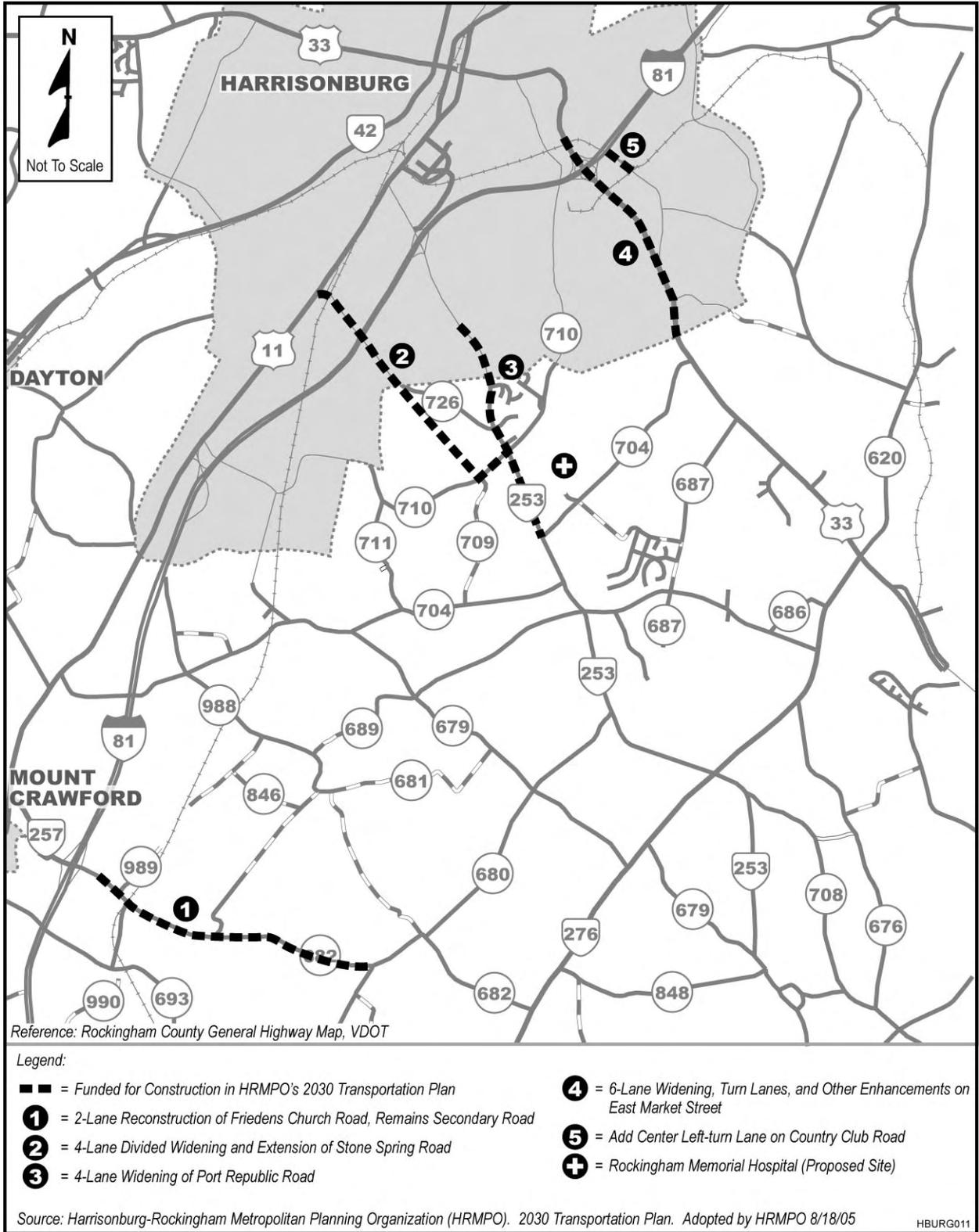
Alternative or Segment(s)	Basis for Elimination
Mass Transit Alternative	The population and employment densities and travel behavior within the study area are such that mass transit alone would not satisfy the identified needs. Furthermore, transit services need adequate infrastructure (i.e., roads) to run on. As discussed in Chapter 1, existing roads across the study are not adequate to serve passenger vehicles, let alone the buses that would be needed to implement transit. Transit services do serve important roles in the overall regional transportation system, but mainly in the more urbanized portions of the region where the JMU student population comprises a major portion of the ridership. HRMPO's <i>2030 Transportation Plan</i> includes several transit-related projects for the region.
HATS Alternative ¹	This conceptual alignment depicted in HATS begins at the I-81/Route 257/Route 682 interchange and curves across the southeastern portion of the study area (generally on new location and closely paralleling the county's urban growth boundary), and ends at the intersection of Routes 276 and 33. Investigations early in this study quickly showed that this alternative would have unjustifiable environmental consequences (e.g., major impacts to the Cross Keys Battlefield) and would require massive earthwork and landscape disturbance due to terrain crossed.
Segments 103, 104, 105, 107, and 114	These segments would serve more of a north-south than an east-west travel pattern and therefore do not adequately address east-west mobility. Furthermore, these segments would have large impacts to farming operations and were not supported by citizens.
Segment 115	The impacts of this segment on the Cross Keys Battlefield appear unwarranted in comparison to other available alternatives and the alignment has a "dogleg" that would require travelers to go south along 253 before being able to go east, resulting in a circuitous movement. A variation of this segment suggested by a citizen also was eliminated.
Segment 117	Although the alignment is direct, the impacts to the residential communities along Shen Lake Drive (Route 689) would be too severe.
Segments 110 and 113	These segments would have undesirable intersections with Route 33.
Segment 300	This segment requires a circuitous movement southward around the regional sanitary landfill before turning east, thereby not adequately serving the east-west pattern that is the focus of this study.

2.4 NO-BUILD ALTERNATIVE

The No-build Alternative is not a do-nothing alternative. Rather, it includes all transportation improvements in the study area that are funded for construction in the Harrisonburg-Rockingham Metropolitan Planning Organization's *2030 Transportation Plan* (adopted August 18, 2005) and in VDOT's current Six-year Improvement Program (see **Figure 2-4**). They include:

- **Friedens Church Road (Route 682).** Reconstruction and realignment of Friedens Church Road to a standard two-lane rural roadway from the I-81 interchange to Route 995 (Koiner Ford Road).

¹ The HATS alignment was a conceptual alignment, drawn without benefit of detailed mapping or knowledge of the Cross Keys Battlefield boundaries. It was part of a regional transportation plan as a concept, and never was intended as an actual proposed location for the highway. Nevertheless, the alignment was interpreted by some as the planned location for a major highway and it generated intense opposition from many in the community.



**Harrisonburg Southeast Connector
 Location Study**

**NO-BUILD ALTERNATIVE
 Figure 2-4**

- **Stone Spring Road - Erickson Avenue Connector and Stone Spring Extension (Route 726).** This series of projects will create a continuous four-lane divided highway from existing Erickson Avenue on the west side of Harrisonburg to the intersection of Port Republic Road (Route 253) and Reservoir Street (Route 710) in Rockingham County on the east side of Harrisonburg. The city portion of the project includes bicycle and pedestrian facilities and reconstruction of the Pear Street railroad crossing.
- **Port Republic Road (Route 253).** In the city and the county, from Neff Avenue to Boyers Road (Route 704), Port Republic Road will be widened to four lanes. The city portion of the project will include pedestrian and bicycle facilities.
- **East Market Street (Route 33) Improvements.** Two projects will improve East Market Street, including six-lane widening from Cantrell Avenue to the existing six-lane section and bicycle, pedestrian, and turning lane enhancements from Cantrell Avenue to the eastern city limits.
- **Country Club Road.** A center turn lane will be added to Country Club Road from Linda Lane to Vine Street.
- **Transportation System Management (TSM).** Conduct an access management study along Route 33 east and coordinate traffic signals along Route 33, Route 11, and Route 253.
- **Transit Services.** Extend Harrisonburg Transit service to Bridgewater, conduct a regional transit study, and fulfill transit capital needs for bus replacements, transit shelters, and bus maintenance facilities.

In addition, the No-build Alternative includes transportation improvements proffered by Rockingham Memorial Hospital as part the site approval process for its proposed relocation to a 254-acre site in the north central part of the study area. Those improvements include the following:

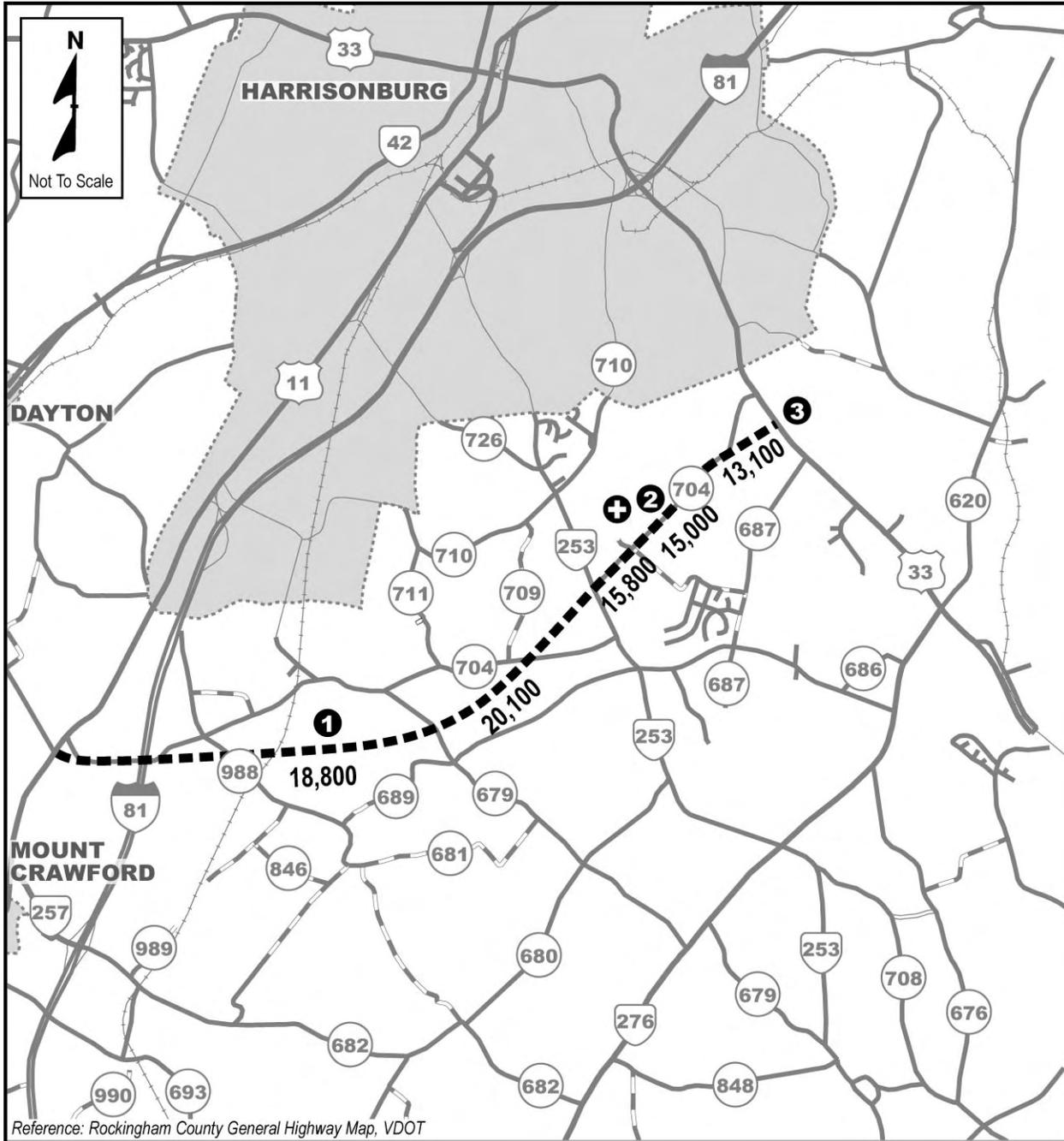
- Design and construction of an intersection including signalization at Port Republic Road and Stone Spring Road Extension.
- Design and construction of approximately 2,600 lineal feet (within a 200-foot right of way) of two lanes of a Stone Spring Road Extension from Port Republic Road to a point approximately 100 feet beyond the intersection with a realigned Reservoir Street. This includes a deceleration lane for entry to the hospital site and all rights of way and easements over the hospital property necessary for the construction of this 2,600-foot portion of the Stone Spring Road Extension.
- The design of a two-lane road for the Stone Spring Road Extension from Associated Developers' property to Port Republic Road.
- Design and construction of approximately 1,635 lineal feet of two lanes for an extension/realignment of Reservoir Street and an intersection (including deceleration lanes, turning lanes, and signalization) where the Stone Spring Road Extension and the Reservoir Street realignment intersect.
- Continuous dedicated turning movement (75-foot right of way) of approximately 1,400 lineal feet along the hospital property boundary with Port Republic Road.
- A deceleration lane on Boyers Road (Route 704) (35-foot right of way).
- Sidewalks for pedestrian mobility within the hospital site and safe and convenient connections for pedestrians to adjacent public roadways.

2.5 BUILD ALTERNATIVES CARRIED FORWARD

Figures 2-5 through 2-9 show the five Candidate Build Alternatives (CBAs) retained for detailed evaluation. Figure 2-10 shows typical cross sections for the CBAs used for planning purposes; however, the design elements of these cross sections are subject to change. Table 2-3 gives a summary comparison of the CBAs and the following text provides details. Section 2.7 discusses the traffic operations characteristics of the CBAs.

**Table 2-3
GENERAL DESCRIPTION OF CANDIDATE BUILD ALTERNATIVES**

	CBA 1	CBA 2	CBA 2A	CBA 3	CBA 4
General Location	Southern portion of study area, Rte 682 and Rte 276	Middle portion of study area, Rte 704 vicinity	Middle portion of study area, Rte 704 vicinity	Northern portion of Study Area, Rte 710/704 vicinity	Northern portion of Study Area, Rte 726/710/704 vicinity
From	I-81 at Exit 240, Rtes 257 and 682	U.S. Route 11 south of Rte 704	U.S. Route 11 south of Rte 704	U.S. Rte 11 at Exit 243, I-81 interchange	Route 726 near the Harrisonburg city limits
To	U.S. Rte 33 at Rte 276	U.S. Route 33 south of Rte 704			
Cross Section	4 lanes & median I-81 to Rte 681; 2 lanes from Rte 681 to Rte 276; 2 lanes within existing right of way from Rte 682 to Rte 689; 4 lanes & median from Rte 689 to Rte 33	4 lanes with median			
Level of Access Control	Controlled access, except for short limited-access section on new location, access management plan	Controlled access	Controlled access	Controlled access	Controlled access
Planning Corridor Width	500 feet I-81 to Rte 276; 80 feet along Rte 276 from Rte 682 to Rte 689; 500 feet from Rte 689 to Rte 33	500 feet	500 feet	500 feet	500 feet
Design Corridor Width	240 feet I-81 to 681; 120 feet 681 to 276; 80 feet along 276 from 682 to 689; 240 feet from 689 to 33	240 feet Rte 11 to Rte 253; 120 feet from Rte 253 to Rte 33	240 feet	240 feet	240 feet
Length of Corridor	8.6 miles	6.2 miles	6.5 miles	6.0 miles	3.1 miles
Right of Way Cost	\$52.8 million (Planning Corridor) \$31.2 million (Design Corridor)	\$67.3 million (Planning Corridor) \$31.1 million (Design Corridor)	\$46.0 million (Planning Corridor) \$24.3 million (Design Corridor)	\$58.7 million (Planning Corridor) \$39.4 million (Design Corridor)	\$17.6 million (Planning Corridor) \$10.9 million (Design Corridor)
Engineering/Construction Cost	\$41.4 million	\$47.2 million	\$49.8 million	\$57.1 million	\$24.1 million



Legend:

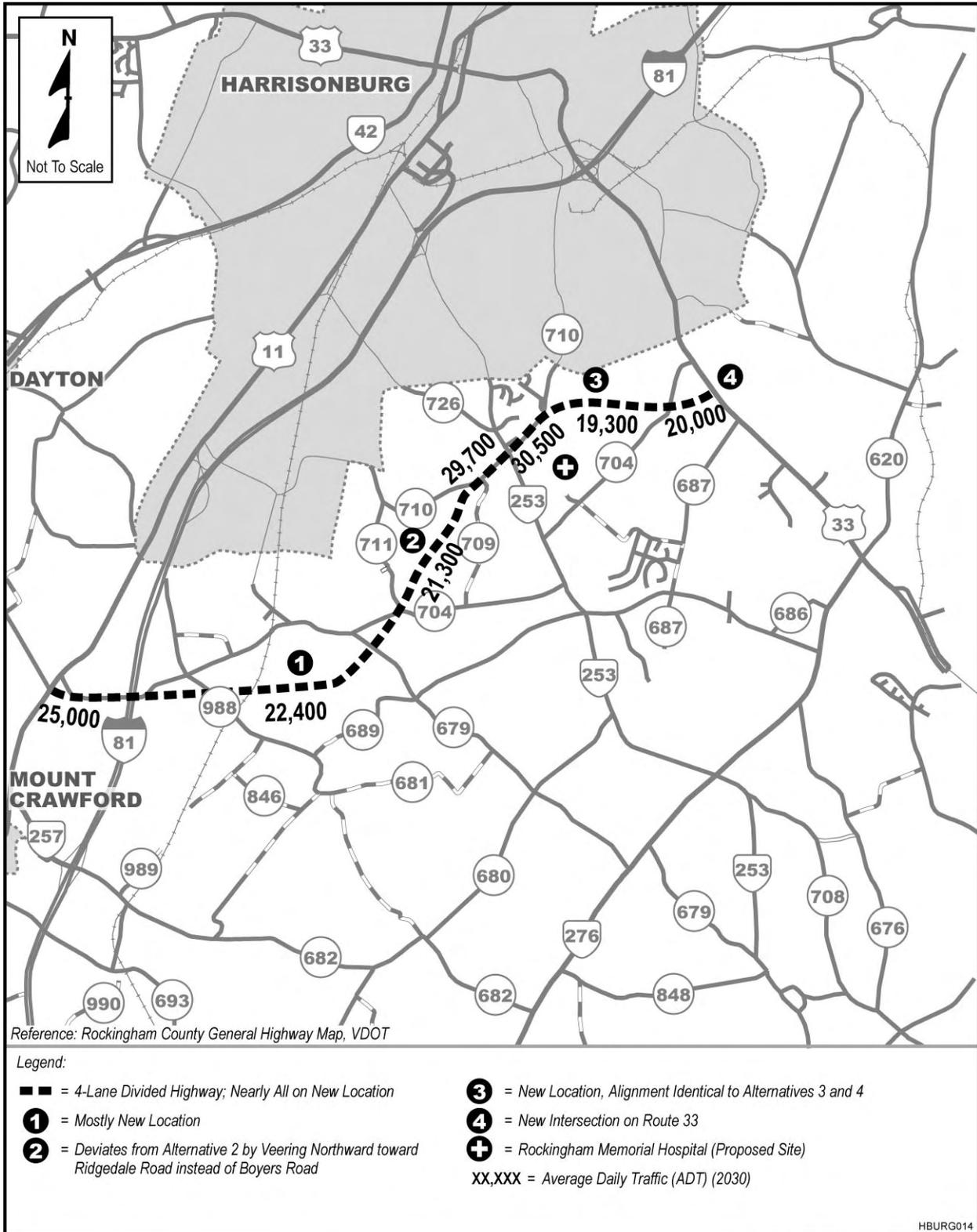
- = 4-Lane Divided Highway
- ① = Mostly New Location
- ② = Widen Existing Boyers Road; Narrow Median
- ③ = Relocate Intersection with Route 33
- ⊕ = Rockingham Memorial Hospital (Proposed Site)

XX,XXX = Average Daily Traffic (ADT) (2030)

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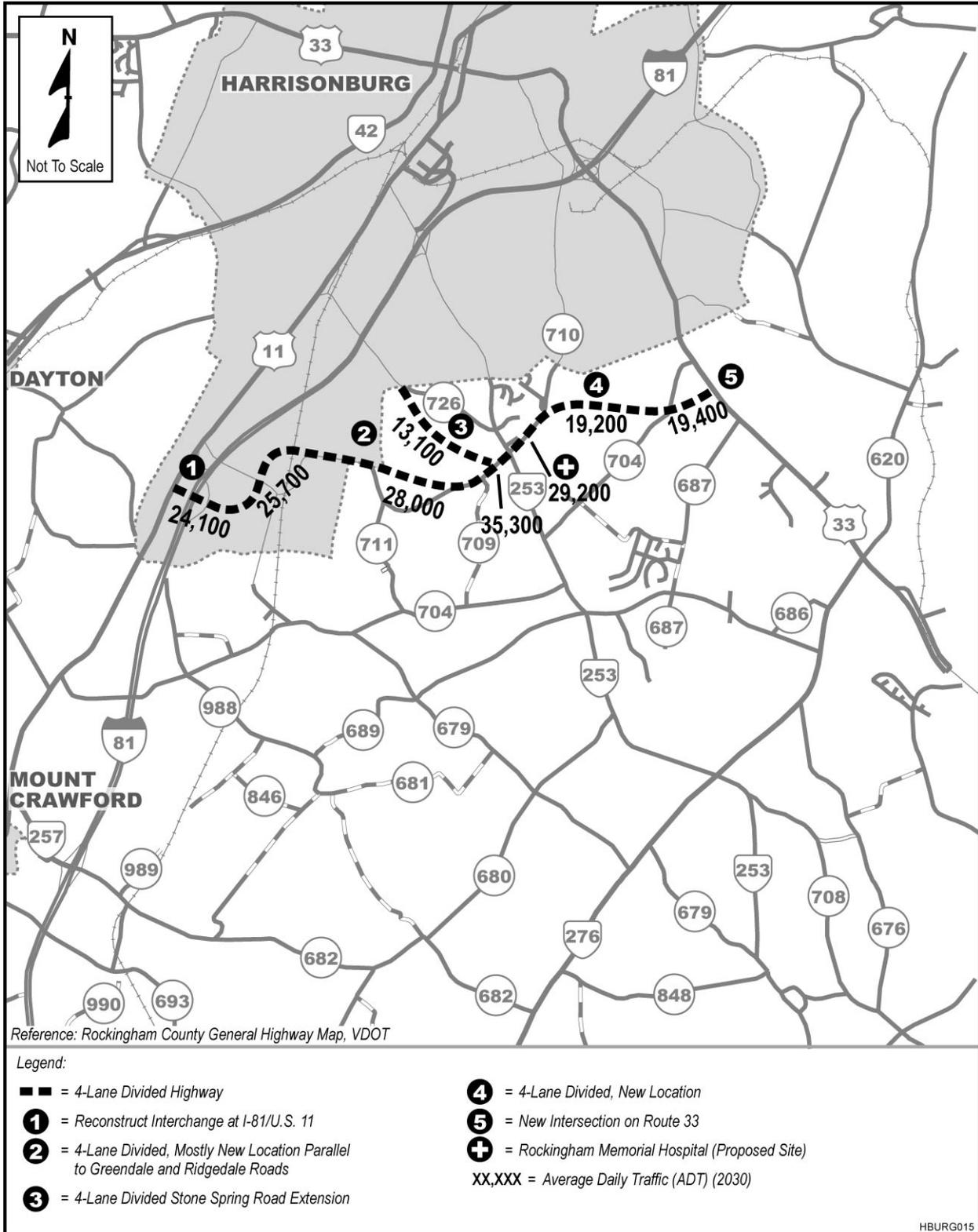
Harrisonburg Southeast Connector
 Location Study

CANDIDATE BUILD
 ALTERNATIVE 2
 Figure 2-6



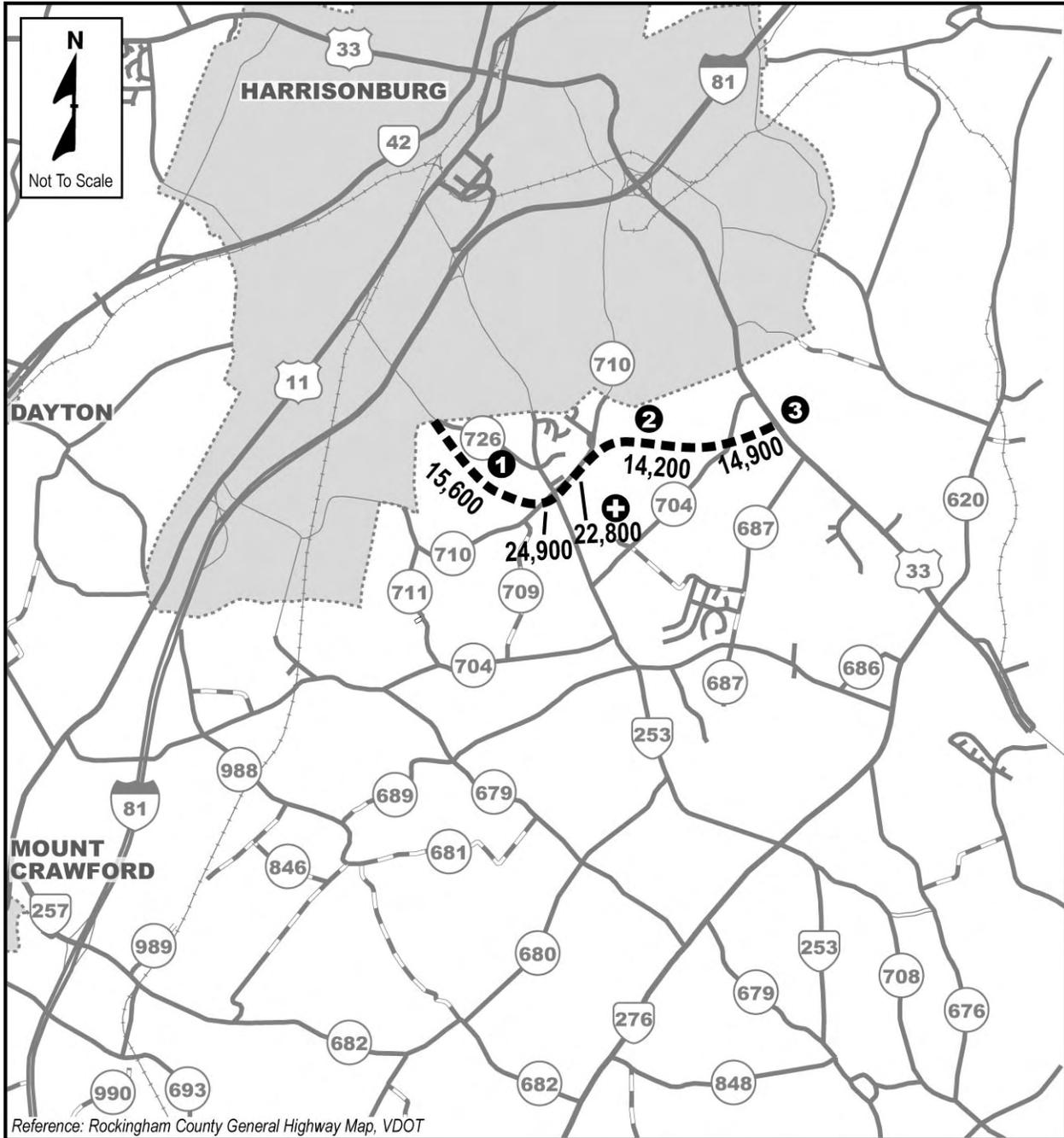
Harrisonburg Southeast Connector
 Location Study

CANDIDATE BUILD
 ALTERNATIVE 2A
 Figure 2-7



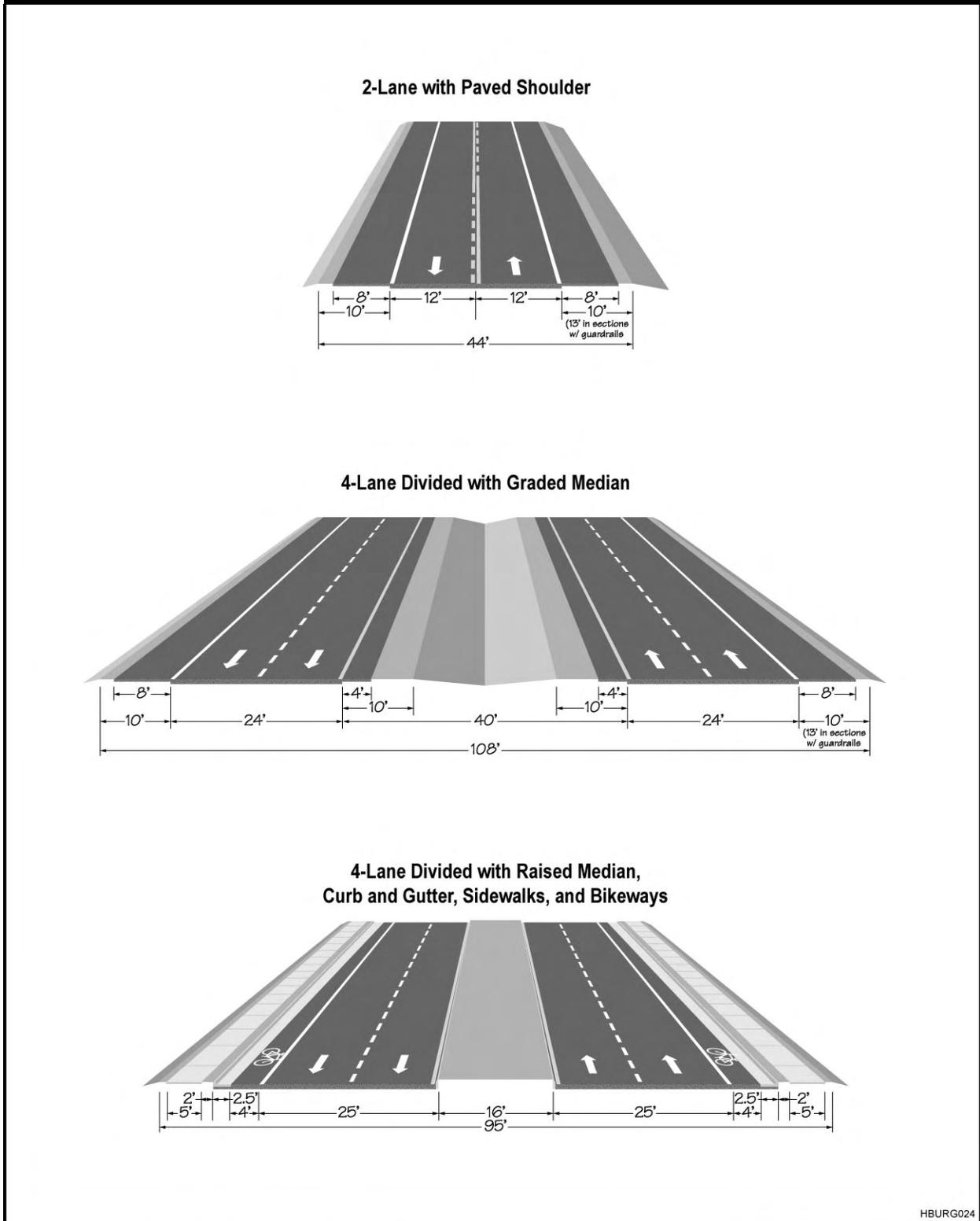
Harrisonburg Southeast Connector
Location Study

CANDIDATE BUILD
ALTERNATIVE 3
Figure 2-8



**Harrisonburg Southeast Connector
 Location Study**

**CANDIDATE BUILD
 ALTERNATIVE 4
 Figure 2-9**



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TYPICAL CROSS SECTIONS
Figure 2-10

2.5.1 Candidate Build Alternative 1 (CBA 1)

Beginning at the Bridgewater Route 257/682 interchange with I-81 (Exit 240) and ending at Route 33, CBA 1 follows an alignment along existing Route 682 (Friedens Church Road) and Route 276 (Cross Keys Road), except for a short section that would bypass the corner at Friedens Church. This alternative would involve widening the existing road to four lanes with a median and paved shoulders between I-81 and Route 681 (South Whitesel Church Road). From Route 681 to Route 276, the existing road would be widened and upgraded to a two-lane highway meeting rural minor arterial design standards, which provide for paved shoulders and alignment features to improve safety. Additionally, it is recommended that Route 682 be reclassified as a primary highway, similar to what was done with Port Republic Road recently. Route 276 would remain two lanes within the existing 80-foot-wide right of way to avoid and minimize effects on the Cross Keys Battlefield, but would be upgraded to provide paved shoulders and with possible spot improvements to improve safety. Between Route 689 (Shen Lake Drive) and Route 33, the existing road would be widened to four lanes with a raised median, curb and gutter, bike lanes, and sidewalks. Connections with all existing intersecting roads would be maintained; however, possibilities would be investigated for an access management plan to help reduce long-term proliferation of access points into individual properties. The section on new location near Friedens Church would have “limited access,” that is, no direct access to adjoining properties.

Basis for retaining CBA 1 for further study:

- Existing routes underlying this alternative already are used for substantial east-west travel in order to avoid congested conditions on Route 33 and I-81 and because it is convenient for the travel pattern between the southwest and northeast corners of the study area. However, the potential for these routes is limited by road design features not commensurate with the travel demand, particularly along Route 682.
- Conforms to recommendations from citizens during scoping and public involvement activities.
- Because of the sensitivity of the Cross Keys Battlefield, the planning and design corridor for this alternative through the Battlefield have been constrained to the existing 80-foot-wide right of way on Route 276.
- Forecasted traffic volumes for this alternative do not seem to justify four lanes for the entire length of the alternative over the planning period (to the year 2030). Thus, four-lane segments are limited to the ends closest to major transportation arteries (i.e., near I-81 and Route 33) where development is expected to be more intense, and thus traffic volumes higher.
- A portion of this alternative overlaps a project along Route 682 that is funded for construction in HRMPO’s *2030 Transportation Plan*. However, that project would leave Route 682 as a secondary road, whereas this alternative would upgrade it to a primary road connecting another primary road (Route 276) with I-81 and Route 11.
- The section of this alternative on new location would bypass a serious “dogleg” in existing Route 682 at Friedens Church.
- The access management features that would be developed should this alternative be selected would be consistent with the Battlefield Preservation Plan adopted by Rockingham County’s

Board of Supervisors and with the goals of the county's comprehensive plan to discourage intensive development outside the designated urban growth boundary.

- The paved shoulders provided for in the typical cross section would serve not only their normal safety and other functions, but could also be used by bicyclists.

2.5.2 Candidate Build Alternative 2 (CBA 2)

CBA 2 begins at Route 11 and follows existing Route 704 (Cecil Wampler Road) to just east of I-81. From there, it continues on new location, crossing Pleasant Run and curving northeastward to the intersection of Route 253 (Port Republic Road) and Route 704 (Boyers Road). The reasons for new location include avoiding the Pleasant Valley historic district and stream impacts to Pleasant Run. From Port Republic Road, the alternative follows existing Route 704 before veering off to connect with Route 33 at a location roughly 1,200 feet south of the present Route 704 intersection at Route 33. This alternative would involve constructing a four-lane road with a median (40 feet wide west of Port Republic Road, 16 feet wide east of Port Republic Road). It would not have an interchange with I-81, primarily because of the spacing relative to other existing interchanges and the remote probability of gaining approval for a new interstate access. It would have "controlled access," that is, access only at intersecting roadways and at property entrances to be determined.

Basis for retaining CBA 2 for further study:

- Provides a central route through the study area that would improve mobility between Route 11 and Route 33, as well as between industrial/commercial areas adjacent to Route 11 and I-81 and residential and commercial areas between Routes 253 and 33. Provides additional transportation capacity through the center of an area designated by the County for future growth, connecting with several secondary roads and providing access near the approved site for the relocation of the regional hospital.
- Parallels or overlaps Route 704, which, though it is discontinuous, already is used for substantial east-west travel through the study area. Much of this alignment is on new location to avoid disruption of residences and a historic district and to avoid a linear involvement with Pleasant Run, which drains much of the study area.
- Conforms to recommendations from citizens during scoping and public involvement activities.
- The alignment for this alternative overlaps a similar project in the "Vision Plan" portion of HRMPO's *2030 Transportation Plan*. Though current allocations of available transportation money do not permit funding at this time in the *Plan* for construction, or even preliminary engineering, the *Plan* nevertheless identifies it as a long-range transportation need to help address regional deficiencies.
- The paved shoulders provided for in the typical cross section would serve not only their normal safety and other functions, but could also be used by bicyclists.

2.5.3 Candidate Build Alternative 2A (CBA 2A)

CBA 2A is a variation of CBA 2. It begins at Route 11 and follows existing Route 704 (Cecil Wampler Road) to just east of I-81. From there, it continues on new location, crossing Pleasant Run and continuing toward Route 679 (Pleasant Valley Road). At Route 679 it veers northward, crosses Pleasant Run again and Route 704 (Osceola Springs Road), and continues to Route 710

(Ridgedale Road) near its intersection with Route 709 (Autumn Lane). From there, it follows the same alignment as CBAs 3 and 4 across Port Republic Road and extends to Route 33 at a location roughly 1,200 feet south of the present Route 704 intersection with Route 33. This alternative would involve constructing a four-lane road with a median. It would not have an interchange with I-81, primarily because of the spacing relative to other existing interchanges and the remote probability of gaining approval for a new interstate access. It would have “controlled access,” that is, access only at intersecting roadways and at property entrances to be determined.

Basis for retaining CBA 2A for further study:

- Same as for CBA 2, except that this alternative would provide more-direct access into the approved site for the relocation of the regional hospital.
- This alternative also would avoid displacements of homes along the Boyers Road portion of Route 704 between Route 253 and Route 33.

2.5.4 Candidate Build Alternative 3 (CBA 3)

CBA 3, beginning at Route 11 and ending at Route 33, follows portions of Route 710 (Greendale and Ridgedale Roads), but otherwise would be on new location. This alternative would involve constructing a four-lane road with a median 16 feet wide. The existing interchange at I-81 (Exit 243) would be reconstructed. [If CBA 3 is the selected alternative, additional traffic operational analysis will be needed to determine the best configuration for the interchange that will be acceptable to FHWA.] East of Port Republic Road, the alignment skirts the northern boundary of property to which Rockingham Memorial Hospital plans to relocate. The road would have “controlled access,” that is, access only at intersecting roadways and at property entrances to be determined. As with CBA 2, the intersection of Route 704 (Boyers Road) with Route 33 would be relocated southward about 1,200 feet. In addition, this alternative would include a spur connecting the new road with Route 726 (Stone Spring Road) to the north (i.e., a Stone Spring Road Extension on new location). Existing intersections of Stone Spring Road and Reservoir Street with Port Republic Road would be eliminated, with both connecting to the new road instead.

Basis for retaining CBA 3 for further study:

- The main line of this alternative in combination with the spur to Route 726 provides routes that would improve mobility across the northern portion of the study area between Route 11 and Route 33. A connection to I-81 also would be provided within a developed industrial/commercial area, and the more-direct route eastward from that connection would facilitate travel between it and other developed residential and commercial areas. Provides additional transportation capacity within the northern portion of the study area that already has experienced substantial growth, but will continue to grow in the future.
- Provides access to the approved site for the relocation of the regional hospital.
- Conforms to recommendations from citizens during scoping and public involvement activities.
- Portions of this alternative overlap a project to widen and relocate a section of Route 726, making it a four-lane divided facility between Route 11 and Route 253, that is funded for construction in HRMPO’s *2030 Transportation Plan*. Another portion of this alternative overlaps a section of road that Rockingham Memorial Hospital proposes to build for access to the hospital along the northern perimeter of its new site.

- The raised median/curb-and-gutter cross section proposed for this alternative reflects the more urbanized conditions in areas closer to Harrisonburg. The bikeways and sidewalks included in the cross section would facilitate bicycle and pedestrian movement through the corridor.
- The alignment configuration in the I-81 interchange area reflects avoidance of Pleasant Valley Elementary School and other site constraints.

2.5.5 Candidate Build Alternative 4 (CBA 4)

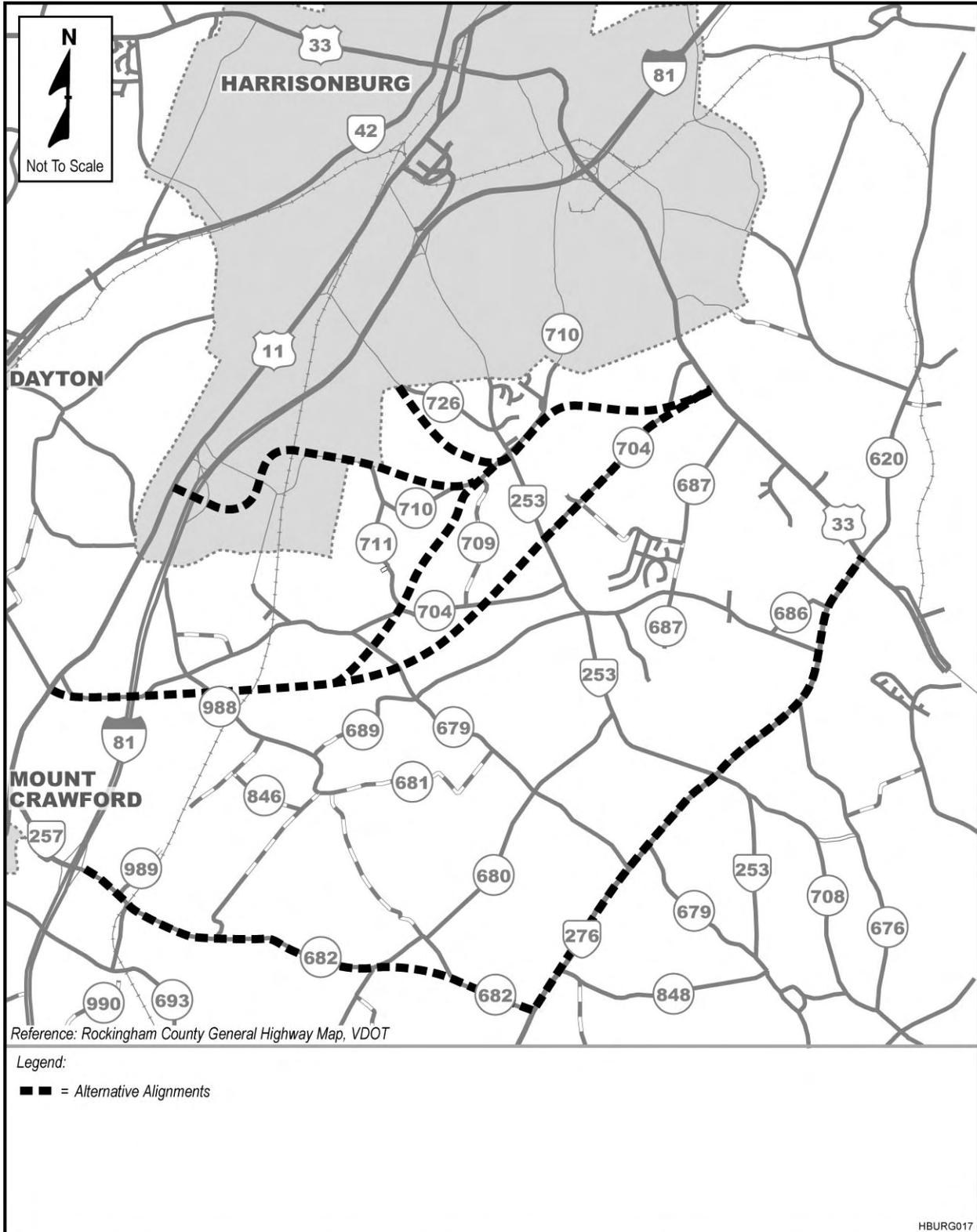
CBA 4, beginning on existing Route 726 (Stone Spring Road) near the City of Harrisonburg limits and ending at Route 33, would be mostly on new location. This alternative would involve constructing a four-lane road with a median 16 feet wide, which would connect with the City of Harrisonburg's proposed upgrade of Stone Spring Road. There would be no interchange with I-81. The road would have "controlled access," that is, access only at intersecting roadways and at property entrances to be determined. As with CBA 2 and CBA 3, the intersection of Route 704 (Boyers Road) with Route 33 would be relocated southward about 1,200 feet. Existing intersections of Stone Spring Road and Reservoir Street with Port Republic Road would be eliminated, with both connecting to the new road instead.

Basis for retaining CBA 4 for further study:

- Provides route that would improve mobility across the northern portion of the study area between Route 11 and Route 33 and between downtown Harrisonburg and commercial areas along Route 33. Provides additional transportation capacity within the northern portion of the study area that already has experienced substantial growth, but will continue to grow in the future.
- Provides access to the approved site for the relocation of the regional hospital.
- Conforms to recommendations from citizens during scoping and public involvement activities.
- Portions of this alternative overlap a project to widen and relocate a section of Route 726, making it a four-lane divided facility between Route 11 and Route 253, that is funded for construction in HRMPO's *2030 Transportation Plan*. Another portion of this alternative overlaps a section of road that Rockingham Memorial Hospital proposes to build for access to the hospital along the northern perimeter of its new site.
- The raised median/curb-and-gutter cross section proposed for this alternative reflects the more urbanized conditions in areas closer to Harrisonburg. The bikeways and sidewalks included in the cross section would facilitate bicycle and pedestrian movement through the corridor.

2.6 COMBINATION ALTERNATIVES

Combinations of the alternatives also are possible. Theoretically, all five alternatives could be implemented, as shown on **Figure 2-11**. However, a more likely combination might be something like CBA 1 plus CBA 4, which would provide both outer and inner connecting routes across the study area. For simplicity, all possible combinations have not been examined in detail in this document, but four possible combinations were tested to determine the potential traffic impacts of combining improvements across several alternatives. The tested combinations are as follows:



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ALTERNATIVE COMBINATIONS
Figure 2-11

- Combination Alternative 1 + 4: Combination of CBA 1 and CBA 4.
- Combination Alternative 2 + 4: Combination of CBA 2 and CBA 4.
- Combination Alternative 1 + 2 + 4: Combination of CBA 1, CBA 2, and CBA 4.
- Combination Alternative 1 + 3: Combination of CBA 1 and CBA 3.

Traffic analyses using the regional transportation model indicate that the Candidate Build Alternatives would provide varying levels of transportation benefits. For example, the alternatives closer to the City of Harrisonburg and I-81 (CBA 3 and CBA 4) would add needed capacity in those areas but would not provide the same level of traffic relief to congested facilities farther from Harrisonburg, whereas CBA 1, CBA 2, and CBA 2A would provide those capacity benefits to the outer portion of the study area. In general, the combination alternatives would provide benefits throughout the study area. These benefits are discussed and quantified more fully in the next section.

2.7 TRAFFIC BENEFITS AND IMPACTS OF ALTERNATIVES

Based on traffic forecasts for the year 2030, each of the Candidate Build Alternatives would carry substantial volumes of traffic, as depicted in Figures 2-5 through 2-9 and as listed below. Depending on the section of road:

- CBA 1 would carry from 9,700 to 15,700 vehicles per day,
- CBA 2 would carry from 13,100 to 20,100 vehicles per day.
- CBA 2A would carry from 19,300 to 30,500 vehicles per day.
- CBA 3 would carry from 19,400 to 35,300 vehicles per day.
- CBA 4 would carry from 14,200 to 24,900 vehicles per day.

One way to judge the effectiveness of the alternatives is to look at the levels of service expected with each alternative compared to the levels of service presented in Chapter 1 (see Section 2.7.1 for explanation of the level of service concept). **Table 2-4** shows the levels of service on roadways that meet the deficiency threshold (i.e., level of service D or worse) if no transportation improvements at all are provided (the “Do Nothing” column in the table) and then, for those same roadways, it compares the levels of service expected for the No-build Alternative (the set of improvements provided for in HRMPO’s “2030 [Financially] Constrained Long Range Plan”), for each Candidate Build Alternative, and for several potential combinations of Candidate Build Alternatives.

As reflected in the table, the Candidate Build Alternatives, alone or in combination with other Candidate Build Alternatives, would affect traffic operations on study area roadways by providing more-direct routes for many east-west trips across the study area and by providing additional transportation capacity within the study area. However, in order to draw a more comprehensive picture of the transportation benefits and impacts of the alternatives, additional analyses were conducted. Study area mobility depends on the extent to which transportation improvements minimize travel times by providing a more direct route and/or a less congested route. Other transportation benefits result from the diversion of traffic from congested roadways in the study area. The analyses and comparisons described in the next subsections are focused on the extent to which the alternatives serve study area mobility and accommodate traffic volumes generated by existing and future development. The analyses are based on traffic forecasts from the approved regional transportation computer model, which incorporates estimates of future development, including the proposed Rockingham Memorial Hospital.

**Table 2-4
 LEVELS OF SERVICE**

Roadway	From	To	Level of Service												
			Do Nothing*	No-build**	CBA 1	CBA 2	CBA 2A	CBA 3	CBA 4	1 + 4	2+4	1+2+4	1+3		
Rte 682 (Friedens Church Rd)	I-81	N. River Rd	D	C	A	C	C	C	C	C	C	A	C	A	A
Rte 682 (Friedens Church Rd)	N. River Rd	S. Whitesel Ch Rd	D	C	A	A	A	A	B	A	A	A	A	A	A
Rte 682 (Friedens Church Rd)	S. Whitesel Ch Rd	Koaner Ford Rd	D	C	C	C	C	C	D	C	C	C	C	B	B
Rte 276 (Cross Keys Rd)	Friedens Ch Rd	Port Republic Rd	D	D	C	B	B	B	B	C	B	C	B	B	C
Rte 276 (Cross Keys Rd)	Port Republic Rd	Shen Lake Dr	F	F	C	B	B	B	B	C	B	C	B	C	C
Rte 276 (Cross Keys Rd)	Shen Lake Dr	Woods Rd	F	F	B	B	B	B	B	B	B	B	B	A	A
Rte 276 (Cross Keys Rd)	Woods Rd	Spotswood Tr	F	F	B	B	B	B	B	C	B	B	B	B	B
Rte 704 (Cecil Wampler Rd)	Valley Pike	Early Rd	E	E	C	B	B	B	B	C	C	C	B	B	B
I-81	Friedens Ch Rd	S. Main St	D	D	D	C	C	C	D	D	D	D	C	C	D
I-81	S. Main St	Port Republic Rd	D	D	D	D	D	D	D	D	D	D	D	D	D
I-81	Port Republic Rd	E. Market St	D	D	D	D	D	D	D	D	D	D	C	C	D
Rte 253 (Port Republic Rd)	Cross Keys Rd	Boyers Rd	E	E	E	E	E	E	E	E	E	E	E	E	E
Rte 253 (Port Republic Rd)	Boyers Rd	Ridgedale Rd	E	C	C	C	C	B	C	B	C	B	C	C	B
Rte 253 (Port Republic Rd)	Ridgedale Rd	Stone Spring Rd	E	C	C	C	C	D	B	B	B	B	B	B	B
Route 689 (Shen Lake Dr)	Port Republic Rd	Massanetta Springs Rd	D	D	D	D	D	D	D	D	D	D	D	D	D
Rte 704 (Boyers Rd)	Port Republic Rd	Spotswood Tr	C	D	A	B	A	A	A	A	A	A	B	A	A
Rte 710 (Ridgedale Rd)	Grassy Creek Rd	Autumn Lane	D	D	D	D	D	E	C	E	C	E	E	E	C
Rte 726 (Stone Spring Rd)	S. Main St	Port Republic Rd	D	C	B	B	B	B	B	C	B	C	B	B	B
Rte 710 (Reservoir St)	Port Republic Rd	Neff Ave	E	E	E	E	E	E	E	E	E	E	E	E	E
Rte 33 (Spotswood Tr)	Boyers Rd	Cross Keys Rd	D	D	C	C	C	C	C	C	C	C	C	C	C
CBA 2 (new-location section)	Cecil Wampler Rd	Port Republic Rd				A									
CBA 2A (new-location section)	Cecil Wampler Rd	Spotswood Tr					A								
CBA 3	S. Main St	Spotswood Tr									B				
CBA 4	Peach Grove Ave	Spotswood Tr										A			

NOTES: * Levels of Service from Technical appendix of HRMPO's 2030 Transportation Plan.
 **Levels of Service if construction projects in Constrained Long Range Plan are implemented (i.e., the No-build alternative for this study).

2.7.1 Analysis Methods

The transportation benefits of the alternatives would accrue at both the micro and macro level. Benefits at the micro level would be those related to detailed roadway and intersection/interchange operations as measured by standard traffic engineering level of service analyses. With detailed level of service analyses, traffic engineers assess operations based on detailed information including peak-hour traffic volumes, peaking characteristics, as well as roadway specifics such as lane configurations and widths, shoulder configurations, etc. This detailed analysis, where roadway operations are graded using a scale from A to F, with A representing excellent traffic flow with minimal delays and F representing failure in traffic operations and very high levels of delay, is typically used to support specific design features. While this analysis was used to assist in developing design features of the Candidate Build Alternatives, the level of detail associated with such analysis is typically not practical or useful to assess alternatives at a broad, study area scale.

For purposes of assessing the traffic impacts of the Candidate Build Alternatives at a study-area-wide scale, macro-level measures are more practical and informative. The macro-level mobility benefits of the Candidate Build Alternatives would accrue from two factors:

1. The extent to which the alternatives would provide more direct routes that support regional travel demand patterns; and,
2. The extent to which they would divert traffic from congested roads and thereby improve overall traffic operations in the study area.

The first factor can be quantified by the volumes of traffic that are forecast to use an alternative. For this analysis, year 2030 average daily traffic volumes on each segment of each Candidate Build Alternative were tabulated and the total number of vehicle-miles (one vehicle-mile is one vehicle traveling one mile) served by all segments of the alternative was calculated. While this provides a measure of total travel, this figure is skewed by the length of the alternative (i.e., longer alternatives would be expected to result in more vehicle-miles). Controlling for the length of the alternative, the average daily traffic volumes were calculated by weighting the volume on each segment by the length of the segment. This provides a good measure of the extent to which each alternative serves travel demands.

The second factor can be estimated by identifying the roadways from which traffic would be diverted and the extent to which these diversions would be from congested roads. To quantify this second factor, two measures of effectiveness were developed and calculated. The first identified roadway segments in the study area that are anticipated to experience congestion in 2030 (volume to capacity ratios of 1.0 or greater on the No-build network) and that would experience increases or decreases in daily traffic volumes of more than 1,000 vehicles per day as a result of the Candidate Build Alternative. This provides a proxy measure of the overall congestion effects, on an area-wide basis, of the various alternatives.

The second measure of effectiveness gauges the effects on all study area roads and weights these roads by the extent to which they are congested under the No-build Alternative. The number of vehicle-miles added or removed from study area roads by each of the Candidate Build Alternatives was calculated. The changes in vehicle-miles then were weighted by the expected level of congestion, based on roadway capacity conditions (under-, near-, or over-capacity). For those roadways expected to be operating at over-capacity conditions, the estimated change in vehicle-miles was multiplied by 1.0; for those roadways expected to be operating at near-

capacity conditions, the factor was 0.7; and for those roadways expected to be operating at under-capacity conditions, the factor was 0.1.² The factored changes in vehicle-miles then were summed for all roadway segments in the study area, resulting in a net factored change in vehicle-miles across the study area. This methodology allows for the effects of congestion to be accounted for in an overall weighting of the expected shifts in traffic within the study area.

2.7.2 Travel Demand for Candidate Build and Combination Alternatives

The average daily traffic volumes that would be served by each of the alternatives in the year 2030, as shown in **Table 2-5**, ranges from a low of approximately 11,500 vehicles per day to a high of approximately 21,600 vehicles per day. In general, those alternatives that are closer to the City of Harrisonburg and connect to the major retail areas in the southeast quadrant of Route 33 and I-81 are expected to carry higher traffic volumes. The highest average volumes of traffic are expected on CBA 2A and CBA 3. CBA 2A provides connections to Route 11 south of the City of Harrisonburg as well as the Route 33 retail areas. CBA 3 makes the same connections, but closer to the city. Forecasted traffic volumes for 2030 by segment for each of the Candidate Build Alternatives were displayed in Figures 2-5 through 2-9.

**Table 2-5
 TRAFFIC VOLUMES AND VEHICLE-MILES**

Candidate Build Alternative	Approximate Length of Alternative (miles) *	Daily 2030 Volume (Weighted Average)**	Total 2030 Daily Vehicle-Miles
CBA 1	8.8	11,600	102,540
CBA 2	6.4	16,900	107,548
CBA 2A	6.6	21,600	142,719
CBA 3	5.7	21,600	121,902
CBA 4	3.1	16,800	51,773
Combination Alternative 1 + 4	11.9	12,200	145,448
Combination Alternative 2 + 4	9.5	16,600	149,471
Combination Alternative 1 + 2 + 4	18.3	11,500	205,113
Combination Alternative 1 + 3	14.5	13,100	189,200

* Approximate number of road-miles included in all segments of the alternative (including new and upgraded facilities). Note: these lengths do not necessarily match those in Table 2-3 because of slight differences in construction termini and traffic analysis termini.

** This is the average traffic served on all segments of the alternatives, weighted by the lengths of the segments. This provides a measure of traffic served per mile of alternative. Because of the weighting by segment length, the combination alternatives that make use of Alternative 1 (which includes longer sections of roadway relative to the closer-in alignments) will have average volumes closer to CBA 1 than could be expected using an unweighted average.

² The weighting factors were estimated based on the range of volume to capacity ratios included in each condition (under, near, and over-capacity) as well as analyses of congestion versus volume-to-capacity ratios. Mirroring the relationship between traffic volumes and congestion, the factors highlight the fact that an additional vehicle on an under-capacity roadway has a much smaller effect on roadway congestion than it would on an over-capacity roadway, and that the effect of an additional vehicle on a near-capacity roadway is closer to that which would be experienced on an over-capacity roadway than an under-capacity roadway.

2.7.3 Traffic Diversions for Candidate Build and Combination Alternatives

One of the primary benefits of all the Candidate Build Alternatives as compared to the No-build Alternative is the diversion of traffic from congested roadways in the study area to new facilities that would be designed to accommodate the forecasted demand. **Table 2-6** summarizes this diversion from congested roads for each of the Candidate Build and Combination Alternatives. Note that for some of the alternatives, traffic would increase on some over-capacity roadways in order to get to and from the roadways that comprise the alternatives. As Table 2-6 shows, CBA 2A would result in substantial traffic volumes (1,000 or more vehicles per day) diverting from the largest number of congested miles of road in the study area, 8.87 miles. CBA 3 and CBA 4, while providing additional capacity within the more congested roadways closer to the City of Harrisonburg and I-81, would not divert traffic away from these congested roads to the extent that the other alternatives would. The end result is that these alternatives are not expected to provide the same level of study-area traffic relief as CBAs 1, 2, and 2A would.

Combination Alternative 1 + 4, by providing improvements that are located both close to the City of Harrisonburg (CBA 4) and farther out (CBA 1), would reduce traffic on the second largest amount of congested roadway miles in the region (8.49 miles) while not creating substantial traffic increases on any congested roadways in the region. This indicates that it would provide a good mix of facilities to divert shorter, more localized trips occurring closer to the city as well as longer trips traveling to and from the edges of the study area. Combination Alternative 2 + 4, by contrast, would provide a higher degree of improvement within the busier, closer-in parts of the study area where traffic volumes are higher. The result would be greater overall volumes of traffic shifting from congested to uncongested roads, but because the improvements in this combination would be more geographically focused, the traffic would remain more concentrated, resulting in fewer congested roadway miles that would experience decreases of 1,000 or more vehicles per day.

**Table 2-6
MEASURES OF EFFECTIVENESS**

Alternative	Congested Miles of Road ¹ in Study Area With:		Congested VMT Factor ² (Rank)
	Traffic Reductions of 1,000 vpd or more	Traffic Increases of 1,000 vpd or more	
CBA 1	7.48	0.00	-19,148 (8)
CBA 2	8.15	1.29	-35,558 (4)
CBA 2A	8.87	0.56	-52,210 (1)
CBA 3	5.18	3.67	-23,742 (6)
CBA 4	3.79	0.00	-4,629 (9)
Combination Alternative 1 + 4	8.49	0.00	-23,691 (7)
Combination Alternative 2 + 4	8.15	0.96	-43,019 (3)
Combination Alternative 1 + 2 + 4	8.15	0.56	-43,284 (2)
Combination Alternative 1 + 3	5.91	3.67	-30,661 (5)

Notes:

[1] -- A congested road is defined as one operating at an over-capacity condition based on the planning-level service levels (developed using volume-to-capacity ratios).

[2] The congested VMT factor is the net number of vehicle-miles removed from congested facilities. The change in VMT for each link was factored based on the level of congestion in the No-build Alternative to reflect the extent to which facilities are congested. The factors used are: under-capacity=0.1, near-capacity=0.7, over-capacity=1.0.

The analysis associated with the measure of net change in vehicle-miles on congested facilities provides a composite measure of the congestion effects of diverting traffic on both near- and over-capacity roadways. This measure of effectiveness provides a good picture of the traffic impacts of the various alternatives, particularly the Combination Alternatives. The largest net decrease in factored vehicle-miles in the study area would result from the construction of Candidate Build Alternative 2A: a decrease of more than 52,000 daily factored vehicle-miles. Combination Alternative 2 + 4 and Combination Alternative 1 + 2 + 4 would provide net decreases of just over 43,000 daily factored vehicle-miles. While all of the alternatives are expected to provide net decreases, the lowest level of decrease would result from the construction of Candidate Build Alternative 4.

2.7.4 Summary of Traffic Benefits

Each of the Candidate Build Alternatives and Combination Alternatives would provide additional roadway capacity in the study area to support mobility demands and would support the transportation needs of existing and future development. The analysis of traffic utilization of the alternatives highlights the extent to which each would serve the study area’s transportation needs. CBAs 2A and 3 would be expected to carry the highest average daily traffic volumes in 2030, indicating that they would provide the highest degree of mobility for the study area. On an area-wide basis, CBA 2A also would provide the highest degree of overall net relief to the study area’s congested roadways, providing a substantial benefit to overall mobility. **Table 2-7** summarizes the key advantages and disadvantages of each alternative from a traffic and transportation standpoint.

**Table 2-7
 SUMMARY OF KEY TRANSPORTATION ADVANTAGES AND DISADVANTAGES**

CBA 1	<ul style="list-style-type: none"> • Low end in terms of regional traffic volume served. • Reduces traffic on congested regional facilities including I-81 & Route 33 (2,000-2,500 vehicles per day). • Also diverts traffic from the south end of Route 253 and Route 704 (1,500-2,500 vehicles per day).
CBA 2	<ul style="list-style-type: none"> • Average traffic served is in the middle of the range for all alternatives (16,200 vehicles per day). • Middle of the range in terms of net reduction of traffic on congested study area roadways. • Reduces traffic on I-81 and Route 33 (north of Route 704), Route 689, Route 682, and Route 276. • Increases traffic on Route 11 south of Route 704 (traffic accessing the new facility) and on Route 33 south of Route 704 (diverted from Route 689).
CBA 2A	<ul style="list-style-type: none"> • Tied with CBA 3 for highest weighted average daily traffic volume served. • High in terms of providing relief to congested regional roadways. • Reduces traffic on I-81 & Route 33 (north of Route 704), 689, Route 682, and Route 276. • Increases traffic on Route 11 south of Route 704 (traffic accessing the new facility), on Route 33 south of Route 704 (diverted from Route 689), and on Route 253 and Route 710 for traffic getting to the new facility.
CBA 3	<ul style="list-style-type: none"> • High end in terms of regional traffic served. • Low in terms of reducing traffic on congested facilities. • Reduces traffic on Route 11 south of Route 704, Route 704, and Route 11 and I-81 north of where this alternative would connect to Route 11 and I-81. • Increases traffic on I-81 south of the project tie-in and on Route 33 south of Route 704. • Substantial localized benefit for Route 33 near I-81.

Table 2-7
SUMMARY OF KEY TRANSPORTATION ADVANTAGES AND DISADVANTAGES

CBA 4	<ul style="list-style-type: none"> • Mid-level in terms of average daily traffic volume served. • Benefits in terms of reducing traffic on other roadways is the most localized of all alternatives; traffic reductions on Neff Avenue, University Boulevard, East Market Street (Route 33), and I-81 north of Route 253.
Combination Alternative 1 + 4	<ul style="list-style-type: none"> • Combination of close-in CBA 4 and CBA 1 at the edge of the study area results in decreased traffic on almost all other study area roadways. This is reflected in the high ranking in terms of net reduction in congested vehicle-miles in the study area.
Combination Alternative 2 + 4	<ul style="list-style-type: none"> • Similar to Combination Alternative 1 + 4 in diverting traffic from most roadways in the study area. • As with CBA 2, this alternative would provide a high level of relief to I-81; traffic accessing the CBA 2 alignment, however, has the potential to increase congestion on Route 11 south of Route 704 and on Route 33 south of Route 704.
Combination Alternative 1 + 2 + 4	<ul style="list-style-type: none"> • Similar to Combination Alternative 2 + 4, but the addition of the improvements to Routes 682 and 276 of CBA 1 would lessen the pressures on Route 11 south of Route 704 and on Route 33 south of Route 704 that the previous alternative could create.
Combination Alternative 1 + 3	<ul style="list-style-type: none"> • CBA 3 alone is expected to increase traffic volumes on congested I-81 south of Exit 243. This Combination Alternative also would add volumes on congested I-81, but the increases would be lessened by providing the CBA 1 improvements on Routes 682 and 276.

AFFECTED ENVIRONMENT

3.1 ISSUES IDENTIFICATION

This chapter characterizes the environment potentially affected by the alternatives that are described in Chapter 2. To avoid bulk and to concentrate attention on important issues, the discussions are commensurate with the importance of the potential effects, with less important material summarized, consolidated, or simply referenced, thereby establishing a context for the environmental consequences analyses presented in Chapter 4. **Table 3-1** lists environmental issues and summarizes their relevance to the study. The sections following the table provide additional information on principal issues.

**Table 3-1
ENVIRONMENTAL ISSUES**

Issue	Remarks
Land Use (See Section 3.2.)	Agriculture dominates land use in outlying portions of the study area, while residential, commercial, industrial, and institutional land uses dominate portions of the study area within and closer to the City of Harrisonburg, as well as along major transportation routes (I-81 and U.S. Routes 11 and 33). City and County comprehensive plans outline desired land use patterns in the study area. Land uses evolve over time and transportation facilities often are perceived as being linked to practical and economic uses of land and changes in such uses.
Historic Properties (Districts, Buildings, Sites, Structures, Objects, Archaeological Sites, and Battlefields) (See Section 3.3.)	One of the most frequently mentioned concerns of citizens during scoping, especially with regard to the Cross Keys Battlefield. A number of historic properties have been identified throughout the study area. Section 106 of the National Historic Preservation Act and Section 4(f) of the Department of Transportation Act require consideration of avoidance and minimization of impacts to these properties.
Farmland, Agricultural and Forestal Districts, and Agricultural Economy (See Section 3.4.)	Much of the land in the study area currently is used for agriculture, and, notwithstanding the County's designation of most of the study area for future growth, many public comments expressed concern about farmland loss associated with highway construction or other development. The federal Farmland Protection Policy Act (FPPA) requires assessment of potential conversions of certain farmland to nonagricultural uses. State law protects agricultural and forestal districts, several of which are located within or near the study area.
Karst and Caves (See Section 3.5.)	The project is located within an area of karst terrain (geology characterized by highly soluble rock, such as limestone), which has particular relevance to groundwater quality, threatened or endangered species, drainage, and structural stability.

Table 3-1
ENVIRONMENTAL ISSUES

Issue	Remarks
Streams, Water Quality, and Wetlands (See Section 3.6.)	Surface waters are characterized chiefly by well-defined stream channels without extensive wetland areas. Several streams have been degraded by pollution from nonpoint sources (agriculture and development activities). The federal Clean Water Act requires avoidance and minimization of impacts to the extent practicable.
Endangered Species (See Section 3.7.)	Federal and state agencies identified four federally listed species (Madison Cave isopod, Indiana bat, Virginia sneezeweed, and northeastern bulrush) and one state-listed species (Madison Cave amphipod) as potentially occurring in the study area.
Homes and Neighborhoods	Much of the study area currently can be characterized as rural with homes scattered along existing roadways. Lands closer to main travel arteries (such as I-81 and U.S. Routes 11 and 33) have been intensively developed over the last couple of decades. The County's comprehensive plan designates most of the study area for future development.
Community Facilities (Churches, Cemeteries, Schools, Fire Stations, Medical Facilities) (See Section 3.2.)	Churches and cemeteries are scattered throughout the study area; two public schools and two fire stations are in the study area; Rockingham Memorial Hospital proposes to relocate from downtown Harrisonburg to a site in the study area (the Rockingham County Board of Supervisors has approved the rezoning required for the move).
Visual Character	The visual character of the area is notable due to the surrounding mountains and the rolling farmland that many perceive as picturesque.
Noise	There are many noise-sensitive receptors (mainly residential sites) within the study area.
Air Quality	Air quality generally is good and the region is in attainment of all National Ambient Air Quality Standards.
Parks and Recreation Areas (See Section 3.2.)	Several parks and recreation areas are located within the study area. These properties are given special consideration due to their value to the community and the protection provided them under Section 4(f) of the U.S. Department of Transportation Act.
Floodplains (See Section 3.6.)	Several floodplains have been designated by the Federal Emergency Management Agency along streams within and near the study area; however, they are not large.
Hazardous Material Sites	The hazardous material sites (sites potentially containing flammable, explosive, corrosive, or toxic substances) in the area are typical of those for a small city and rural agricultural community. They include gas stations, industrial sites, underground tanks, and others. Concerns associated with them include health hazards, liability issues, and potentially very high costs of clean-up.
Forest Land	Forest land has been largely displaced and fragmented due to agricultural and development activities within the study area. Approximately 2,494 acres of forest, mainly comprised of mixed hardwoods, are scattered across the area, amounting to roughly 12% of the total study area.
Wildlife and Habitat (See Section 3.7.)	Former natural habitats have been extensively altered by agriculture and development and few native woodlands exist. Nevertheless, a number of animal species adapted to human-altered environments reside in or migrate through the remaining mosaic of forests, farms, and yards.
Migratory Birds	U.S. Fish & Wildlife Service requested this issue be addressed. However, migratory bird habitat is limited in the study area due to extensive agricultural areas and development.

**Table 3-1
 ENVIRONMENTAL ISSUES**

Issue	Remarks
Public Water Supplies	There are no surface public water supplies in the study area. Groundwater is the water supply source for a number of homes and for several small community groundwater waterworks. There are no sole-source aquifers designated by the U.S. Environmental Protection Agency in the study area. A few comments were received during scoping expressing concerns about possible effects on water supplies.
Navigable Waterways	There are no navigable waterways in the study area.
Scenic Byways/Scenic Rivers	No state-designated scenic byways or scenic rivers and no federally designated wild and scenic rivers are located within or near the study area.

3.2 LAND USE AND SOCIOECONOMICS

3.2.1 Existing Land Use

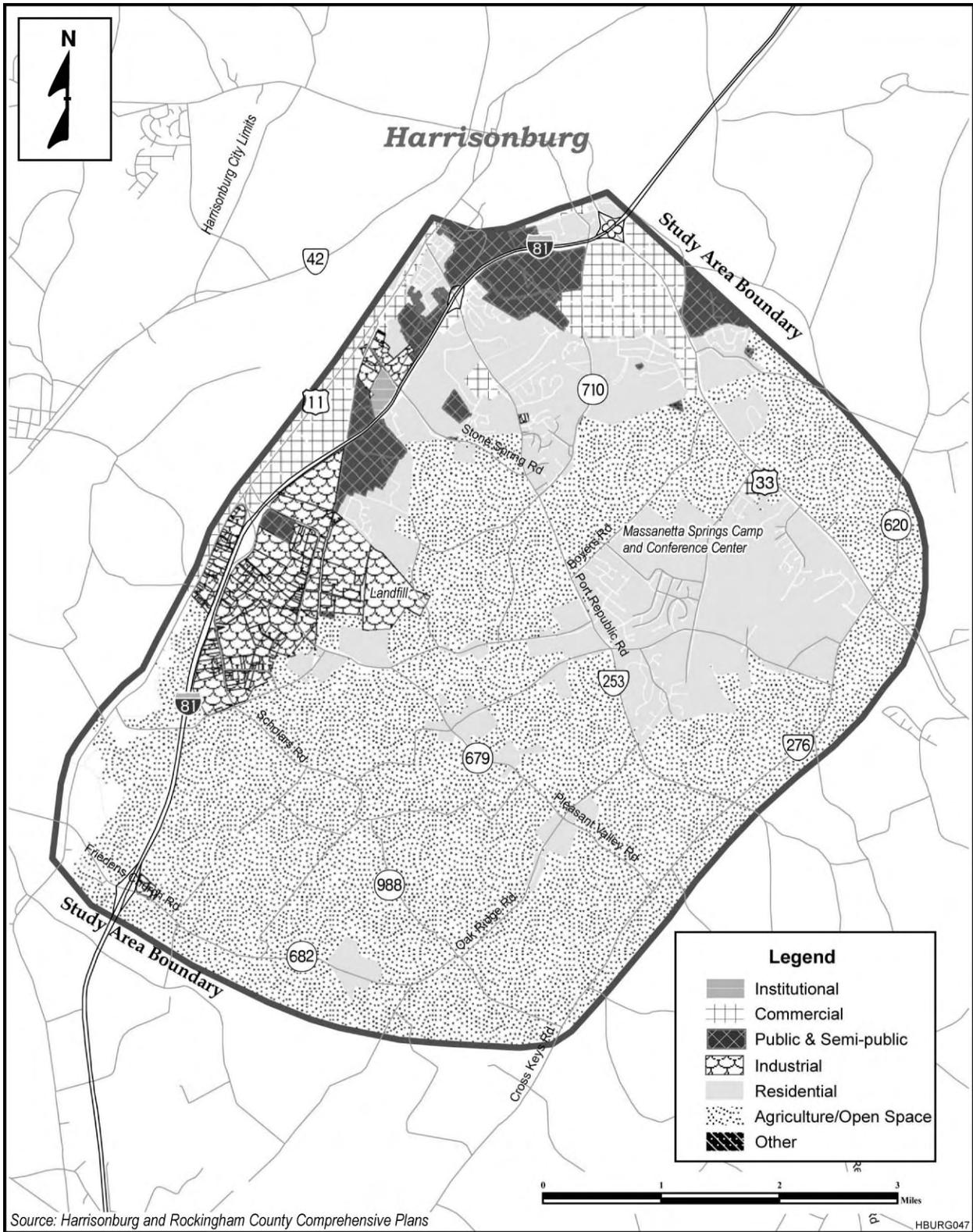
Existing land use in the study area consists of a mix of agricultural, residential, commercial, industrial, and institutional land uses, with the heavier development concentrated in the City of Harrisonburg and near major roadways such as U.S. Route 11, U.S. Route 33, Route 253, and the I-81 interchanges. Additional communities in or near the study area include Pleasant Valley, Massanetta Springs, Peales Crossroads, Mount Crawford, and Keezletown. Within the City of Harrisonburg, James Madison University is a major landholder. **Figure 3-1** depicts existing land uses within the study area.

3.2.2 Status of Local Planning

The Rockingham County Board of Supervisors on April 28, 2004 unanimously adopted a new comprehensive plan, entitled *Comprehensive Plan for 2020 and Beyond*, pursuant to Section 15.2-2223 of the Code of Virginia. Adoption of the plan followed a three-year public involvement program that included 15 meetings with a 30-member Citizen Advisory Committee, 20 citizen input meetings, and a formal public hearing (January 14, 2004) over a period of three years. The Harrisonburg City Council adopted a new comprehensive plan, entitled *Comprehensive Plan 2004 Update*, on February 24, 2004. Adoption of the city’s plan followed extensive consultations with a 15-member Comprehensive Plan Advisory Committee, two rounds of community input sessions, and a formal public hearing (February 24, 2004). These comprehensive plans lay out the respective local governments’ long-term visions, goals, and strategies for land uses, infrastructure, and community and economic development.

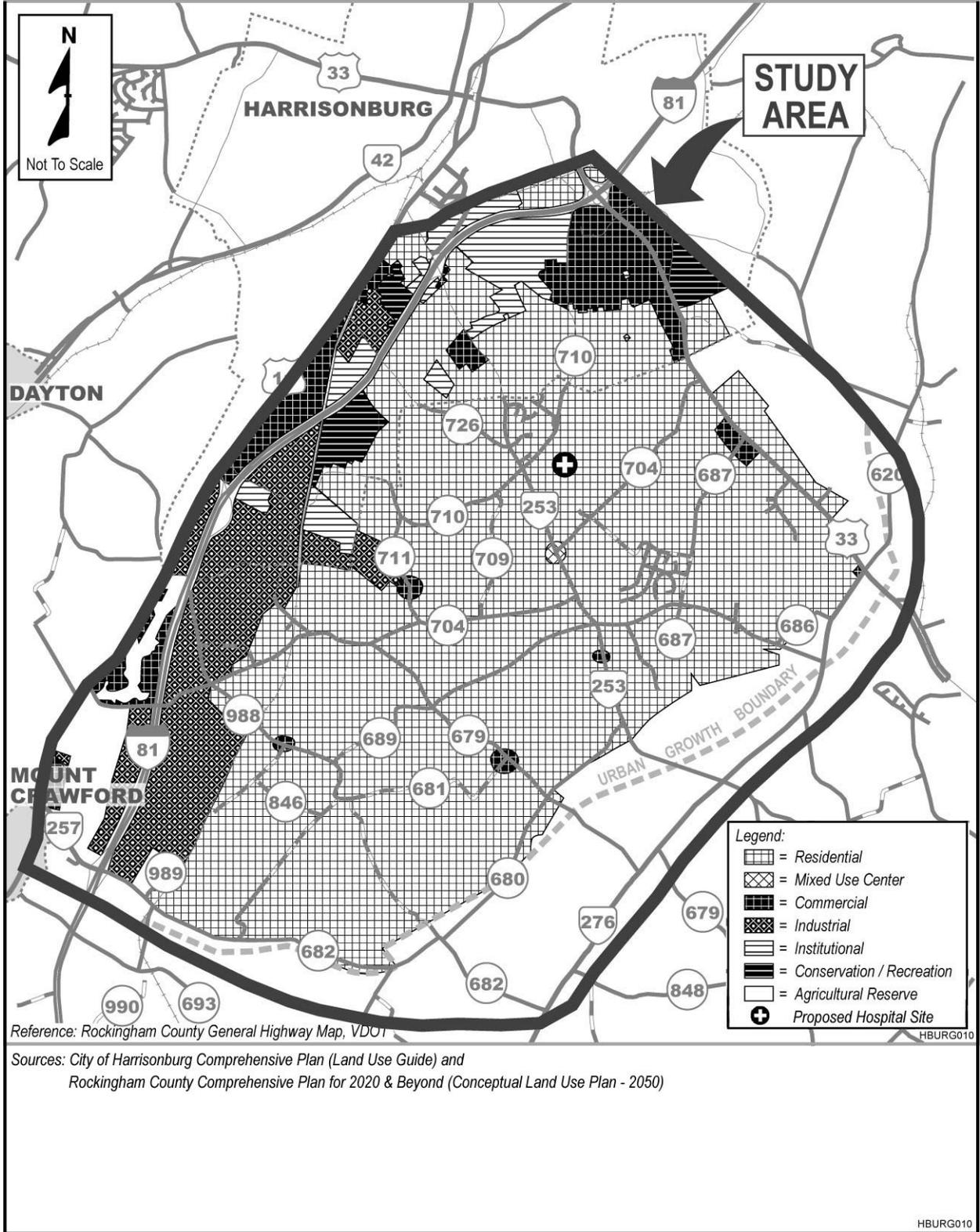
3.2.3 Development Trends

Rockingham County is directing new development to areas in or near existing towns in order to preserve its agricultural roots and economy. According to its *Comprehensive Plan for 2020 and Beyond*, the County plans to extend public water and sewer services to these development areas in concert with increases in population and employment. With the phasing proposed in the comprehensive plan, the bulk of the study area will have public water and sewer service by 2050. In the City of Harrisonburg’s comprehensive plan, the two main land use goals are 1) to improve the quality and compatibility of land use and development and 2) to promote novel patterns of development like those developed early in the city’s history – vital, well planned, and well integrated mixed-housing and mixed-use urban areas of distinct character. **Figure 3-2** is a composite map of designated future land uses from the city and county comprehensive plans.



Harrisonburg Southeast Connector
 Location Study

EXISTING LAND USE
 Figure 3-1



Harrisonburg Southeast Connector
Location Study

FUTURE LAND USE
Figure 3-2

Future land uses are expected to consist of the gradual expansion of residential, commercial, and industrial uses into the existing agricultural areas within the county's designated urban growth boundary. According to projections by local planners, population and employment in the study area are both expected to grow approximately 77% by the year 2030, while the number of households is expected to grow approximately 120% (household growth is greater than population growth because of declining household size). These trends reflect a continuation of recent expansions in population and employment in the Harrisonburg region. Since 1970, the Rockingham/Harrisonburg population has increased more than 70 percent and currently exceeds 100,000. Economic growth in recent years has resulted largely from growth of James Madison University, growth in the poultry processing industry, and growth in the services sector including warehousing, distribution, and tourism. The recent opening of a large merchandise distribution center adjacent to I-81 in the southwest portion of the study area is representative of an ongoing orientation of portions of the study area to the distribution industry. The recent proposal by the regional hospital to relocate from downtown Harrisonburg to a larger tract in the study area, as well as other development proposals, are indicative of an expanding services infrastructure to keep pace with the growing population. The region boasts a high quality of life in a rural historic setting with easy access to the interstate and major metropolitan areas. Over the past decade, tourism spending in Harrisonburg and Rockingham has steadily increased, growing faster than for Virginia as a whole. Both the city and the county have low unemployment rates compared to Virginia and the nation.

3.2.4 Community Facilities and Services

Schools. Pleasant Valley Elementary School, a Rockingham County school located within the City of Harrisonburg, and Stone Spring Elementary School, a city school, are in the study area. Also in the study area are Massanutten Technical Center (jointly owned by the city and county), Dominion Business School (a private business school), and portions of James Madison University (JMU, a four-year state-supported university with an enrollment of close to 14,000). The East Campus of JMU is located at the northern end of the study area.

Utilities. Virginia Power, Harrisonburg Electric Commission, and Shenandoah Valley Electric Cooperative provide electricity in the region. Several major power transmission lines traverse the study area. Columbia Gas of Virginia provides natural gas service. Solid waste in Harrisonburg and Rockingham County is disposed at the 100-acre landfill located in the west center of the study area. Public water supply sources for the City of Harrisonburg are the North River, Rawley Springs, Silver Lake, and the South Fork Shenandoah River, all outside the study area. Rockingham County's public water supply is provided through two wells located outside the study area near McGaheysville. The Harrisonburg-Rockingham Regional Sewer Authority provides sewage treatment to Harrisonburg and adjoining portions of the county. The treatment plant located near Mount Crawford discharges to the North River, outside the study area.

Fire and Police Protection. Police services are provided by the Rockingham County Sheriff's Department, the Harrisonburg Police Department, and the Virginia State Police. Fire protection is provided by the Harrisonburg Fire Department, with four stations, and the Rockingham County Fire Department, with eleven stations. Both departments operate with a mix of full-time and volunteer firefighters. Each department also is equipped to respond to hazardous material incidents. There are two fire stations in the study area.

3.2.5 Parks and Recreational Areas

The following publicly owned parks are in the study area:

- The City of Harrisonburg's Purcell Park contains 67 acres, with softball/baseball fields, tennis courts, playground areas, picnic shelters, and walking trails.
- The City of Harrisonburg's Ramblewood Fields contains 60 acres, with lighted softball/baseball fields, concession stands, and electronic scoreboards.
- Rockingham County's Albert Long Park contains 6 acres, with a softball/baseball field and a picnic area.

Rockingham County Public Schools has a formal agreement with the Rockingham County Recreation Department whereby school recreational facilities may be used for various county athletic and recreational programs. The City of Harrisonburg does not have a similar formal arrangement; however, facilities on school properties are available for public use after school hours. The James Madison Arboretum, a garden area open for public tours, also is located in the study area. The East Rockingham Recreation Association operates a private club open only to members and offering a swimming pool, tennis courts, picnic shelter, playground, and basketball courts on Route 689 (Shen Lake Drive) near Route 276 (Cross Keys Road). Two privately owned golf courses also are located in the study area: Lakeview (36 holes) and Spotswood Country Club (18 holes).

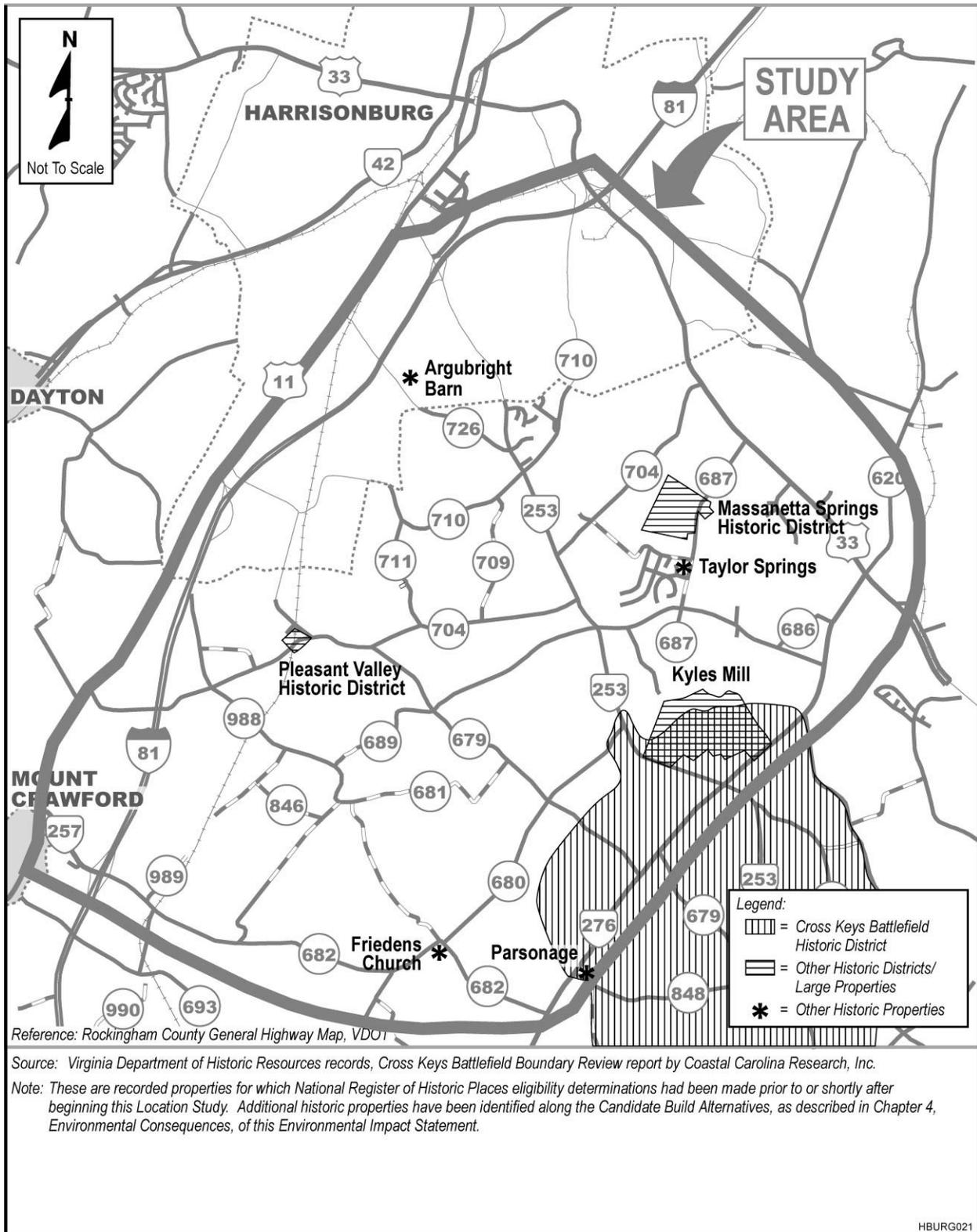
3.3 HISTORIC PROPERTIES

Historic properties are archaeological sites and historic buildings, structures, objects, and districts that are listed in, or eligible for listing in, the National Register of Historic Places (NRHP). The NRHP was established by the National Historic Preservation Act. Section 106 of the Act requires federal agencies to consider the effects of their actions on historic properties.

3.3.1 Historic Architectural Properties and Districts

A review of Virginia Department of Historic Resources (VDHR) archives of previously recorded properties showed several NRHP-listed or NRHP-eligible properties in the study area. They are located as shown on **Figure 3-3** and listed in **Table 3-2**. [Note: identification of additional properties along the Candidate Build Alternatives is discussed in Chapter 4, Environmental Consequences.]

The largest historic resource in the study area is the Cross Keys Battlefield. The June 8, 1862 battle at Cross Keys, along with the nearby battle at Port Republic that occurred the next day, capped Stonewall Jackson's famous 1862 Valley Campaign. With the defeat of the Union armies at Cross Keys and Port Republic, Jackson was able to march his troops out of the Valley and join General Robert E. Lee in the defense of Richmond. The Cross Keys Battlefield boundaries encompass more than 5,400 acres, more than two-thirds of which are outside the study area, and include all places related or contributing to the battle event (i.e., where troops deployed and maneuvered before, during, and after the engagement). Details on the battlefield are included in the report, *Cross Keys Battlefield Boundary Review*, which was submitted to VDHR for purposes of establishing the NRHP-eligible boundaries of the Battlefield.



Harrisonburg Southeast Connector
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PREVIOUSLY RECORDED
 HISTORIC RESOURCES
 Figure 3-3

**Table 3-2
 PREVIOUSLY RECORDED HISTORIC RESOURCES**

VDHR File # ^a	Resource Name	Description	NRHP Status & Criteria ^b
082-0102	Friedens Church and Cemetery	Early 19 th century church & cemetery	Eligible, A & C
082-0376	Cross Keys Battlefield	1862 Civil War battlefield	Eligible, A
082-0509	Massanetta Springs Historic District	Early 20 th century resort hotel and associated buildings and appurtenances	Eligible, C
082-0635	Taylor Springs	Ca. 1850 single dwelling & spring/springhouse	Listed, C
082-0641	Pleasant Valley Historic District	Late 19 th /early 20 th century historic district of dwellings & other buildings	Eligible, A & C
082-5075	Kyles Mill Farm	Mid 18 th century farm complex	Listed, C
082-5204	German Reformed Church Parsonage	Late 18 th century parsonage	Eligible, C
115-5055	Argubright Barn	Mid 19 th century barn	Eligible, A & C
<p>^a VDHR (Virginia Department of Historic Resources) is the office of the State Historic Preservation Officer (SHPO), who has responsibilities under the National Historic Preservation Act for administering the state historic preservation program, which includes maintenance of an archive of recorded historic properties, consultation in the evaluation of properties for National Register eligibility, consultation in determinations of effects on those properties, and provision of other guidance and input on historic resources issues.</p> <p>^b 36 CFR 60.4, National Register Eligibility Criteria: A. Associated with important historical events, which could be of local, statewide, or national significance (e.g., Civil War battle); B. Associated with important historical persons (e.g., Stonewall Jackson); C. Embody distinctive characteristics of a type, period, or workmanship (usually architecture, e.g., 19th century Federal-style dwelling); D. Contains information important in history or prehistory (archaeological sites, e.g., Indian campsites, Cross Keys Tavern site).</p>			

The Cross Keys Battlefield also is an element of the Shenandoah Valley Battlefields National Historic District established by Congress in the Shenandoah Valley Battlefields National Historic District and Commission Act of 1996 (P.L. 104-333). The eight-county District contains 10 Civil War battlefields mapped by the National Park Service (NPS) in 1992 (the Cross Keys Battlefield is the only element of the District that is within the study area). Under provisions of the Act, a Management Plan was developed to establish a planning process for the preservation and interpretation of battlefields included in the District, and to increase public awareness of the legacy of the Civil War in the Shenandoah Valley. The Shenandoah Valley Battlefields National Historic District is an entity established by Congress and is not the same as a historic district established under the criteria used to determine NRHP eligibility under the National Historic Preservation Act; nor are any properties in the District within the study area that are beyond the boundaries of the Cross Keys Battlefield eligible for the NRHP, except to the extent they merit eligibility for factors unrelated to the District or the Battlefield. P.L. 104-333 imposes no restrictions on landowners or local, state, or federal agencies with respect to actions or land use decisions within the District.

3.3.2 Archaeology

A search of VDHR’s archives revealed 21 recorded archaeological sites in the study area, of which 10 are Native-American artifact scatter sites, nine are 18th, 19th, or 20th century historic domestic sites, and two have both Native-American and historic components. Though recorded,

most of these sites remain unevaluated for NRHP eligibility. Additional sites from all time periods are potentially present throughout the study area; however, the potential for large prehistoric base camps and villages is generally low given the lack of riverine settings (i.e., broad floodplains and terraces). Civil War-related sites may be present in the area given the extensive troop movements and battle-related activities that occurred. Several local residents have reported that camping and other troop activities occurred on their lands. Other historic period sites representative of domestic occupations also may be present.

Because substantial expense is associated with archaeological field surveys of long corridors, because the historic value of most archaeological sites can be realized only through scientific excavation, and because most archaeological sites are of value chiefly for what can be learned through archaeological data recovery, intensive efforts to identify archaeological sites potentially affected by the Candidate Build Alternatives are being deferred until after a preferred alternative has been identified. This approach is consistent with 36 CFR 800.4(b)(2), which provides for the phased identification of historic properties on projects “where alternatives under consideration consist of corridors or large land areas,” and with Stipulation 9 of the Programmatic Agreement Between the Virginia Departments of Transportation and Historic Resources Concerning Interagency Project Coordination (1999). If a build alternative is identified as the preferred alternative, archaeological field studies then will be conducted in consultation with VDHR and other consulting parties to determine if archaeological sites eligible for the NRHP within the corridor associated with the preferred alternative will be affected. The results of these studies will be reported in the Final EIS.

Although intensive archaeological investigations have been deferred, an archaeological assessment was conducted for the Candidate Build Alternatives to evaluate any appreciable differences among alternatives in terms of the potential range, quantity, and integrity of archaeological resources. The assessment also included evaluation of the potential for alternatives to contain sites meriting preservation in place, or sites that would be extraordinarily complex and/or expensive to excavate. Discussion of the archaeological assessment is included in Chapter 4, Environmental Consequences.

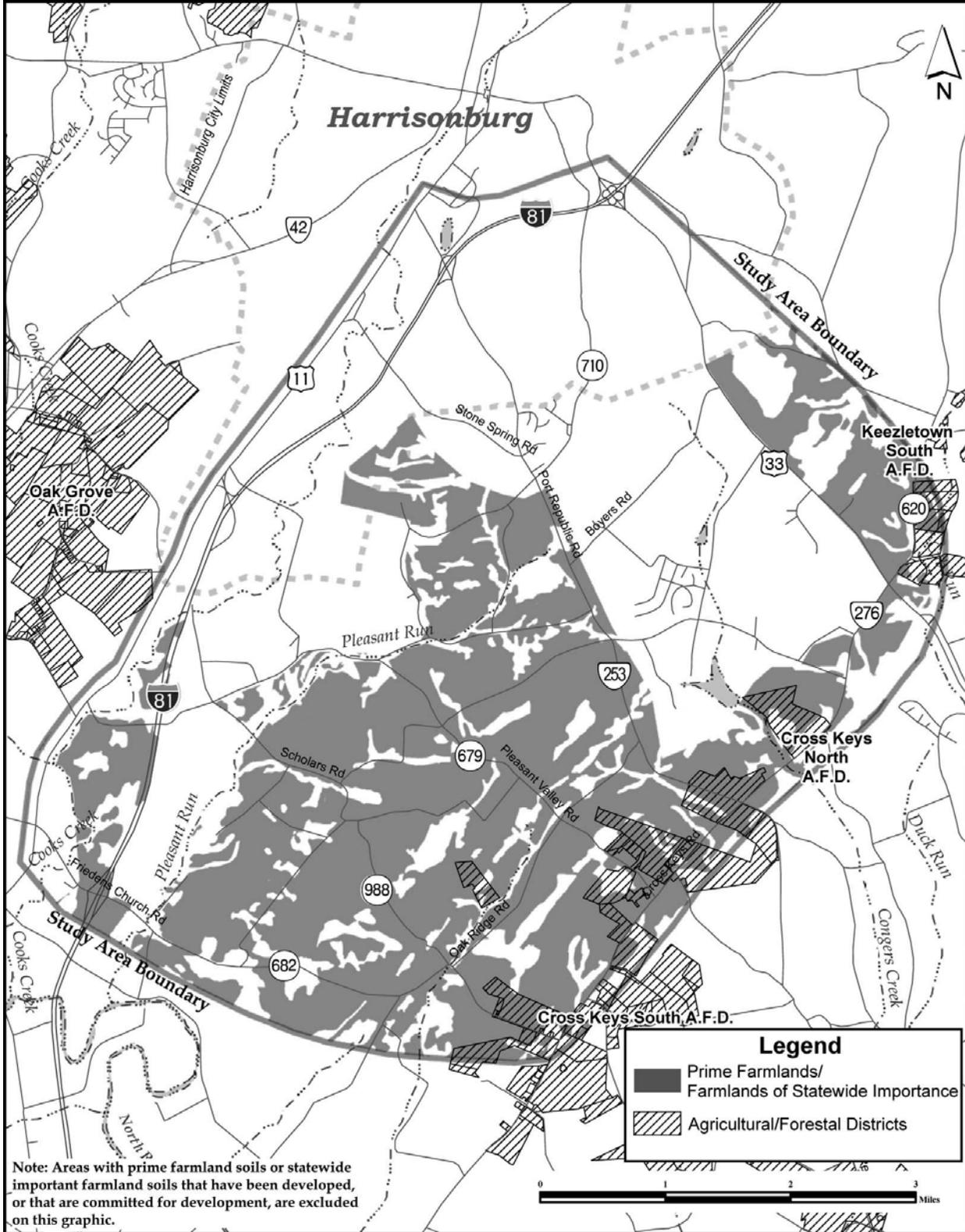
3.4 FARMLAND AND AGRICULTURE

3.4.1 Farmland

Under the federal Farmland Protection Policy Act, the U.S. Department of Agriculture defines “farmland” as:

- Prime farmland - land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses.
- Unique farmland - land other than prime farmland that is used for production of specific high-value food and fiber crops.
- Farmland other than prime or unique farmland that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops.

The land may be in cultivation, forest, pasture, or other uses except for urban or built-up land or water uses. **Figure 3-4** shows the combined extent of soils classified as prime and statewide important, but excludes areas that no longer are available for producing crops. There are no unique farmlands in the study area.



**Harrisonburg Southeast Connector
 Location Study**

**FARMLANDS & AGRICULTURAL
 & FORESTAL DISTRICTS**

Figure 3-4

Table 3-3 lists the soils indicative of prime farmlands and farmlands of statewide importance that occur within the study area along with the extent of each soil type within the study area. The soil survey from which this information was taken was completed in 1982, and some areas underlain by these soil types have been developed. Therefore, the percentages indicated in Table 3-3 are higher than the current actual extent of farmland, which has been reduced by development in the study area.

**Table 3-3
 SOILS INDICATING PRIME FARMLANDS AND FARMLANDS OF STATEWIDE IMPORTANCE**

Soil Map Unit Name	Farmland Classification	Acreage in Study Area	Percentage of Study Area
Edom silty clay loam, 2 to 7 percent slopes, eroded	Prime farmland	424	2.08%
Endcav silt loam, 2 to 7 percent slopes, eroded	Prime farmland	314	1.54%
Endcav silt loam, 2 to 7 percent slopes, rocky, eroded	Prime farmland	109	0.53%
Frederick and Lodi silt loams, 2 to 7 percent slopes, eroded	Prime farmland	2,061	10.13%
Frederick and Lodi gravelly silt loams, 2 to 7 percent slopes, eroded	Prime farmland	512	2.52%
Frederick and Lodi silt loams, rocky, 2 to 7 percent slopes, eroded	Prime farmland	139	0.68%
Guernsey silt loam, 2 to 7 percent slopes	Prime farmland	24	0.12%
Massanetta silt loam, 0 to 2 percent slopes	Prime farmland	94	0.46%
Sequoia silt loam, 2 to 7 percent slopes, eroded	Prime farmland	7	0.03%
Shenval loam, 2 to 7 percent slopes	Prime farmland	145	0.71%
Swimley silty clay loam, 2 to 7 percent slopes, eroded	Prime farmland	106	0.52%
Wheeling fine sandy loam, 0 to 4 percent slopes, rarely flooded	Prime farmland	2	0.01%
Aquic Udifluvents, nearly level	Farmland of statewide importance	347	1.71%
Endcav silt loam, 7 to 15 percent slopes, eroded	Farmland of statewide importance	83	0.41%
Endcav silt loam, 7 to 15 percent slopes, rocky, eroded	Farmland of statewide importance	95	0.47%
Frederick and Lodi silt loams, 7 to 15 percent slopes, eroded	Farmland of statewide importance	5,418	26.65%
Frederick and Lodi silt loams, 15 to 25 percent slopes, eroded	Farmland of statewide importance	933	4.59%
Frederick and Lodi gravelly silt loams, 7 to 15 percent slopes, eroded	Farmland of statewide importance	1,905	9.37%
Frederick and Lodi gravelly silt loams, 15 to 25 percent slopes, eroded	Farmland of statewide importance	1,228	6.04%
Frederick and Lodi silt loams, rocky, 7 to 15 percent slopes, eroded	Farmland of statewide importance	582	2.86%
Frederick and Lodi silt loams, rocky, 15 to 25 percent slopes, eroded	Farmland of statewide importance	202	0.99%
Nixa-Frederick-Lodi gravelly loams, 2 to 7 percent slopes	Farmland of statewide importance	57	0.28%

**Table 3-3
SOILS INDICATING PRIME FARMLANDS AND FARMLANDS OF STATEWIDE IMPORTANCE**

Soil Map Unit Name	Farmland Classification	Acreage in Study Area	Percentage of Study Area
Nixa-Frederick-Lodi gravelly loams, 7 to 15 percent slopes	Farmland of statewide importance	97	0.47%
Sequoia-Berks silt loams, 7 to 15 percent slopes, eroded	Farmland of statewide importance	8	0.04%
Shenval loam, 7 to 15 percent slopes, eroded	Farmland of statewide importance	28	0.14%
TOTAL	Prime farmland and farmland of statewide importance	14,920	73%

Source: Soil Survey of Rockingham County, Virginia, U.S. Department of Agriculture, 1982.

3.4.2 Agricultural and Forestal Districts

Agricultural and Forestal Districts are protected under Section 15.2-4300 of the Code of Virginia, also known as the Agricultural and Forestal Districts Act. This Act was enacted in 1977 to protect and encourage the development and improvement of the Commonwealth’s agricultural and forestal lands for the production of food and other products and to protect these lands as valued natural and ecological resources. The power to create districts lies with the localities upon the agreement of all landowners forming the district. Districts are not established in perpetuity and may be renewed periodically. The acquisition of land from an Agricultural and Forestal District by a state agency, such as VDOT, requires adherence to procedures outlined in the code. **Table 3-4** lists the four agricultural/forestal districts that have parcels within or adjacent to the study area; Figure 3-4 shows their locations.

**Table 3-4
AGRICULTURAL AND FORESTAL DISTRICTS**

Name of District	Total Size of District (acres)	Number of Parcels of District in Study Area	Acreage in Study Area	Percentage of Study Area	Expiration Date
Oak Grove	1,381	0 ^a	0 ^a	0% ^a	1/26/10
Cross Keys South	1,447	16	163	0.80%	4/25/08
Cross Keys North	699	18	613	3.02%	4/25/08
Keezletown South	438	8	121	0.60%	6/23/12
Total		42	898	4.42%	

^a The Oak Grove District abuts the western study area boundary along U.S. Route 11, but does not extend into the study area. It is included here because it could be affected by alternatives connecting with U.S. Route 11.

3.4.3 Agricultural Economy

Agriculture remains a staple of the region’s economy and Rockingham County leads all counties in Virginia in terms of market value of agricultural products sold. It also ranks in the top twenty in the nation for livestock and poultry production. According to the County’s comprehensive plan, there are more than 230,000 acres in farms in Rockingham County.

3.5 GEOLOGY AND TOPOGRAPHY

Rockingham County lies on a broad valley floor bordered to the east by the Blue Ridge Mountains and to the west by the Appalachian Mountains. Massanutten Mountain is a notable geologic feature dividing this broad valley into two portions, which are drained by the North Fork and South Fork of the Shenandoah River, respectively. The study area is located in the Ridge and Valley geologic province. Ridges of sandstone and shale and valleys of limestone and dolomite comprise this province. This karst terrain is distinguished by long-term subterranean dissolution and erosion of carbonate rocks, the presence of sinkholes and caves, and relatively direct interaction between surface and groundwater systems. Karstic aquifers generally are considered more vulnerable to contamination than normal aquifers because of the highly porous and permeable rocks and direct connections through sinkholes. There are a few small documented caves and sinkholes in the study area. Undocumented sinkholes and caves may occur in the area.

3.6 WATER RESOURCES

3.6.1 Surface Waters

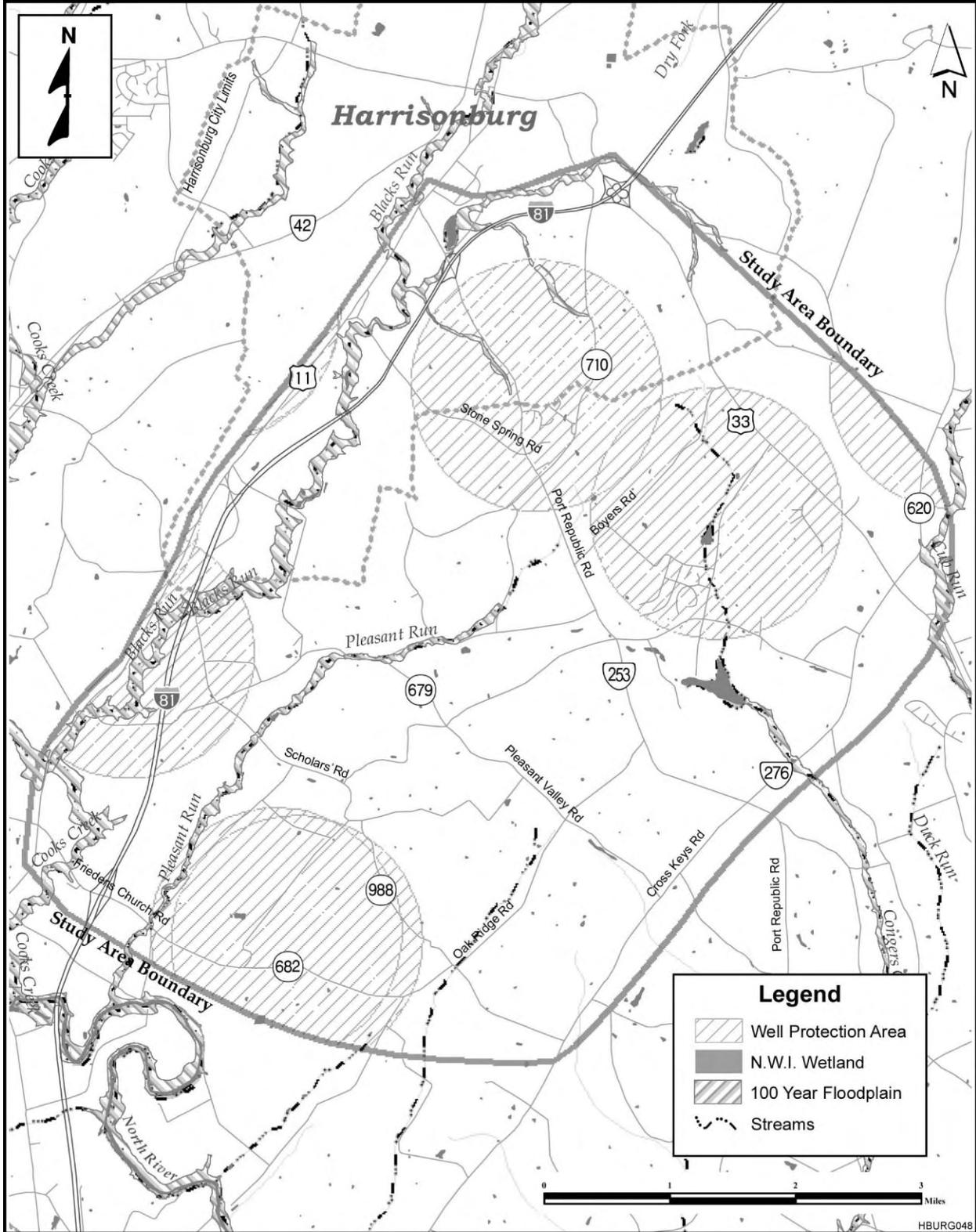
Surface waters in the study area include Cooks Creek, Blacks Run, Pleasant Run, Mill Creek, Congers Creek, Cub Run, several intermittent unnamed tributaries, Lake Shenandoah (formed by a dam across Congers Creek), and a number of farm ponds. **Figure 3-5** shows the drainage pattern in the study area. Based on the Cowardin classification system for waters and wetlands,¹ surface water types include palustrine unconsolidated bottom, palustrine unconsolidated shore, palustrine aquatic bed, and palustrine submerged bed. The U.S. Environmental Protection Agency (EPA) and the Virginia Department of Environmental Quality (VDEQ) have categorized Cooks Creek, Blacks Run, Pleasant Run, Mill Creek, and Cub Run as impaired, because water quality in those streams does not meet water quality standards (for E-Coli bacteria in the case of Cub Run and for fecal coliform bacteria and benthic aquatic life in the case of the other four streams). EPA and VDEQ established total maximum daily loads (TMDL)² for the applicable pollutants (E-Coli bacteria, fecal coliform bacteria, sediment, and phosphorus) in these streams. The principal sources of these pollutants are agricultural and urban runoff.

3.6.2 Groundwater

Nearly two-thirds of the housing units in Rockingham County are served by individual water systems (i.e., wells). In a study conducted several years ago by the Virginia Cooperative Extension, tests of groundwater samples from some portions of Rockingham County showed elevated levels of iron, manganese, hardness, total dissolved solids, sodium, nitrate, and bacteria. Groundwater contamination sources identified during the study included home heating oil storage tanks, septic system drainfields, and agricultural activities.

¹ Cowardin, Lewis M., Virginia Carter, Francis C. Golet, & Edward T. LaRoe. 1979. *Classification of wetlands and deepwater habitats of the United States*. U.S. Department of the Interior, Fish and Wildlife Service. FWS/OBS-79/31. Classifies waters and wetlands based on hydrological and ecological characteristics, widely used by state and federal agencies in mapping and evaluating water resources.

² A TMDL identifies the sources polluting a water and expresses the amount of a pollutant that can be introduced from those sources without causing the water to exceed a State's water quality standards. The objective of a TMDL is to allocate allowable loads among different pollutant sources so that appropriate control actions can be taken in order to achieve water quality standards.



Harrisonburg Southeast Connector
Location Study

**WATER RESOURCES
AND FLOODPLAINS**
Figure 3-5

The presence of sinkholes and subterranean solution channels in the karst terrain make groundwater in the area more susceptible to contamination. The Virginia Department of Health runs a well protection program for small community groundwater waterworks. As part of that program, well protection areas, essentially consisting of one-mile-radius buffer zones representing the well recharge areas, are designated around community groundwater facilities. As shown on Figure 3-5, there are several such well protection areas in the study area. These wells are not for general public water supply, but, rather, serve facilities such as the Massanetta Springs Camp and Conference Center and mobile home parks. The protection area designation does not confer any particular restrictions on activities in the area, but is a tool to help localities manage groundwater resources.

3.6.3 Wetlands

Wetlands are defined by the presence of surface and/or groundwater hydrology, hydric soils (soils that develop under wet conditions), and hydrophytic vegetation (plants that are favored by wet conditions). Wetlands in the study area were identified initially from National Wetland Inventory (NWI) mapping (see Figure 3-5). Field observations were conducted to identify wetlands in greater detail along the Candidate Build Alternatives (see Chapter 4).

Wetlands in the study area generally occur along streams or pond margins and at groundwater seeps. Hydric soils that have developed in these areas are poorly to somewhat poorly drained and have a water table at or near the surface or are frequently ponded or flooded during the growing season. Based on the classifications of waters and wetlands developed by Cowardin, et al., the wetland types present include palustrine emergent (PEM) systems with persistent vegetation and palustrine scrub-shrub (PSS) systems with broad-leaved deciduous vegetation, with temporary (A) or seasonal (C) flooding regimes. Common species include New York ironweed (*Vernonia noveboracensis*), swamp aster (*Aster puniceus*), fox sedge (*Carex vulpinoidea*), pale sedge (*Carex lurida*), soft rush (*Juncus effusus*), a variety of bulrushes (*Scirpus spp.*), common alder (*Alnus serrulata*), black willow (*Salix nigra*), and sycamore (*Platanus occidentalis*). The functions of these wetlands include groundwater discharge to support low-flow conditions, sediment/toxicant retention, nutrient removal, sediment stabilization, and wildlife habitat.

3.6.4 Floodplains

The 100-year floodplains within the study area, shown on Figure 3-5, were identified through Rockingham County's geographic information system (GIS) database. One-hundred-year floodplains have a one percent chance of flooding in any given year. These areas, which represent the floodplains designated by the Federal Emergency Management Agency (FEMA), are located along Blacks Run, Pleasant Run, Cooks Creek, Cub Run, and Congers Creek. Floodplains have a number of natural and beneficial values, including flood flow moderation, water quality maintenance, and wildlife habitat.

3.7 WILDLIFE, HABITAT, AND ENDANGERED SPECIES

Wildlife habitat in the study area consists of a mosaic of forestland, farmland, and landscaped residential land, dissected by roads, powerlines, and streams. Most forested areas are relatively small, totaling approximately 2,500 acres across the entire study area (about 12% of the study

area). A variety of wildlife species adapted to these conditions occur in the study area, either as permanent populations or as transient migrants.

The Madison Cave isopod (*Antrolana lira*), a subterranean aquatic crustacean endemic to karst aquifers of the Shenandoah Valley, is listed as threatened under the U.S. and Virginia Endangered Species Acts. One of the 11 documented locations is the nearby Massanutten Caverns to the northeast of the study area. According to the Virginia Division of Natural Heritage's Karst Protection Coordinator, the species could be present beneath the surface of the study area, though there are no recorded occurrences there. Another subterranean aquatic crustacean that may be present in the study area, the Madison Cave amphipod (*Stygobromus stegorum*), is listed as threatened under the Virginia Endangered Species Act. There are no recorded occurrences of this species in the study area.

Additionally, the U.S. Fish and Wildlife Service (USFWS) stated during scoping that the Indiana bat (*Myotis sodalis*), Virginia sneezeweed (*Helenium virginicum*), and Northeastern bulrush (*Scirpus ancistrochaetus*) may potentially occur within the study area. The Indiana bat and Northeastern bulrush are both federally listed as endangered while the Virginia sneezeweed is federally listed as threatened.

Though the Indiana bat occurs at least occasionally in 27 states, USFWS estimates that 87% of the entire population uses just seven known major wintering hibernacula, all in Indiana, Kentucky, and Missouri. There are no recorded occurrences of Indiana bat in Rockingham County, but there are occurrences in two adjacent counties: Shenandoah County in Virginia and Pendleton County in West Virginia. Caves or mines meeting the bat's specific temperature requirements are used for winter hibernation. Riparian and upland forest may be used in the summer for roosting and foraging. Both dead and living trees are used for multiple roost maternity colonies if suitable conditions are met.

The habitat of the Northeastern bulrush consists of open tall herbaceous wetlands. It usually grows at the water's edge. It also is found in sinkhole ponds with a sandstone substrate.

The Virginia sneezeweed is found only in seasonally flooded limestone ponds in Rockingham and Augusta Counties, Virginia. It is known from 30 sites and is found along the shores of ponds with other herbaceous plants in acidic silty loam soils.

ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter presents the direct, indirect, and cumulative effects of the alternatives, which include a No-build Alternative and five Candidate Build Alternatives (CBA) (1, 2, 2A, 3, and 4), as discussed in Chapter 2. Impacts analyses are based on “planning corridors” that are 500 feet wide, except along most of Route 276 (Cross Keys Road) where the planning corridor is constrained to the existing 80-foot-wide right of way (to minimize effects on the Cross Keys Battlefield). The 500-foot-wide corridors are wide enough to encompass potential variations in actual alignments and design features during the design phase, should a build alternative be selected, and to illustrate the maximum potential impacts of the alternatives. However, more-refined estimates of impacts also are provided for illustrative purposes. These are based on a narrower “design corridor” for each CBA derived from generalized cross section templates that more closely represent what the actual impacts may be. **Table 4-1** lists the planning and design corridor widths for the CBAs. Sections 4.2 through 4.16 present the direct effects of the CBAs. Section 4.17 discusses indirect effects and Section 4.18 discusses cumulative effects.

**Table 4-1
PLANNING AND DESIGN CORRIDOR WIDTHS**

	CBA 1	CBA 2	CBA 2A	CBA 3	CBA 4
Planning Corridor Width	<ul style="list-style-type: none"> • 500 feet between I-81 and Rte 276 • 80 feet along Rte 276 between Rtes 682 and 689 • 500 feet between Rtes 689 and 33 	500 feet	500 feet	500 feet	500 feet
Design Corridor Width	<ul style="list-style-type: none"> • 240 feet between I-81 and Rte 681 • 120 feet between Rtes 681 and 276 • 80 feet along Rte 276 between Rtes 682 and 689 • 240 feet between Rtes 689 and 33 	<ul style="list-style-type: none"> • 240 feet between Rtes 11 and 253 • 120 feet between Rtes 253 and 33 	240 feet	240 feet	240 feet

4.2 LAND USE

4.2.1 Land Use Conversions

Any of the five Candidate Build Alternatives would require land acquisition and conversion of existing uses to highway use. **Table 4-2** shows the acreages of direct land use conversions for each alternative for both the planning corridor and the design corridor. Displacements of homes and businesses resulting from the land use conversions are discussed in Section 4.3.1. Section 4.17 discusses indirect land use impacts.

Table 4-2
LAND USE CONVERSIONS (ACRES)

Corridor	CBA 1	CBA 2	CBA 2A	CBA 3	CBA 4
Planning Corridor	314	373	386	357	182
Design Corridor	131	146	190	178	93

4.2.2 Compatibility with Local Land Use and Transportation Planning

The city and county comprehensive plans designate most of the study area for planned growth and development. To serve this development, both comprehensive plans also include concepts for new and improved transportation facilities to serve the traffic that will be generated and to facilitate mobility throughout the study area (see Figure 2-2 in Chapter 2 for illustration of highway facilities included in Rockingham County’s comprehensive plan). The Candidate Build Alternatives are responsive to the transportation goals and visions outlined in the local comprehensive plans. Some segments of the alternatives are identical or similar to segments depicted in the comprehensive plans. Therefore, the alternatives generally can be considered to be consistent with the local comprehensive plans.

The following bullets summarize elements of the alternatives compared to elements of the *2030 Transportation Plan* adopted by the Harrisonburg-Rockingham Metropolitan Planning Organization (HRMPO) (see Figure 2-2 in Chapter 2 for graphic of projects in the *Plan*). In order for FHWA to complete the environmental documentation process and issue a Record of Decision, the selected alternative must be included in the “2030 [Financially] Constrained Long Range Plan” portion of HRMPO’s *Plan*, which in the case of some portions of the alternatives would require amendments to the current *Plan*.

CBA 1

- 4-lane section between I-81 and Rte 681, redesignate as primary, access management plan to be developed. • *Plan* includes construction of 2-lane widening and reconstruction as secondary road.
- 2-lane section between Rte 681 and Rte 995, redesignate as primary, access management plan to be developed. • *Plan* includes 2-lane widening and reconstruction as secondary road.
- 2-lane relocation section of Rte 682, limited access. • *Plan* includes 2-lane straightening of this section of Rte 682 only in the Vision Plan (i.e., not funded for preliminary engineering or construction due to inadequate funding).
- 2-lane widening section of Rte 682 to Route 276, redesignate as primary, access management plan to be developed. • *Plan* includes 2-lane widening of Rte 682 all the way to Rte 276 only in the Vision Plan.
- Widening of Route 276 to add shoulders, access management plan to be developed. • No comparable element in *Plan*.

- Widening of Route 276 between Rte 689 and Rte 33 to 4 lanes.
 - No comparable element in *Plan*.
- CBA 2**
- 4-lane-divided on new location, except for sections that overlap Rte 704.
 - *Plan's* Vision Plan component includes nearly identical facility, however, no funding is identified for preliminary engineering or construction.
- CBA 2A**
- 4-lane-divided on new location, except for sections that overlap Rte 704, between Rte 11 and Rte 679.
 - *Plan's* Vision Plan component includes nearly identical facility for portion between Rte 11 and Rte 679; however, no funding is identified for preliminary engineering or construction.
 - 4-lane-divided on new location between Rte 679 and Rte 710.
 - No comparable element in *Plan*.
 - 4-lane-divided along Rte 710 between Rte 709 and Rte 253.
 - *Plan* includes construction of comparable section as part of a Rte 726 extension.
 - 4-lane-divided on new location between Rte 253 and Rte 33.
 - *Plan* includes preliminary engineering for this section as part of extension of Rte 726 between Rte 253 and Rte 33, with construction included only in the Vision Plan due to inadequate funding.
- CBA 3**
- 4-lane-divided on new location, except for sections that overlap Rte 710.
 - *Plan* includes preliminary engineering for section between Rte 253 and Rte 33. No comparable element in *Plan* for section between I-81 and Rte 710 in vicinity of Rte 709.
- CBA 4**
- 4-lane-divided on new location, except for sections that overlap Rte 710.
 - *Plan* includes construction of Rte 726 extension between existing Rte 726 and Rte 253.
 - *Plan* includes preliminary engineering for extension of Rte 726 between Rte 253 and Rte 33, with construction included only in the Vision Plan due to inadequate funding.

4.3 SOCIOECONOMICS

4.3.1 Potential Relocations

The estimated numbers of homes, businesses, farms, and nonprofit organizations that are within the corridors for each alternative, and that could potentially be displaced or relocated, are reported in **Table 4-3**. These numbers are from estimates contained in the *Stage I Relocation Assistance Report* prepared by VDOT. Based on current real estate multiple listings services (MLS), there appears to be adequate housing and business replacement sites in the Harrisonburg/Rockingham area. VDOT has the ability and, if necessary, is willing to provide housing of last resort, including the purchase of land or dwellings; repair of existing dwellings to meet decent, safe, and sanitary conditions; relocation or remodeling of dwellings purchased by VDOT; or construction of new dwellings. Assurance is given that all displaced families and individuals would be relocated to suitable replacement housing, and that all replacement housing would be fair housing available to all persons without regard to race, color, religion, sex, or national origin and would be within the financial means of the displacees. Each person would be given sufficient time to negotiate for and obtain possession of replacement housing. No residential occupants would be required to move from property needed for the project until comparable decent, safe, and sanitary replacement dwellings have been made available to them.

Table 4-3
 POTENTIAL RELOCATIONS

Corridor	CBA 1	CBA 2	CBA 2A	CBA 3	CBA 4
RESIDENTIAL					
Planning Corridor	51	93	57	60	19
Design Corridor	32	38	26	29	10
BUSINESSES					
Planning Corridor	2	2	2	14	0
Design Corridor	2	1	2	12	0
FARMS					
Planning Corridor	7	3	4	1	1
Design Corridor	6	2	3	0	1
NONPROFITS (e.g., churches, community service clubs, etc.)					
Planning Corridor	0	2	0	0	0
Design Corridor	0	0	0	0	0

If a build alternative is selected, VDOT would develop a detailed relocation plan upon completion of a more in-depth design to ensure that orderly relocation of all displacees can be accomplished in a satisfactory manner. The acquisition of right of way and the relocation of displacees would be in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Assurance is given that relocation resources would be available to all residential, business, farm, and nonprofit displacees without discrimination.

4.3.2 Changes to Neighborhoods and Community Cohesion

The alignments of the Candidate Build Alternatives have been located to avoid splitting communities and residential subdivisions and they would not isolate any portions of communities or ethnic groups.

4.3.3 Changes in Travel Patterns and Accessibility

Under all of the alternatives, connections to existing roads would be maintained or relocated such that no substantial disruptions to neighborhood access would be imposed. The No-build Alternative would include widening and upgrading the portion of Route 682 (Friedens Church Road) between I-81 and Route 995 (Koiners Ford Road), thereby increasing the attractiveness of that route for travel between I-81 and Route 33. CBA 1 also would upgrade Route 682, but to higher design standards than would the No-build Alternative. In addition, CBA 1 would involve changing the designation of Route 682 from a secondary road to a primary road. CBA 1 also would involve adding paved shoulders to both Route 682 and Route 276, which would make both routes safer and also would facilitate bicycle travel (cyclists could use the paved shoulder). Currently, there is no space on Route 682 or Route 276 to safely accommodate cyclists. A portion of CBA 1 on new location would eliminate the dogleg and 90-degree turn on Route 682

at Friedens Church. Finally, CBA 1 also would involve developing an access management plan to try to reduce the future proliferation of new driveways as development occurs over time.

CBA 2 and CBA 2A would increase accessibility to and through the central portion of the study area, and provide a more direct connection between Routes 11 and 33. These alternatives also would increase accessibility to the proposed relocation site of the regional hospital.

CBA 3 would upgrade the interchange of I-81 with Route 11 in the Pleasant Valley vicinity, thereby improving access into industrial areas adjacent to I-81 and Route 11. The connection that would be provided between the interchange and Route 33 would facilitate travel from the Route 11/I-81 area to Route 33 and also improve accessibility to the relocated regional hospital. In addition, the portion of CBA 3 that overlaps CBA 4 would provide a relief route to Route 33 for travelers going from areas west and south of downtown Harrisonburg to areas east of Harrisonburg, including the new regional hospital.

CBA 2, 2A, 3, and 4 would have “controlled access,” that is, access to the road from adjacent properties would be limited to designated points, which would be established during the design phase, should one of these alternatives be selected. This controlled access feature may entail some minor inconvenience to certain property owners, who may have to access their properties via a more circuitous route (e.g., by a service road or an access point that consolidates entrances to multiple properties). Additional details about the traffic consequences of the alternatives are provided in Chapter 2.

4.3.4 Effects on Community Facilities

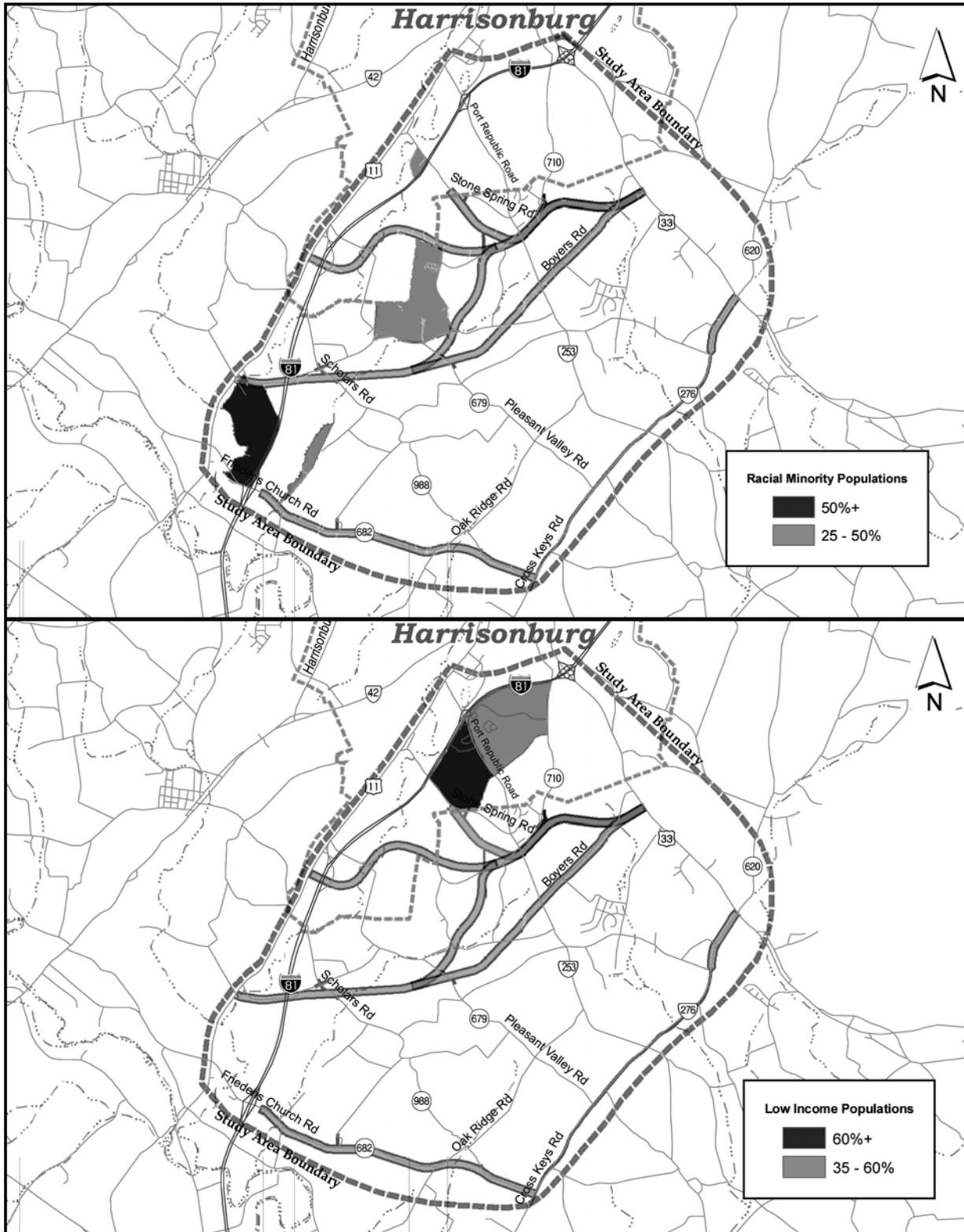
No community facilities would be displaced by any of the alternatives. As noted above, the No-build alternative and CBA 2, 2A, 3, and 4 would improve accessibility to the new regional hospital. All of the alternatives would improve the ability to provide emergency services, particularly those that would be located near existing emergency response stations.

4.3.5 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to promote nondiscrimination in federal programs affecting human health and the environment and to consider disproportionately high and adverse human health or environmental effects of their actions on minority and low-income communities. These populations were identified within the study area by census block, as shown on **Figure 4-1**. None of the environmental effects of any of the alternatives would be predominantly borne by a minority or low-income population. Nor would the effects to be suffered by the minority population or low-income population be appreciably more severe or greater in magnitude than the adverse effects that would be suffered by non-minority or non-low income populations. None of the alternatives would affect natural resources that minority or low-income populations rely on for subsistence.

4.4 PARKS AND RECREATION AREAS

No land from any existing publicly owned public parks or recreation areas would be used by any of the alternatives. There is currently a conceptual Greenway plan for portions of Blacks Run in the City of Harrisonburg. The *Blacks Run Greenway Master Plan* was developed by a private group through a grant from the Virginia Department of Forestry and with assistance from City of



Source: 2030 Transportation Plan. Harrisonburg-Rockingham Metropolitan Planning Organization

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**SOCIOECONOMIC POPULATION
 CHARACTERISTICS**

Figure 4-1

Harrisonburg staff. The *Plan* envisions voluntary easements from landowners along Blacks Run to implement a trail system that would be available for public use. CBA 3 crosses Blacks Run within the proposed Greenway corridor. This area crossed by CBA 3 in the vicinity of Blacks Run currently is zoned for industrial use and already is heavily developed with industrial uses. Because the land within the proposed Blacks Run Greenway is privately owned, it is not subject to the provisions of Section 4(f) of the Department of Transportation Act.

4.5 HAZARDOUS MATERIALS

Table 4-4 shows the numbers of potential hazardous material sites that might be affected by the alternatives. **Figure 4-2** shows the locations of the sites. These sites were identified using a commercially available database search, supplemented by field reconnaissance. The sites include industrial properties, petroleum product storage facilities, and other properties potentially containing materials that are flammable, toxic, corrosive, or reactive. Typically, the major issue associated with such sites on most highway projects is the cost of investigations and remediation to ensure that no human health risks remain following completion of the construction. Prior to the acquisition of right of way and construction, thorough site investigations would be conducted to determine whether any of the sites are actually contaminated, and, if so, the nature and extent of that contamination. All necessary remediation would be conducted in compliance with applicable federal, state, and local environmental laws and would be coordinated with the U.S. Environmental Protection Agency (EPA), the Virginia Department of Environmental Quality (VDEQ), and other federal or state agencies as necessary. Additional details of the hazardous materials investigations are provided in the *Hazardous Materials Technical Memorandum*, which is available for review upon request.

Table 4-4
POTENTIAL HAZARDOUS MATERIAL SITES

Corridor	CBA 1	CBA 2	CBA 2A	CBA 3	CBA 4
Planning Corridor	9	1	1	11	1
Design Corridor	2	0	0	4	0

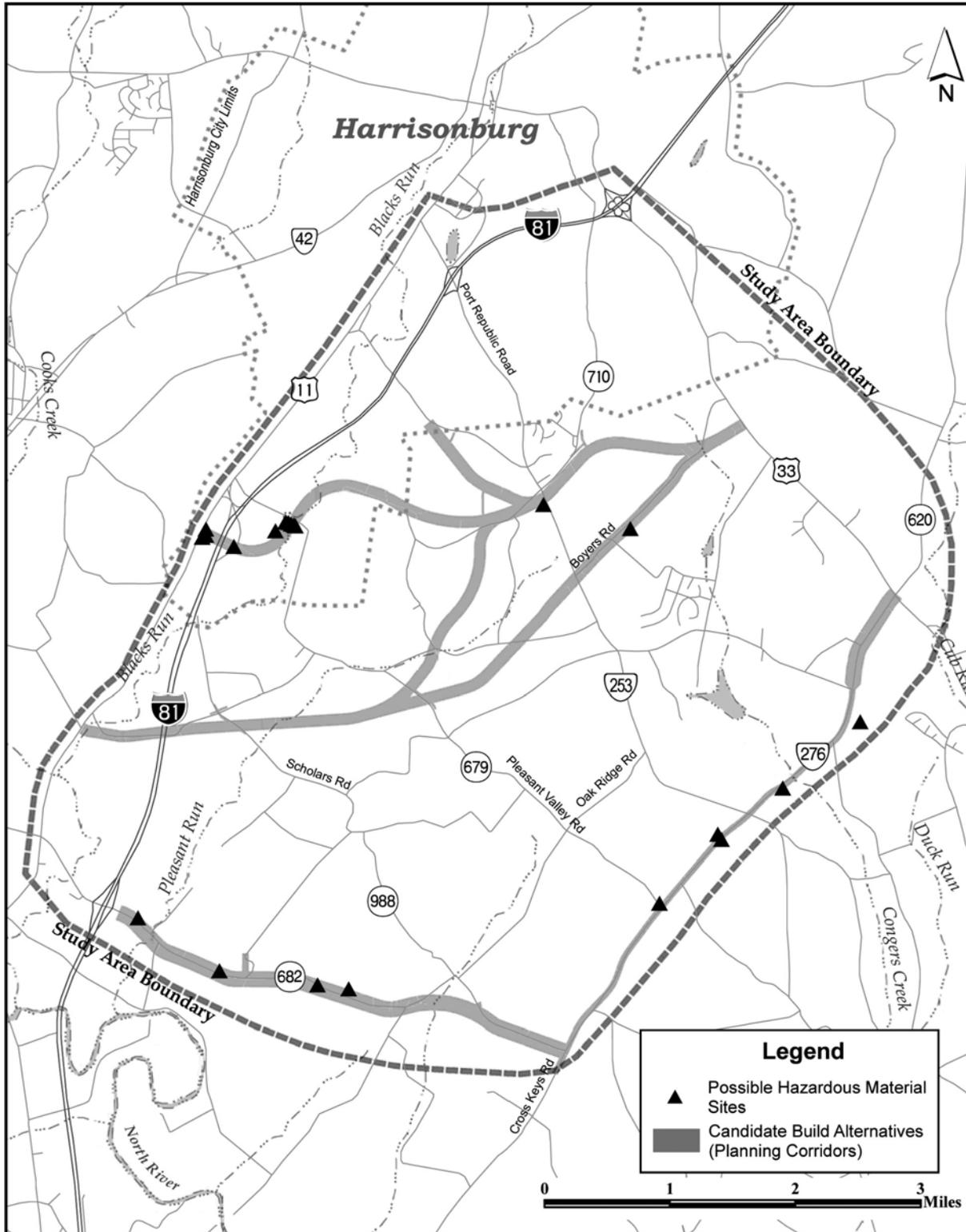
4.6 FARMLAND

4.6.1 Farmland Conversions

Contacts with Natural Resources Conservation Service District Conservationists and offices of planning and geographic information systems mapping in Rockingham County were made in order to identify prime farmland soils and/or the presence and location of any unique farmlands, or farmlands of statewide or local importance for Farmland Protection Policy Act (FPPA) compliance. No farmland located within the study area was classified as unique farmland. As required by FPPA, Form CPA-106, Farmland Conversion Rating, was submitted to the District Conservationist. No reply was received. The potential impacts to prime farmland and farmland of statewide importance are shown in **Figure 4-3** and listed in **Table 4-5**.

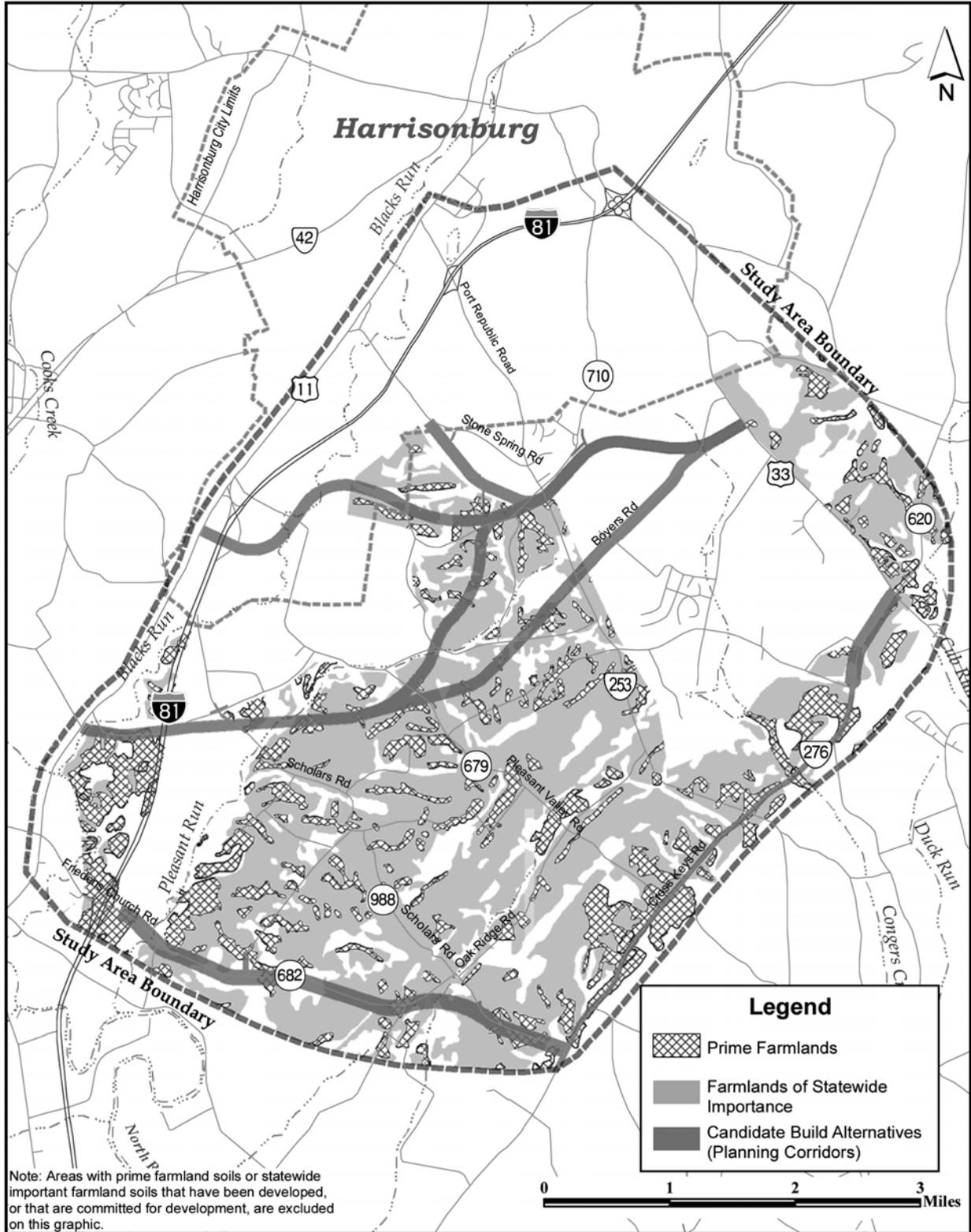
4.6.2 Agricultural and Forestal Districts

There are four Agricultural and Forestal Districts in or adjacent to the study area. **Figure 4-4** shows the relationships of the districts to the Candidate Build Alternatives. **Table 4-6** shows the

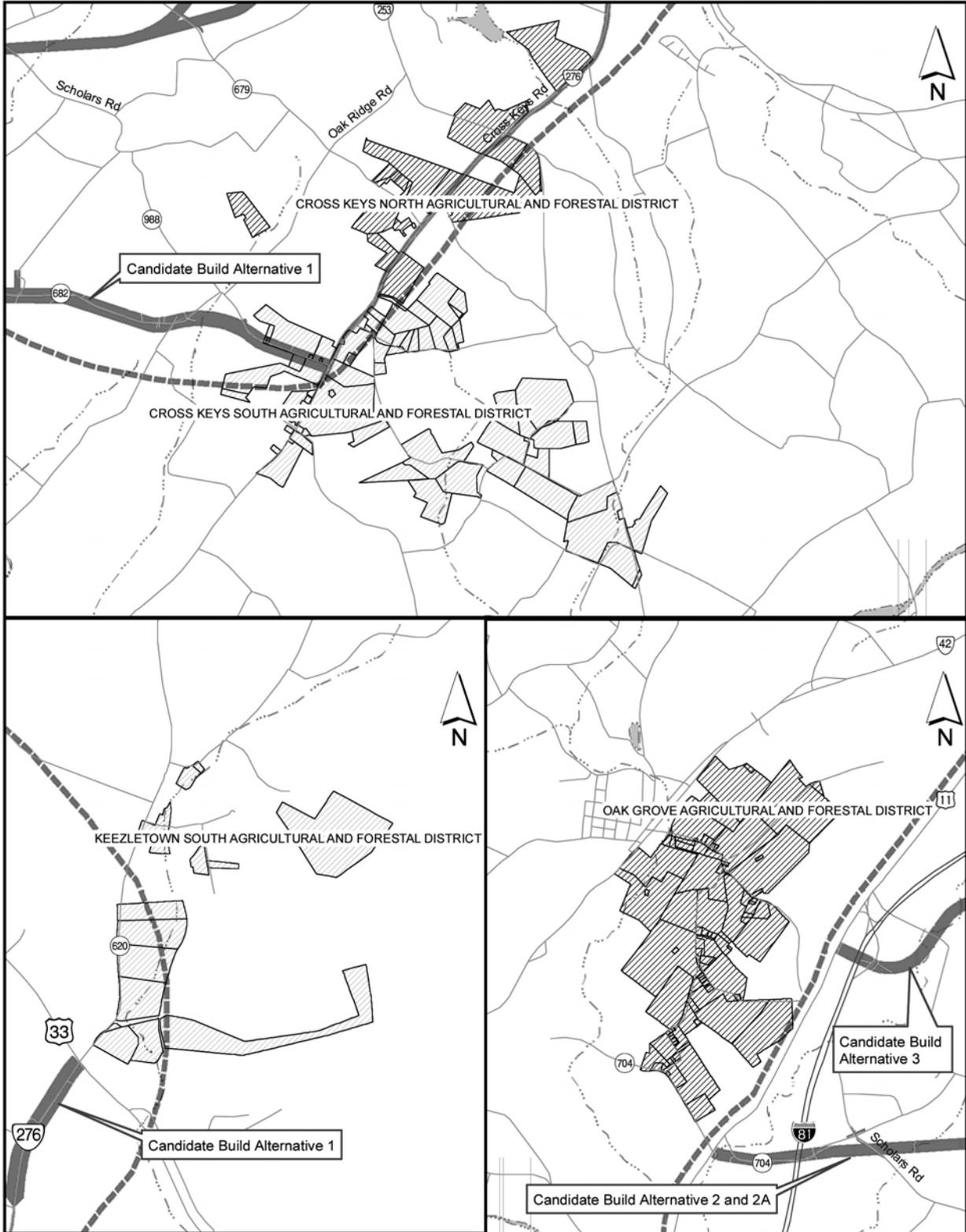


**Harrisonburg Southeast Connector
 Location Study**

**HAZMAT SITES WITHIN
 PLANNING CORRIDORS**
 Figure 4-2



Harrisonburg Southeast Connector PRIME AND STATEWIDE IMPORTANT FARMLAND Location Study
Figure 4-3



Note: Maps are at different scales Source: Rockingham County GIS Department

**Harrisonburg Southeast Connector
 Location Study**

**AGRICULTURAL AND FORESTAL
 DISTRICTS
 Figure 4-4**

**Table 4-5
PRIME FARMLAND AND FARMLAND OF STATEWIDE IMPORTANCE (ACRES)**

	CBA 1		CBA 2		CBA 2A		CBA 3		CBA 4	
	Planning Corridor	Design Corridor								
Prime Farmland Conversion	78	43	42	19	43	20	9	3	1	1
Statewide-Important Farmland Conversion	129	39	136	67	145	71	54	23	2	2
Total Farmland Conversion	207	82	178	86	188	91	63	26	3	3

**Table 4-6
IMPACTS TO AGRICULTURAL AND FORESTAL DISTRICTS (ACRES)**

Ag/Forest District	CBA 1		CBA 2		CBA 2A		CBA 3		CBA 4	
	Planning Corridor	Design Corridor								
Cross Keys South	30.8	11.2	0	0	0	0	0	0	0	0
Cross Keys North	0	0	0	0	0	0	0	0	0	0
Keezletown South	0	0	0	0	0	0	0	0	0	0
Oak Grove	0	0	0	0	0	0	0	0	0	0
Total Impacts	30.8	11.2	0	0	0	0	0	0	0	0

potential impacts of the alternatives on the Districts. CBA 1 would impact the Cross Keys South District, mostly along Route 682 (Friedens Church Road) because the section along Route 276 (Cross Keys Road) would be constrained within existing right of way. The roadway would be upgraded but would remain a two-lane facility. The other Candidate Build Alternatives would not impact any Agricultural and Forestal Districts.

4.7 AIR QUALITY

Air quality is defined by ambient atmospheric concentrations of specific pollutants determined by EPA to be of concern with respect to the health and welfare of the general public. These pollutants are ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), respirable particulate matter (PM₁₀ and PM_{2.5}), and lead (Pb). EPA established National Ambient Air Quality Standards (NAAQS) for these pollutants. The City of Harrisonburg and Rockingham County are located in an area determined by EPA to be in attainment of the NAAQS. The effects on air quality by the alternatives are illustrated by an assessment of CO concentrations. CO is a stable pollutant for which atmospheric concentrations are easily modeled using the FHWA-approved CAL3QHC computerized CO dispersion model (Version 2.0). Output from the model is expressed as the maximum 1-hour and 8-hour downwind

concentrations of CO in parts per million (ppm). **Table 4-7** shows the three highest CO concentrations output from the model. These results, which are well below the NAAQS, represent the worst impacts anywhere along any of the alternatives. The *Air Quality Technical Report*, which is available for review upon request, provides details on the air quality analyses.

Table 4-7
CARBON MONOXIDE CONCENTRATIONS

Location	Alternative	Year	Maximum 1-hour Concentration (ppm)	Maximum 8-hour Concentration (ppm)
CBA 1 Receptor 2 Residential	No-build	2002	8.0	5.6
		2015	7.1	5.0
		2030	7.1	5.0
	Build	2015	7.1	5.0
		2030	7.1	5.0
CBA 2 Receptor 4 Residential	No-build	2002	6.7	4.7
		2015	6.5	4.6
		2030	7.0	4.9
	Build	2015	7.0	4.9
		2030	7.3	5.1
CBA 2 Receptor 5 Residential	No-build	2002	9.0	6.3
		2015	8.0	5.6
		2030	8.6	6.0
	Build	2015	6.8	4.8
		2030	6.8	4.8
National Ambient Air Quality Standards (NAAQS)			35.0	9.0

None of the alternatives would cause a violation of the NAAQS for CO. A comparison of the alternatives shows that the CO concentrations would be similar for the No-build Alternative and all the Candidate Build Alternatives. The CO analysis demonstrates that none of the alternatives would have substantial adverse effects on air quality and none would cause or contribute to a violation of the NAAQS.

During scoping, a citizen expressed concern that air quality in Shenandoah National Park could be adversely affected by constructing a project in the study area. None of the alternatives are expected to have any measurable effects on the air quality in Shenandoah National Park because the distance between the study area and the Park is too great.

4.8 NOISE

The potential noise impacts caused by the alternatives have been assessed in accordance with FHWA guidelines published in Volume 7, Chapter 7, Section 2 of the Federal Aid Policy Guide (FAPG 7-7-2) and with the State Noise Abatement Policy. Included in FAPG 7-7-2 are noise abatement criteria (NAC), which are noise levels (in decibels, denoted as dBA) representing the

threshold at which noise impact is considered to occur, and at which noise abatement measures must be considered. The NAC apply to areas where regular human use occurs. If, for a given area having applicable human activity, the noise levels in the design-year (2030 for this study) for a build alternative “approach or exceed the NAC,” then an impact is said to occur and abatement measures must be considered. “Approach” has been defined by VDOT as 1 dBA less than the NAC. A noise impact also is deemed to occur if the design-year-build noise levels are substantially higher than existing levels, even though the levels may not reach the NAC, and abatement measures must be considered. The State Noise Policy defines a substantial increase as 10 or more dBA. Final decisions on whether to provide noise abatement measures take into account design feasibility, cost, and the opinions of property owners impacted by the noise.

4.8.1 CBA 1

Of 102 noise-sensitive properties evaluated for CBA 1, two would incur substantial increase impacts under design-year 2030 build conditions with noise levels increasing 10 or more dBA over existing levels. Four properties would incur noise impacts under design year 2030 build conditions due to noise levels approaching or exceeding the NAC impact criterion of 66 dBA. Noise abatement measures do not appear feasible due to access constraints.

4.8.2 CBA 2

The traffic noise impact analysis for CBA 2 evaluated 85 noise-sensitive properties. The results indicate that 58 would incur substantial-increase impacts under design-year 2030 build conditions with noise levels increasing 10 or more dBA over existing levels. Two properties would incur noise impacts under design year 2030 build conditions with noise levels approaching or exceeding the NAC impact criterion of 66 dBA, and 10 properties would experience both types of noise impact. Noise abatement measures do not appear feasible due to access constraints.

4.8.3 CBA 2A

The traffic noise impact analysis for CBA 2A evaluated 60 noise-sensitive properties. The results indicate that 17 properties would incur substantial-increase impacts under design-year 2030 build conditions with noise levels increasing 10 or more dBA over existing levels. Four properties would incur noise impacts under design year 2030 build conditions with noise levels approaching or exceeding the NAC impact criterion of 66 dBA, and eight properties would experience both types of noise impact. One potential noise barrier appears to be feasible, based on preliminary evaluation. It would cost approximately \$250,000.

4.8.4 CBA 3

The traffic noise impact analysis for CBA 3 evaluated 64 noise-sensitive properties. The results indicate that 16 properties would incur substantial-increase impacts under design-year 2030 build conditions with noise levels increasing 10 or more dBA over existing levels. Three properties would incur noise impacts under design year 2030 build conditions with noise levels approaching or exceeding the NAC impact criterion of 66 dBA, and 11 properties would experience both types of noise impact. One noise barrier appears to be feasible, based on preliminary evaluation. It would cost approximately \$125,000. [Note: for purposes of the noise analysis, a conceptual configuration for the interchange at I-81 was assumed. However, while

suitable for estimating impacts for environmental documentation purposes, that configuration is preliminary and may not represent the actual design should CBA 3 be selected for further development. If CBA 3 is selected, additional noise analyses would be conducted based on the actual configuration to be developed during the design phase, and the actual noise impacts may be higher or lower depending on the ultimate design.]

4.8.5 CBA 4

The traffic noise impact analysis for CBA 4 evaluated 37 noise-sensitive properties. The results indicate that five properties would incur substantial-increase impacts under design-year 2030 build conditions with noise levels increasing 10 or more dBA over existing noise levels. Four properties would incur noise impacts under design-year 2030 build conditions with noise levels approaching or exceeding the NAC impact criterion of 66 dBA. Noise abatement measures do not appear feasible due to access constraints.

4.8.6 Noise Study Summary

A comparison of noise impacts by alternative indicates that CBA 2 would affect more noise-sensitive properties than the other alternatives. The noise analysis also indicates that the use of sound barriers to mitigate the noise impacts was not feasible due to access constraints for properties within this corridor. The alternative comparison also indicates that CBA 1 would have the least amount of noise impacts. Due to access constraints, noise barriers do not appear feasible on CBA 1. **Table 4-8** provides a summary of noise impacts in three categories: Substantial-increase impacts (SI), NAC Impacts (NAC), and both impact criteria combined (NAC & SI). **Table 4-9** summarizes potential noise barriers.

Table 4-8
SUMMARY OF NOISE IMPACTS

	Approach or Exceed NAC Only "NAC"	Substantial Increase Only "SI"	Both NAC and Substantial Increase "NAC & SI "	TOTAL
CBA 1				
Existing	None	None	None	None
No-build (2030)*	None	None	None	None
Build (2030)	4	2	None	6
CBA 2				
Existing	None	None	None	None
No-build (2030)*	1	None	None	1
Build (2030)	2	58	10	70
CBA 2A				
Existing	None	None	None	None
No-build (2030)*	None	None	None	None
Build (2030)	4	17	8	29

**Table 4-8
SUMMARY OF NOISE IMPACTS**

	Approach or Exceed NAC Only "NAC"	Substantial Increase Only "SI"	Both NAC and Substantial Increase "NAC & SI"	TOTAL
CBA 3				
Existing	None	None	None	None
No-build (2030)*	None	None	None	None
Build (2030)	3	16	11	30
CBA 4				
Existing	None	None	None	None
No-build (2030)*	None	None	None	None
Build (2030)	4	5	None	9

*Note: for purposes of the noise analysis, "No-build" refers only to not building the particular Candidate Build Alternative, not to the entire No-build Alternative as defined in Chapter 2.

**Table 4-9
PRELIMINARY NOISE BARRIER SUMMARY**

CBA 2A							
Barrier Name	Location	Average Height (feet)	Length (feet)	Square Feet	No. Sites Protected	No. Sites Benefited	Total Cost
Barrier 2A-1	Route 704 Sites 38-42	14	800	11,200	4	1	\$250,000
TOTALS			800	11,200	4	1	\$250,000
CBA 3							
Barrier 3-1	Route 711 Sites 1, 2, 3	14	400	5,600	1	2	\$125,000
TOTALS			400	5,600	1	2	\$125,000

4.9 VISUAL QUALITY AND AESTHETICS

The visual resources of the study area consist of two notable aspects [note: visual effects on historic properties in the context of Section 106 of the National Historic Preservation Act are discussed in Section 4.15]:

- The views of distant mountains to the east, particularly Massanutten Mountain approximately two miles east of the study area. None of the Candidate Build Alternatives would affect this aspect of visual resources of the study area because the mountains are too distant.
- The picturesque qualities of farmland, which include open-space vistas, punctuated by farm buildings and grazing livestock. This aspect of visual resources is not unique to the study area, but is common throughout the Shenandoah Valley. It is, however, an attraction that draws people to reside in the study area to enjoy the views while remaining close to

employment, entertainment, and other opportunities. The following discussion outlines the effects of the alternatives on this aspect of visual resources.

CBA 1 is located in the portion of the study area most removed from the developing urbanized area of Harrisonburg and adjoining portions of Rockingham County. It also is the longest alternative. Therefore, the landscape surrounding it contains more farmland than is present in the vicinity of alternatives closer to Harrisonburg. However, because CBA 1 follows existing roads and only provides for two lanes along most of its length, the landscape would not be substantially altered and viewers of the landscape (residents adjacent to the alternative and potential travelers along the alternative) would continue to see essentially what they see now.

CBA 2 and **CBA 2A** would have four lanes and a median and would be largely on new location across existing farmlands for substantial portions of their lengths. Of all the alternatives, they have the greatest potential for affecting the views of adjacent residents by introducing a new highway where currently none exists. Potential travelers along these alternatives would enjoy views similar to those currently experienced along existing Route 704.

CBA 3 and **CBA 4** pass through areas that are, or soon will be, developed into industrial, commercial, or residential uses, and therefore should have little effect on the visual character of the area. Residents adjacent to the alternatives and potential travelers along the alternatives would see a mix of industrial, commercial, residential, and institutional (schools, churches, proposed hospital) land uses.

Comments received during scoping indicated concerns about visual impacts to Shenandoah National Park and Skyline Drive. The nearest boundary of the Park is approximately eight miles from the study area; the nearest point on Skyline Drive is approximately 14 miles from the study area. At those distances, it is unlikely that any of the alternatives would be readily distinguishable from other highways in the region or from the general urbanized appearance of the Harrisonburg metropolitan area. Consequently, no visual impacts on the Park or Skyline Drive are anticipated.

4.10 GEOLOGY AND GROUNDWATER

4.10.1 Karst Terrain

None of the alternatives would impact any known caves, sinkholes, or other karst features within the study area.

4.10.2 Groundwater

A considerable portion of the project area is served, or is planned by Rockingham County's government to be served, by public water supply systems. However, the supply sources for those systems are outside the study area. Therefore, domestic drinking water resources drawn from public water supplies by a large segment of the public would not be affected. Currently, however, residents of a substantial portion of the study area obtain potable water from wells established in shallow aquifers (wells less than 100 feet deep). Construction of cut slopes sometimes can result in localized lowering of very shallow groundwater levels. Increases in impervious surfaces may marginally decrease the amount of infiltration of precipitation into the ground. However, the sizes of paved portions of the alternatives are small relative to the size of the study area. Therefore, the additional increments of impervious surfaces attributable to the

alternatives are not expected to substantially diminish the amount of water infiltrating the ground to recharge the regional water table.

Highway-related pollutants commonly associated with groundwater contamination can include deicers, herbicides used for roadside vegetation management, accidental spills of hazardous materials during transportation, pavement tars, oils and grease, metals, and emissions from vehicles using the roadways. It is expected that stormwater management ponds that would be implemented with any of the alternatives would collect runoff from the roadway areas, thus reducing the potential for that runoff to infiltrate into the groundwater. Some contamination due to seepage from the stormwater management ponds might occur; however, it would not be expected to have more than minimal localized effects on groundwater quality.

Generally, the displacement of wells is considered a design-related issue; therefore, no estimates are available at this time on the number of wells that may need to be closed. Any such well closures would be completed in accordance with VDOT's *Road and Bridge Specifications*, which require compliance with Virginia Department of Health Private Well Regulations and all other applicable state and local regulations.

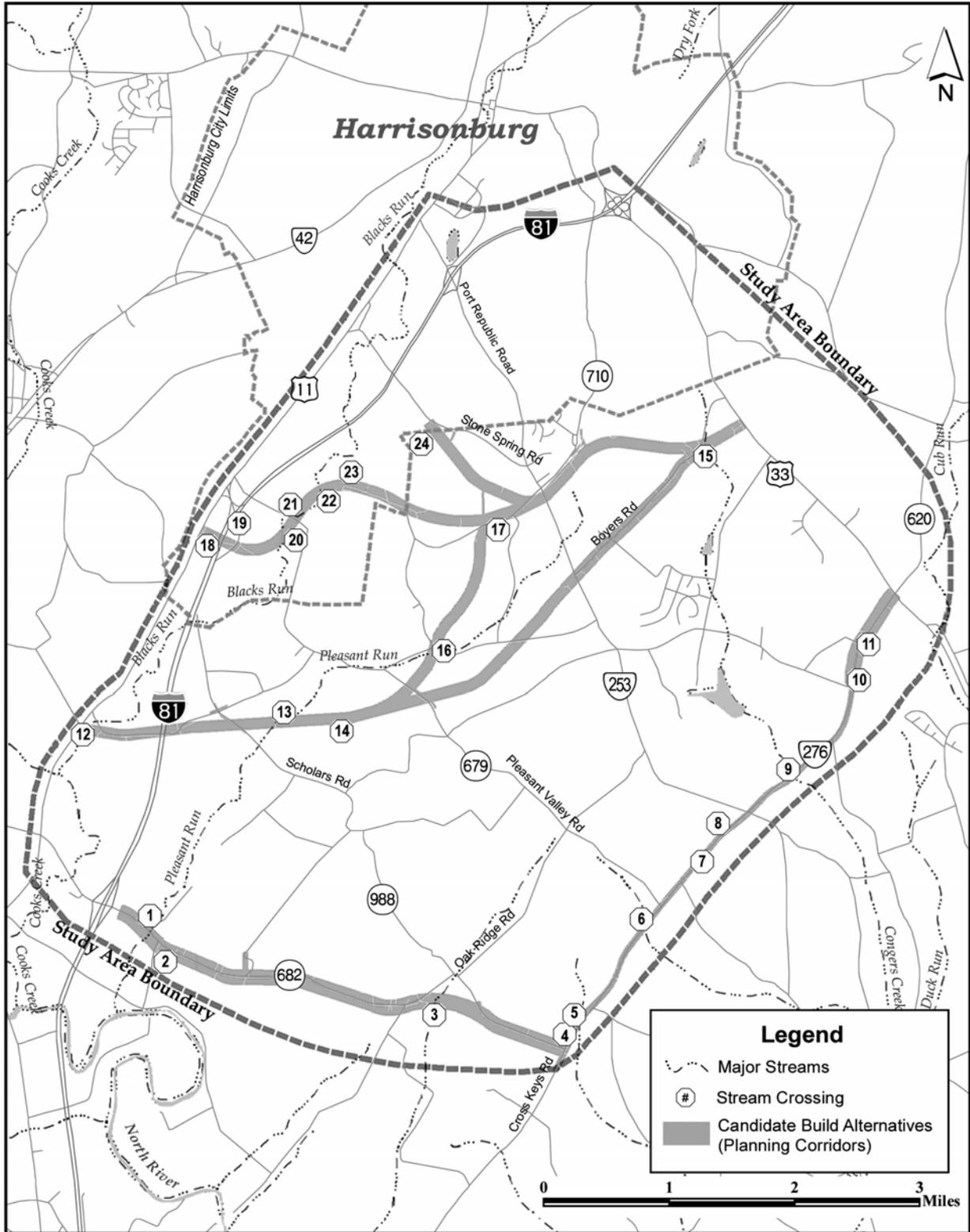
4.11 SURFACE WATERS, INCLUDING WETLANDS

4.11.1 Surface Waters

Figure 4-5 shows the locations of stream crossings by the five Candidate Build Alternatives. **Table 4-10** outlines the lengths of streams within the planning and design corridors for the alternatives. At this stage of project development, detailed hydraulic studies have not been done to conclusively determine the sizes and types of drainage structures that would be needed. However, pipe culverts likely would be VDOT's preferred method of carrying the smallest streams under the roadway. Box culverts may be more appropriate at several of the larger crossings. If pipe or box culverts are used, they would be countersunk to provide for low flow conditions and so that natural bottoms could reestablish inside the culverts. Bridges likely would be used at the largest stream crossings, such as those involving Blacks Run and the lower reaches of Pleasant Run. Any unavoidable stream relocations will be performed using natural stream design, which means that the channel should mimic the dimension, pattern, and profile of a representative reference stream reach.

At this preliminary stage of development, sufficient design has not been developed to determine the precise locations of stormwater management facilities such as detention ponds. However, all practicable efforts will be made to ensure that such facilities would not be located in streams. Any requests for authorization under the requisite federal and state water quality permits to place these facilities or portions of them in streams would be accompanied by an analyses of why alternative upland sites are not practicable.

Compensation for stream impacts may be provided as part of the permit conditions for any authorizations issued by the U.S. Army Corps of Engineers and the Virginia Department of Environmental Quality. Because these agencies determine the compensation requirements for stream impacts on a case-by-case basis, the quantitative requirements for the selected alternative would be negotiated with them as part of the permit application process. Compensation may involve enhancement or restoration to stream and riparian areas, use of credits from an approved stream mitigation bank, or payments to the Virginia Wetlands Restoration Trust Fund.



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SURFACE WATERS

Figure 4-5

Table 4-10
STREAM IMPACTS

Site Number	Description	Drainage Area (sq. mi.)	Length within Planning Corridor (feet)	Length within Design Corridor (feet)
CBA 1				
1	Pleasant Run, perennial stream, crosses Route 682 perpendicularly; 3' - 8' wide; 0.5' - 2' deep; silt/sand/gravel/cobble substrate	7.5	581	262
2	Intermittent tributary of Pleasant Run, parallels south side of Route 682 between confluence with Pleasant Run and crossing of Route 682, crosses Route 682 perpendicularly and runs alongside north side of road to headwaters; 1' - 3' wide; 0' - 1' deep; silt substrate	0.4 (0.07 above Rte 682 crossing)	3,285	1,320
3	Intermittent Tributary of North River, crosses new-location portion of corridor at approx. 40° angle; 1' - 3' wide; 0.1' - 1' deep; silt/sand/gravel/cobble substrate	0.8	647	134
4	Intermittent tributary of North River, crosses Route 276 perpendicularly; 1' - 3' wide; 0.1' - 1.5' deep; silt substrate	0.5	84	84
5	Intermittent tributary of North River, crosses Route 276 at approx. 45° angle; 2' - 3' wide; 0.5' - 1' deep; silt substrate	0.5	104	104
6	Mill Creek, intermittent stream, crosses Route 276 at approx. 20° angle; 1' - 3' wide; 0.5' - 1' deep; silt substrate	0.9	117	117
7	Intermittent tributary of Mill Creek, crosses Route 276 perpendicularly; 2' wide; 0.1' - 1' deep; silt substrate	0.4	91	91
8	Intermittent tributary of Mill Creek, crosses Route 276 perpendicularly; 1' - 2' wide; 0.5' - 1' deep; silt/sand/gravel substrate	0.8	84	84
9	Congers Creek, perennial stream, crosses Route 276 perpendicularly; 7' - 12' wide; 0.5' - 2' deep; silt/sand/gravel/cobble substrate	4.5	81	81
10	Intermittent tributary of Cub Run, crosses Route 276 perpendicularly; 5' - 7' wide; 0.5' deep; silt/sand substrate	0.5	81	81
11	Intermittent tributary of Cub Run, crosses Route 276 perpendicularly and then runs alongside Route 276 a short distance before turning away again; 2' - 3' wide; 0.5' deep; silt/sand substrate	0.2	158	158
Total CBA 1			5,313	2,516
CBA 2				
12	Blacks Run, perennial stream, parallels east side of Route 11, crosses CBA 2 perpendicularly; 30' - 40' wide; 1' - 4' deep; silt/sand/gravel/cobble substrate	18.7	501	240

Table 4-10
STREAM IMPACTS

Site Number	Description	Drainage Area (sq. mi.)	Length within Planning Corridor (feet)	Length within Design Corridor (feet)
13	Pleasant Run, perennial stream, crosses CBA 2 at approx. 50° angle from perpendicular; 15' - 20' wide; 0.5' - 2' deep; silt/sand/gravel substrate	3.8	1,082	654
14	Intermittent tributary of Pleasant Run, crosses CBA 2 at approx. 55° angle from perpendicular; 2' - 5' wide; dry at time of field review; silt/sand/gravel/cobble substrate	0.1	853	569
15	Intermittent tributary of Congers Creek, crosses CBA 2 at approx. 30° angle from perpendicular; 2' - 3' wide; 0' - 0.5' deep; silt substrate	0.3	665	192
Total CBA 2			3,101	1,655
CBA 2A				
12	Blacks Run, perennial stream, parallels east side of Route 11, crosses CBA 2A perpendicularly; 30' - 40' wide; 1' - 4' deep; silt/sand/gravel/cobble substrate	18.7	501	240
13	Pleasant Run, perennial stream, crosses CBA 2A at approx. 50° angle from perpendicular; 15' - 20' wide; 0.5' - 2' deep; silt/sand/gravel substrate	3.8	1,082	654
14	Intermittent tributary of Pleasant Run, crosses CBA 2A at approx. 55° angle from perpendicular; 2' - 5' wide; dry at time of field review; silt/sand/gravel/cobble substrate	0.1	853	569
16	Pleasant Run, perennial stream, crosses CBA 2A at approx. 15° angle from perpendicular; 5' - 8' wide; 0.1' - 1' deep; silt/sand substrate	2.5	553	261
17	Intermittent tributary of Pleasant Run, crosses CBA 2A at approx. 30° angle from perpendicular	0.2	406	227
15	Intermittent tributary of Congers Creek, crosses CBA 2A at approx. 15° angle from perpendicular; 2' - 3' wide; 0' - 0.5' deep; silt substrate	0.3	555	264
Total CBA 2A			3,950	2,215
CBA 3				
18	Intermittent tributary of Blacks Run; 2' - 8' wide; 0' - 1.5' deep; silt/gravel/cobble substrate	0.2	706	336
19	Intermittent tributary of Blacks Run; 2' - 12' wide; 0' - 2' deep; silt/gravel/cobble substrate	0.7	403	243

Table 4-10
STREAM IMPACTS

Site Number	Description	Drainage Area (sq. mi.)	Length within Planning Corridor (feet)	Length within Design Corridor (feet)
20	Blacks Run, perennial stream, crosses CBA 3 perpendicularly, then turns and runs parallel, entering into the planning corridor again at two locations just north of the crossing (Sites 21 & 22); 20' - 35' wide' 1' - 5' deep; silt/ sand/gravel/cobble substrate	14.0	750	240
21	Blacks Run, perennial stream, crosses a portion of CBA 3 perpendicularly and a portion at approx. a 70° angle to perpendicular; 20' - 35' wide' 1' - 5' deep; silt/ sand/gravel/cobble substrate	14.0	910	480
22	Blacks Run, perennial stream, crosses CBA 3 perpendicularly; 20' - 35' wide' 1' - 5' deep; silt/sand/gravel/cobble substrate	14.0	515	250
23	Intermittent tributary of Blacks Run, generally parallels CBA 3 alignment; 2' - 5' wide; 0.5' - 2' deep; silt/sand/gravel/cobble substrate	0.2	2,447	1,865
17	Intermittent tributary of Pleasant Run, crosses CBA 3 at approx. 15° angle to perpendicular; 1' - 3' wide; 0.1' - 0.3' deep; silt substrate	0.2	522	252
15	Intermittent tributary of Congers Creek, crosses CBA 3 at approx. 15° angle from perpendicular; 2' - 3' wide; 0' - 0.5' deep; silt substrate	0.3	555	264
24	Intermittent tributary of Blacks Run, crossing of CBA 3/4 varies from near perpendicular to near parallel; 1' - 2' wide; 0' - 0.4' deep; silt substrate	0.2	890	716
Total CBA 3			7,698	4,646
CBA 4				
24	Intermittent tributary of Blacks Run, crossing of CBA 3/4 varies from near perpendicular to near parallel; 1' - 2' wide; 0' - 0.4' deep; silt substrate	0.2	890	716
15	Intermittent tributary of Congers Creek, crosses CBA 3 at approx. 15° angle from perpendicular; 2' - 3' wide; 0' - 0.5' deep; silt substrate	0.3	555	264
Total CBA 4			1,445	980

Minor long-term water quality effects could occur as a result of increases in impervious pavement surfaces, increases in traffic volumes, and consequent increases in pollutants washed from the road surface into receiving streams. Pollutants would include grease, oil, metals, nutrients, nitrogen, deicing salts, roadside vegetation management chemicals, and suspended solids. Because none of the receiving streams are elements of local public water supplies, the

potential for human health effects from roadway runoff is minimal. Moreover, temporary and permanent stormwater management measures, including detention basins, vegetative controls, and other measures, would be implemented to minimize potential degradation of water quality. These measures would reduce or detain discharge volumes and remove pollutants. The requirements and special conditions of any required permits for work in and around surface waters would be incorporated into construction contract documents. The construction contractor would be required to comply with those conditions and with pollution control measures specified in VDOT's *Road and Bridge Specifications*.

4.11.2 Wetlands

Wetlands along the alternatives are small in size and scattered in distribution; most are limited to narrow and disjunct bands of emergent vegetation [common species include New York ironweed (*Vernonia noveboracensis*), swamp aster (*Aster puniceus*), fox sedge (*Carex vulpinoidea*), pale sedge (*Carex lurida*), soft rush (*Juncus effusus*) and a variety of bulrushes (*Scirpus spp.*)] or shrubs along the banks of streams [mainly common alder (*Alnus serrulata*), and shrub-sized black willow (*Salix nigra*) and sycamore (*Platanus occidentalis*)]. The Cowardin¹ classifications for these wetlands are: palustrine emergent (PEM) systems with persistent vegetation and palustrine scrub-shrub (PSS) systems with broad-leaved deciduous vegetation, both with temporary (A) or seasonal (C) flooding regimes. Their locations generally coincide with the stream locations depicted on Figure 4-5. The amounts and types of wetlands within the CBA planning and design corridors are tabulated in **Table 4-11**. The types of wetlands affected are not unique to the project area. The functions of these wetlands include groundwater discharge, sediment/toxicant retention, nutrient removal, sediment stabilization, and wildlife habitat.

Table 4-11
WETLANDS WITHIN ALTERNATIVES

Wetland Area (Acres)									
CBA 1		CBA 2		CBA 2A		CBA 3		CBA 4	
Planning Corridor	Design Corridor	Planning Corridor	Design Corridor	Planning Corridor	Design Corridor	Planning Corridor	Design Corridor	Planning Corridor	Design Corridor
0.04	0.00	1.05	0.43	1.41	0.48	1.36	0.84	0.60	0.08

At this preliminary stage of development, sufficient design has not been developed to determine the precise locations of stormwater management facilities such as detention ponds. However, all practicable efforts will be made to ensure that such facilities would not be located in wetlands. Any requests for authorization under the requisite federal and state water quality permits to place these facilities in wetlands would be accompanied by an analyses of why alternative upland sites are not practicable.

¹ Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of wetlands and deepwater habitats of the United States*. U.S. Fish and Wildlife Service FWS/OBS - 79/31. 131 pp. A hierarchical system for classifying waters and wetlands based on hydrological and ecological characteristics, widely used by state and federal agencies in mapping and evaluating water resources and adopted by the Federal Geographic Data Committee as a Data Classification Standard.

All available measures to avoid and minimize impacts to wetlands would be implemented where feasible. For unavoidable wetland losses, VDOT will develop compensatory mitigation in cooperation with the federal and state water quality permitting agencies. Such compensation would account for lost wetland types and functions and could include construction of replacement wetlands onsite or offsite, enhancement of existing wetlands, use of credits from an approved wetlands mitigation bank, or payments to the Virginia Wetlands Restoration Trust Fund.

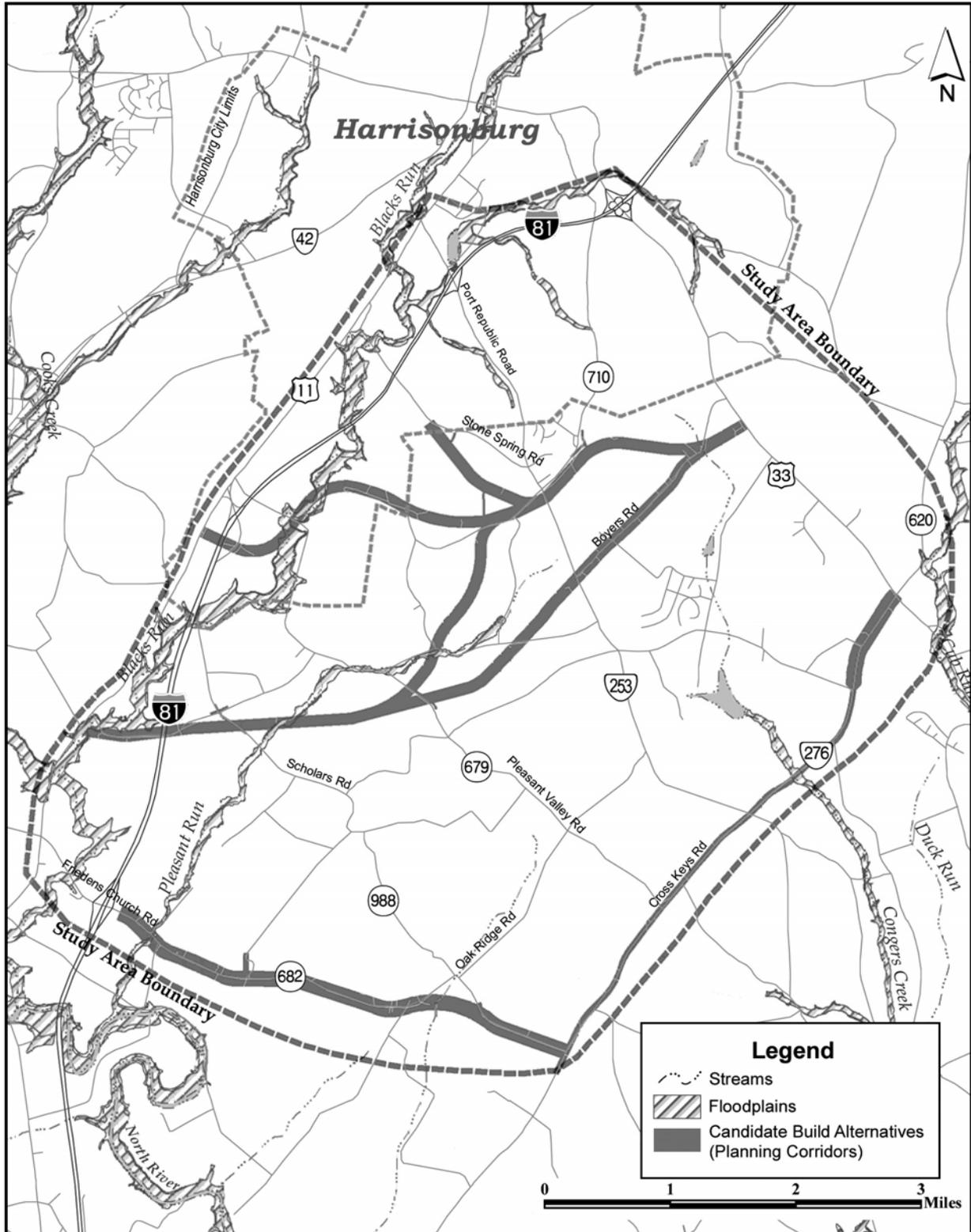
4.12 FLOODPLAINS

The boundaries of 100-year floodplains were obtained from the National Flood Insurance Maps (FIRM) prepared by the Federal Emergency Management Agency (FEMA). Determining floodplain impacts involved superimposing the alternative designs onto the 100-year floodplain digital mapping. The impacts are tabulated in **Table 4-12** and shown in **Figure 4-6**.

Table 4-12
FLOODPLAIN ENCROACHMENTS

Alternative		Planning Corridor (acres)	Design Corridor (acres)
CBA 1	Pleasant Run	2	1
	Congers Creek	1	1
	Total CBA 1	3	2
CBA 2	Pleasant Run	6	3
	Blacks Run	9	3
	Total CBA 2	15	6
CBA 2A	Pleasant Run	9	5
	Blacks Run	9	3
	Total CBA 2A	18	8
CBA 3	Blacks Run/Total	25	12
CBA 4	No Impacts	0	0

All drainage structures would be designed so that potential increases in flood levels would be minimal. There is no evidence that any of the floodplain encroachments would increase the probability of flooding or the potential for property loss and hazard to life during the service lives of any bridges or other drainage structures and their roadway approaches. Therefore, none of the alternatives would have any effect on flooding risks. None of the alternatives would be expected to have substantial effects on fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, forestry, natural moderation of floods, water quality maintenance, groundwater recharge, and other natural and beneficial floodplain values. The project would not encourage, induce, allow, serve, support, or otherwise facilitate additional or incompatible base floodplain development. The floodplain encroachments would not be “significant encroachments” (as defined in 23 CFR 650.105(q)) because:



Source: Federal Emergency Management Agency

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FLOODPLAINS

Figure 4-6

- They would pose no significant potential for interruption or termination of a transportation facility that is needed for emergency vehicles or that provides a community's only evacuation route.
- They would not pose significant flooding risks.
- They would not have significant adverse impacts on natural and beneficial floodplain values.

Therefore, the project is consistent with Executive Order 11988, *Floodplain Management*, which prohibits federal support of incompatible floodplain development unless there is no practical alternative, and no Floodplain Finding in accordance with Executive Order 11988 is required.

Sections 107 and 303 of VDOT's specifications require the use of stormwater management practices to address concerns such as post-development stormflows and downstream channel capacity. These standards require that stormwater management ponds be designed to reduce stormwater flows to pre-construction conditions for up to a 10-year storm. VDOT would adhere to its specifications to prevent an increase in flooding risks associated with the improvements. It is expected that backwater elevations and velocity increases at the floodplain encroachments would be nonexistent or minimal. During final design, a detailed hydraulic survey and study would evaluate effects on stormwater discharges. This evaluation would help ensure that no substantial increases in downstream flooding would occur.

Through coordination with City of Harrisonburg and Rockingham County local floodplain management officials, the local floodplain ordinances were obtained and reviewed. Both ordinances require that any proposed development not result in increasing the elevation of the 100-year flood by more than one foot at any point.

Based on the above, none of the alternatives would be expected to have substantial impacts to floodplains or the natural and beneficial values of floodplains.

4.13 WILDLIFE AND HABITAT

4.13.1 Aquatic Habitat

Placement of culverts to carry streams under any of the alternatives would result in minor losses of stream-bottom habitat and the resident benthic (bottom-dwelling) organisms. However, most of the streams in the study area already have diminished benthic communities because of agricultural runoff. The major receiving tributaries (Blacks Run, Pleasant Run, and Mill Creek) are all classified by EPA as impaired waters due to fecal coliform bacteria contamination (from livestock operations). Because of the small size and intermittent flow of most of the streams, their fisheries value is considered low. Localized water quality impacts of runoff from the alternatives could further suppress benthic populations due to stresses caused by contaminants in highway runoff. However, most of the impact sites already are crossed by existing roads, or are near existing road crossings. Moreover, the impacts of habitat loss and contamination would be offset by implementation of mitigation measures, such as countersinking of culverts (so that natural bottom could reestablish within the culvert and the movement of aquatic organisms would not be obstructed) and installation and management of proper stormwater management facilities. Given the absence of existing stormwater controls, it is possible that the overall water quality of receiving streams could actually improve following the installation of stormwater management facilities as part of the implementation of any road construction. Additional mitigation measures would be developed during design development in cooperation with the U.S. Army Corps of Engineers, EPA, and USFWS. Such measures could include stream

restoration, establishment of riparian buffers, use of credits from a stream mitigation bank, or payments into the Virginia Aquatic Resources Trust Fund.

4.13.2 Terrestrial Habitat

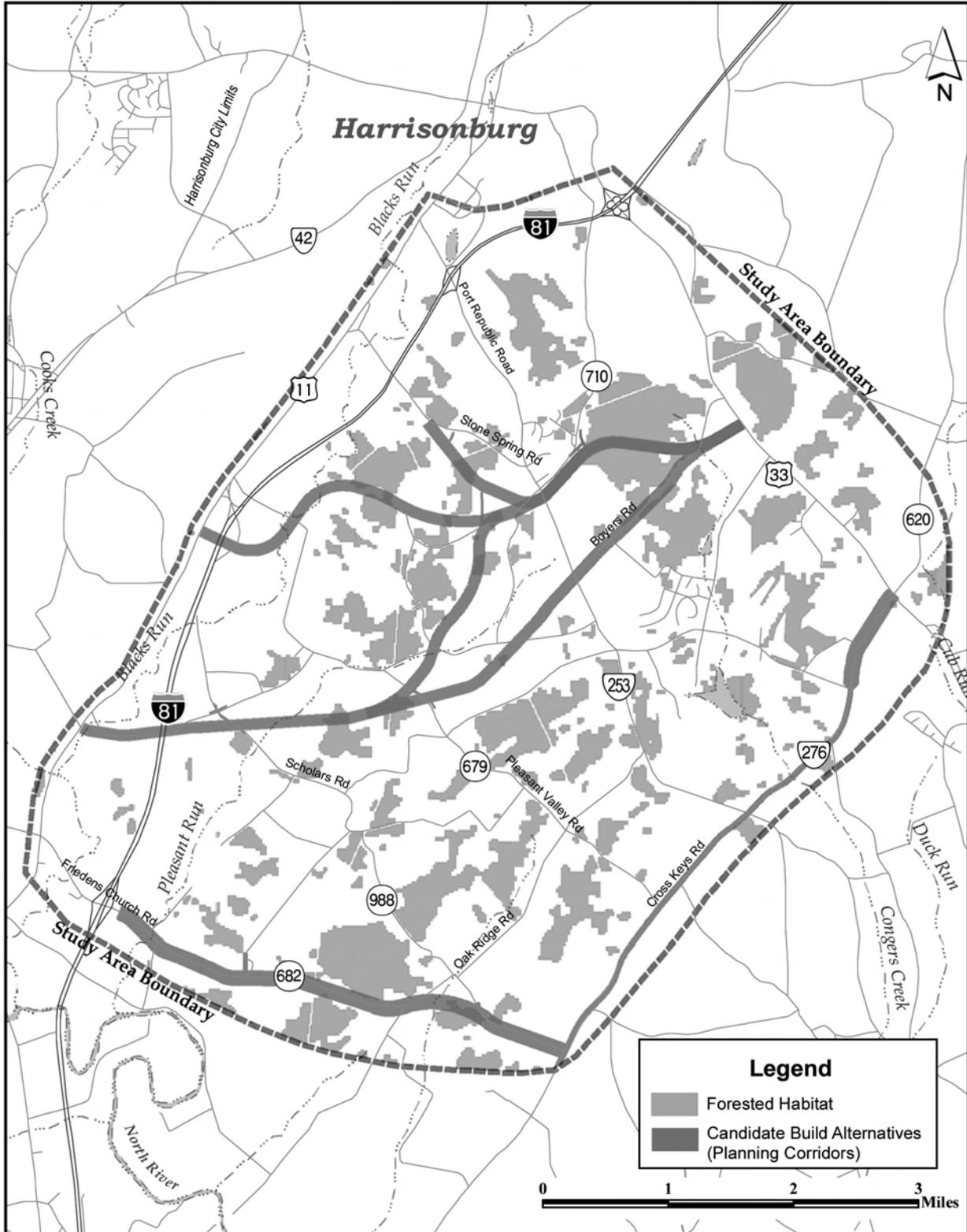
Terrestrial habitat within the study area already has been extensively fragmented by agricultural activities, residential development, powerlines, and roads. As a result, most remaining forested areas consist of “islands” on hilltops that are too steep to farm. Such areas also generally are too steep for roads, resulting in relatively low forestland impacts for all the alternatives (see **Table 4-13** and **Figure 4-7**). Although pasture land, cropland, and residential land have habitat values for a number of wildlife species, the losses of these areas to highway right of way would not constitute severe losses of available habitat or wildlife populations. Segments of alternatives that would be on new location would marginally increase the fragmentation of habitat. Most of these segments pass through areas of open unforested lands.

Table 4-13
IMPACTS TO FORESTED HABITAT (ACRES)

Corridor	CBA 1	CBA 2	CBA 2A	CBA 3	CBA 4
Planning Corridor	8.8	22.1	45.8	42.3	28.9
Design Corridor	1.9	9.0	22.7	18.4	12.9

4.13.3 Migratory Birds

Migratory birds include hundreds of species of songbirds, waterfowl, raptors (birds of prey), and others as listed under various international conventions, such as the Migratory Bird Treaty Act of 1918, and other treaties and legislation that are aimed at conserving bird populations. More particularly, “neotropical” migratory birds are those that breed in or migrate through the United States and spend the nonbreeding season in Mexico, Central America, the Caribbean and/or South America. Migratory birds provide various environmental, economic, recreational, and aesthetic benefits. The migratory birds of primary concern for this study are songbirds, which include thrushes, warblers, vireos, grosbeaks, and many other familiar species. Research indicates that the most important stopover habitat for most migratory songbirds consists of forest with dense undergrowth. This type of habitat provides many different types of feeding and resting areas and good cover from predators. Many neotropical songbirds also require large areas of forest to raise their young. For example, some warblers need at least 250 acres of forest for successful nesting. However, there are no large blocks of forest within the study area. The small fragmented areas of forest in the study area also do not provide the multiple vegetative layers optimal for migratory songbird habitat. In contrast, the George Washington National Forest to the west and Shenandoah National Park to the east provide vast federally protected and managed forestlands that provide suitable migratory bird habitat. As shown in Table 4-13, the effects of the alternatives on forestland would be minimal, and, consequently, the effects on forest-dwelling migratory birds would be minimal as well. Some migratory birds, such as meadowlarks and several species of sparrows, require grassland habitats for courtship, nesting, foraging, rearing young, and roosting or resting. Grasslands are plentiful in and around the study area and include agricultural lands, old fields, pastures, orchards, parks, golf courses, and cut-over forests. Each of the alternatives would impact grassland habitats to the extent of the highway right of way acreages across pastures or croplands and similar areas. These acreages are relatively small in comparison to the total acreage in the study area.



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FORESTED HABITAT

Figure 4-7

4.13.4 Invasive Species

In accordance with Executive Order 13112, *Invasive Species*, the potential for the establishment of invasive animal or plant species during construction of any of the Candidate Build Alternatives would be minimized by following provisions in VDOT's *Road and Bridge Specifications*. These provisions require prompt seeding of disturbed areas with seeds that are tested in accordance with the Virginia Seed Law and VDOT's standards and specifications to ensure that seed mixes are free of noxious species. While the right of way is vulnerable to colonization by invasive plant species from adjacent properties, implementation of the stated provisions will reduce the potential for the establishment and proliferation of invasive species within highway right of way.

4.14 THREATENED AND ENDANGERED SPECIES

Early in the study, the U.S. Fish and Wildlife Service (USFWS) and the Virginia division of Natural Heritage provided lists of endangered and threatened species that occur or may occur in Rockingham County. In addition, input was solicited and received from the Virginia Department of Conservation and Recreation's Karst Protection Coordinator with respect to species associated with karst terrain.

According to the Karst Protection Coordinator: "The Madison Cave isopod, a subterranean aquatic crustacean, is endemic to karst aquifers of the Shenandoah Valley. One of the 11 documented locations is the nearby Massanutten Caverns. The species may well be present beneath the surface of the entire study area. Protecting the species requires maintaining the pre-development hydrology and maintaining or improving the water quality. In particular, water should not be diverted to or away from sinkholes or drainageways terminating in sinkholes. Water ultimately discharged to sinkholes should enter a detention basin prior to release."

None of the alternatives would affect any of the threatened or endangered species, or the habitat of such species, noted by the state or federal resource agencies. None of the alternatives traverse any sinkholes, caves, fissures, or other features leading to potential subterranean Madison Cave isopod (*Antrolana lira*) habitat. Stormwater runoff would not be diverted to sinkholes or drainageways terminating in sinkholes. Therefore, no effects are anticipated on this federally listed threatened species. Nor would any effects be anticipated on the Madison Cave amphipod (*Stygobromus stegorum*), which is listed as threatened under the Virginia Endangered Species Act. None of the alternatives affect any caves that could potentially serve as hibernacula for the Indiana bat (*Myotis sodalis*), a federally listed endangered species. Nor would any densely wooded areas or riparian or floodplain forests that might serve as Indiana bat foraging areas be affected by any of the alternatives. Due to the extensive agricultural land uses and development activities, optimal foraging and roosting habitat for this species is virtually nonexistent throughout the entire study area. Based on this information, no effects on the Indiana bat are anticipated. None of the alternatives cross any suitable habitat for Northeastern bulrush (*Scirpus ancistrochaetus*), federally listed as endangered, and Virginia sneezeweed (*Helenium virginicum*), federally listed as threatened.

Correspondence from USFWS received in December 2005 indicates that none of the alternatives are "likely to affect federally listed or proposed species or adversely modify critical habitat. Therefore, no Biological Assessment or further Section 7 consultation is required with the Service."

4.15 HISTORIC PROPERTIES

“Historic property” means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria. (36 CFR 800.16(l)(1)).

4.15.1 Historic Architectural Properties

Identification of historic architectural properties. In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR 800 (the federal Advisory Council on Historic Preservation’s regulations implementing the Act), historic architectural properties within the areas of potential effects² (APE) were identified and evaluated for each alternative. These efforts included:

- A review of properties in the study area that previously had been listed in, or determined eligible for listing in, the National Register of Historic Places (NRHP).
- Field surveys within the APE of each Candidate Build Alternative to identify other districts, buildings, structures, or objects potentially eligible for the NRHP.
- Detailed evaluation of potentially eligible properties to conclusively determine their eligibility.
- Coordination with the Virginia Department of Historic Resources (VDHR) and consulting parties.

A series of reports documents the historic architectural property identification and evaluation efforts.³ The findings have been coordinated with VDHR, which is the State Historic Preservation Office for Virginia, and with Section 106 consulting parties in accordance with the regulations.⁴ VDHR concurred with the findings of the identification and evaluation efforts. The Shenandoah Valley Battlefields Foundation and the Civil War Preservation Trust concurred with the Cross Keys Battlefield boundaries. **Table 4-14** lists the historic properties within the areas of potential effects of the alternatives (listed by alternative, in order from west to east and south to north); **Figure 4-8** shows the locations of the properties, along with the locations of other historic properties outside the areas of potential effects but within the study area.

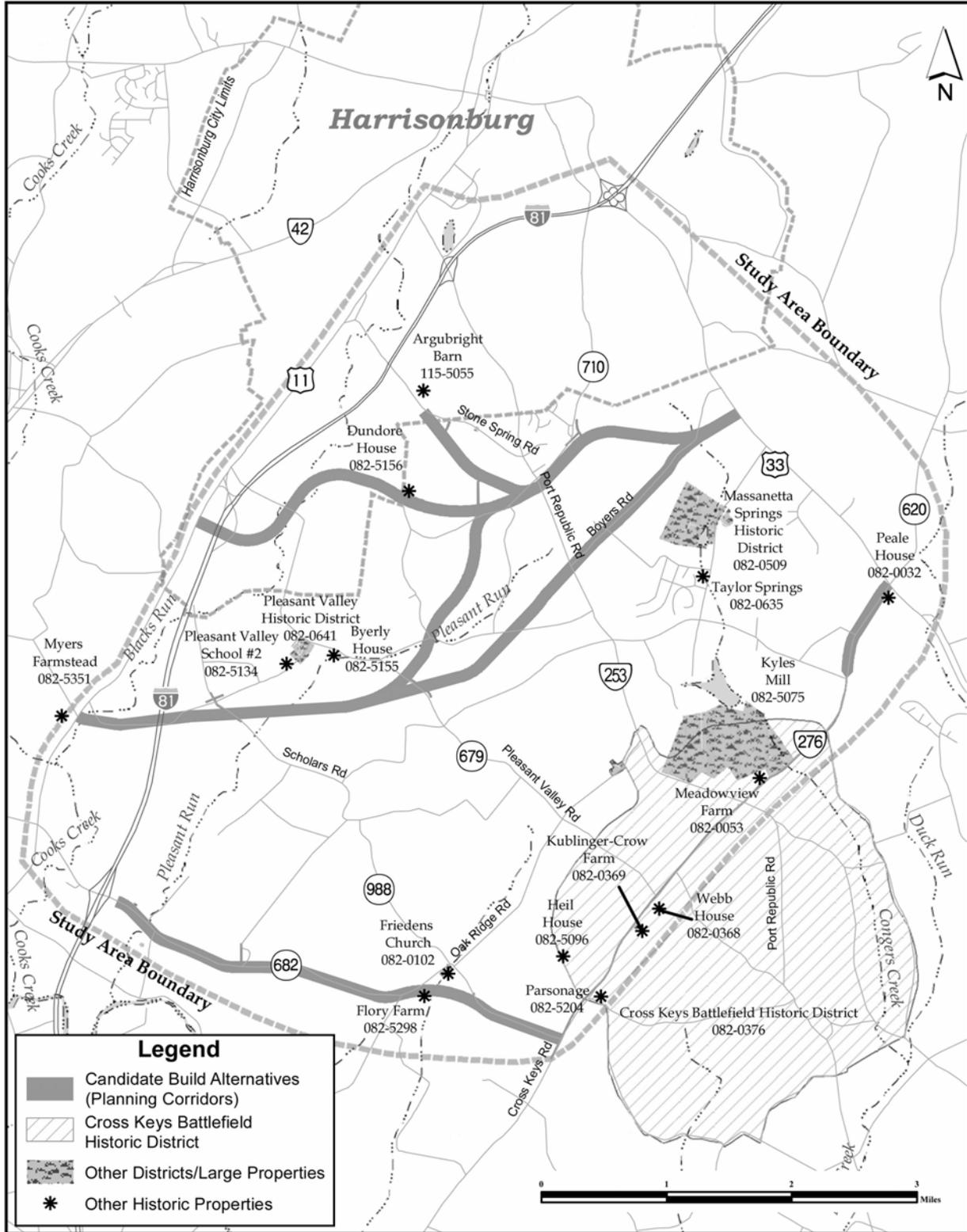
² Area of Potential Effect: the geographic area within which an undertaking directly or indirectly may cause alterations in the character or use of historic properties (36 CFR 800.16(d)). For architectural properties, it is defined as a 1,000-foot-wide corridor along each CBA alignment, plus other resources adjacent to or visible from the corridor. For archaeological resources, it is defined as the planning corridor, which varies from 80 to 500 feet wide (see Table 4-1).

³ *Cultural Resources Constraints Report, Architectural Identification Survey Management Summary, and Architectural Evaluation Survey.*

⁴ Consulting parties included the Shenandoah Valley Battlefields Foundation, the Civil War Preservation Trust, and the Harrisonburg-Rockingham Historical Society.

**Table 4-14
NRHP-LISTED OR ELIGIBLE HISTORIC PROPERTIES**

VDHR File # ^a	Resource Name & Location	Description	NRHP Status & Criteria ^b
CBA 1			
082-5298	Flory Farm, 3550 Friedens Church Road	Ca. 1854 house, late nineteenth century additions, outbuildings, and millrace	Eligible, A & C
082-0102	Friedens Church	Ca. 1819 church	Eligible, A, C
082-5096	Peter Heil House (Springdale Farm), 4090 Cross Keys Road	Ca. 1850 house	Eligible, C
082-5204	German Reformed Church Parsonage, 4067 Cross Keys Road	Late 18th century parsonage	Eligible, C
082-0376	Cross Keys Battlefield Historic District, straddles eastern study area boundary	5,400-acre 1862 Civil War Battlefield, including contributing resources	Eligible, A
082-0369	Kublinger-Crow Farm, 3591 Cross Keys Road	Ca. 1835 house and outbuildings	Individually ineligible, but contributing resource to Cross Keys Battlefield Historic District
082-0368	Dr. J.B. Webb House, 3327 Cross Keys Road	Late 1850s house and early 20 th century barn	Eligible, C; contributing resource to Cross Keys Battlefield Historic District
082-0053	Meadowview Farm, 1776 Cross Keys Road	Ca. 1870 house and outbuildings	Eligible, C
082-5075	Kyles Mill Farm, 1764 Cross Keys Road	Mid 18th century farm complex	Listed, C
082-0032	Peale House (Crossroads Farm), 67 Cross Keys Road at intersection of Route 33	Ca. 1845 house and servants quarters	Eligible, A & C
CBA 2 and 2A			
082-5351	Myers Farmstead, 5536 South Valley Pike	Ca. 1840 house	Eligible, C
082-5134	Pleasant Valley School No. 2, 1827 Cecil Wampler Road	Ca. 1905 school	Individually ineligible, but contributing to Pleasant Valley Historic District
082-0641	Pleasant Valley Historic District	Mid-late 19 th century district	Eligible, A
082-5155	Byerly House, 1819 Pleasant Valley Road	Ca. 1845 dwelling and outbuildings	Eligible, A, C
082-0509	Massanetta Springs Historic District	Ca. 1909 historic district	Listed, A, C
CBA 3			
082-5156	Dundore House, 1582 Ridgedale Road	Ca. 1873 house	Eligible, C
115-5055	Argubright Barn	Ca. 1850 barn	Eligible, A, C
CBA 4			
115-5055	Argubright Barn	Ca. 1850 barn	Eligible, A, C
^a VDHR (Virginia Department of Historic Resources) is the office of the State Historic Preservation Officer (SHPO), who has responsibilities under the National Historic Preservation Act for administering the state historic preservation program. ^b 36 CFR 60.4, National Register Eligibility Criteria: A. Associated with important historical events, which could be of local, statewide, or national significance (e.g., Civil War battle); B. Associated with important historical persons (e.g., Stonewall Jackson); C. Embody distinctive characteristics of a type, period, or workmanship (usually architecture, e.g., 19th century Federal-style dwelling); D. Contains information important in history or prehistory (archaeological sites, e.g., Indian campsites).			



Source: Virginia Department of Historic Resources & Coastal Carolina Research, Inc

**Harrisonburg Southeast Connector
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HISTORIC PROPERTIES

Figure 4-8

Effects. Effects of the alternatives on historic properties have been evaluated by VDOT staff meeting the Secretary of the Interior’s professional qualifications standards for architectural history (48 FR 44739) by applying the definition of effect and the criteria of adverse effect as stated in the regulations implementing Section 106 of the National Historic Preservation Act. These regulations define an effect as an “alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register” [36 CFR 800.16(i)]. The effect is adverse when the alteration of a qualifying characteristic occurs in a “manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association” (36 CFR 800.5(a)). The potential effects of the alternatives on historic properties are discussed below. A final Determination of Effect will be made and coordinated with the State Historic Preservation Officer after identification of a preferred alternative and during development of the Final Environmental Impact Statement.

CBA 1.

082-5298, Flory Farm: Though within the planning and design corridors for CBA 1 (see **Figure 4-9**), encroachment on the resource can be avoided by realigning the alternative to pass north of the site while staying within the planning corridor. The alternative may be visible from the resource and, if so, could have a visual impact. **Potential adverse effect.**

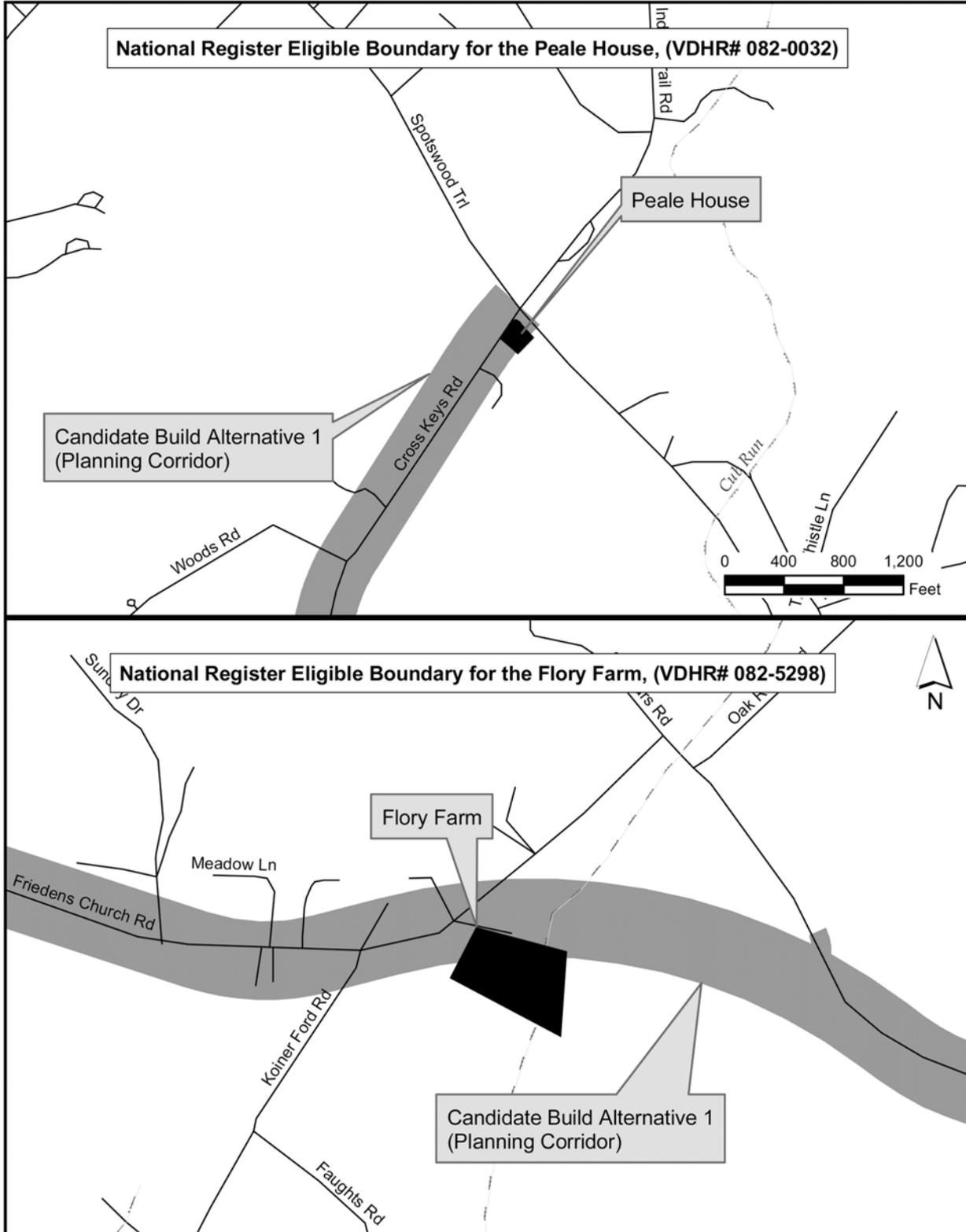
082-0102, Friedens Church: CBA 1 would avoid the resource. The alignment would move a considerable distance away from the current alignment of Route 682. CBA 1 would not be within the viewshed of the church and would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

082-5096, Peter Heil House: CBA 1 would avoid the resource. The dwelling is set a considerable distance back from Route 276, with driveway access with modern dwellings on either side. CBA 1 would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

082-5204, German Reformed Church Parsonage: CBA 1 would avoid the resource and would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

082-0376, Cross Keys Battlefield Historic District: Construction activities through this portion of CBA 1 would be limited to areas within the existing 80-foot-wide right of way, avoiding elements contributing to the significance of the resource. The appearance of the road would change from a road with little or no shoulder and no paved portion of shoulder to one with full standard shoulders, with an eight-foot-wide paved shoulder on both sides of the road. There are numerous modern residences and some commercial buildings within the district. CBA 1 would not alter any character-defining features qualifying the battlefield for the National Register. **No adverse effect.**

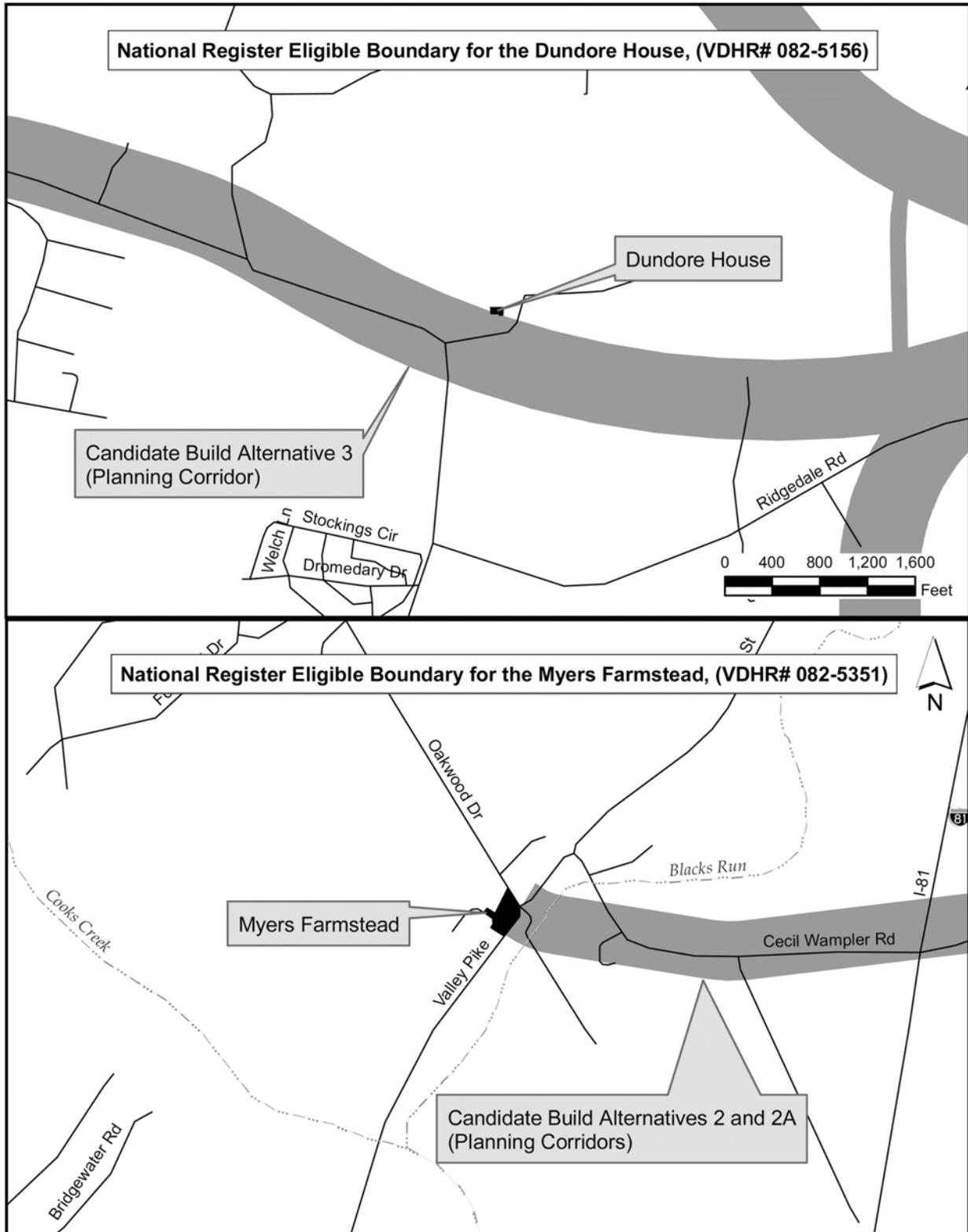
082-0369, Kublinger-Crow Farm: CBA 1 would avoid the resource, which is also within the Cross Keys Battlefield Historic District. Construction activities through this portion of CBA 1 would be limited to areas within the existing 80-foot-wide right of way. The immediate setting of the property itself has been compromised with the construction of a swimming pool next to the dwelling. CBA 1 would not alter any character-defining features qualifying the resource for the National Register. **No effect.**



Source: Rockingham County GIS Department Historic Resources: Coastal Carolina Research, Inc.

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**PEALE HOUSE &
FLORY FARM
Figure 4-9**



Source: Rockingham County GIS Department Historic Resources: Coastal Carolina Research, Inc.

**Harrisonburg Southeast Connector
Location Study**

**DUNDORE HOUSE &
MYERS FARMSTEAD
Figure 4-10**

082-0368, Dr. J. B. Webb House: CBA 1 would avoid the resource, which is also within the Cross Keys Battlefield Historic District. Construction activities through this portion of CBA 1 would be limited to areas within the existing 80-foot-wide right of way. The house is across Route 276 from multiple modern residences. CBA 1 would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

082-0053, Meadowview Farm: CBA 1 would avoid the resource. Although not a contributing resource, the resource is located within the Cross Keys Battlefield Historic District. Construction activities through this portion of CBA 1 would be limited to areas within the existing 80-foot-wide right of way. The house is elevated above the existing roadway and would continue to be so for CBA 1. CBA 1 would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

082-5075, Kyles Mill: CBA 1 would avoid the resource. The property is also within the Cross Keys Battlefield Historic District and construction activities through this portion of CBA 1 would be limited to areas within the existing 80-foot-wide right of way. The house and its few outbuildings are set back from the existing roadway, behind a modern pond. Access to the house is through a drive between two parcels under separate ownership. CBA 1 would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

082-0032, Peale House: Though within the planning and design corridors (see Figure 4-9), encroachment on the resource can be avoided by holding the existing right of way on the southeast side of Route 276 and constructing all the widening to the northwest, requiring reconstructing the intersection with Route 33. The setting of the house has been progressively changed over the years, with Routes 33, 276 and their intersection immediately adjacent to the house. A modern church is located across four-lane-divided Route 33, in the east quadrant of the existing intersection. Additionally, there is a very large recent residential development across Route 276 from the house; construction of additional residences is ongoing, as is construction of a large commercial building in the west quadrant of the intersection. A large portion of the residential development is on rising ground, clearly visible from the house. There is a large boxwood hedge that screens the existing roadway from the house; that screen would not be impacted by CBA 1. Constructing all widening to the northwest would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

CBA 2 and CBA 2A.

082-5351, Myers Farmstead: CBA 2 and 2A would avoid the resource. The farmstead is on the west side of Route 11, at its intersection with Route 704 (see **Figure 4-10**). The farmstead currently fronts four-lane-divided Route 11, and there is a large commercial building southwest, adjacent to the house yard, along with modern residences along Route 11. CBA 2 and 2A would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

082-5134, Pleasant Valley School No. 2: CBA 2 and 2A would avoid the resource, which is not individually eligible, but considered contributing to the Pleasant Valley Historic District. The district's setting is compromised by encroaching, large-scale industrial development around it and the school is in an area of modern residences. Route 704 and the development along it lie between the school and the alternatives. The alternatives would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

082-0641, Pleasant Valley Historic District: CBA 2 and 2A would avoid the resource. The district's setting is compromised by encroaching, large-scale industrial development around it. Route 704 and development along that road lie between the district and the alternatives, which are more than 2,000 feet away. CBA 2 and 2A would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

082-5155, Byerly House: CBA 2 and 2A would avoid the resource. The property's integrity of setting has been compromised by a large distribution center within its immediate viewshed. CBA 2 and 2A would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

082-0509, Massanetta Springs Historic District: CBA 2 would avoid the resource. The alignment is separated from the district by a large wooded area and would not be within the district's viewshed. CBA 2 and 2A would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

CBA 3 and 4.

082-5156, Dundore House: CBA 3 would avoid the resource. This property is eligible for the NRHP solely for the construction techniques used to build the dwelling. The resource can be avoided (see Figure 4-10). CBA 3 would not alter any character-defining features qualifying the resource for the National Register. This property is not within the APE of CBA 4. **No effect.**

115-5055, Argubright Barn: CBA 3 and CBA 4 would avoid the resource. Located out of the resource's viewshed, the alternatives would not alter any character-defining features qualifying the resource for the National Register. **No effect.**

4.15.2 Archaeology

An assessment of potential for the presence of archaeological resources within the APE of each Candidate Build Alternative.⁵

An archaeological assessment was conducted along the Candidate Build Alternatives to evaluate any appreciable differences among alternatives in terms of the potential range, quantity, and integrity of archaeological resources. The assessment also included evaluation of the potential for any alternatives to contain sites meriting preservation in place, or sites that would be extraordinarily complex and/or expensive to excavate. The following discussion summarizes the results of the assessment.

Sites from all time periods have at least some potential of being encountered in unsurveyed areas of the alternatives. While most of the potential pre-contact (before Colonial settlement) and post-contact (after Colonial settlement) site types would be unlikely to affect decision making (because such sites generally are important, not for preservation in place, but for the information they contain, which can be recovered), some Civil War-related site types could merit preservation in place or be costly and complex to document or excavate. The potential for Civil War-related sites is moderate to high in CBA 1, moderate in CBA 2, low in CBA 2A, and low to moderate in CBAs 3 and 4. The portion of CBA 1 along Route 276 has high potential due to the fact that it passes through the Cross Keys Battlefield Historic District. However, construction

⁵ Because the alternatives under consideration consist of corridors covering large land areas, field archaeological surveys will be conducted after the identification of a preferred alternative, as provided for in 36 CFR 800.

activities on undisturbed ground through this portion of CBA 1 would be limited and constrained to areas within the existing 80-foot-wide right of way.

Table 4-15 presents the potential for encountering sites from different time periods for each of the Candidate Build Alternatives. The results are based on consideration of the previously recorded sites in the study area, settlement patterns for each period, and the nature of the terrain crossed by each alternative.

Table 4-15
POTENTIAL FOR ENCOUNTERING ARCHAEOLOGICAL SITES FROM SPECIFIC TIME PERIODS

Alternative	Paleo-Indian Period	Archaic Period	Woodland Period	Post-contact Period
No-build	Low	Low	Low	High
CBA 1	Low	Low to moderate	Low	High
CBA 2	Low	Low to moderate	Low	High
CBA 2A	Low	Low to moderate	Low	High
CBA 3	Low	Low to moderate	Low	High
CBA 4	Very low	Low	Very low	High

Upon identification of a preferred alternative, detailed archaeological studies will be undertaken to identify all archaeological sites on or eligible for the National Register of Historic Places within the APE for the preferred alternative. This work will be conducted in two phases:

- **Phase I** - Conduct field survey by visually inspecting the ground surface and digging test pits by shovel at regularly spaced intervals, with additional shovel testing in locations where archaeological artifacts or features are discovered, in order to identify archaeological sites. For any identified sites, the approximate horizontal and vertical boundaries will be estimated, artifacts will be defined as to type and time period, and a recommendation of potential for National Register eligibility and whether additional work is warranted will be developed. All findings will be documented in a report and coordinated with VDHR.
- **Phase II** - For those sites determined to be potentially eligible for the National Register, additional excavations and analyses will be conducted to conclusively establish their eligibility for the National Register. All findings will be documented in a report and coordinated with VDHR.

For archaeological sites that are determined eligible for the National Register, and which cannot be avoided by the preferred alternative and therefore would incur an adverse effect, VDOT and FHWA will undertake additional consultations with VDHR and other consulting parties to develop a Memorandum of Agreement outlining how the adverse effects will be resolved (e.g., through data recovery excavations).

4.15.3 Cross Keys Battlefield

A 2.8-mile portion of CBA 1 along Route 276 passes through the Cross Keys Battlefield, as shown on **Figure 4-11**. An evaluation and determination of the NRHP-eligible boundaries of the Cross Keys Battlefield Historic District was conducted (*Cross Keys Battlefield Boundary Review*) and VDHR reviewed and concurred with the boundaries.

The construction along this section would entail widening the shoulders on both sides of the existing road to meet minor rural arterial standards (10 feet wide, with 8 of the 10 feet paved), reworking drainage ditches where needed, and extending culverts where necessary to accommodate the shoulder improvements, all within existing right of way. Although the visual character of Cross Keys Road would be altered by the addition of shoulders and other minor work, no character-defining features qualifying the battlefield for the National Register would be altered. Therefore, there would be no adverse effect on the Battlefield.

The Cross Keys Battlefield also is an element of the Shenandoah Valley Battlefields National Historic District established by Congress in the Shenandoah Valley Battlefields National Historic District and Commission Act of 1996. The eight-county District contains 10 Civil War battlefields mapped by the National Park Service. The Act created a planning process for the oversight and preservation of battlefields included in the District. The Shenandoah Valley Battlefields National Historic District is an entity established by Congress and is not the same as a historic district established under the criteria used to determine eligibility for the National Register of Historic Places under the National Historic Preservation Act. For purposes of Section 106, effects only on the National Register-eligible boundaries of the Cross Keys Battlefield are of concern for any of the alternatives. No other National Register-eligible battlefields within the Shenandoah Valley Battlefields National Historic District are in the vicinity of the study area. Coordination with the Shenandoah Valley Battlefields Foundation was begun shortly after initiation of the Harrisonburg Southeast Connector Location Study. A copy of the *Cross Keys Battlefield Boundary Review* report was provided to the Foundation for review and comment. The Foundation concurred with the findings of the report and the recommended National Register-eligible boundaries for the Battlefield. The Foundation is a consulting party for purposes of Section 106.

The Civil War Preservation Trust also has been consulted and also was provided a copy of the *Cross Keys Battlefield Boundary Review* report. The Trust concurred with the recommended National Register-eligible boundaries and expressed its chief concern as the integrity of the Cross Keys Battlefield. The Trust also is a consulting party under Section 106.

4.16 CONSTRUCTION IMPACTS

Construction impacts are short-term effects resulting from the process of building a project. Construction impacts can involve temporary changes in land use and community access, water quality, air quality, and noise levels.

4.16.1 Land Use and Access

Access to businesses and homes could be temporarily disrupted due to temporary detours that are necessary to allow ample space for equipment staging and construction. These temporary disruptions are unavoidable and would be minimized to the extent possible by carefully planning for maintenance of traffic during the process and incorporating maintenance of traffic details into the design plans.

4.16.2 Wildlife and Habitat

The clearing of vegetated cover within the construction footprint would displace temporarily certain habitat areas that would become reestablished over time with the revegetation of cut and fill slopes and other areas within the construction limits but outside of paved areas and the

required clear zone. Grasses would be reestablished quickly and volunteer trees and shrubs would colonize disturbed areas over a period of years. The mechanical removal of cover would cause animal migration away from the disturbance, resulting in a temporary decrease in available habitat and increased competition for remaining habitat. Construction activities also may cause direct mortality of wildlife unable to move out of the way of construction equipment. Opportunistic or invasive plant species may have a competitive advantage in colonizing bare areas during early construction activities; however, temporary and permanent revegetation establishment in accordance with VDOT's *Road and Bridge Specifications* would minimize the extent and duration of undesirable plant growth.

4.16.3 Water Quality

Short-term water quality impacts may result from erosion and siltation following ground disturbance and earthmoving operations. After entering streams, the eroded material may increase turbidity levels and sedimentation downstream. Excessive quantities of suspended solids can harm fish and other aquatic life. Deposition of suspended solids may alter the substrate of streambeds, interfere with plant production and fish spawning, smother benthic fauna, and reduce substrate utilization. Eroded material also may contain organic matter and nutrients, such as nitrogen and phosphorus. Inputs of organic matter could result in increases in biochemical oxygen demand and decreases in dissolved oxygen concentrations. Inputs of nutrients can increase both turbidity and eutrophication by increasing algae production.

A project-specific Erosion and Sediment Control Plan will be prepared in accordance with VDOT's *Erosion and Sediment Control Annual Plan*, which encompasses all of VDOT's erosion and sediment control standards, specifications, policies, and design guidelines as outlined in the *Road and Bridge Standards, Road and Bridge Specifications, Drainage Manual, Instructional and Informational Memoranda*, and other associated directives. The *Annual Plan* is submitted each year for review and approval by the Virginia Department of Conservation and Recreation. Implementation of the Plan would be expected to minimize impacts of erosion and sedimentation during construction. Erosion and sediment control measures would be implemented throughout the construction period to minimize water quality impacts from increased levels of sedimentation and turbidity. Control measures may include berms, dikes, sediment basins, fiber mats, straw silt barriers, netting, mulch, temporary and permanent seeding, and other methods. Construction impacts to in-stream aquatic habitats would be minimized to the extent practicable by avoiding stream relocations and by crossing streams at right angles where possible. To the extent possible, construction equipment would be restricted from fording and otherwise disrupting in-stream habitats.

4.16.4 Air Quality

Construction impacts on air quality include exhaust emissions from construction equipment and dust generated by construction activities on disturbed earth. These impacts would be minimized by enforcement of construction specifications and adherence to VDEQ regulations. VDOT's *Road and Bridge Specifications* require the contractor to comply with all applicable local, state, and federal laws, ordinances, regulations, orders, and decrees. This includes compliance with emissions standards for construction equipment and adherence to regulations for burning of materials from clearing and grubbing, demolition, or other operations. The *Specifications* were reviewed by the VDEQ and were found to conform to the State Implementation Plan. The *Specifications* prohibit burning of tires, asphalt materials, used crankcase oil, or similar materials

that produce dense smoke. Provisions would be included in the contract for allaying dust from bare ground and from construction traffic.

4.16.5 Noise

Noise receptors that would be sensitive to highway traffic noise also would be sensitive to noise from construction equipment. To minimize the effects of construction noise, VDOT's *Road and Bridge Specifications* contain noise control provisions, which include the following:

- Equipment shall in no way be altered so as to result in noise levels that are greater than those produced by the original equipment.
- The contractor's operations shall be performed such that the exterior noise levels measured at a noise-sensitive activity shall not exceed 80 dBA during periods of such activity.
- VDOT reserves the right to prohibit or restrict to certain portions of the project any work that produces objectionable noise during normal sleeping hours, 10 p.m. to 6 a.m., unless other hours are established by local ordinance, in which case the local ordinance shall govern.

4.17 INDIRECT EFFECTS

Indirect effects (40 CFR 1508.8(b)) occur later in time and farther in distance than direct effects, and can include changes in land use patterns, population density, or development rates, and related effects on air, water, and other natural systems. Such effects are not directly attributable to project construction, but, rather, are attributable to other development that may be induced by changes to land accessibility or travel patterns brought about by a project. Quantifying indirect effects often is difficult due to the inability to precisely foresee relationships between a given project and future development, as well as the interplay of factors other than transportation (e.g., overall economic conditions, availability of other infrastructure such as water and sewer systems, growth policies and plans of local governments, rezoning decisions by local governments, and inclinations of individual landowners) that play large roles in development decisions. An additional element is whether the development is planned (i.e., consistent with local comprehensive plans and policies) or unplanned (i.e., not consistent with local comprehensive plans and policies).

During the scoping process for this study, several citizens expressed concerns that certain alternatives, particularly those on new location, might stimulate unwanted development. No such concerns have been expressed by county planners or officials. All portions of the study area within the Harrisonburg city limits and most of the Rockingham County portion of the study area are designated in the local comprehensive plans for development. All portions of the study area currently are accessible by existing roads, although most are secondary roads. Rockingham County plans to extend sewer and water services throughout most of the study area over the next several decades. Recent growth trends in Harrisonburg and Rockingham County suggest that the Harrisonburg region will remain an attractive place to live and work for the foreseeable future, and that the influx of new residents will continue. The proximity of the undeveloped lands within the study area to Harrisonburg and to other activity centers inside and outside the study area make these lands attractive for development. The goals stated in Rockingham County's comprehensive plan include the encouragement of development in areas such as that encompassed by the study area boundaries, rather than in outlying portions of the county well beyond existing residential and employment centers. Based on the above, development in the study area will continue, regardless of whether any of the Candidate Build Alternatives are

implemented. Indeed, one of the major purposes of the alternatives is to respond to travel needs arising from such planned development. Therefore, any of the alternatives could play a small incremental role in influencing development decisions. However, other factors, such as availability of water and sewer services, economic conditions and trends, local government land use decisions, and landowner initiatives, all would play much larger roles. Consequently, it appears unlikely that any of the alternatives would be a major causal factor in stimulating unwanted or unplanned development in the study area, and therefore, no substantial indirect effects are anticipated.

4.18 CUMULATIVE EFFECTS

Cumulative effects (40 CFR 1508.7) result from the incremental impacts of an alternative when added to other past, present, and reasonably foreseeable future actions that affect the same resources. To alleviate confusion regarding the nature of cumulative impacts, the Council on Environmental Quality has issued recent guidance on consideration of past actions.⁶ According to the guidance, a cumulative effects analysis is not merely a cataloging of the environmental impacts of past actions. Rather, the analysis considers “the identifiable present effects of past actions to the extent that they are relevant and useful in analyzing whether the reasonably foreseeable effects of the agency proposal for action and its alternatives may have a continuing, additive, and significant relationship to those effects.” The aggregate environmental effects of past actions in the study area are reflected in the current state of the affected environment, as described in Chapter 3.

Present and reasonably foreseeable future actions include ongoing development activities in the study area by private enterprise and public infrastructure installations by local governments and VDOT, as reflected in local comprehensive plans, VDOT’s Six-year Improvement Program, and HRMPO’s financially constrained *2030 Transportation Plan*. Described below are other recent or reasonably foreseeable projects within the study area that could affect the same resources that would be affected by one or more of the Candidate Build Alternatives. Cumulative effects occur when there is an additive and a causative relationship attributable to the alternative being considered.

4.18.1 Private Projects

- Rockingham Memorial Hospital will relocate from downtown Harrisonburg to a 254-acre site bounded by Routes 253, 704, and 710 near the center of the study area (currently mostly farmland).
- Tenneco/Walker Manufacturing Company will expand its current Harrisonburg automotive exhaust systems manufacturing facility in the vicinity of Alternative 3 near the I-81 interchange. The expansion would include construction of a minimum of 70,000 square feet of new space, resulting in a total of approximately 700,000 square feet within its Harrisonburg campus.
- The Crossroads subdivision at the intersection of Routes 33 and 276 is under construction at the time of preparation of this document.

⁶ June 24, 2005. Memorandum from James L. Connaughton, Chairman, Council on Environmental Quality, Executive Office of the President, to Heads of Federal Agencies. Re: Guidance on the Consideration of Past Actions in Cumulative Effects Analysis.

- Wal-Mart has just opened a major warehouse/distribution center at the Route 682/I-81 interchange.
- Other industrial development is ongoing in the existing industrial area along the east side of I-81 between Routes 704 and 679.

4.18.2 City and County Projects

- Water and sewer lines and pumping stations are being installed in areas between Route 253 and 33.
- Rockingham County has adopted a Battlefield Preservation Plan for lands in the vicinity of the Cross Keys Battlefield.

4.18.3 VDOT Projects

- All projects within the study area in HRMPO’s *2030 Transportation Plan* that are funded for construction (see Figure 2-4 in chapter 2 for locations of these projects):
 - Route 682 widening and reconstruction from the I-81 interchange to Route 995.
 - Route 726 widening and reconstruction.
 - Route 253 widening and reconstruction from Neff Avenue to Boyers Road (Route 704).
 - Route 33 widening and reconstruction.
 - Country Club Road left-turn lane.
 - Various transportation system management and transit projects.

Table 4-16 shows the combined estimated impacts of these programmed projects, based on planning and design corridor widths similar to those used for the Candidate Build Alternatives.

Table 4-16
ENVIRONMENTAL EFFECTS OF OTHER FORESEEABLE VDOT PROJECTS

Category	Planning Corridor	Design Corridor
Land used for highway right of way	410	129
Potential Hazardous Material Sites	17	5
Prime Farmland (acres)	32	10
Statewide-important Farmland (acres)	99	29
Stream Impacts (linear feet)	1,803	757
Wetlands (acres)	0.07	0.03
Floodplains (acres)	20	8
Forestland (acres)	37	10

- These other recent construction projects occurred in the study area; however, their impacts were inconsequential:
 - Route 704 just east of I-81.
 - Turn lanes and signal at intersection of Routes 253 and 276.
 - Turn lanes and signal at intersection of Routes 253 and 689.
 - Route 679 widening.

4.18.4 Discussion of Cumulative Effects

The following discussion addresses cumulative effects of the alternatives:

Farmland. It is likely that much of the farmland in the study area gradually will transform into developed areas. However, this transformation is in accordance with planning and development goals of local governments. Some farmers have indicated during public meetings that they and their children intend to continue farming for the foreseeable future, regardless of what development occurs around them. Even with the conversions of farmland in the study area to other uses, Rockingham County would remain a leading agricultural center in Virginia. None of the alternatives would be a substantial causal factor in ongoing conversions of farmland to other uses in the study area. Moreover, the total impacts to farmland by the alternatives amount to a relatively small fraction of total farmland in the study area or in the Rockingham County.

Water quality and floodplains. Water quality in study area streams already is impaired primarily because of agricultural land uses. The conversion of agricultural lands to other uses may actually improve water quality by eliminating or reducing sources of fecal coliform bacteria and nutrient contamination in these streams. However, the agricultural sources of pollutants may ultimately be replaced by development sources as additional homes, businesses, and other structures and uses are introduced into the area. The collection of effluent from human developments into sewer systems that the county plans for the area, and conveyance of that effluent to a treatment plant, would offset the potential increases in pollutant discharges from new development. Both Harrisonburg's and Rockingham County's floodplains ordinances prohibit any new construction or development unless it is demonstrated that the cumulative effect of the proposed development, when combined with other existing and anticipated development, will not increase the elevation of the one hundred year flood more than one foot at any point. Both ordinances contain other provisions that control and restrict development within floodplains. Therefore, none of the alternatives would be expected to result in any substantial cumulative effects on floodplains. Any of the alternatives would have to comply with VDOT's *Road and Bridge Specifications* for stormwater treatment, which would mitigate any cumulative adverse effects on water quality and may ultimately improve quality in some areas.

Wildlife and habitat. Natural terrestrial habitat in the project area is not optimal and is limited due to extensive impacts from agriculture and development. Aquatic habitat has been degraded by pollution from agricultural activities. Few forested areas would be impacted by the alternatives or by other foreseeable projects. None of the alternatives would be expected to cause substantial cumulative effects to terrestrial or aquatic biota and their habitats. There are no documented occurrences of threatened or endangered species in the project study area, so no cumulative effects to those species would occur.

Historic resources. There are no other foreseeable projects that would adversely affect historic resources in the study area. Rockingham County's Board of Supervisors has approved a Preservation Plan developed jointly by the Shenandoah Valley Battlefields Foundation, Rockingham County, and a Citizens Steering Committee for the Cross Keys Battlefield to help preserve its integrity and prevent conversions of Battlefield lands to development. Though not binding on the county or landowners, the plan lays out strategies and actions that can be taken to preserve the Battlefields. Current county zoning for the Battlefield area is agriculture. The county's comprehensive plan explicitly states a policy of support for the Preservation Plan and strategies for sustaining such support, including continuance of planning and zoning of

Battlefield areas for agricultural use, refraining from extending water and sewer service into the Battlefield area, and applying preservation measures as appropriate (e.g., purchase of development rights and promoting the establishment of agricultural and forestal districts). The comprehensive plan contains other provisions promoting the preservation of other historic properties throughout the county.

Should CBA 1 be selected, an access management plan would be developed as part of the implementation of that alternative to help discourage proliferation of new driveways into lands along that alternative, particularly the portion through the Battlefield. The identification of historic properties as part of this study may have a beneficial effect on historic properties, making local residents more aware of the historic properties and perhaps stimulating more preservation efforts for those properties.

4.19 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Local short-term uses of the environment principally include the construction impacts described in Section 4.16 and the resources that would be used in the construction of any of the Candidate Build Alternatives, including materials, energy, and labor. The short-term environmental impacts and use of resources must be balanced against long-term transportation benefits. The local short-term impacts and use of resources for the project are consistent with the maintenance and enhancement of long-term productivity.

4.20 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Construction of any of the Candidate Build Alternatives would require a commitment of natural, physical, human, and fiscal resources. Land used for project right of way would be considered an irreversible commitment during the time period that the land is used for highway facilities. However, if a greater need arises for use of the land or if the completed roadway no longer is needed, the land could be converted to another use. At present, there is no reason to believe such a conversion would ever be necessary or desirable.

Considerable amounts of fossil fuels, labor, and highway construction materials, such as cement, aggregate, asphalt, and steel, would be expended. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. These materials generally would not be retrievable; however, they are not in short supply and their use would not have an adverse effect on the continued availability of these resources. Any construction also would require a substantial one-time expenditure of state and federal funds that would not be retrievable. The commitment of these resources is based on the concept that residents in the immediate area and the region would benefit from the improved quality of the transportation system and improved mobility and transportation capacity.

LIST OF PREPARERS

The Virginia Department of Transportation, in close coordination with the Federal Highway Administration, prepared this Environmental Impact Statement and supporting technical studies. Key individuals included the following:

FEDERAL HIGHWAY ADMINISTRATION, VIRGINIA DIVISION

John Simkins	M.S., Environmental Sciences; B.S., Biology; 7 years experience preparing, reviewing, and approving NEPA documentation.	FHWA review of the EIS and supporting documentation.
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VIRGINIA DEPARTMENT OF TRANSPORTATION

James O. Clarke, AICP	M.U.R.P., Urban & Regional Planning; 15 years experience planning & environmental studies.	Project Manager; EIS review.
Christopher Collins	M.S. and B.S. Biology; 12 years experience environmental studies.	EIS review.
Tom Woods	A.S., Civil Engineering; 37 years experience highway planning and design, project management.	Preliminary engineering, alternatives development.
Amy Wells, E.I.T.	B.S., Civil Engineering; 7 years experience preliminary design and location studies.	Preliminary engineering, alternatives development, design criteria and typical sections, cost estimates.
Luke Cawley	B.S., Mechanical Engineering; 5 years experience noise analyses and abatement designs.	Noise analyses.
Monica Franz	B.S., Mechanical Engineering, 3 years experience noise analyses.	Noise analyses.
Bruce Penner, RPA	M.A.A., Anthropology; 15 years experience historic resources management.	Historic resources data and documentation review.
Kitty L. Houston	M.A., historic preservation planning; 16 years experience historic resources management.	Historic resources data and documentation review.
Bob Ball, P.E., PTOE	MSCE, BSCE, 25 years experience transportation planning and engineering.	Traffic data review.
Bob Ryder	B.A.; 43 years experience right of way, utilities and relocation studies.	Right of way and relocation estimates.
Laurie C. Henley	B.S., Urban Studies and Planning, B.A., Political Science; 2 years experience air quality analyses.	Air quality assessment.

CONSULTANT, PARSONS TRANSPORTATION GROUP INC.

Stuart Tyler, P.E., AICP	M.S., Civil Engineering; B.A., Environmental Science; 28 years experience transportation and environmental planning and NEPA studies.	Consultant's Project Manager, EIS and supporting documentation.
Joseph Springer	Masters coursework, Urban Planning; B.A., English & Art History; 20 years experience traffic modeling and transportation planning and analysis.	Traffic modeling and analysis, traffic data for air and noise analyses, purpose and needs data and documentation, travel patterns and transportation impacts assessments.
Joshua Wade, P.E.	B.S., Civil Engineering; 11 years experience transportation planning and engineering, mapping, computer-based analyses, graphical presentations, and impacts analysis.	Alternatives development and assessment, GIS manager and analyst, engineering issues assessment, mapping management and preparation, CAD Graphics, hazardous materials technical memorandum and impacts assessment.
Bruce Barnett, P.E.	B.S., Civil Engineering; 14 years experience transportation planning, engineering, and design.	Alternatives development and assessment, engineering issues analysis, EIS and supporting documentation.
Michele Fall, A.I.C.P.	M.S. Environmental Engineering; B.S. Biology; 11 years experience environmental analysis and documentation.	Affected environment description, secondary and cumulative impacts analysis, natural resources impacts assessment, EIS and supporting documentation.
Stephen Walter	M.S., B.S., Environmental Science; 29 years experience environmental planning and NEPA studies.	Quality Control, proofing.
Kevin Chrisman	B.S., Advertising Design; 15 years experience illustration and graphics design.	Illustrations and computer graphics.
Sung Kim	A.S., Computer Science/Civil Engineering; 9 years experience digital mapping and analysis.	Impacts computations, mapping, graphics.
Erich W. Kutsche	B.A., Geography ; 4 years experience digital mapping and analysis.	Impact computations, mapping, graphics, socioeconomics and land use data.

SUBCONSULTANT, STRAUGHAN ENVIRONMENTAL SERVICES, INC.

Russell Ruffing	B.S., Environmental Resource Management; 18 years experience wetlands/water quality work.	Quality control, wetlands work.
Justin Haynes	B.S., Integrated Science and Technology; 2 years experience wetlands/water quality work.	Wetlands and water quality fieldwork lead.
Steven Quarterman	M.S., Environmental Management; 5 years experience wetlands/water quality work.	Technical lead for wetlands and water quality.

SUBCONSULTANT, COASTAL CAROLINA RESEARCH, INC.

Loretta Lautzenheiser, RPA	M.A., Anthropology; 25 years experience historic resources identification, evaluation, and documentation.	Task Leader, historic resources.
Jennifer Stewart	M.A., Historic Preservation; 5 years experience historic properties identification, evaluation, and documentation.	Historic properties identification, evaluation, and documentation.
Bill Hall	B.A., History; 7 years experience historic properties identification, evaluation, and documentation.	Historic properties identification, evaluation, and documentation.
Susan Bamann, Ph.D., RPA	Ph.D., Anthropology; 13 years experience archaeological resources work.	Archaeological evaluation and documentation.

DISTRIBUTION OF ENVIRONMENTAL IMPACT STATEMENT

Copies of this Draft Environmental Impact Statement were sent to the following agencies, organizations, and individuals.

6.1 FEDERAL AGENCIES

- Advisory Council on Historic Preservation - Eastern Office of Planning and Review
- Federal Emergency Management Agency
- U.S. Army Corps of Engineers - Norfolk District
- U.S. Department of Agriculture - Natural Resources Conservation Service
- U.S. Department of Commerce, National Oceanic & Atmospheric Administration
 - National Marine Fisheries Service
- U.S. Department of Interior
 - Office of Environmental Policy and Compliance
 - Fish and Wildlife Service
- U.S. Environmental Protection Agency

6.2 COMMONWEALTH OF VIRGINIA AGENCIES

- Virginia Department of Agriculture and Consumer Services
- Virginia Department of Conservation and Recreation
 - Division of Natural Heritage
 - Karst Protection Coordinator
- Virginia Department of Environmental Quality
- Virginia Department of Forestry
- Virginia Department of Game and Inland Fisheries
- Virginia Department of Health
- Virginia Department of Historic Resources
- Virginia Marine Resources Commission
- Virginia Department of Emergency Services
- Virginia Department of Rail and Public Transportation

6.3 ROCKINGHAM COUNTY AGENCIES AND OFFICIALS

- Rockingham County Administrator
- Rockingham County Planning and Community Development Department
- Rockingham County Recreation and Facilities Department
- Rockingham County Public Works Department
- Rockingham County Health Department
- Rockingham County Public Schools Superintendent
- Members, Rockingham County Board of Supervisors

6.4 CITY OF HARRISONBURG AGENCIES AND OFFICIALS

- Harrisonburg City Manager
- Harrisonburg Department of Planning and Community Development
- Harrisonburg Department of Parks and Recreation
- Harrisonburg Public Works Department
- Harrisonburg City Public Schools Superintendent
- Harrisonburg/Rockingham Joint LEPC
- Members, Harrisonburg City Council

6.5 OTHER LOCAL GOVERNMENTS AND AGENCIES

- Bridgewater Town Manager
- Dayton Town Manager
- Mount Crawford Zoning Administrator
- Central Shenandoah Planning District Commission/HRMPO

6.6 ORGANIZATIONS AND INDIVIDUALS

- Shenandoah Valley Battlefields Foundation
- Civil War Preservation Trust
- Harrisonburg-Rockingham Historical Society
- Community Alliance for Preservation
- James Madison University
- Massanetta Springs Camp and Conference Center
- Harrisonburg-Rockingham Chamber of Commerce
- Bruce A. Wiggins, Ph.D., Professor, Department of Biology, James Madison University

COORDINATION AND COMMENTS

In accordance with 40 CFR 1501.7, an early and open process was implemented for determining the scope of issues to be addressed in the study and for identifying the key issues and concerns related to the study. Throughout the study, the Virginia Department of Transportation (VDOT) has coordinated extensively with local, state, and federal agencies, and conducted an inclusive public involvement program. A Notice of Intent to Prepare an Environmental Impact Statement was published by the Federal Highway Administration (FHWA) in the Federal Register on May 7, 2004 (Vol. 69 No. 89 page 25655). Local, state, and federal agencies were contacted early in the study and asked to identify issues of concern and to provide information about environmental resources within the study area. The public was notified about the study and given opportunities to provide comments about transportation needs, potential alternatives, and environmental concerns. The agency and public comments received in response to these coordination efforts were instrumental in defining the scope of the Environmental Impact Statement (EIS).

7.1 AGENCY COORDINATION

7.1.1 State Environmental Review Process

VDOT uses the State Environmental Review Process (SERP) to provide other state agencies the opportunity to comment and provide information on environmental issues at the beginning of project development. This feedback helps VDOT identify key environmental concerns within the study area and initiates coordination with the other state agencies in avoiding and minimizing adverse environmental impacts.

The following agencies were contacted during SERP:

- Virginia Department of Conservation and Recreation
- Virginia Department of Environmental Quality – Air Division
- Virginia Department of Environmental Quality – Waste Division
- Virginia Department of Environmental Quality – Water Division
- Virginia Department of Forestry
- Virginia Department of Game and Inland Fisheries
- Virginia Department of Health
- Virginia Department of Historic Resources
- Virginia Department of Mines, Minerals, and Energy
- Virginia Marine Resources Commission
- Virginia Outdoors Foundation

The following key issues were mentioned in the responses from these agencies (see table of contents and index for locations in the EIS where these issues are discussed):

- The project study area is in a faulted karst area.
- Potential presence of endangered or threatened species and their subterranean habitats within the study area.
- The presence of wetlands within the study area.
- The presence of hazardous material sites within the study area.

7.1.2 Agency Scoping Meeting

VDOT and FHWA held a formal agency scoping meeting on June 10, 2004 at the VDOT Materials Division office at Elko in Henrico County. The purpose of the meeting was to help identify substantive issues related to the study and determine the scope of issues to be addressed in the EIS. The following agencies were invited to participate:

Advisory Council on Historic Preservation
Federal Emergency Management Agency
National Marine Fisheries Service
U.S. Department of the Interior, Office of Environmental Policy and Compliance
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Department of Agriculture, Natural Resources Conservation Service
Virginia Department of Agriculture and Consumer Services
Virginia Department of Conservation and Recreation
Virginia Department of Forestry
Virginia Department of Environmental Quality
Virginia Department of Game and Inland Fisheries
Virginia Department of Health
Virginia Department of Historic Resources
Virginia Department of Rail and Public Transportation
Virginia Marine Resources Commission
Virginia Department of Emergency Services
Virginia Outdoors Foundation
Virginia Department of Mines, Minerals, and Energy

The Virginia Department of Historic Resources (VDHR) and the Virginia Department of Conservation and Recreation's Division of Natural Heritage (VDCR-DNH) were the only agencies represented at the meeting.

The following suggestions and comments were received:

- VDHR suggested ensuring that all historic properties potentially affected by the alternatives be identified and taken into account and that VDHR's regional representative in Winchester be contacted for thoughts on which individuals or organizations might serve as consulting parties for purposes of Section 106 of the National Historic Preservation Act.
- VDCR-DNH indicated that karst features may harbor endangered species such as the Madison Cave isopod, a federally listed threatened species. Surveys may be recommended

later in the study process. VDCR-DNH also had concerns about potential stormwater discharges into sinkholes and filling of sinkholes and recommended VDOT avoid these activities and continue coordination with VDCR's Karst Program Coordinator.

The U.S. Fish and Wildlife Service, the U.S.D.A. Natural Resources Conservation Service, and the Federal Emergency Management Agency (FEMA) responded in writing to the scoping meeting invitation. Those agencies made the following suggestions and comments:

- FEMA noted the possibility that portions of the project will be within FEMA-designated 100-year floodplains, requested that the study team coordinate with the Floodplain Management Officer of Rockingham County, and noted the need to comply with Executive Order 11988, *Floodplain Management*.
- The U.S.D.A. Natural Resources Conservation Service noted the potential for losses of prime farmland and requested consideration of the presence, location, and effect on any prime farmlands, as listed in the Rockingham County Soil Survey.
- The U.S. Fish and Wildlife Service:
 - Provided a list of federally listed endangered and threatened species that occur or may occur in Rockingham County and suggested coordination with the Virginia Department of Game and Inland Fisheries and VDCR concerning endangered and threatened species.
 - Provided information concerning the Service's Mitigation Policy for potential wetland impacts. According to the Service's Mitigation Policy (FR Part III, Vol. 46, No. 15, January 23, 1981, p. 7660), wetland impacts should be avoided or minimized to the maximum extent practicable. If wetland losses are unavoidable, low-habitat-value upland sites should be used to provide compensation on a 1.5 to 1 areal basis for emergent wetlands and 2 to 1 for scrub/shrub and forested wetlands.
 - Provided information concerning Executive Order 11988, *Floodplain Management*, and recommended that mitigation of floodplain impacts follow the recommendations for wetland mitigation.
 - Requested the following information be included in each alternative:
 1. Maps showing location and acreage of all habitats to be impacted including streams, wetlands, and uplands.
 2. Maps showing impacts within the 100-year floodplain.
 3. Sequence and timing of project construction.
 - Suggested that information be included on the potential indirect and cumulative impacts to upland and wetland habitat types predicted to result from each project alternative and the anticipated acreage to be impacted.
 - Suggested consideration of potential impacts to forested habitat in the study area and recommended that some type of restoration/enhancement of forested habitat be implemented to offset such impacts (e.g., riparian or floodplain reforestation).

7.1.3 Letters to Agencies and Organizations

Letters requesting information and comments for use in the study were sent to the following agencies and organizations (those denoted with an asterisk responded):

- * Harrisonburg City Manager
- * Harrisonburg Department of Planning and Community Development
- * Harrisonburg Department of Parks and Recreation
- Harrisonburg Public Works Department
- * Harrisonburg Economic Development Department
- * Harrisonburg Department of Transportation
- * Harrisonburg City Public Schools
- Harrisonburg/Rockingham Social Services District
- * Harrisonburg/Rockingham Joint Local Emergency Planning Coordinator (LEPC)
- Rockingham County Administrator
- Rockingham County Planning and Community Development Department
- Rockingham County Recreation and Facilities Department
- Rockingham County Public Works Department
- Rockingham County Health Department
- * Rockingham County Public Schools
- * Bridgewater Town Manager
- Dayton Town Manager
- Mount Crawford Zoning Administrator
- Central Shenandoah Planning District Commission
- * Virginia Department of Forestry
- * Virginia Department of Conservation and Recreation, Karst Protection Coordinator
- * Shenandoah Valley Battlefields Foundation
- Harrisonburg-Rockingham Historical Society

In their responses, these agencies mentioned the following key issues:

- The karst terrain and subterranean habitat of the Madison Cave isopod and Madison Cave amphipod.
- Emergency response delays during construction.
- Potential loss of prime farmlands.
- Access from any new connector road to Harrisonburg.
- Bike facilities.
- Level of access control to be imposed.
- Accommodating travel needs arising from continuing population growth and development.
- Minimizing impacts to Cross Keys Battlefield.

7.1.4 Agency Partnering

VDOT and FHWA use an agency coordination process referred to as “Partnering,” which provides the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the U.S. Environmental Protection Agency multiple opportunities to participate in studies of complex transportation projects, beginning in the earliest stages of project development. During this study, there have been three partnering meetings as outlined below. In addition, preliminary drafts of chapters of this EIS were provided to the agencies for review and comment.

November 21, 2003 Meeting. The agencies were informed of the study and that the scoping process would begin in the near future. The discussion included the following:

- Purpose of the study.
- The relationship with the I-81 Corridor Improvement Study.
- Logical termini for alternatives.
- Potential use of existing highway corridors.

April 5, 2005 Meeting. The agencies received the results of the scoping process and a draft purpose and need memorandum. The following issues were discussed during the meeting:

- Forecasted travel patterns and capacity deficiencies.
- Types of access control.
- Potential impacts to migratory bird habitat and karst features.
- Protection of Cross Keys Battlefield.
- Preliminary conceptual alternatives.

May 5, 2005 Meeting. The agencies were presented with the conceptual alternatives, the screening process that was being used to identify Candidate Build Alternatives (CBAs) to carry forward into the Draft EIS, and VDOT's preliminary conclusions on these alternatives. Preliminary traffic numbers and impacts were provided for the proposed CBAs. The following issues also were discussed during the meeting:

- Stream crossings (parallel versus perpendicular crossings).
- The use of planning and design corridors (i.e., a wide generalized planning corridor and a narrower, more realistic design, or "footprint," corridor to estimate environmental impacts, see Section 4.1 of Chapter 4, Environmental Consequences).
- Endangered species issues within study area.

7.1.5 Metropolitan Planning Organization Coordination

The Harrisonburg-Rockingham Metropolitan Planning Organization (HRMPO) was developing its *2030 Transportation Plan* during the same time as this location study process. Coordination with HRMPO's director and HRMPO's consultant was conducted during the study to ensure consistency of traffic modeling and alternative development issues.

7.1.6 Other Agency Coordination

Several of the agencies listed in preceding sections were consulted throughout the environmental review process. For example, VDOT met with City of Harrisonburg and Rockingham County officials on several occasions to gather additional information about specific locations, to review alternatives, to review local plans and policies, and to discuss specific technical issues. A presentation was made to the Rockingham County Board of Supervisors to review alternatives and preliminary study findings. Other local agencies were consulted to obtain technical information, GIS mapping and databases, or details about facilities and services within the study area. These agencies include the City of Harrisonburg, Rockingham County, the Virginia Department of Conservation and Recreation, and the Shenandoah Valley Battlefields Foundation. Additional input was received from the U.S. Fish and Wildlife Service indicating that no impacts were expected on federally listed endangered or threatened species. Detailed reports and data regarding historic properties were submitted to the Virginia Department of Historic Resources for review and concurrence on National Register of Historic Places eligibility determinations.

7.2 PUBLIC INVOLVEMENT

7.2.1 Public Scoping Meeting

VDOT held a Public Scoping Meeting on July 22, 2004 to obtain citizen input for use in defining the scope of the study. At the meeting, the study team presented maps and displays describing the location study process, environmental constraints, and other study information. Key issues revealed by comments submitted by citizens included:

- The need to accommodate east west travel movements.
- Concern for historic properties, farmlands, scenic attributes, water resources, and air quality.
- Considerable anti-growth sentiment exists; with many comments reflecting a fear that new roadway construction would induce or speed development.
- Substantial support exists for improving existing roads.

7.2.2 Citizen Information Meeting

As a follow-up to the Public Scoping Meeting, VDOT held a Citizen Information Meeting on March 24, 2005 to solicit public input on transportation needs identified and a range of conceptual alternatives to meet those needs. The comments generally confirmed the principal elements of purpose and need that the study had identified, but also reflected an opinion that these needs not be met with an alternative that would have excessive impacts to the human and natural environments. Also, the comments indicated continued and strong support for the improvement of existing roads. There was general opposition to any alternative that would take too much farmland, destroy historic properties, or not address the transportation problems.

7.2.3 Input from Interest Groups

Several interest groups, community organizations, and individual property owners provided additional input through meetings, telephone conversations, or other correspondence with study team representatives. Topics of discussion included potential alternatives, the environmental review process, and specific questions about the study and potential environmental impacts. These groups included:

- Shenandoah Valley Battlefields Foundation (principal concern - potential effects on Cross Keys Battlefield).
- Civil War Trails (principal concern - potential effects on Cross Keys Battlefield).
- Massanetta Springs Camp and Conference Center (principal concerns - potential effects on Massanetta Springs property, a Presbyterian-affiliated retreat and conference center, portions of which have been determined eligible for the National Register of Historic Places.
- Community Alliance for Preservation (principal concerns – potential impacts to rural community, historic properties, the viewshed of the Shenandoah National Park, and potential for urban sprawl).

7.3 OTHER COORDINATION EFFORTS

This Draft EIS is being made available to the public for review and comment and distributed to agencies and individuals with jurisdiction, expertise, or interest in the issues involved in the study. This document will be available for review at the Location Public Hearing. All substantive review comments received on the Draft EIS or at the Hearing will be considered during preparation of the Final EIS and in reaching a decision on the study.

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