APPENDIX B

Project R-2247
Alternative Comparison Summary for Selection of a Preferred Alternative, January 1993

Winston-Salem Northern Beltway (Western Section)
R-2247
Forsyth County, NC

ALTERNATIVES COMPARISON SUMMARY FOR SELECTION OF A PREFERRED ALTERNATIVE

INTRODUCTION

The engineering and environmental study for the Western Section of the Northern Beltway in Forsyth County, North Carolina, has culminated in the circulation and review of the Draft Environmental Impact Statement (DEIS). The DEIS was circulated in late July 1992.

The availability and location of the DEIS and Corridor Hearing Map for public review were announced in the fourth edition of the project newsletter in late July 1992. This went out to a mailing list of over 2,250 households. The dates and locations for the Citizens' Informational Workshops and Public Hearing were included.

Citizens' Informational Workshops were conducted August 26 and 27, 1992, by the City of Winston-Salem and the consulting firm of Espey, Huston & Associates, who prepared the study.

The North Carolina Department of Transportation (NCDOT) conducted a formal Corridor Public Hearing on September 1, 1992. Estimates indicate that 750 people were in attendance, and 45 people spoke at the public hearing. The post-hearing comment period extended through October 15, 1992. Over 500 pages of original comments were received by the NCDOT Public Involvement Unit, along with an additional 800 signatures on petitions expressing positions on the project. A summary of public comment issues is included as Attachment 1 to this document, along with copies of letters from local officials.

A Post-Public Hearing Meeting was conducted on October 30, 1992, by the NCDOT.

It is assumed that all local, state, and federal resource agencies with an interest in this project have provided written comment in response to circulation of the DEIS. The DEIS comment period extended through September 30, 1992. Agency comment has been received by NCDOT as late as November 10, 1992.

The next step in the process is the selection of a preferred alternative for the project. This document has been prepared to summarize the comparison of alternatives, utilizing information from the DEIS and comments on the project received from Resource Agencies, the public, and local governments after circulation of the DEIS.

PROJECT PURPOSE AND NEED

The Western Section of the Northern Beltway will correct circumferential deficiencies in the current radial-dominated road network in western Forsyth County. There are no continuous circumferential routes in western Forsyth County beyond the Silas Creek Parkway, which is located well within city limits.

The proposed facility is located in an area of western Forsyth County that is identified for short- and long-range growth in the County's approved growth management plan, Vision 2005. Traffic modeling was accomplished using population and employment distributions consistent with this approved growth management plan. The year 2015 has been selected as the design year for this facility.

By removing circumferential traffic from the existing radials, the new facility will relieve congestion on the principal arterials. As development increases, the travel desires of the increasingly built-up area will be more varied. By augmenting the current system of radials, this loop facility will help serve the future travel needs of this rapidly growing area.

Traffic modeling has shown that approximately 10 percent of the traffic using this facility will be through-traffic (with both origin and destination outside the County). The remaining 90 percent of the traffic using the Beltway will be local. Moving its location further from developed areas (as proposed by a large number of local residents) will greatly reduce its ability to serve the 90 percent local users predicted in the model.

Widening existing circumferential roads will provide only slight improvement to the overall transportation system. Improvement in Total Network Travel Time by the Improve Existing Alternative is 1,600 vehicle hours per day, or 0.5 percent for the entire network. The build alternatives provide between 6,000 and 8,000 vehicle hour reductions, or 2.1 to 2.8 percent.

ALTERNATIVES

This document is provided for study and use by those involved in the selection of a Preferred Alternative for the Western Section of the Northern Beltway (WSNB). This is not a stand-alone document, but references information contained in the DEIS and written comments from the public and resource agencies contained in the project files. Tables and exhibits from the DEIS have been copied and included in the text. Those with alphanumeric designations are taken from the DEIS, while those with alphabetical designations have been prepared especially for this document. The Summary section from the DEIS is included in Attachment 2.

The No-Build alternative consists of the roadway network that is expected to be in place in the western portions of Winston-Salem and Forsyth County in the design year 2015. This network includes a majority of the new facilities and widenings proposed in the current NCDOT Transportation Improvement Program, as well as projects contained in the approved Thoroughfare Plan that have a reasonable chance of being constructed by the design year. The No-Build Alternative contains the Eastern Section of the Northern Beltway, but does not include the Western Section of the Northern Beltway.

An Improve Existing Alternative was considered that widened existing circumferential roads beyond their No-Build cross sections. After evaluation of the preliminary alternatives, the Improve Existing, Transportation System Management, and Mass Transit/Multi-Modal alternatives were not considered to be feasible alternatives to address the identified transportation deficiencies.

All of these alternatives--the No-Build, the Improve Existing, Transportation System Management, and Mass-Transit/Multi-Modal--are still available for consideration by the Selection/Steering Committee. The DEIS was prepared for the alternatives considered best able to enhance the western Forsyth County roadway network in the year 2015, and provide the transportation infrastructure necessary to serve the future population residing in this area. Selection of options other than a build alternative will not address the severe linkage problem among existing circumferential roads, and will not provide for the transportation needs of the future population of the area.

The build alternatives have been designed as multi-lane, divided, facilities with full control of access. The restriction of access to this facility will ensure that the desired high level of traffic service will not degrade over time as the result of residential and business development with access directly onto the facility. Grade-separated interchanges with US 52, US 421, and I-40 have been designed to allow continuous, high-speed movements between each of these intersecting controlled access facilities. Cost and environmental impacts documented in the DEIS and repeated in this

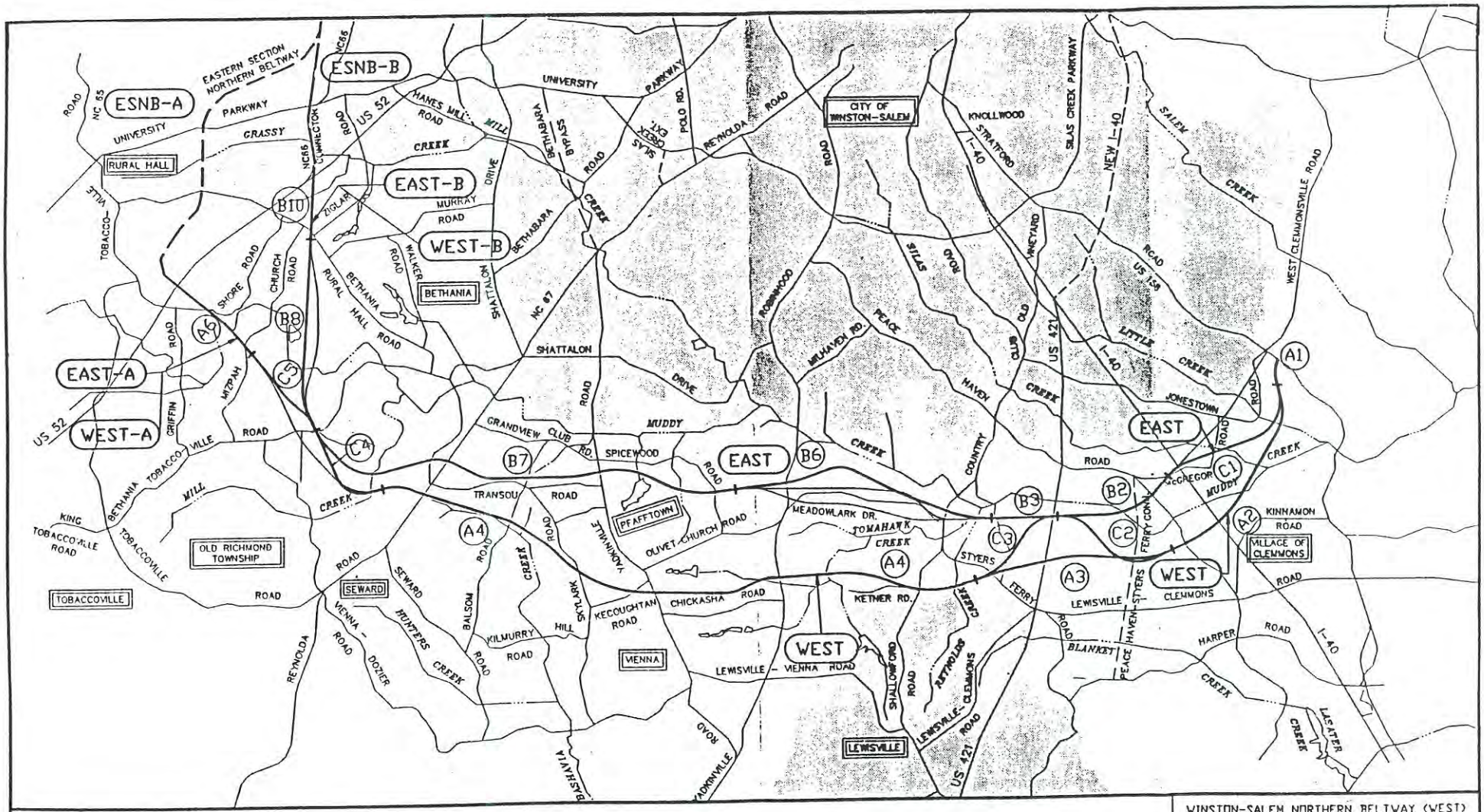
document are based upon this type of facility, one providing and maintaining a high level of traffic service.

The southern endpoint for the build alternatives lies along US 158 (Stratford Road), in the vicinity of West Clemmonsville Road. There are no plans for continuation of a major loop facility around the south side of Winston-Salem beyond this point. The northern endpoint(s) for the WSNB alternatives lie along US 52. An extension of this major loop road, the Eastern Section of the Northern Beltway (ESNB), will pass around the east side of Winston-Salem, ending at US 421 (old I-40) between Winston-Salem and Greensboro. The ESNB is being addressed by a separate study. The choice between the two different northern endpoints for the WSNB-ESNB connection requires the consideration of cost and impact information for the ESNB that is not contained in the DEIS and has not yet been developed as a part of the ESNB study. Generalizations will be made and explained where required.

The DEIS contains analysis and comparison of preliminary project alternatives in Section 2.4, with a further focusing and narrowing of alternatives in Section 2.6. This comparison summary will start with a definition of the alternatives as those contained in Exhibit S-1 from the DEIS. The study alternatives generally consist of two parallel routes (west and east), with two crossover locations (at Bethania-Tobaccoville Road in the north and US 421 in the south). Eight route combinations are possible using the east and west routes with crossovers. Tables S-1 and S-2 contain the major costs and impacts for the eight study alternatives. Exhibit 2.6-3 traces the path of each alternative route.

The comparison contained in the following pages focuses on issues considered to have high priorities with the public, the resource agencies, local governments, and the NCDOT and FHWA. These include, in no special order:

Cost
Residential and community disruption
Disruption of business and employment
Historic concerns
Aquatic resources and wetlands
Wildlife habitat
Traffic service and function of the facility
Local governmental preference
Public opinion



WINSTON-SALEM NORTHERN BELTWAY (WEST)
EIS R-2247

EXHIBIT S-1

PROJECT ALTERNATIVES

TABLE S-1

PROJECT ALTERNATIVES SUMMARY

Impact Category	units	WEST-A	EAST-A	WEST-B	EAST-B
Segments making up alternative		A1,A2,A3,A4, C4,C5,A6	A1,C1,B2,B3, B6,B7,C5,A6	A1,A2,A3,A4, C4,B8,B10	A1,C1,B2,B3, B6,B7,B8,B10
Length	miles	17.22	16.31	17.59	16.68
Right-of-Way area	acres	1273	1163	1259	1149
Construction Limits	acres	1075	996	1134	1055
Forest	acres	490	538	584	632
Agricultural	acres	281	238	239	196
Wetlands	acres	12	6	12	6
Stream Crossings	number	41	43	49	51
Stream Channel Relocations	feet	3600	1200	3800	1400
100-Year Floodplains	acres	102	102	118	118
Bridge Crossings	number	10	9	13	12
Box Culvert Crossings	number	20	14	22	16
Prime Farmland Soils	acres	202	155	182	135
State Important Farmland Soils	acres	335	295	325	286
Residential Relocations	number	385	276	408	292
Owner	number	221	229	234	242
Tenant	number	164	47	174	57
Minority	number	81	43	82	44
Business Relocations	number	22	5	25	8
Community Facilities	number	1	0	1	0
Affected Neighborhoods	number	22	19	26	23
Historic Sites 4(f)	number	0	0	0	0
Historic Districts 4(f)	number	0	1	0	1
Historic Sites Adverse Effect	number	2	4	2	4
Schools	number	0	0	0	0
Churches	number	0	0	0	0
Cemeteries	number	0	0	0	0
Parks/Recreation Areas *	number	1	0	1	0
Potential Hazardous Materials	number	3	2	3	2
Noise Impacts pre-barrier	number	55	92	78	115
Noise Impacts post-barrier	number	30	66	30	66
Noise Barrier Protected Homes	number	53	76	93	116
Barrier Number/ Length	no./ feet	2 / 4200	2 / 5600	4 / 8600	4 / 10000
Noise Barrier Costs	$M	0.987	1.131	1.574	1.718
Construction Costs	$M	171.300	161.300	173.200	163.200
Right-of-Way Costs	$M	73.350	55.543	72.860	55.053
Total Costs	$M	245.637	217.974	247.634	219.971
Benefit Cost Ratio at 7% Discount Rate		1.474	--	--	2.120

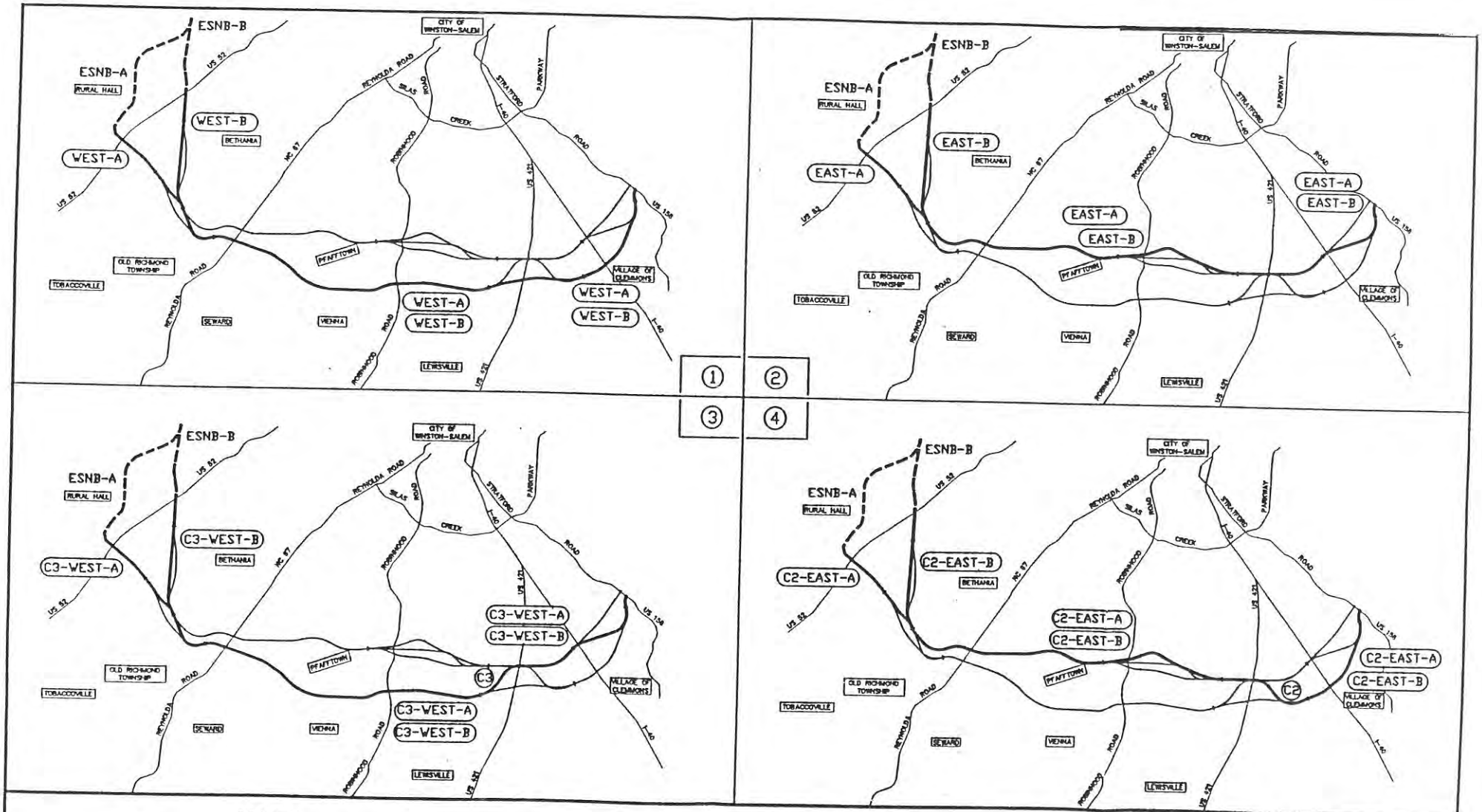
-A- indicates a northern connection with the eastern leg of the N. Beltway near the Shore Road/Westinghouse Road interchange
-B- indicates a northern connection with the eastern leg of the N. Beltway near the NC 66 Connector interchange
* privately owned

TABLE S-2

CROSSOVER ALTERNATIVES SUMMARY

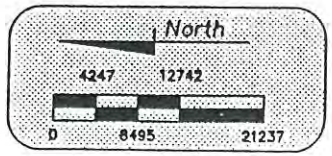
Impact Category	units	C3-WEST-A	C2-EAST-A	C3-WEST-B	C2-EAST-B
Segments making up alternative		A1,C1,B2,C3, A4,C4,C5,A6	A1,A2,C2,B3, B6,B7,C5,A6	A1,C1,B2,C3, A4,C4,B8,B10	A1,A2,C2,B3, B6,B7,B8,B10
Length	miles	16.97	17.04	17.35	17.42
Right-of-Way area	acres	1215	1222	1201	1208
Construction Limits	acres	1014	1058	1073	1117
Forest	acres	481	584	575	678
Agricultural	acres	294	238	252	196
Wetlands	acres	12	8	12	8
Stream Crossings	number	39	45	47	53
Stream Channel Relocations	feet	2300	2500	2500	2700
100-Year Floodplains	acres	78	161	94	177
Bridge Crossings	number	9	13	12	16
Box Culvert Crossings	number	15	19	17	21
Prime Farmland Soils	acres	214	183	193	162
State Important Farmland Soils	acres	301	312	291	302
Residential Relocations	number	266	340	289	363
Owner	number	246	240	259	253
Tenant	number	20	100	30	110
Minority	number	43	54	44	55
Business Relocations	number	7	15	10	18
Community Facilities	number	0	1	0	1
Affected Neighborhoods	number	21	20	25	24
Historic Sites 4(f)	number	0	0	0	0
Historic Districts 4(f)	number	0	1	0	1
Historic Sites Adverse Effect	number	2	4	2	4
Schools	number	0	0	0	0
Churches	number	0	0	0	0
Cemeteries	number	0	0	0	0
Parks/Recreation Areas *	number	0	1	0	1
Potential Hazardous Materials	number	1	2	1	2
Noise Impacts pre-barrier	number	75	99	98	122
Noise Impacts post-barrier	number	44	50	44	50
Noise Barrier Protected Homes	number	86	122	126	162
Barrier Number/ Length	no./ feet	3 / 7700	3 / 7700	5 / 12100	5 / 12100
Noise Barrier Costs	$M	1.556	1.543	2.143	2.130
Construction Costs	$M	159.800	168.900	161.700	170.800
Right-of-Way Costs	$M	57.637	70.956	57.147	70.466
Total Costs	$M	218.993	241.399	220.990	243.396

-A- indicates a northern connection with the eastern leg of the N. Beltway near the Shore Road/Westinghouse Road interchange
-B- indicates a northern connection with the eastern leg of the N. Beltway near the NC 66 Connector interchange
* privately owned



LEGEND

1. WEST-A, WEST-B
2. EAST-A, EAST-B
3. C3-WEST-A, C3-WEST-B
4. C2-EAST-A, C2-EAST-B



WINSTON-SALEM NORTHERN BELTWAY (WEST)
EIS R-2247

EXHIBIT 2.6-3
PROJECT ALTERNATIVE ROUTES

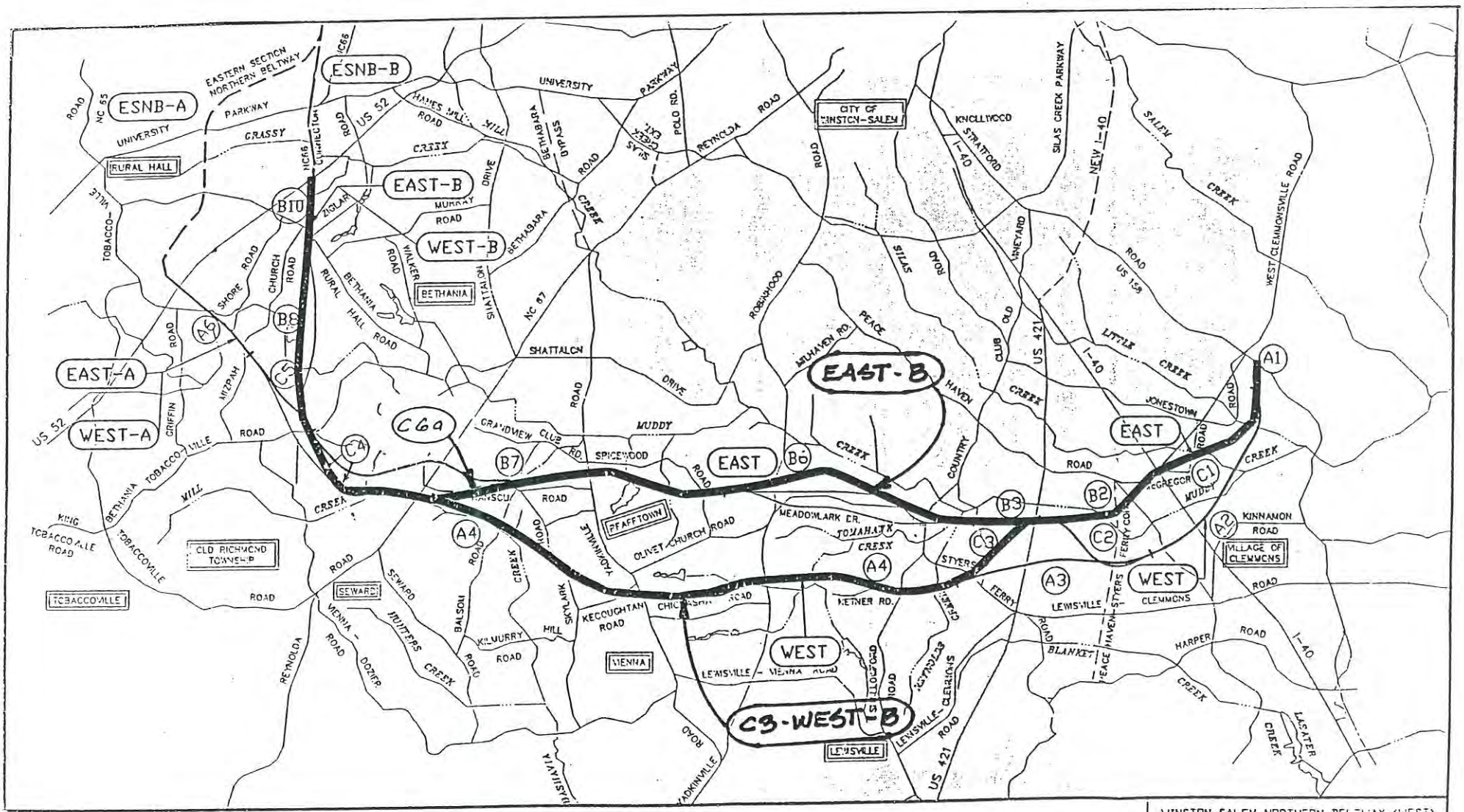
Based upon the information in the DEIS and comments received from the public, resource agencies, and local governments, the identification of a preferred corridor is straightforward in the area north of the crossover at Bethania-Tobaccoville Road and in the area south of the crossover at US 421, given the cost, relocation, design, and environmental differences between alternatives. This document contains comparisons and corridor recommendations in these northern and southern regions of the project. Those recommended are the **most eastern corridors in each of these regions:**

Route segments B8-B10 in the north
Route segments A1-C1-B2 in the south

These recommendations result in a simplification of the options from eight to two, differing in the middle region of the project, between the two crossover points. The remaining alternatives, shown in Exhibit A, are EAST-B and C3-WEST-B.

In the middle region, a comprehensive listing and discussion of the pros and cons of the remaining alternatives is provided to inform decision-makers of the issues and the preferences identified by the various interested parties. The tradeoffs between these alternatives are not straightforward enough for an overall preference to be expressed in this document.

This report's recommendation of the "B" endpoint in the north region of the project and the eastern alternatives in the southern region of the project is not meant to eliminate the other routes from the Selection/Steering Committee's consideration. Any of the eight possible corridor alternatives may be selected by the Committee. The intent of this report is to simplify the Committee's decision where certain routes appear to be more favorable. Tables S-1 and S-2 contain comparisons between all eight possible corridor alternatives.



LEGEND

WEST-A — ALTERNATIVES

A4 — ROUTE SEGMENTS

— LESS FEASIBLE ROUTE SEGMENTS

ESNB-A — EASTERN SECTION OF NORTHERN BELTWAY

RECOMMENDED ALTERNATIVES
EAST-B
C3-WEST-B

North
2000 6000
0 4000 10000

WINSTON-SALEM NORTHERN BELTWAY (WEST)
EIS R-2247

RECOMMENDED ALTERNATIVES
EXHIBIT A

NORTH REGION COMPARISON

There are two alternate routes north and east of Bethania-Tobaccoville Road (see Exhibit B). The corridor identified as "A-Endpoint" connects with US 52 near the existing Westinghouse Road-Shore Road interchange. This is the more western of the two corridors. The corridor identified as "B-Endpoint" connects with US 52 at the existing NC 66 Connector interchange. The existing NC 65 interchange is located just north of this crossing of US 52. This is the more eastern of the two corridors. The western, or A-Endpoint, route is composed of route segments C5-A6 and the eastern, or B-Endpoint, route is composed of route segments B8-B10. As shown in Table A, when viewed only to its juncture at US 52, the western route, A-Endpoint, is 0.38 mile shorter than the eastern, B-Endpoint, with resultant length-related cost and impact advantages.

However, consideration must also be given to the adjoining project, the Eastern Section of the Northern Beltway (ESNB). When consideration is given to the ESNB extension beyond US 52, an additional 2 miles is added to the combined A-Endpoint route. As shown in Exhibit B, this provides for a comparison of alternatives with common endpoints in the west at Bethania-Tobaccoville Road, and in the east where the two ESNB routes recombine east of University Parkway. The addition of the ESNB routes makes the comparative length of the Endpoint-A route more than 1.5+ miles longer than the combined B-Endpoint route. Much of this extra length lies within the Town of Rural Hall, whereas the ESNB extension of the B-Endpoint route follows an existing highway corridor, the NC 66 Connector, along the southern edge of Rural Hall and across University Parkway.

The B-Endpoint route (segments B8-B10) is recommended north of Bethania-Tobaccoville Road due to the cost and impacts of the A-Endpoint route passing through the Town of Rural Hall, the desirability of the B-Endpoint interchange with US 52 from a design viewpoint, the ability of the B-Endpoint route to remove a greater amount of traffic from NC 65 through Bethania, and the reduced cultural resource impacts (historic sites) of the B-Endpoint route.

Cost

Estimating the ESNB costs at approximately $10 million/mile, the additional 1.5+ miles contained in the combined A-Endpoint route will cost an extra $15 million. Table A shows the cost difference west of US 52 to be in favor of the A-Endpoint route (approximately $2 million). Considering ESNB contributions results in a cost differential of approximately $13 million in favor of the B-Endpoint route.

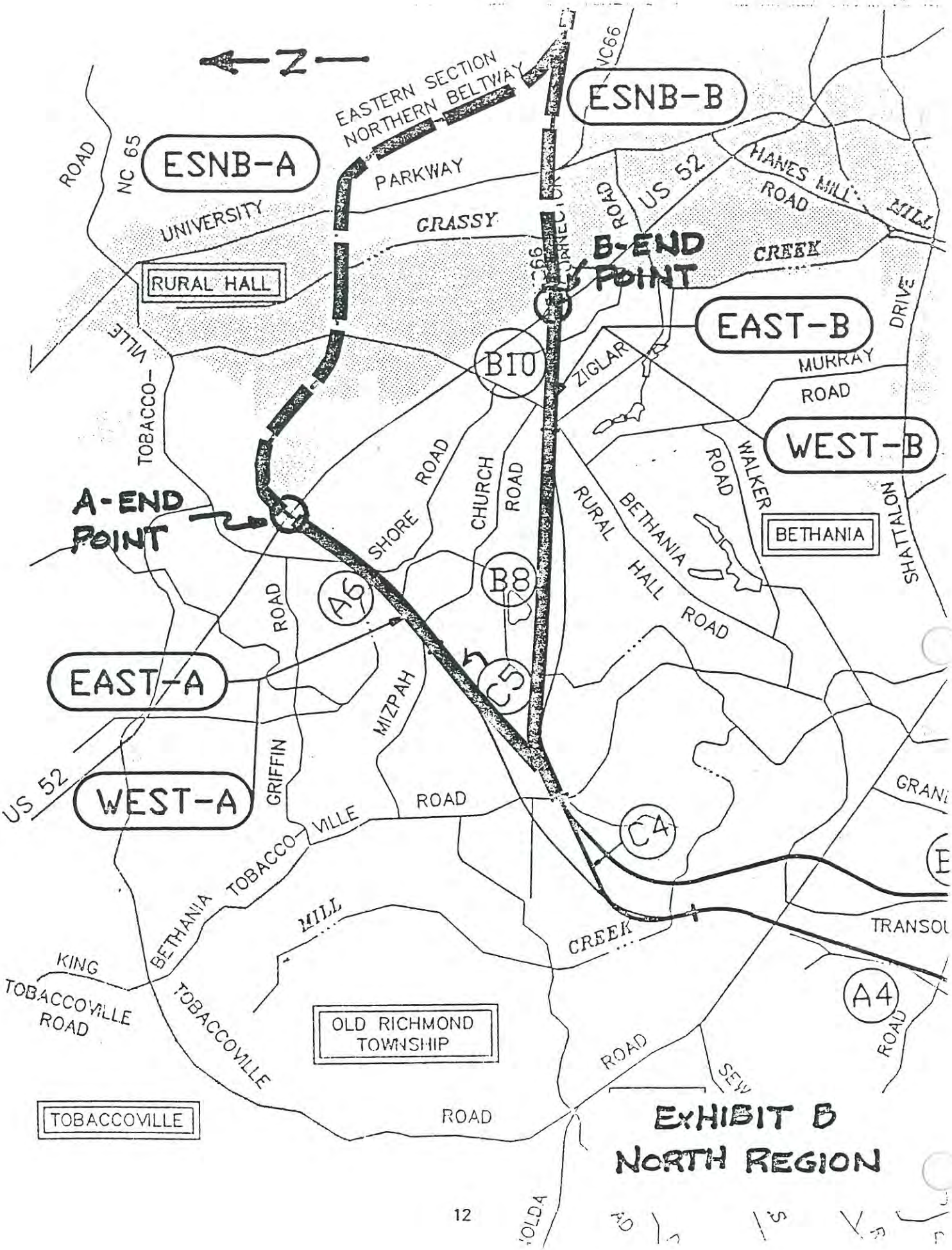

EASTERN SECTION NORTHERN BELTWAY
ESNB-A
ESNB-B
NC 65
ROAD
UNIVERSITY
PARKWAY
GRASSY
US 52
HANES MILL ROAD
MILL
CREEK
B-END POINT
RURAL HALL
EAST-B
DRIVE
MURRAY ROAD
B10
ZIGLAR
WEST-B
TOBACCO-VILLE
A-END POINT
SHORE ROAD
CHURCH ROAD
WALKER ROAD
BETHANIA
SHATTALON
RURAL HALL ROAD
A6
B8
EAST-A
MIZPAH
C5
GRIFFIN ROAD
US 52
WEST-A
ROAD
C4
TOBACCO-VILLE
BETHANIA
MILL
CREEK
TRANSOL
KING
TOBACCOVILLE ROAD
TOBACCOVILLE
OLD RICHMOND TOWNSHIP
A4
ROAD
TOBACCOVILLE
ROAD
EXHIBIT B
NORTH REGION

TABLE A

NORTH ALTERNATIVES SUMMARY

Impact Category	units	western A-Endpoint	eastern B-Endpoint
Segments making up alternative		C5-A6	B8-B10
Length	miles	3.24	3.62
Right-of-Way area	acres	285	271
Construction Limits	acres		
Forest	acres	151	244
Agricultural	acres	56	15
Wetlands	acres	0.4	0.6
Stream Crossings	number	10	18
Stream Channel Relocations	feet	700	900
100-Year Floodplains	acres	4	21
Bridge Crossings	number	2	5
Box Culvert Crossings	number	6	8
Prime Farmland Soils	acres	53	33
State Important Farmland Soils	acres	50	40
Residential Relocations	number	16	39
Owner	number		
Tenant	number		
Minority	number		
Business Relocations	number	2	5
Community Facilities	number	0	0
Affected Neighborhoods	number	1	5
Historic Sites 4(f)	number	0	0
Historic Districts 4(f)	number	0	0
Historic Sites Adverse Effect	number	2	2
Schools	number	0	0
Churches	number	0	0
Cemeteries	number	0	0
Parks/Recreation Areas	number	1	0
Potential Hazardous Materials	number	1	1
Noise Impacts pre-barrier	number	0	23
Noise Impacts post-barrier	number	0	0
Noise Barrier Protected Homes	number	0	40
Barrier Number/ Length	no./ feet	0	2 / 4400
Noise Barrier Costs	$M	0.000	0.587
Construction Costs	$M	38.700	40.600
Right-of-Way Costs	$M	14.386	13.896
Total Costs	$M	53.086	55.083

-A- indicates a northern connection with the eastern leg of the N. Beltway near the Shore Road/Westinghouse Road interchange
-B- indicates a northern connection with the eastern leg of the N. Beltway near the NC 66 Connector interchange

Residential / Community Disruption

Considering only the WSNB sections, Endpoint-B has 23 more relocations than the A-Endpoint route. There will be substantially greater relocations and community disruption resulting from the 2-mile passage of the combined A-Endpoint route through Rural Hall. Although official relocation estimates have not been made for ESNB, the combined route residential impacts will equalize, or even favor, the B-Endpoint due to impacts in Rural Hall.

Business / Employment Disruption

The WSNB section of the A-Endpoint route affects fewer businesses, but the ones it displaces at Westinghouse Road (Langenthal Mills and Trucking Firm) have more employment than the small businesses that are affected by the B-Endpoint near the NC 65 interchange with US 52. The A-Endpoint interchange right-of-way for the ramp from northbound US 52 to eastbound Beltway is so close to the Sara Lee distribution facility that retaining walls may be required to keep from affecting the driveway around the facility. Additional business impacts from the ESNB routes through Rural Hall are unknown.

Cultural Resources

Both the A-Endpoint and B-Endpoint routes have Adverse Effects on two National Register historic sites. The effects on the Stauber House and Barn (N245) are similar for the two options, as they share the same interchange location at Bethania-Tobaccoville Road.

The A-Endpoint route has an Adverse Effect on the Columbus Kapp Farm (N454). The high-speed ramp from northbound Beltway to southbound US 52 is located adjacent to the northern boundary of the historic farm. The alignment of segment A6 cuts the farm off from its current access to Shore Road. The Department of the Interior (DOI) commented that they consider that the adverse effect may constitute a "constructive use" under Section 4(f) and has requested that FHWA reevaluate.

The B-Endpoint route is located near the Constantine Stoltz House (N407), with the right-of-way of the relocated NC 65 on-ramp to southbound US 52 and southbound Beltway adjacent to the northern and eastern boundaries of the historic site. DOI again questions whether 4(f) constructive use applies. However, DOI goes on to state that it considers "adequate

recordation" to be suitable mitigation for N407, as the property is currently for sale as industrial property.

Given the DOI's opinion on adequate mitigation of the Stoltz House (N407) through recordation, the lesser impacts of the B-Endpoint on historic resources make this a more favorable alternative.

Natural Resources (Aquatic Resources and Wetlands / Forest / Wildlife Habitat)

Written resource agency response favored the WSNB A-Endpoint over the B-Endpoint due to lower forest/wildlife habitat losses and lesser water resource and wetland impacts. These preferences did not take into account the differences between the extension of the ESNB east of US 52. Given the 1.5+-mile greater length of the combined A-Endpoint route compared with the B-Endpoint route, the likelihood is high that additional aquatic resource impacts will bring these options to a similar level of impacts.

The greater acreages of forested habitat for WSNB sections of the B-Endpoint compared with the A-Endpoint are due to the existence of more farmland along the A-Endpoint route. The additional length of the ESNB along the A-Endpoint route will reduce the disparity, but not equalize the totals, for forest impact.

There was no indication in resource agency responses of specific, substantial biologic resources along the B-Endpoint (segments B8-B10) that would keep the agencies from supporting this route given cost, sociologic, and functional advantages.

Traffic Service / Function of the Facility

The B-Endpoint crossing of US 52 has a superior interchange design and a greater separation from adjacent interchanges along US 52. The separation of the Beltway crossing and the NC 65 interchange at US 52 is sufficient for adequate function of the interchange with common collector-distributor roadways.

At the A-Endpoint crossing of US 52, the Beltway crossing and the existing interchange at Westinghouse Road/Shore Road are extremely close. The importance of the Westinghouse Plant to the community requires that the access from Westinghouse Road to US 52 be maintained. The proximity of the interchanges and desire to maintain access to the existing

interchange require a complex system of ramps, loops, and collector-distributor roadways. Driver stress will be greater and confusion will be more likely for those navigating their way to and from the three interconnected facilities--US 52, the Beltway, and Westinghouse/Shore Roads.

The location of the B-Endpoint entrance ramp at the site of the existing interchange with NC 65 will redirect considerably more Rural Hall traffic from passing through Bethania than will the A-Endpoint interchanges. Currently, the heavy truck traffic through the Historic District is having a detrimental effect on the material condition of the old masonry structures.

Local Governmental Preference

The Town of Rural Hall overwhelmingly supports the B-Endpoint option crossing from US 52 to University Parkway at the Town's southern border, rather than the A-Endpoint option that passes through Rural Hall for nearly 2 miles between US 52 and University Parkway. The northern option would split the community and disrupt residential communities and businesses within Rural Hall. The alignment along the existing transportation corridor connecting US 52 to NC 66 would have far less effect on established communities in Rural Hall.

Public Opinion

Public opinion generally favors options with the least cost and fewest disruptions to residences, businesses, and community facilities. Most of the written and verbal comments received from the public throughout this project have not indicated specific corridor preferences in each of the three regions, as addressed in this document. As a result, the following statement as to public opinion is based upon the public's sensitivity to the issues, rather than from specific corridor preferences contained in their letters and statements. Other than those who live along NC 65 near the B-Endpoint route crossing between Mizpah Church Road and Zigler Road, there was no strong public preference between the options in the northern part of the study area. With the cost, function, and community disruptions cited in prior paragraphs in favor of the B-Endpoint and cumulative natural resource impacts being similar, selection of the B-Endpoint is in line with the predominant public priorities described above.

SOUTH REGION COMPARISON

There are four alternate routes in the southern region, made up of a western and an eastern corridor with crossover segments C2 and C3 allowing each southern corridor to interconnect with western and eastern corridors in the middle region of the project. These routes are shown in Exhibit C. Equivalent endpoints are located at US 158 (Stratford Road) to the south and just north of Phillips Bridge Road to the north. Table B contains cost and impact data for the four routes: A1-A2-A3, A1-A2-C2-B3, A1-C1-B2-C3, and A1-C1-B2-B3.

The two alternatives that incorporate the eastern corridor (route segments A1-C1-B2) are recommended in the south region. Cost, residential, business and community disruption, aquatic resources, wildlife habitat, and design of the interchange with I-40 all clearly show the eastern corridor to cost less and have reduced impacts on the human and natural environment compared with the western corridor south of US 421.

Cost

The two routes containing the western corridor (route segment A2) have far greater total costs than the other options. The differences range from $22 million to $28 million more for the approximately 5 miles of roadway in the southern region.

Residential / Community Disruption

The two routes containing the western corridor (route segment A2) have from 64 to 119 more residential relocations than do the other two routes. All options greatly affect the communities along the north and south sides of US 421. The route containing segment A3 has the worst effect on these communities due to its splitting of the Marty Lane-Moravian Heights community south of US 421. Although they also relocate many homes in this area, the three routes with eastern crossings of US 421 take homes from the far eastern end of the Marty Lane-Moravian Heights developments and leave the remainder of this community intact.

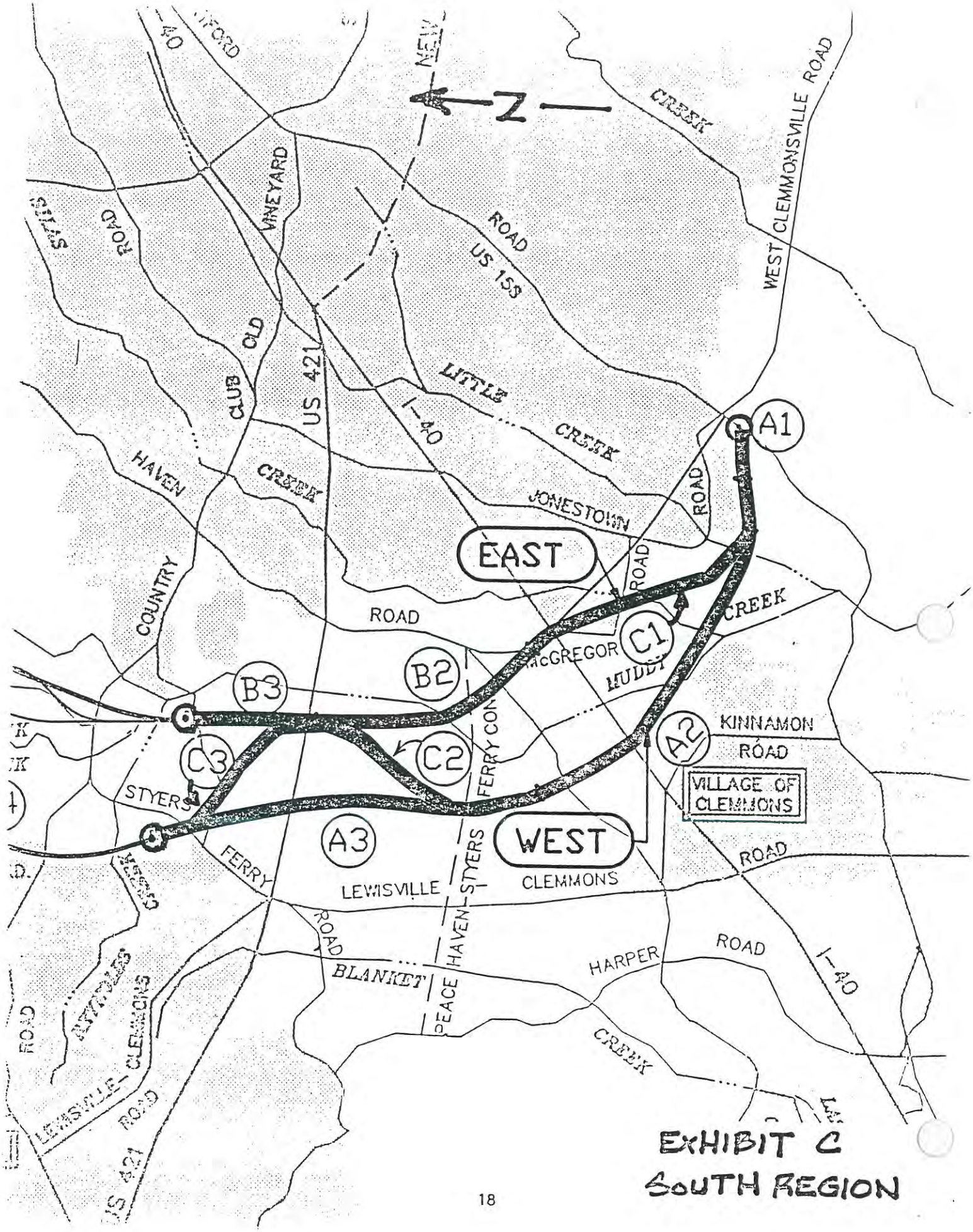


EXHIBIT C
SOUTH REGION

TABLE B

SOUTH ALTERNATIVES SUMMARY

Impact Category	units	western	western	eastern	eastern
Segments making up alternative		A1,A2,A3	A1,A2,C2,B3	A1,C1,B2,C3,	A1,C1,B2,B3,
Length	miles	5.27	5.26	5.02	4.52
Right-of-Way area	acres	523	501	465	441
Construction Limits	acres				
Forest	acres	185	233	177	187
Agricultural	acres	90	88	103	88
Wetlands	acres	2.3	4.3	2.5	2.5
Stream Crossings	number	12	14	10	12
Stream Channel Relocations	feet	1300	1300	0	0
100-Year Floodplains	acres	90	131	65	72
Bridge Crossings	number	8	11	7	7
Box Culvert Crossings	number	8	8	3	3
Prime Farmland Soils	acres	70	59	82	31
State Important Farmland Soils	acres	166	148	131	131
Residential Relocations	number	282	239	163	175
Owner	number				
Tenant	number				
Minority	number				
Business Relocations	number	16	11	1	1
Community Facilities	number	1	1	0	0
Affected Neighborhoods	number	12	11	11	10
Historic Sites 4(f)	number	0	0	0	0
Historic Districts 4(f)	number	0	0	0	0
Historic Sites Adverse Effect	number	0	0	0	0
Schools	number	0	0	0	0
Churches	number	0	0	0	0
Cemeteries	number	0	0	0	0
Parks/Recreation Areas *	number	1	1	0	0
Potential Hazardous Materials	number	2	0	0	0
Noise Impacts pre-barrier	number	10	31	30	24
Noise Impacts post-barrier	number	10	8	24	24
Noise Barrier Protected Homes	number	0	46	33	0
Barrier Number/ Length	no./ feet	0	1 / 2100	1 / 3500	0
Noise Barrier Costs	$M	0.000	0.412	0.569	0.000
Construction Costs	$M	81.300	79.800	69.800	72.200
Right-of-Way Costs	$M	40.604	37.392	24.891	21.979
Total Costs	$M	121.904	117.604	95.260	94.179

* privately owned

Business / Employment Disruption

The western corridor (route segment A2) results in severe impacts on the industrial and business park located along the south side of I-40. The western corridor routes have from 10 to 15 more business relocations than the eastern corridor routes.

Cultural Resources

There are no substantial historic concerns associated with the Beltway routes south of US 421.

Natural Resources (Aquatic Resources and Wetlands / Forest / Wildlife Habitat)

In their written responses, the resource agencies clearly favor the eastern corridor routes south of US 421 due to the involvement of lesser acreages of water resource and forested habitat impacts. Both western and eastern corridors involve major crossings of, and have major interchanges located partially on, the Muddy Creek and Silas Creek floodplains. The resource agencies' preference for the eastern route is one of degree; although reduced, the agencies are still concerned with the impacts from the eastern corridor.

The western corridor routes impact Muddy Creek and its floodplain both north and south of I-40, and at its confluence with Silas Creek south of I-40. The western corridor routes impact from 17 to 66 acres more floodplain, relocate 1,300 feet more major stream channel, have wetland impacts from 0.24 to 1.82 acres more, and displace from 7 acres less to 56 acres more forested habitat than the eastern corridor routes containing segment B2. The crossing of both the Silas Creek and Muddy Creek floodplains near their confluence is considered to be a major fragmentation of wildlife habitat by the western corridor.

Traffic Service / Function of the Facility

With respect to design and operation, the eastern corridor interchange with I-40 (segments C1-B2) is preferred over the western corridor interchange at I-40 (segment A2). The eastern location is far enough from adjacent interchanges to function adequately with a system of ramps and loops. The western interchange requires a collector-distributor system between the Beltway and Lewisville-Clemmons Road. The programmed widening of I-40 in this area would not require modification if the eastern location is chosen.

Local Governmental Preference

The Town of Clemmons favors the eastern corridor routes. The western corridor routes in the Muddy Creek floodplain would pass very close to Clemmons communities south of I-40, and the disruption caused to the business and industrial park south of I-40 would adversely affect employment for Clemmons residents, along with tax base.

Public Opinion

Public opinion generally favors those options with the least cost and fewest disruptions to residences, businesses, and community facilities. Most of the written and verbal comments received from the public throughout this project have not indicated specific corridor preferences in each of the three regions, as addressed in this document. As a result, the following statement as to public opinion is based upon the public's sensitivity to the issues, rather than from specific corridor preferences contained in their letters and statements. The cost differential, the reduced residential and business relocations, and community disruptions associated with the eastern corridor routes lead recommendation of the eastern routes south of US 421 to be aligned with the public priorities described above. With the majority of all residential and business relocations for the entire project located in the southern region, there is good likelihood that the public will consider the eastern corridor routes as the better choice, as do the resource agencies with respect to the water resource and habitat losses.

MIDDLE REGION COMPARISON

The endpoints for the comparison of routes in the middle region are defined as US 421 in the south and Bethania-Tobaccoville Road in the north. The western alternate is composed of route segments C3-A4-C4, and the eastern alternate consists of route segments B3-B6-B7. Refer to Exhibit D. Table C contains the costs and impacts for the alternates in the middle region.

During the comment period on the DEIS, the John Henry Kapp House (N464) was placed on the National Register of Historic Places. The recognized boundaries associated with the listing extend approximately 300 feet beyond those estimated in the DEIS, and previously concurred to by the State Historic Preservation Office (SHPO). The new boundaries extend into the right-of-way of the eastern route (segment B7 north of Reynolda Road). The taking of land from the National Register property would constitute a 4(f) action and require analysis showing that no feasible and prudent alternative to the taking of historic property exists. A crossover (segment C6a), located south of Reynolda Road, has received preliminary evaluation as an avoidance alternative for this historic site. It appears that the C6a crossover, connecting segment B7 south of Balsom Road with segment A4 at and north of Reynolda Road, is a feasible and prudent alternative to the taking of property from the Kapp Farm (N464). The C6a route is shown in Exhibit E. With this alteration of the eastern route, the study is left with only one feasible corridor between Reynolda Road (NC 67) and Bethania-Tobaccoville Road. This alignment has been determined by SHPO to have No Adverse Effect on the John Henry Kapp House, and it avoids separating the historic John Henry Kapp House from historic Bethania. This route stays west of the power transmission lines between Reynolda Road and Bethania-Tobaccoville Road.

Replacing the stretch of segment B7 north of Reynolda Road with C6a-(A4)-C4 results in modification to the cost and impact numbers in Table C, as shown. Construction costs increase by approximately $1.5 million, residential relocations decrease by two, and wetland impacts increase by 1.4 acres. The resultant eastern route, now composed of B3-B6-(B7)-C6a-(A4)-C4, will be compared with the western route, C3-A4-C4. Note that the use of parentheses around segment identifiers ( ) indicate that the route contains only a portion of that segment.

Cost

After adjusting the eastern route for the C6a alternative, the total estimated costs for the western and eastern routes between US 421 and Bethania-Tobaccoville Road differ by $ 0.5 million.

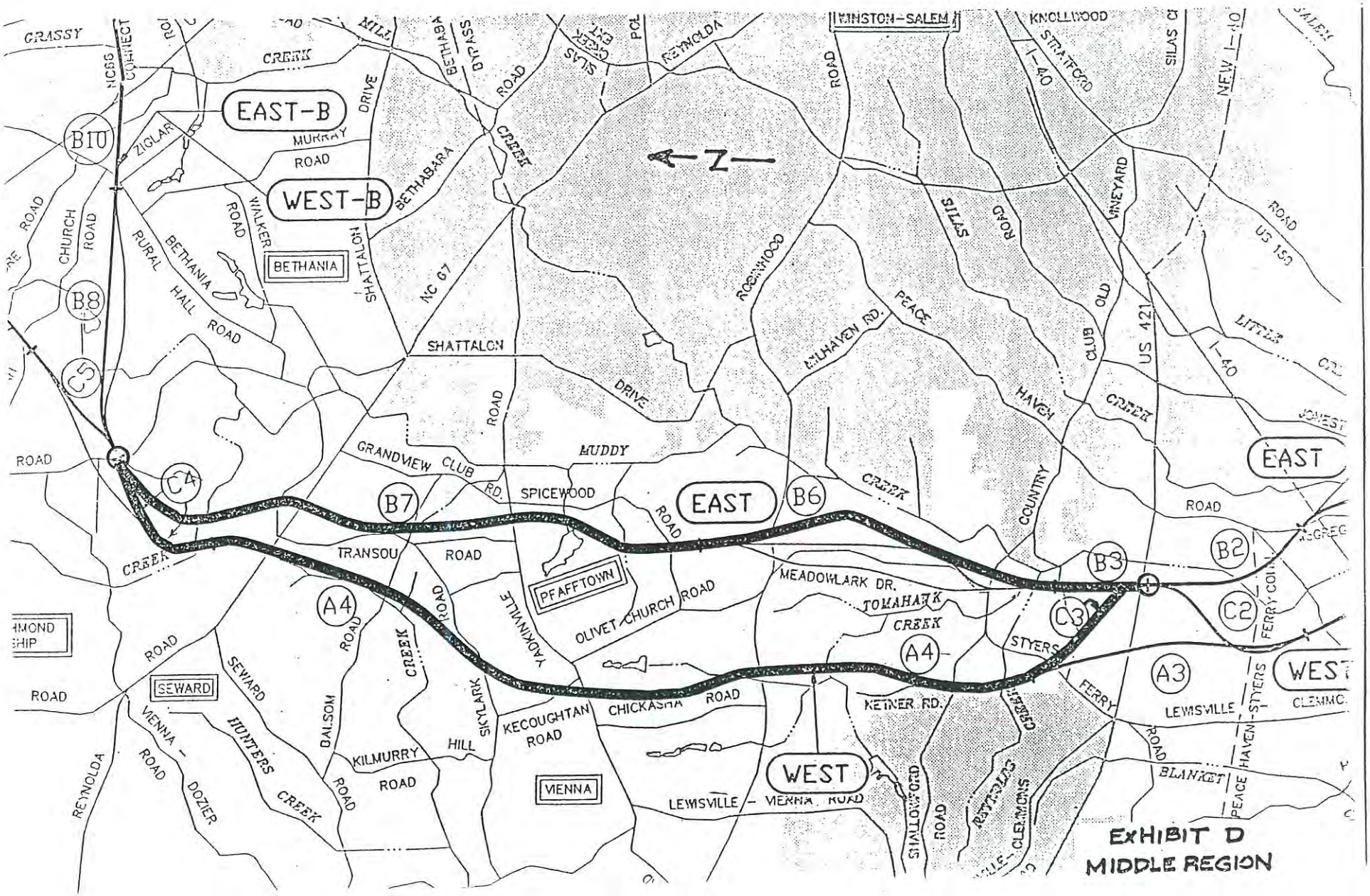


EXHIBIT D
MIDDLE REGION
EAST-B
WEST-B
EAST
WEST
B10
B8
C5
C4
B7
B6
B3
B2
C3
C2
A4
A3
WINSTON-SALEM
BETHANIA
PFAFFTOWN
VIENNA
SEWARD
KNOLLWOOD
STRATFORD
SILAS CR
NEW I-40
US 150
US 421
I-40
VINEYARD
OLD CLUB
PEACE HAVEN
MILHAVEN RD.
ROBINWOOD
SILAS CREEK
REYNOLDA
BETHABARA
BETHANIA RURAL HALL ROAD
SHATTALON
NC 67
SHATTALON DRIVE
MUDDY CREEK
GRANDVIEW CLUB RD.
SPICEWOOD ROAD
TRANSOU ROAD
MEADOWLARK DR.
TOMAHAWK CREEK
OLIVET CHURCH ROAD
YADKINVILLE ROAD
CHICKASHA ROAD
KETNER RD.
STYERS FERRY ROAD
LEWISVILLE - VIENNA ROAD
KECOUGHTAN ROAD
KILMURRY HILL ROAD
SEWARD ROAD
HUNTERS CREEK ROAD
DALSON CREEK ROAD
SKYLARK ROAD
VIENNA - DOZIER ROAD
REYNOLDA ROAD
CLEMMONS
LEWISVILLE
BLANKET
FERRY
COUNTRY
ZIGLAR
MURRAY ROAD
WALKER ROAD
CHURCH ROAD
CRASSY CREEK
NC 66
CONNECT
HAMMOND SHIP

TABLE C

MIDDLE ALTERNATIVES SUMMARY

Impact Category	units	western	eastern	eastern modified*
Segments making up alternative		C3,A4,C4	B3,B6,B7	B3,B6,(B7), C6a,(A4),C4
Length	miles	10.01	9.34	9.59
Right-of-Way area	acres	623	580	+
Construction Limits	acres			
Forest	acres	202	259	+
Agricultural	acres	181	124	+
Wetlands	acres	9.3	3.3	4.7
Stream Crossings	number	20	24	+
Stream Channel Relocations	feet	1600	500	+
100-Year Floodplains	acres	28	52	+
Bridge Crossings	number	2	2	+
Box Culvert Crossings	number	7	8	+
Prime Farmland Soils	acres	139	80	+
State Important Farmland Soils	acres	149	144	+
Residential Relocations	number	141	151	149
Owner	number			
Tenant	number			
Minority	number			
Business Relocations	number	4	2	4
Community Facilities	number	0	0	+
Affected Neighborhoods	number	12	10	9
Historic Sites 4(f)	number	0	0	0
Historic Districts 4(f)	number	0	1	1
Historic Sites Adverse Effect	number	0	2	1
Schools	number	0	0	+
Churches	number	0	0	+
Cemeteries	number	0	0	+
Parks/Recreation Areas	number	0	0	+
Potential Hazardous Materials	number	0	1	+
Noise Impacts pre-barrier	number	51	68	+
Noise Impacts post-barrier	number	20	42	+
Noise Barrier Protected Homes	number	86	76	+
Barrier Number/ Length	no./ feet	3 / 7700	2 / 5600	+
Noise Barrier Costs	$M	1.556	1.131	+
Construction Costs	$M	70.800	72.3	73.800
Right-of-Way Costs	$M	29.876	27.782	+
Total Costs	$M	102.232	101.213	102.713
Average 2015 Traffic	vehicles/day	40,400	46,700	+

* Modified for Segment C6a to avoid historic Kapp property

+ Use data from eastern for comparison purposes

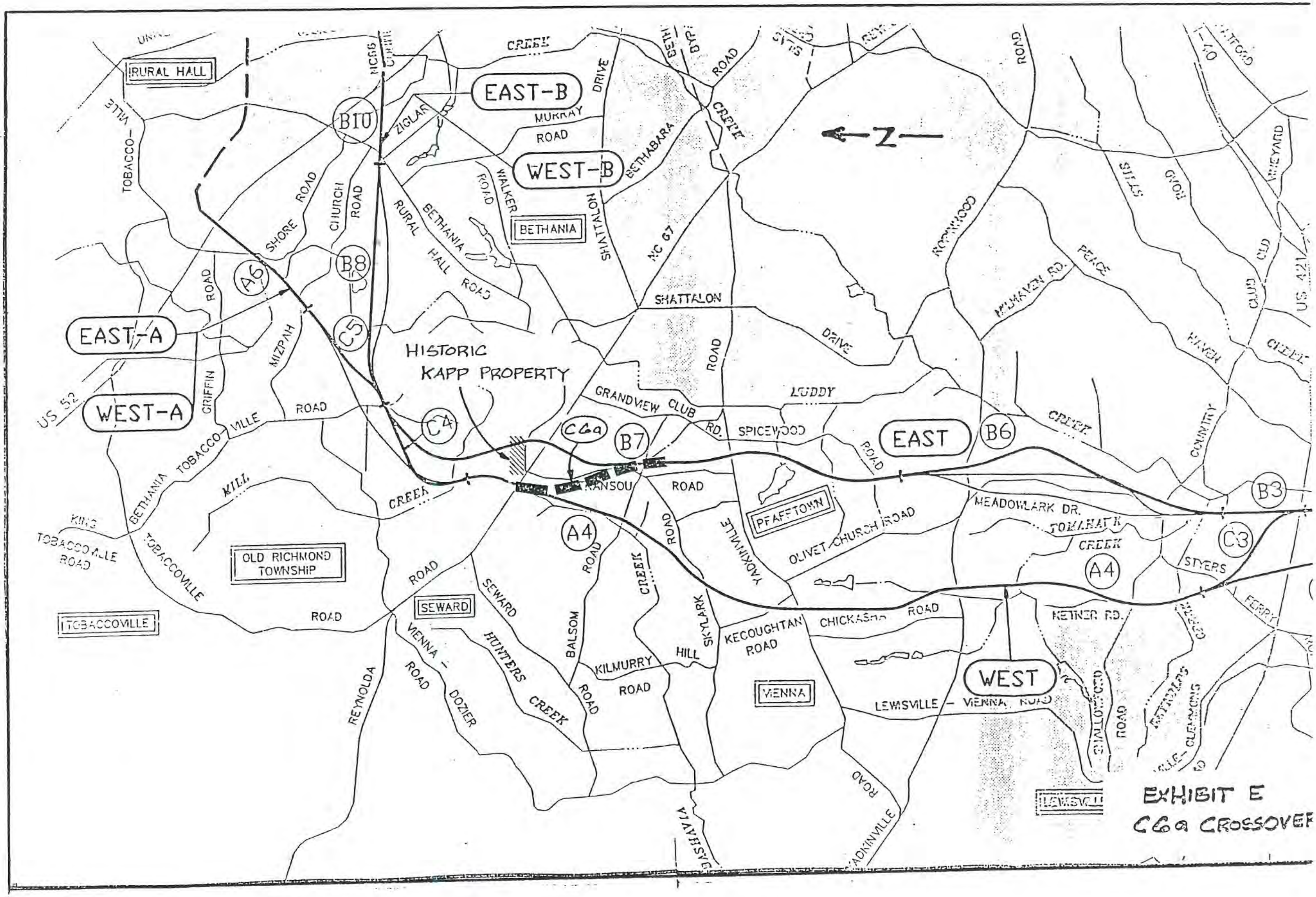


EXHIBIT E
C6a CROSSOVER

Residential / Community Disruption

The eastern route displaces 8 more residences than the western route.

The western route has interchanges with Shallowford Road and Yadkinville Road in the vicinity of two schools. The proposed right-of-way limit is approximately 1,100 feet east of Forsyth Country Day School and 500 feet east of Vienna Elementary School. Current pedestrian and bicycle access will be disrupted, traffic in front of the schools will increase in comparison with the 2015 No-Build conditions, and traffic-generated noise will increase 4 dBA and 2 dBA, respectively, to levels below the 67 dBA impact criterion. The visual disruption of traffic on school activities will increase. There are no schools in the vicinity of the eastern route.

Some members of the public see the proximity of the western route to these schools as a benefit. Parents of those living north and south of the schools favor the location of Beltway interchanges near the schools for the improved access it provides. These people will have a much easier time driving their children to and from school on their way to and from work. With its wide enrollment area and lack of public busing, the added convenience provided to Forsyth Country Day School parents is substantial.

Public comment has identified the disruption of older rural communities (multiple generation, extended families) as an important issue. The letter writers draw a distinction between residents of developed subdivisions who form a community based upon proximity, and those who, through the generations, have established communities of shared land, experience, and bloodlines. In numerous letters, these people describe their area as "living history", as compared with the architecturally historic sites recognized and protected by the National Register.

The western route affects such an older rural community, loosely surrounding and linked together by membership in the Sharon Church family. This area encompasses older land holdings along Styers Ferry Road, Shallowford Road, and Ketner Road. Impact to the Sharon Church family is experienced in the vicinity of the Beltway crossing of Styers Ferry Road, where farmland remains in the possession of extended families who live on adjacent plots. Additional disruption will occur in the vicinity of the old Sharon Church sanctuary, along Shallowford Road across from Ketner Road. The Sharon Church "family" believes that,

although the church sanctuary and cemetery will not be taken by the project, the relocation of the church parsonage and that of a substantial number of church members along Styers Ferry, Shallowford, and Ketner Roads will bring an end to the viability of their church family.

Although there may be other older rural communities affected by the proposed routes, the Sharon Church area is the only one so prominently described in the public comments.

Business / Employment Disruption

Both alternatives affect four businesses. No significant variations in employment exist between these relocations.

Cultural Resources

The western route has no effect on sites on or eligible for the National Register of Historic Places.

The eastern route requires the use of vacant land within the recognized boundaries of the proposed Pfafftown Historic District. This use constitutes a taking under Section 4(f) of the Department of Transportation Act (23 CFR 771.135 (a)(2)). Additionally, the eastern route has been determined to have an Adverse Effect on the Pfafftown Historic District under Section 106 of the National Historic Preservation Act of 1966. The Pfafftown Historic District is a collection of homes along Transou Road, extending north and south of Yadkinville Road. The eastern route introduces an interchange very close to the Historic District between Transou Road and Grandview Club Road. North of the Yadkinville Road, the alternative passes along the rear property boundaries of Historic District properties on the east side of Transou Road. The interchange and proximity of the eastern alignment are considered by SHPO to be an Adverse Effect on the Historic District and its contributing properties.

The eastern route's Adverse Effect (Section 106) on the John Henry Kapp House (N464) has been eliminated with the adoption of the C6a crossover between Balsom Road and Reynolda Road.

The cultural resource oversight agencies (Department of the Interior, State Historic Preservation Office, and local historic organizations) all favor the western route due to the proximity of the eastern route to the Pfafftown Historic District.

In a letter of support for the Northern Beltway, the Mayor of Winston-Salem (Attachment 1) asked for sensitivity toward protecting both the natural environment and historic locations in the community. In another letter of support, the City Manager of Winston-Salem (Attachment 1) requested that careful consideration be given to impacts on historic sites, and to the natural and man-made environment. While the impacts to both the natural and man-made environment, although different, are fairly well balanced between the western and eastern alternatives, the eastern route has a much greater effect on historic resources with its proximity to, and Adverse Effect on, the Pfafftown Historic District.

Natural Resources (Aquatic Resources and Wetlands / Forest / Wildlife Habitat)

The eastern route has smaller water resource/wetland impacts. The western route accumulates its 4.6 acres greater wetland impacts along Tomahawk and Bashavia Creeks. The eastern route affects approximately 25 acres more floodplain than the western route due to the impacts at the US 421 interchange and its crossing of Reynolds Creek at its confluence with Muddy Creek, north of Phillips Bridge Road.

The western alternative involves smaller forest habitat impacts, with 57 fewer acres of impact.

In letters containing their review comments on the DEIS, both the U.S. Fish and Wildlife Service (FWS) and the Army Corps of Engineers (COE) state that they would find both middle alternatives "acceptable" since they avoid "substantial" impacts to the natural environment. In their letter, the COE states that they would support the western route despite greater aquatic losses if there is determined to be better balance between water and other natural environment concerns compared with other alternatives.

Traffic Service / Function of the Facility

The eastern interchange at US 421 (segment B3) provides a more desirable design than the western route (segment C3) due to the horizontal curve within the C3 interchange.

The traffic model shows the eastern route carrying more traffic in design year 2015 than the western route. The difference is approximately 8,000 vehicles per day (vpd) from US 421 to Robinhood Road, and 11,000 vpd from Robinhood Road to Yadkinville Road. Over the 10-mile middle section of the project, the average difference is 6,300 vpd (46,700 vpd eastern and 40,400 vpd western). In spite of this difference, the western route attracts enough traffic to

warrant six lanes (Level of Service C) over the 3-1/2 mile stretch between US 421 and Robinhood Road.

The difference in traffic volumes (which provides benefit to more users on the eastern route), the similar construction and right-of-way costs, and slightly longer length of the western route (higher maintenance and user costs) leads to a better benefit-cost ratio for the eastern route.

Local Governmental Preference

The Town of Lewisville has taken a position against the western route due to impacts on traffic on Shallowford Road near the proposed Beltway interchange, the proximity to Forsyth Country Day School, and impacts to the Sharon Church community.

In a letter of support for the Northern Beltway, the Mayor of Winston-Salem (Attachment 1) asked for sensitivity towards protecting both the natural environment and historic locations in the community. In another letter of support, the City Manager of Winston-Salem (Attachment 1) requested that careful consideration be given to impacts on historic sites, and to the natural and man-made environment. In light of the greater historic site involvements along the eastern route, this statement could be construed to favor the western route, if all other issues are in balance.

Public Opinion

Public opinion generally favors those options with the least cost and fewest disruptions to residences, businesses, and community facilities. Most of the written and verbal comments received from the public throughout this project have not indicated specific corridor preferences in each of the three regions, as addressed in this document. As a result, the following statement as to public opinion is based upon the public's sensitivity to the issues, rather than from specific corridor preferences contained in their letters and statements.

Specific public comment regarding the two middle alternatives included the following major points:

* Concern about Muddy Creek as a recreational or "wild" buffer between Winston-Salem and developing western Forsyth County. This stretch of Muddy Creek is identified for Greenway preservation/development in the Vision 2005 Growth Management Plan. Recreational, wildlife, and "solitude" values in the floodplain would be degraded between US 421 and Robinhood Road due to the proximity of the eastern alternative.

* Concern with protecting the setting and integrity of recognized historic settlements (Pfafftown Historic District) in the Winston-Salem/Forsyth County area. Those expressing this desire favor the western alternative.

* Concern with accelerated water quality degradation of Muddy Creek due to location of the eastern route adjacent to the Muddy Creek floodplain between US 421 and Robinhood Road.

* Concern with impact on older communities, such as the Sharon Church family, that contain a "living history" through extended families and ancestral land holdings. Those expressing this opinion favor the eastern alternative. There may be other such locations within the study area that were not identified by the public.

* Concern with "quality of life" impacts within neighborhoods as opposed to the "quality of recreation/solitude" impacts advanced by the "Muddy Creek preservation" proponents. This is heard from those living along the western route.

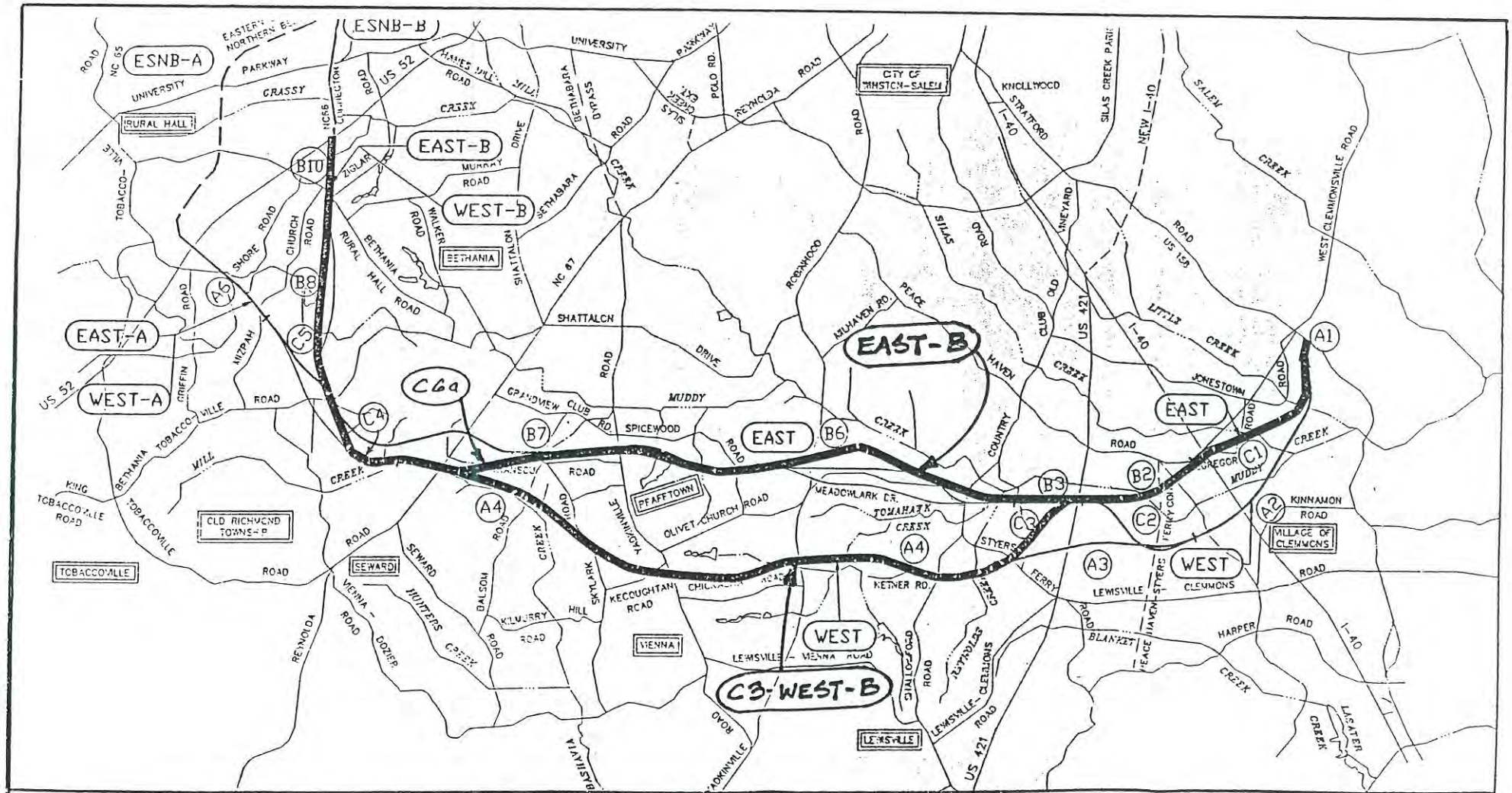
* Concern with proximity effects on churches and schools located near the western route.

TOTAL PROJECT ALTERNATIVES

Table D provides a concise summary of the differences between the two remaining routes, which differ only between US 421 and Reynolda Road, as previously shown in Exhibit A. More detail on the issues listed in this summary table are found in the previous section of this document. Table E contains the costs and impacts of the two remaining corridors, EAST-B (with C6a Crossover) and C3-WEST-B, stretching from US 52 in the north to US 158 in the south.

TABLE D

WESTERN C3-WEST-B	EASTERN EAST-B (with C6a crossover)
There are no significant differences in estimates of total monetary costs or residential or business relocations.	
Natural environment resource agencies will support the choice of either route.	
Favored by federal, state, and local historic resource organizations due to the eastern route's impact on the Pfafftown Historic District. The eastern route will constitute a 4(f) impact to the Pfafftown Historic District.	Has a more desirable interchange design at US 421.
Favored by a segment of the public due to the impacts of the eastern route on the water quality, recreational, wildlife, and aesthetic qualities of the Muddy Creek floodplain between US 421 and Robinhood Road.	Traffic model projects higher average traffic volumes--15 percent more (6,300 vpd) over the stretch between US 421 and Bethania-Tobaccoville Road. This leads to a higher benefit-to-cost ratio.
Favored by a segment of the public who consider the eastern route to be located too close to Winston-Salem to address future traffic congestion.	Favored by the Town of Lewisville due to western route impacts near Sharon Church and Forsyth Country Day School.
Favored by residents of eastern Phillips Bridge Road-Buckhorn Lane, Ashlyn Drive, Fleetwood Circle, Storm Canyon Drive, Wessex Road, Pine Hill Road (Pfafftown), and Lochurst Subdivision due to the detrimental effect of the proximity of the eastern route on the quality of life and aesthetics of their communities.	Favored by a segment of the public due to the western route's proximity to Vienna Elementary and Forsyth Country Day School, and the resultant adverse traffic, noise, and visual effects.
Favored by some parents who desire more convenient access to Vienna Elementary and Forsyth Country Day Schools from areas north and south of the schools.	Favored by residents of the neighborhoods and communities of Nottingham, Shallowford Road, Vienna (Yadkinville Road area), and the Kecoughtan Road area due to the detrimental effect of the proximity of the western route on the quality of life and aesthetics of their communities.
Letters from the Mayor and City Manager of Winston-Salem could be construed to favor the western route due to the proximity of the eastern route to historic sites (Pfafftown Historic District).	



LEGEND

WEST-A — ALTERNATIVES

A4 — ROUTE SEGMENTS

— LESS FEASIBLE ROUTE SEGMENTS

ESNB-A — EASTERN SECTION OF NORTHERN BELTWAY

RECOMMENDED ALTERNATIVES

North

2000 6000

0 4000 10000

WINSTON-SALEM NORTHERN BELTWAY (WEST)
EIS R-2247

EXHIBIT A (REPEAT) RECOMMENDED ALTERNATIVES

TABLE E

ALTERNATIVES SELECTION SUMMARY

Impact Category	units	C3-WEST-B	EAST-B*
Segments making up alternative		A1,C1,B2,C3, A4,C4,B8,B10	A1,C1,B2,B3,B6 B7,C6a,(A4),C4,B8,B10
Length	miles	17.35	16.93
Right-of-Way area	acres	1201	1149
Construction Limits	acres	1073	1055
Forest	acres	575	632
Agricultural	acres	252	196
Wetlands	acres	12	7.4
Stream Crossings	number	47	51
Stream Channel Relocations	feet	2500	1400
100-Year Floodplains	acres	94	118
Bridge Crossings	number	12	12
Box Culvert Crossings	number	17	16
Prime Farmland Soils	acres	193	135
State Important Farmland Soils	acres	291	286
Residential Relocations	number	289	290
Owner	number	259	242
Tenant	number	30	57
Minority	number	44	44
Business Relocations	number	10	10
Community Facilities	number	0	0
Affected Neighborhoods	number	25	22
Historic Sites 4(f)	number	0	0
Historic Districts 4(f)	number	0	1
Historic Sites Adverse Effect	number	2	4
Schools	number	0	0
Churches	number	0	0
Cemeteries	number	0	0
Parks/Recreation Areas	number	0	0
Potential Hazardous Materials	number	1	2
Noise Impacts pre-barrier	number	98	115
Noise Impacts post-barrier	number	44	66
Noise Barrier Protected Homes	number	126	116
Barrier Number/ Length	no./ feet	5 / 12100	4 / 10000
Noise Barrier Costs	$M	2.143	1.718
Construction Costs	$M	161.700	164.700
Right-of-Way Costs	$M	57.147	55.053
Total Costs	$M	220.990	221.471

* Modified for Segment C6a to avoid historic Kapp property