INTERCHANGE JUSTIFICATION STUDY

INTERSTATE 26 WELCOME CENTER

KINGSPORT, SULLIVAN COUNTY

PREPARED BY:

Neel-Schaffer, Inc.

FOR THE
TENNESSEE DEPARTMENT
OF TRANSPORTATION

FEBRUARY 2009

TABLE OF CONTENTS

Chapter		Page
1.	INTRODUCTION……	1
	A. Purpose of Study..……....	1
	B. Description of Project Location……	1
	C. Relationship to Other Transportation Improvement Plans & Classifications……..	4
2.	PRELIMINARY PLANNING DATA……..….	5
	A. Land Use……..…….....	5
	B. Traffic Served……	5
	C. Proposed Improvement……..	5
3.	ENGINEERING INVESTIGATIONS……..….	9
	A. Traffic Operations…….....	9
	B. Cost……	12
	C. Environmental Concerns……..	12
4.	FHWA POLICY REQUIREMENTS……..…….	15
5.	SUMMARY AND CONCLUSIONS……..…….	18
	DESIGN DIVISION CONCURRENCE LETTER……	19
	APPENDIX……	20

LIST OF FIGURES

Figure **Page**

1. Location Map…..…….. 2
2. Area Map……..…….. 3
3. Average Annual Daily Traffic Volumes…… 6

LIST OF TABLES

Table **Page**

1. Levels of Service– No Build…….. 10
2. Levels of Service – Option A…….. 10
3. Levels of Service – Option B…….. 11

CHAPTER 1

INTRODUCTION

A. Purpose of Study

The purpose of this Interchange Justification Study is to determine the feasibility of providing access from Interstate 26 (US 23) to a new Welcome Center in Sullivan County (see Figures 1 and 2).

Five separate locations were studied along Interstate 26. The location selected is approximately 0.67 miles north of the existing State Route 347 (Rock Springs Road) interchange, south of Kingsport.

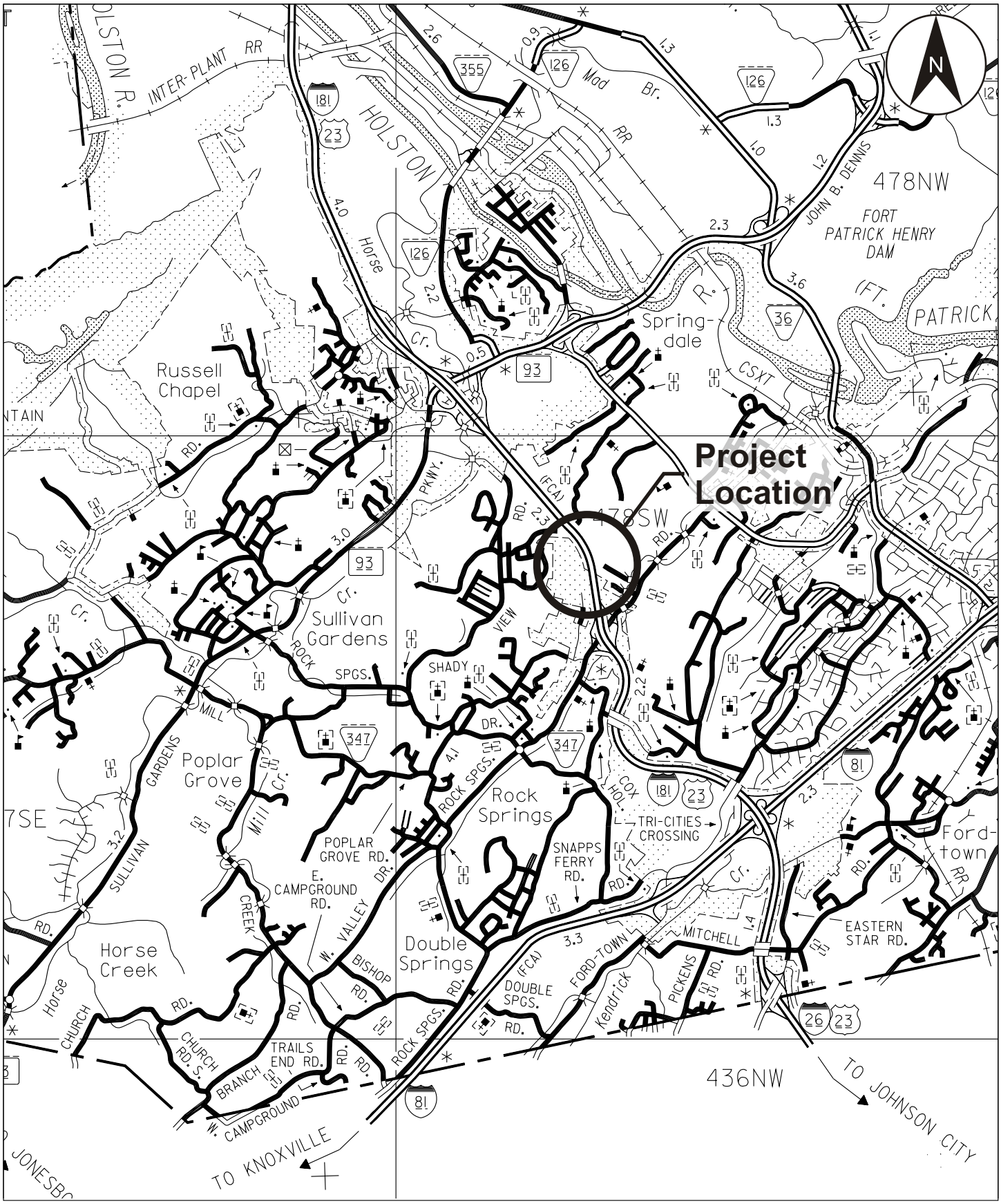
This study considers current and future needs of the area and analyzes traffic operational features for access points at this location. Estimated costs for the proposed interchange have been prepared, functional plans developed and preliminary environmental concerns for the proposed project were identified.

This route is a portion of the Appalachian Development Highway System and therefore falls under the jurisdiction of the Appalachian Region Commission.

B. Description of Project Location

The proposed interchange location for the Welcome Center is approximately 1.51± miles south of the existing State Route 93 separation structure and 0.67± miles north of the State Route 347 (Rock Springs Road) interchange.

Interstate 26 is currently a four-lane, fully-controlled access facility with a depressed grass median through the proposed interchange area. The typical roadway cross-section contains four (4) twelve (12)-foot travel lanes, six (6)-foot inside shoulders, ten (10)-foot outside shoulders, and a 30-foot grass median inside of a variable width right-of-way.



SCALE

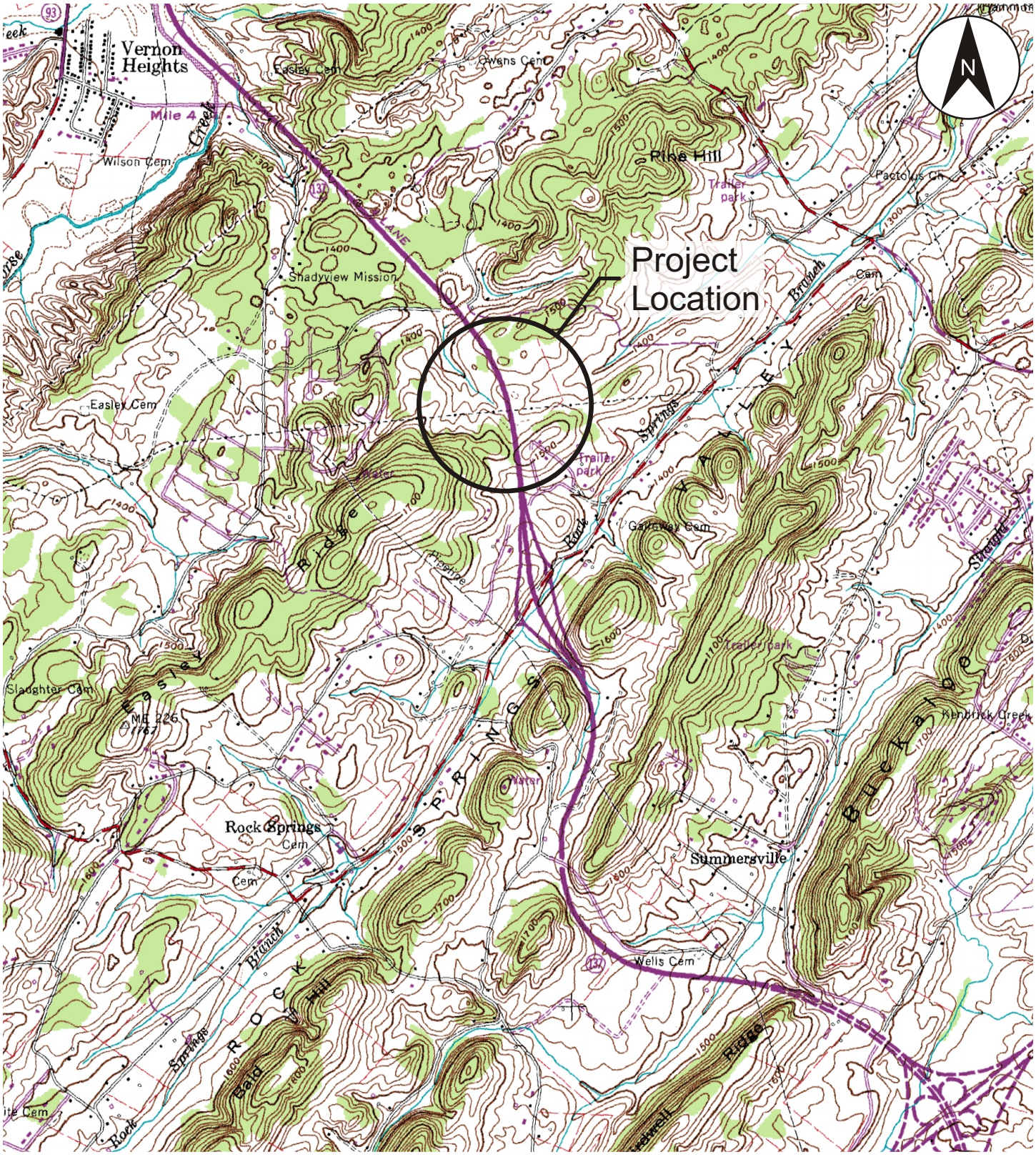
2 0 2 4 6 8 MILES

Figure 1

Location Map

Sullivan County

TDOT Go.



Quad Map
Sullivan Gardens - 189 NE

TDOT Go.

Figure 2

Area Map

Sullivan County

C. Relationship to Other Transportation Improvement Plans & Classifications

I-26 in the study area is classified as an urban interstate and located just south of the Kingsport City Limits. State Route 347 (Rock Springs Road) in this area is an urban minor arterial. The proposed interchange is not anticipated to result in the modification of any existing classification. Due to the interstate designation and design of I-26, no dedicated pedestrian or bicycling features exist.

This proposed Welcome Center on I-26 will be the state's 14th center. This route is a portion of the Appalachian Development Highway System (Tennessee Corridor "B") and therefore falls under the jurisdiction of both the Appalachian Region Commission (ARC) and the Federal Highway Administration (FHWA). The original Appalachian Development Act of 1965 designated this portion of US 23 as an APD route and proposed a Welcome Center to be constructed between US 11W and the Virginia State Line (Section B23). A separate investigation of possible sites in this section by TDOT found that construction of a Welcome Center here would require acquisition of more than a dozen residences, detrimental environmental impacts, and high construction costs. Furthermore, estimates of the potential visitation of a Welcome Center at this location predicted only about 600 trips per day.

At the request of the City of Kingsport, investigation was made of relocating the proposed Welcome Center site to other locations along I-26. The current site just north of State Route 347 (Rock Springs Road) was chosen over approximately five (5) others due to its size, availability, public support, and access opportunities. One of the other sites considered was just south of the SR 93 interchange, but it was found to have significant subsurface geologic problems.

In June 2001, an Interchange Justification Study was completed by the City of Kingsport in cooperation with TDOT that was later approved by the FHWA. This proposed interchange was located approximately 1.0 mile south of the interchange at State Route 93 and approximately 1.0 mile north of the interchange at State Route 347 (Rock Springs Road). As part of this study, the State Route 93 location was analyzed for a Welcome Center site, but was found to have considerable subsurface geologic problems. TDOT found significant karst terrain in the approved interchange area south of State Route 93. This made the approved interchange location impractical. The entire length of I-26 between State Route 93 and State Route 347 (Rock Springs Road) was studied and an area closer to State Route 347 was found to be acceptable. This new location was selected as the location of the proposed Welcome Center.

Estimates found costs and impacts to be substantially lower and visitor usage higher than other locations. Placing a Welcome Center on the west (southbound) side of I-26 would provide typical southbound access, but allow northbound access as well.

CHAPTER 2

PRELIMINARY PLANNING DATA

A. Land Use

The proposed Welcome Center is located just north of the I-26/State Route 347 (Rock Springs Road) interchange in Sullivan County. Land use in the immediate vicinity of the interchange location is primarily rural and low to moderate density housing. Heavier commercial, industrial, and residential development exists north of the interchange.

Adjacent existing interchanges are located at State Route 347 (Rock Springs Road), approximately 0.67± miles south of the proposed location and at State Route 93, approximately 1.5± miles north of the proposed location. Other nearby interchanges include Meadowview Parkway (2.0± miles north), US 11W/Stone Drive (5.5± miles north), and a directional interchange with I-81 (2.8± miles south).

B. Traffic Served

The Tennessee Department of Transportation (TDOT) furnished traffic data for this study effort. Traffic provided for the existing system shows a 2010 Base Year Average Annual Daily Traffic (AADT) volume of 42,202 vehicles per day on I-26 between the State Route 347 (Rock Springs Road) and State Route 93 interchanges. Design year (2030) volumes on this section are expected to reach 50,390 vehicles per day. Traffic volumes using the proposed Welcome Center are 3,240 vehicles per day in 2010 and 3,880 in 2030. Base year and design year projected traffic volumes are shown in Figure 3.

C. Proposed Improvement

Two interchange configurations were analyzed based on the input of local officials and the analysis of the projected traffic. A simple diamond interchange and a trumpet interchange were analyzed. In both cases, an auxiliary lane for weaving is proposed between the State Route 347 (Rock Springs Road) interchange and the proposed Welcome Center ramps. The two options are shown in Figures 4 and 5.

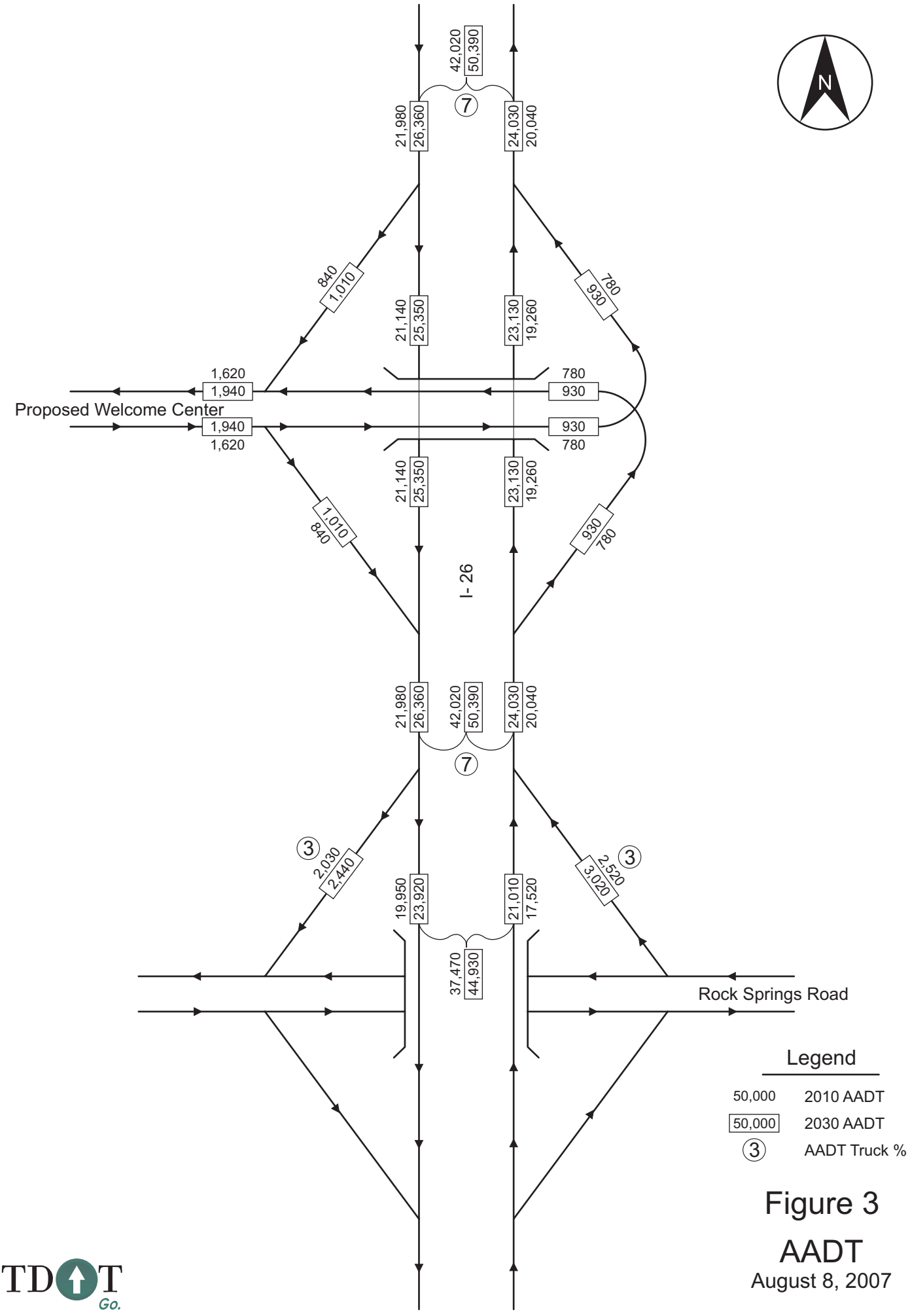


Figure 3

AADT

August 8, 2007

TDOT Go.

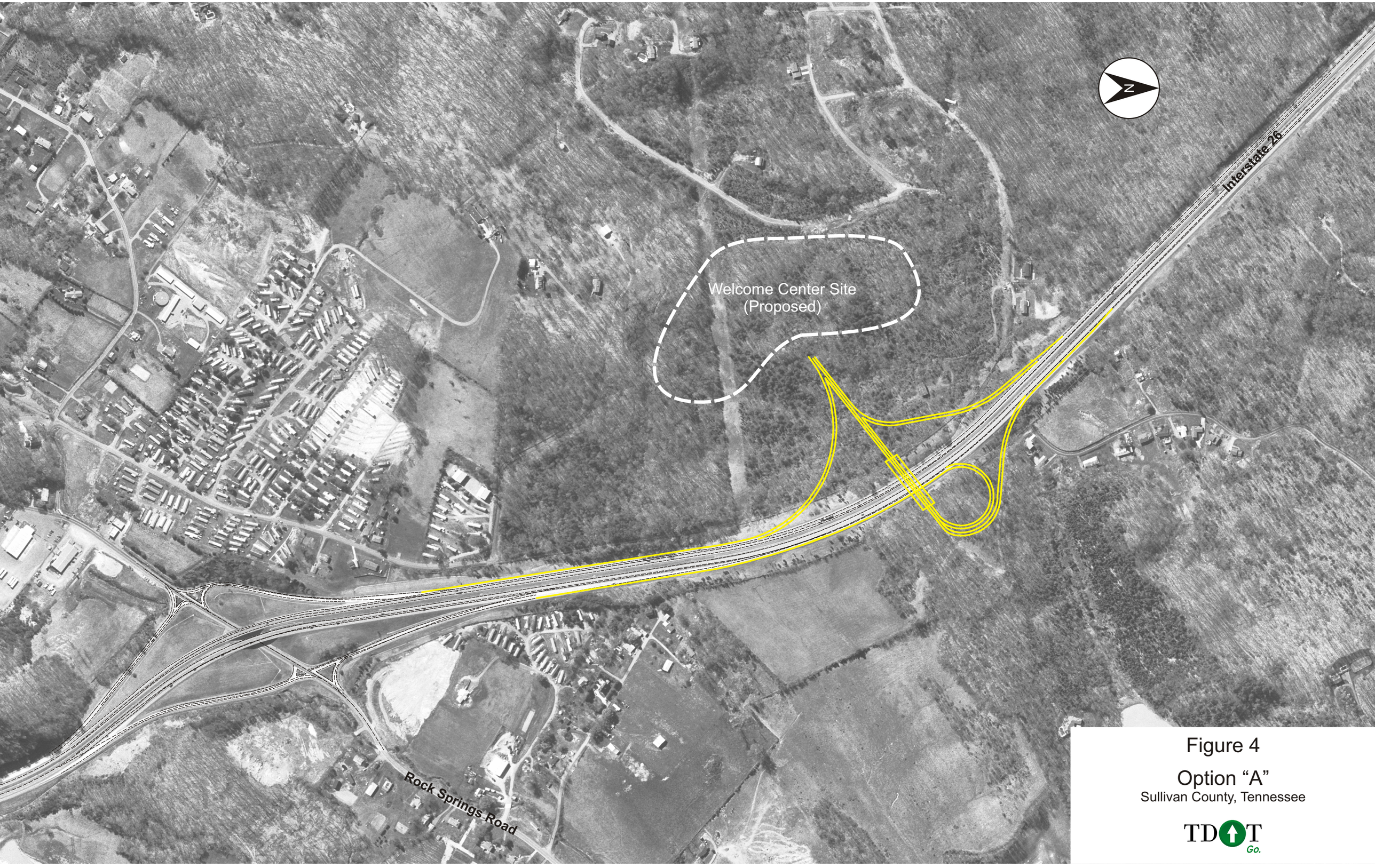


Figure 4

Option “A”

Sullivan County, Tennessee

TDOT Go.

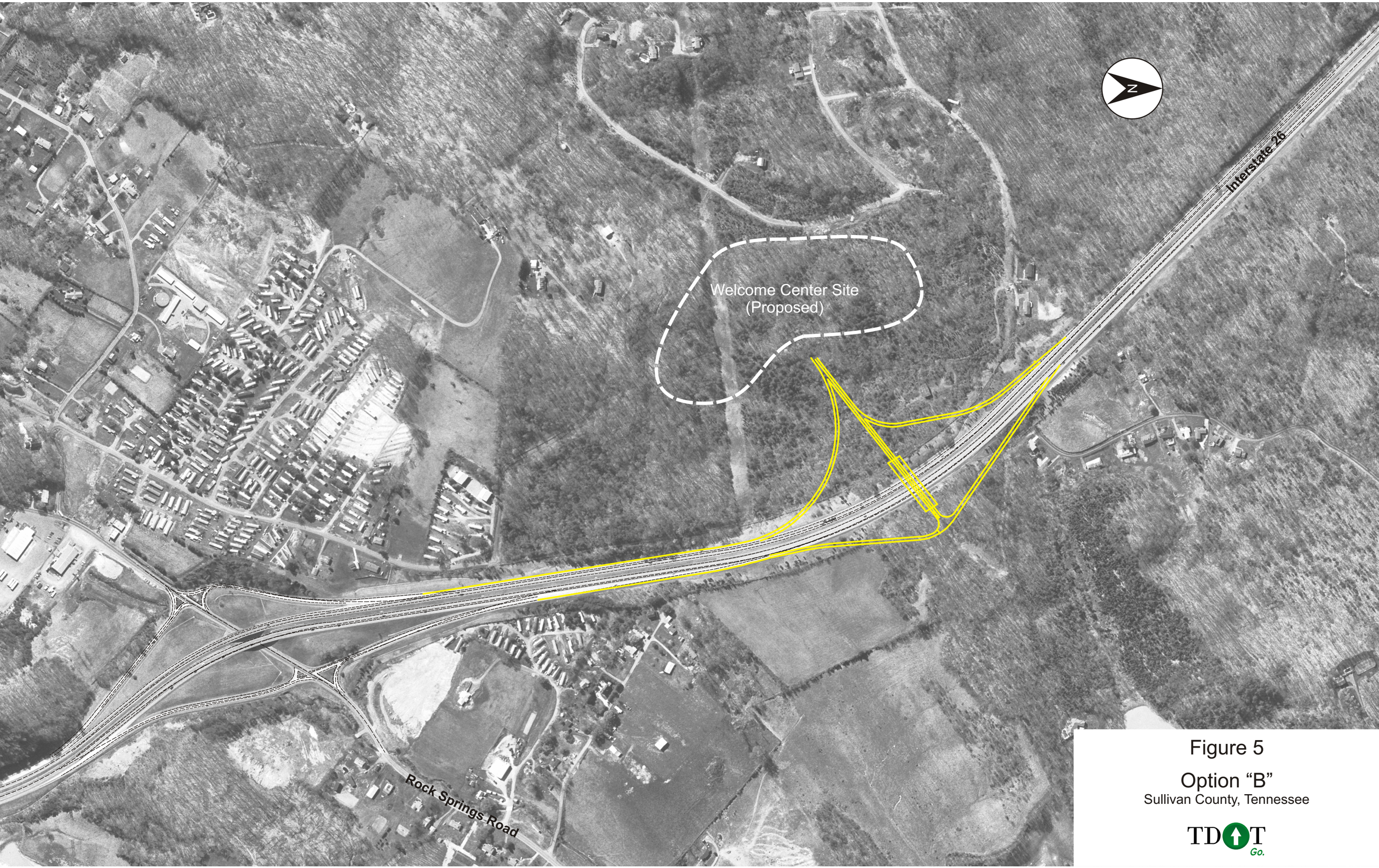


Figure 5

Option “B”

Sullivan County, Tennessee

TDOT Go.

CHAPTER 3

ENGINEERING INVESTIGATIONS

A. Traffic Operations

An analysis was conducted to determine what impacts the proposed Welcome Center interchange would have on I-26 adjacent to the interchange and to the existing State Route 347 (Rock Springs Road) interchange. The traffic operation analysis is contained in the appendix.

Existing Conditions (No-Build Analysis)

Without the proposed Welcome Center, the analysis shows the existing mainline I-26 and the Rock Springs Road interchange operates at acceptable levels of service.

Proposed Conditions (Options A and B)

With the proposed interchange for the Welcome Center, mainline sections of I-26 are not expected to see any significant increases or decreases in traffic volumes. Therefore, mainline operations would be expected to remain at acceptable levels of service.

Tables 1-3 show a summary of the levels of service for various sections of the study area.

Both Options A and B are expected to have similar levels of service. The weaving maneuver on the proposed auxiliary lane between the State Route 347 (Rock Springs Road) interchange and the new Welcome Center interchange is expected to operate at a level of service B in both the 2010 Base Year and 2030 Design Year. No significant traffic operational issues are expected to result from the proposed Welcome Center.

Table 1
Levels of Service
No Build

Direction	Movement	2010	
		AM	PM
Northbound	Rock Springs Road On Ramp	C	B
Southbound	Rock Springs Road Off Ramp	B	B
Northbound	Mainline	C	C
Southbound	Mainline	C	C

Table 2
Levels of Service
Option A

Direction	Movement	2010		2030	
		AM	PM	AM	PM
Northbound	Rock Springs Road On Ramp	N/A	N/A	N/A	N/A
	Welcome Center On Ramp	C	B	C	C
	Weave - Rock Springs Road to Welcome Center	B	B	B	B
Southbound	Rock Springs Road Off Ramp	N/A	N/A	N/A	N/A
	Welcome Center Off Ramp	C	C	C	C
	Weave - Welcome Center to Rock Springs Road	B	B	B	B
Northbound	Mainline	C	C	D	C
Southbound	Mainline	C	C	D	D

Table 3
Levels of Service
Option B

Direction	Movement	2010		2030	
		AM	PM	AM	PM
Northbound	Rock Springs Road On Ramp	N/A	N/A	N/A	N/A
	Welcome Center On Ramp	C	B	C	C
	Weave - Rock Springs Road to Welcome Center	B	B	B	B
Southbound	Rock Springs Road Off Ramp	N/A	N/A	N/A	N/A
	Welcome Center Off Ramp	C	C	C	C
	Weave - Welcome Center to Rock Springs Road	B	B	B	B
Northbound	Mainline	C	C	D	C
Southbound	Mainline	C	C	D	D

B. Cost

The total estimated cost for Option A is $9,768,360. This total estimated cost includes $259,200 for right-of-way acquisition, $92,160 for utility relocations, $8,287,000 for construction, and $1,130,000 for preliminary engineering. The total estimated cost for Option B is $8,966,360. This total estimated cost for Option B includes $259,200 for right-of-way acquisition, $92,160 for utility relocations, $7,581,000 for construction, and $1,034,000 for preliminary engineering. The cost estimates are detailed on the following pages. Worksheets used in developing these cost estimates are contained in the appendix of this report.

C. Environmental Concerns

While analyzing other locations for the new Welcome Center, TDOT found significant karst terrain in the area south of State Route 93. This terrain has subsequently been identified as three geologic formations: Honaker Formation, Knox Group, and Sevier Shale. In particular, developmental issues such as sensitive sinkholes, caves, and subsurface drainage are associated with the Honaker and Knox conditions and these features were found to be present in the area. Therefore, the proposed site of an interchange for a new Welcome Center is located near State Route 347 (Rock Springs Road) to avoid this karst area.

An unnamed but USGS-identified stream is located near the project area, draining into a nearby sinkhole on the west side of I-26. Modifications to the State Route 347 (Rock Springs Road) interchange could affect Rock Springs Branch and potentially one or more lesser tributary streams flowing into it. At least two other drainage features that empty into nearby sinkholes could be affected as well. Proper permitting and special considerations may be required to minimize impacts to these streams.

Project:Corridor B Welcome Center: Preferred Site - Option A
Length: Addition of Full Interchange Ramps & Cross-Street

Right-of-Way			
Land, Improvements and Damages (Acres)	9 acres		$243,600.00
Incidentals (5 Tracts)			$15,600.00
Relocation Payments (Residentials)		0	$0.00
(Businesses)		0	
(Non-Profit)		0	
Total Right-of-Way Cost			$259,200.00
Utility Relocation			
Reimbursable			$84,480.00
Non-Reimbursable			$7,680.00
Total Adjustment Cost			$92,160.00
Construction Cost			
Clearing and Grubbing			$50,000.00
Earthwork			$2,997,000.00
Pavement Removal			$0.00
Drainage			$515,000.00
Major Items	$182,000.00		
Other Drainage	$77,000.00		
Erosion Control	$256,000.00		
Structures			$1,188,000.00
Railroad Crossing or Separation Structure			$0.00
Paving			$1,210,000.00
Retaining Walls			$45,000.00
Maintenance of Traffic			$50,000.00
Topsoil			$75,000.00
Seeding			$24,000.00
Sodding			$297,000.00
Signing			$108,000.00
Signalization			$0.00
Fence			$80,000.00
Guardrail			$11,000.00
Rip-Rap or Slope Protection			$0.00
Other Const. Items (8.5%)			$565,000.00
Sub-Total Construction			$7,215,000.00
Mobilization			$319,000.00
Sub-Total Construction			$7,534,000.00
10% Engineering and Contingencies			$753,000.00
Total Construction Cost			$8,287,000.00
Preliminary Engineering (15%)			$1,130,000.00
TOTAL PROJECT COST			$9,768,360.00

Project:Corridor B Welcome Center: Preferred Site - Option B
Length: Addition of Full Interchange Ramps & Cross-Street

Right-of-Way			
Land, Improvements and Damages (Acres)	9 acres		$243,600.00
Incidentals (00 Tracts)			$15,600.00
Relocation Payments (Residentials)		0	$0.00
(Businesses)		0	
(Non-Profit)		0	
Total Right-of-Way Cost			$259,200.00
Utility Relocation			
Reimbursable			$84,480.00
Non-Reimbursable			$7,680.00
Total Adjustment Cost			$92,160.00
Construction Cost			
Clearing and Grubbing			$50,000.00
Earthwork			$2,583,000.00
Pavement Removal			$0.00
Drainage			$504,000.00
Major Items	$200,000.00		
Other Drainage	$70,000.00		
Erosion Control	$234,000.00		
Structures			$1,089,000.00
Railroad Crossing or Separation Structure			$0.00
Paving			$1,215,000.00
Retaining Walls			$45,000.00
Maintenance of Traffic			$50,000.00
Topsoil			$75,000.00
Seeding			$24,000.00
Sodding			$247,000.00
Signing			$108,000.00
Signalization			$0.00
Fence			$80,000.00
Guardrail			$11,000.00
Rip-Rap or Slope Protection			$0.00
Other Const. Items (8.5%)			$517,000.00
Sub-Total Construction			$6,598,000.00
Mobilization			$294,000.00
Sub-Total Construction			$6,892,000.00
10% Engineering and Contingencies			$689,000.00
Total Construction Cost			$7,581,000.00
Preliminary Engineering (15%)			$1,034,000.00
TOTAL PROJECT COST			$8,966,360.00

CHAPTER 4

FHWA POLICY REQUIREMENTS

1. The existing interchanges and/or local roads and streets in the corridor can neither provide the necessary access nor be improved to satisfactorily accommodate the design-year traffic demands while at the same time providing the access intended by the proposal.

The existing interchanges and/or local roads and streets within the corridor cannot provide the necessary access or meet the traffic demands that will be associated with the new Welcome Center along I-26. Since a new Welcome Center will be provided, a new interchange will be needed at the proposed location. The Welcome Center is not expected to generate additional traffic along I-26 as it is intended for traffic currently travelling along I-26.

2. All reasonable alternatives for design options, location and transportation system management type improvements (such as ramp metering, mass transit, and HOV facilities) have been assessed and provided for if currently justified, or provisions are included for accommodating such facilities if a future need is identified.

Two interchange configurations were analyzed based on the input of local officials and the analysis of the projected traffic. Based on the proposed traffic volumes, two design configurations were determined to be the most logical – economically and environmentally – to construct. A trumpet interchange (Option A) and a simple diamond interchange (Option B) were analyzed. In both cases, an auxiliary lane for weaving is proposed between the State Route 347 (Rock Springs Road) interchange and the proposed Welcome Center ramps. The two options are shown in Figures 4 and 5 of this report.

Transportation system management improvement options do not apply to this project since the interchange is not intended to address congestion issues or is it expected to generate any additional traffic (only captured traffic).

3. The proposed access point does not have a significant adverse impact on the safety and operation of the Interstate facility based on an analysis of current and future traffic. The operational analysis for existing conditions shall, particularly in urbanized areas, include analysis of sections of Interstate to and including at least the first adjacent existing or proposed interchange on either side. Crossroads and other roads and streets shall be included in the analysis to the extent necessary to assure their ability to collect and distribute traffic to and from the interchange with new or revised access points.

The proposed interchange is not expected to have any significant adverse impacts on I-26 or other roads in the area. Both Options A and B are expected to have similar levels of service. The weaving maneuver on the proposed auxiliary lane between the State Route 347 (Rock Springs Road) interchange and the new Welcome Center interchange is expected to operate at a level of service B in both the 2010 Base Year and 2030 Design Year. No significant traffic operational issues are expected to result from the proposed Welcome Center. See Chapter 3 of this report for details on the operational analyses of the proposed interchange.

4. The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" for special purposes access for transit vehicles, for HOV's, or into park and ride lots may be considered on a case-by-case basis. The proposed access will be designed to meet or exceed current standards for Federal-aid projects on the Interstate System.

A full diamond interchange is recommended for the new Welcome Center on I-26. Access to the Welcome Center will be a public road and will provide for all traffic movements.

5. *The proposal considers and is consistent with local and regional land use and transportation plans.*

The preferred option is consistent with existing and proposed plans for development in the area, and would provide direct access to the new Welcome Center. Furthermore, the Kingsport Area Metropolitan Planning Organization (MPO) has identified a new interchange and Tennessee Welcome Center along I-26 near Rock Springs Road in its 2030 Long Range Transportation Plan (LRP). The new interchange is identified as project number I-1a in the MPO's LRP.

6. In areas where the potential exists for future multiple interchange additions, all requests for new or revised access are supported by a comprehensive Interstate network study with recommendations that address all proposed and desired access within the context of a long-term plan.

The access request for the new Welcome Center on I-26 is in a well-developed area of the interstate. Adjacent existing interchanges are located at State Route 347 (Rock Springs Road), approximately 0.67± miles south of the proposed location and at State Route 93, approximately 1.5± miles north of the proposed location. Other nearby interchanges include Meadowview Parkway (2.0± miles north), US 11W/Stone Drive (5.5± miles north), and a directional interchange with I-81 (2.8± miles south). It is not expected that any future interchanges will be constructed within the area.

7. The request for a new or revised access generated by new or expanded development demonstrates appropriate coordination between the development and related or otherwise required transportation system improvements.

At the request of the City of Kingsport, investigation was made of relocating the proposed Welcome Center site to other locations along I-26. The current site just north of State Route 347 (Rock Springs Road) was chosen over at least five (5) other locations due to its size, availability, public support, and access opportunities. The new Welcome Center is not likely to generate additional traffic along I-26. As a result, additional transportation system improvements are not expected.

8. The request for new or revised access contains information relative to the planning requirements and the status of the environmental processing of the proposal.

An environmental analysis was conducted as part of this IJS. The complete findings of the environmental analysis can be found in Chapter 3 – Section C of this report. Proper permitting and special considerations may be required to minimize impacts to the streams located near the study area. At the time of this report, the status of any specific environmental documents is unknown.

CHAPTER 5

SUMMARY AND CONCLUSIONS

The preceding study was conducted to evaluate current and future traffic operations on Appalachian Development Route Interstate 26 near the proposed Welcome Center.

Through the analysis of five (5) Welcome Center sites, the proposed interchange location was selected as the most desirable by local officials and agreed upon by TDOT. All proposed intersections, ramps, weaving areas, and mainline sections have been shown to operate at acceptable levels in both AM and PM peak periods through the 2030 design year.

Both Options A and B are expected to have similar levels of service. However, Option B is recommended for implementation of the proposed interchange. The total cost for Option B is expected to be approximately $1,145,000 lower than Option A. Fully developed concept plans for Option B are included in the appendix.

The Design Division Concurrence Letter is included on the following page.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-0348

MEMORANDUM

TO: Steve Allen, Director, Project Planning Division

FROM: MA Michael Agnew, Assistant Director, Design Division

DATE: July 30, 2008 (Revised)

SUBJECT: Pin No. 102241.00
I-26, Welcome Station
Sullivan County

The Design Division has reviewed the functional line sketches for Options "A' & "B" for the proposed I-26 Welcome Center located north of the Rock Springs Road Interchange. Both options provide for ingress and egress to I-26 from the proposed Welcome Center for both northbound and southbound traffic with Option "A" utilizing a trumpet interchange configuration and Option "B" utilizing a diamond interchange configuration. As requested in your memorandum of May 12, 2008, the Design Division is providing concurrence for the subject project as requested based upon the review of the functional line sketches and study prepared by Neel-Schaffer, Inc. for the Department.

Ramp spacing between the Rock Springs Road Interchange and the proposed Welcome Center interchange was reviewed for both alternates and found to meet minimum weave distance recommended by AASHTO in the 2001 Policy on Geometric Design of Highways and Streets. The review also confirmed that both alternates could be adequately signed along with the Rock Springs Road interchange.

Due to the level of detail of the functional line sketches, it was not possible to check controlling elements of design including alignment and profile. Based upon the review of the functional sketches, it appears that if any modifications to the geometry are required to meet design standards during the survey and design phase, the modifications should be minimal and would not change the location of access points, the design concept, or interchange location.

MA/MA

cc: Mr. Jeff Jones

APPENDIX

NO BUILD

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/24/2007
Analysis time period:	No Build DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Junction:	Rock Springs Road
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - No Bui

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2096	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	241	vph
Length of first accel/decel lane	920	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2096	241		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	582	67		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2410	277	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2410 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2687	4700	No
v_{R12}	2687	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 20.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.305

Space mean speed in ramp influence area, S_R = 58.0 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 58.0 mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/24/2007
Analysis time period:	No Build DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Junction:	Rock Springs Road
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - No Bui

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1829	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	243	vph
Length of first accel/decel lane	920	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1829	243		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	508	68		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2103	279	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2103 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2382	4700	No
v_{R12}	2382	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 18.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.290	
Space mean speed in ramp influence area,	S_R = 58.3	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 58.3	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/24/2007
Analysis time period:	No Build DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Junction:	Rock Springs Road
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - No Bui

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2512	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	289	vph
Length of first accel/decel lane	920	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2512	289		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	698	80		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2889	332	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2889 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3221	4700	No
v_{R12}	3221	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 24.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.345	
Space mean speed in ramp influence area,	S_R = 57.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/24/2007
Analysis time period:	No Build DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Junction:	Rock Springs Road
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - No Bui

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2193	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	292	vph
Length of first accel/decel lane	920	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2193	292		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	609	81		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2522	336	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2522 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2858	4700	No
v_{R12}	2858	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 21.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.315	
Space mean speed in ramp influence area,	S_R = 57.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.7	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/23/2007
Analysis time period:	No Build DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Junction:	Rock Springs Road
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - No Bui

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2387	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	129	vph
Length of first accel/decel lane	1100	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2387	129		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	663	36		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2745	148	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2745 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2745	4700	No
v_{12}	2745	4400	No
$v_{FO} = v_F - v_R$	2597	4700	No
v_R	148	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 18.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.441	
Space mean speed in ramp influence area,	S_R = 54.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.8	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/23/2007
Analysis time period:	No Build DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Junction:	Rock Springs Road
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - No Bui

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2448	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	274	vph
Length of first accel/decel lane	1100	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2448	274		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	680	76		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2815	315	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2815 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2815	4700	No
v_{12}	2815	4400	No
$v_{FO} = v_F - v_R$	2500	4700	No
v_R	315	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 18.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.456	
Space mean speed in ramp influence area,	S_R = 54.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/23/2007
Analysis time period:	No Build DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Junction:	Rock Springs Road
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - No Bui

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2896	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	155	vph
Length of first accel/decel lane	1100	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2896	155		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	804	43		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3330	178	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3330 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3330	4700	No
v_{12}	3330	4400	No
$v_{FO} = v_F - v_R$	3152	4700	No
v_R	178	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 23.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.444	
Space mean speed in ramp influence area,	S_R = 54.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.8	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/23/2007
Analysis time period:	No Build DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Junction:	Rock Springs Road
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - No Bui

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2903	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	329	vph
Length of first accel/decel lane	1100	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2903	329		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	806	91		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3338	378	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3338 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3338	4700	No
v_{12}	3338	4400	No
$v_{FO} = v_F - v_R$	2960	4700	No
v_R	378	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 23.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.462	
Space mean speed in ramp influence area,	S_R = 54.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.4	mph

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: DCD
Agency/Co: Neel-Schaffer
Date: 7/26/2007
Analysis Period: No Build DHV AM Peak
Highway: Interstate 26
From/To: north of Rock Springs Road
Jurisdiction:
Analysis Year: 2010
Project ID: Kingsport Welcome Center - No Build

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	60.0	mph	60.0	mph

VOLUME

Direction	1		2	
Volume, V	2337	vph	2387	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	649		663	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.966		0.966	
Flow rate, vp	1343	pcphpl	1372	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1343	pcphpl	1372	pcphpl
Free-flow speed, FFS	60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	60.0	mph	60.0	mph
Level of service, LOS	C		C	
Density, D	22.4	pc/mi/ln	22.9	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DCD
Agency/Co:	Neel-Schaffer
Date:	7/26/2007
Analysis Period:	No Build DHV PM Peak
Highway:	Interstate 26
From/To:	north of Rock Springs Road
Jurisdiction:	
Analysis Year:	2010
Project ID:	Kingsport Welcome Center - No Build

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	60.0	mph	60.0	mph

VOLUME

Direction	1		2	
Volume, V	2072	vph	2448	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	576		680	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.966		0.966	
Flow rate, vp	1191	pcphpl	1407	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1191	pcphpl	1407	pcphpl
Free-flow speed, FFS	60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	60.0	mph	60.0	mph
Level of service, LOS	C		C	
Density, D	19.9	pc/mi/ln	23.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DCD
Agency/Co:	Neel-Schaffer
Date:	7/26/2007
Analysis Period:	2030 DHV AM Peak
Highway:	Interstate 26
From/To:	north of Rock Springs Road
Jurisdiction:	
Analysis Year:	2030
Project ID:	Kingsport Welcome Center - No Build

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	60.0	mph	60.0	mph

VOLUME

Direction	1		2	
Volume, V	2801	vph	2896	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	778		804	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.966		0.966	
Flow rate, vp	1610	pcphpl	1665	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1610	pcphpl	1665	pcphpl
Free-flow speed, FFS	60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	59.1	mph	58.8	mph
Level of service, LOS	D		D	
Density, D	27.2	pc/mi/ln	28.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: DCD
Agency/Co: Neel-Schaffer
Date: 7/26/2007
Analysis Period: 2030 DHV PM Peak
Highway: Interstate 26
From/To: north of Rock Springs Road
Jurisdiction:
Analysis Year: 2030
Project ID: Kingsport Welcome Center - No Build

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	60.0	mph	60.0	mph

VOLUME

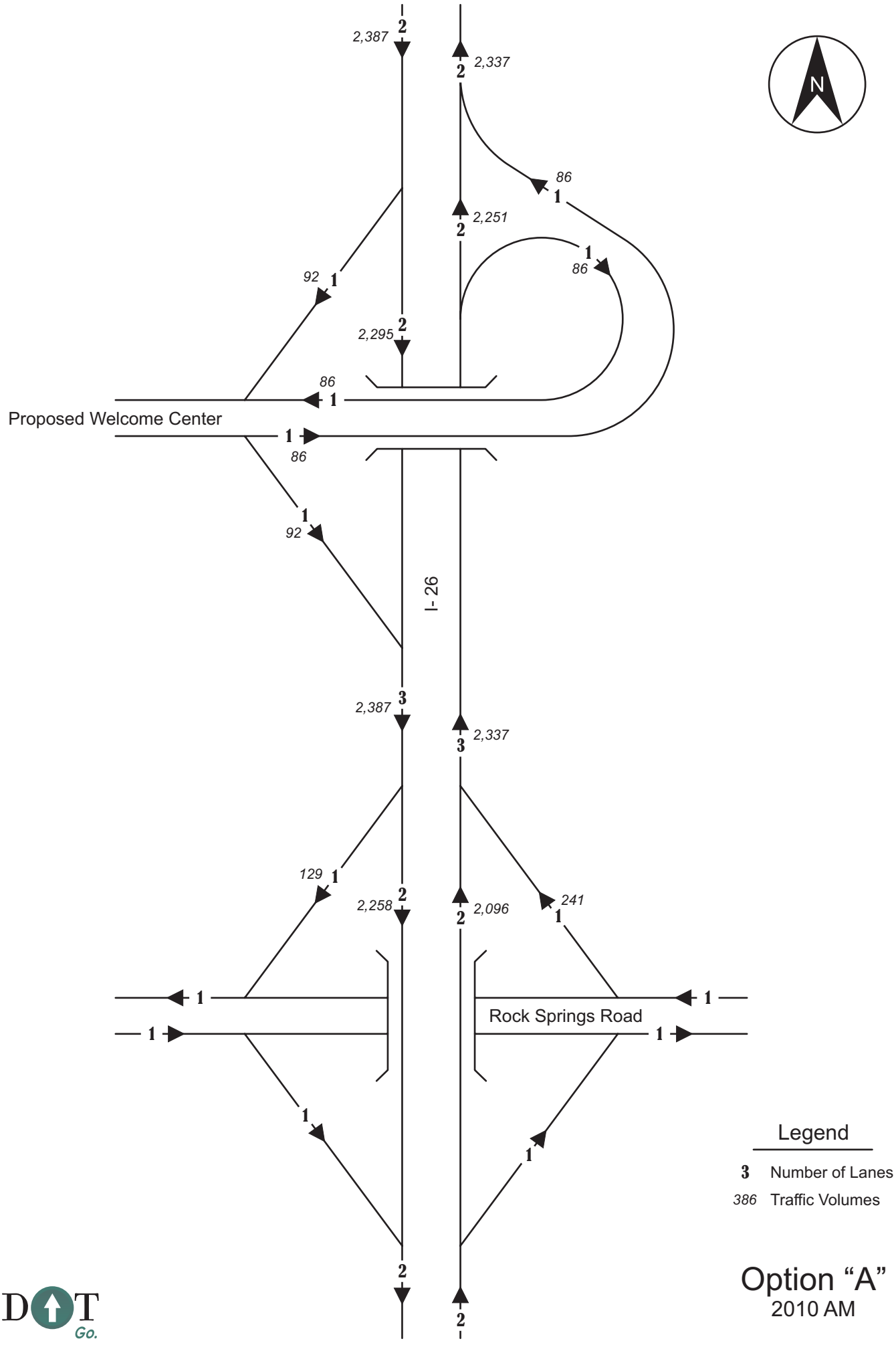
Direction	1		2	
Volume, V	2485	vph	2903	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	690		806	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.966		0.966	
Flow rate, vp	1428	pcphpl	1669	pcphpl

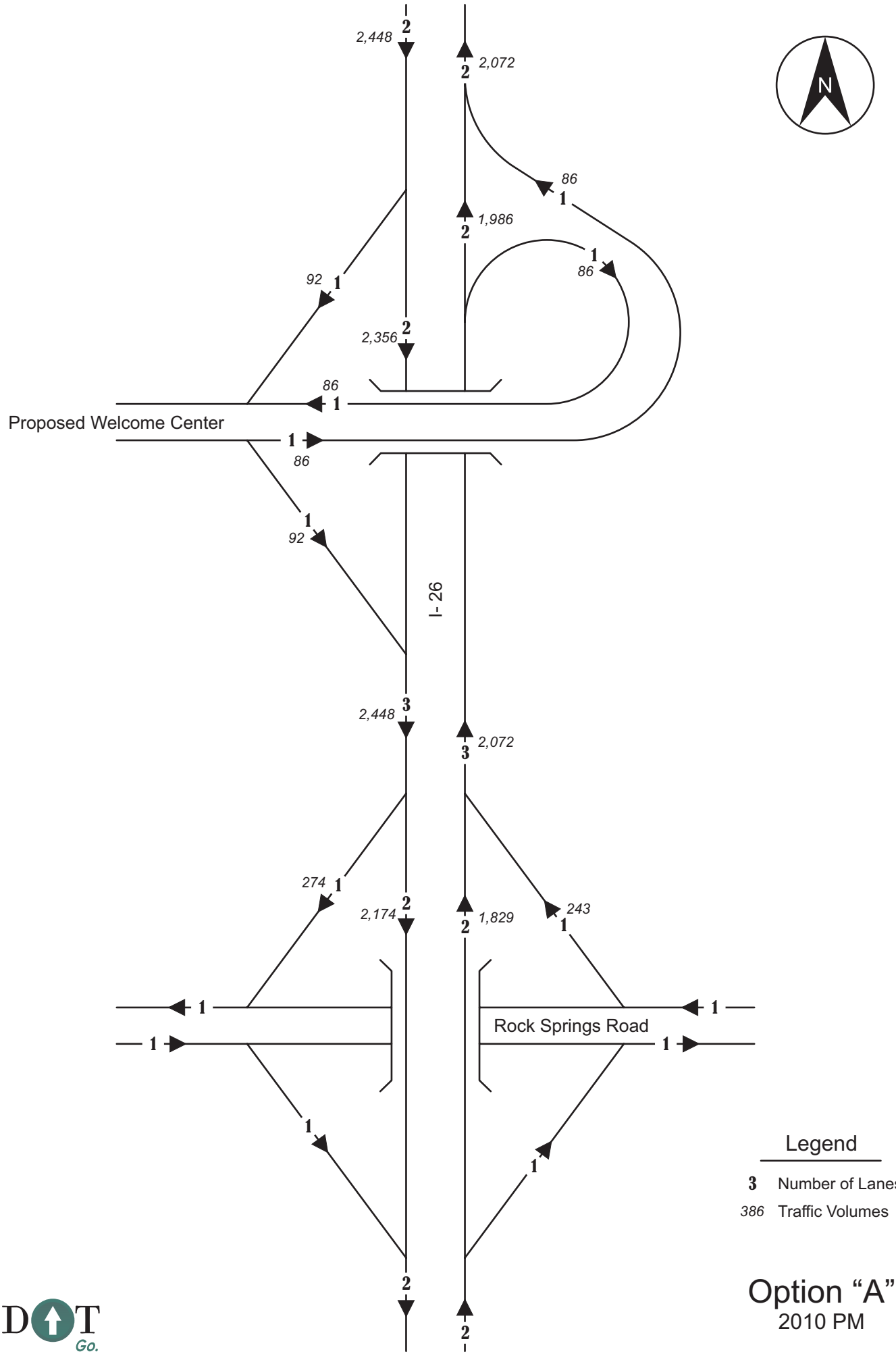
RESULTS

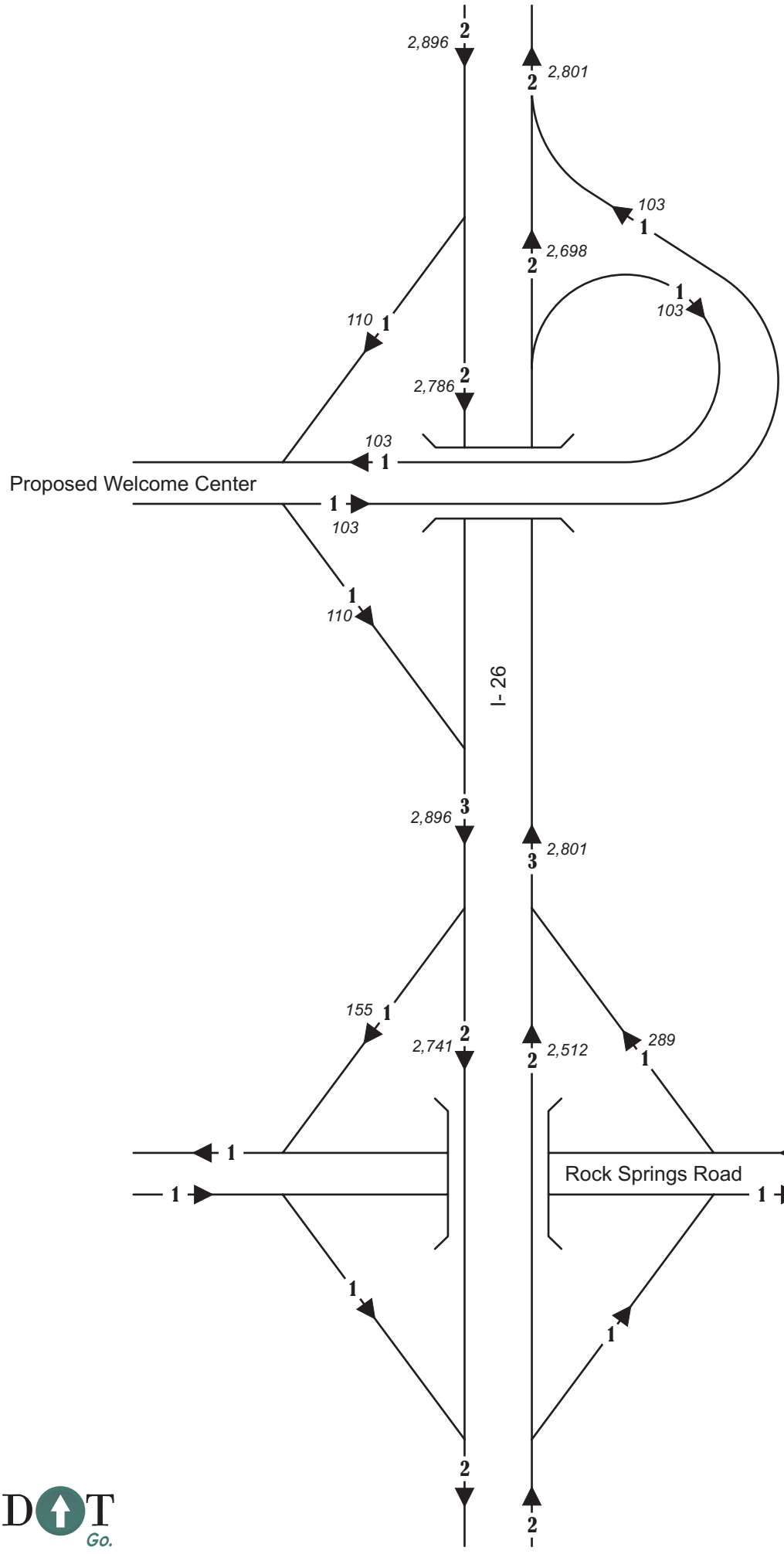
Direction	1		2	
Flow rate, vp	1428	pcphpl	1669	pcphpl
Free-flow speed, FFS	60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	59.9	mph	58.8	mph
Level of service, LOS	C		D	
Density, D	23.8	pc/mi/ln	28.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

OPTION A


N
2,387
2
2,337
2
86
1
2,251
2
1
86
92
1
2,295
2
86
1
Proposed Welcome Center
1
86
1
92
I- 26
2,387
3
2,337
3
129
1
2,258
2
2,096
2
241
1
1
1
Rock Springs Road
1
1
1
1
2
2
Legend
3 Number of Lanes
386 Traffic Volumes
Option “A”
2010 AM
TDOT
Go.


N
2,448
2
2
2,072
86
1
1,986
2
1
86
92
1
2,356
2
86
1
Proposed Welcome Center
1
86
1
92
I- 26
2,448
3
3
2,072
274
1
2,174
2
2
1,829
243
1
1
1
Rock Springs Road
1
1
1
1
2
2
Legend
3 Number of Lanes
386 Traffic Volumes
Option “A”
2010 PM
TDOT
Go.



Legend

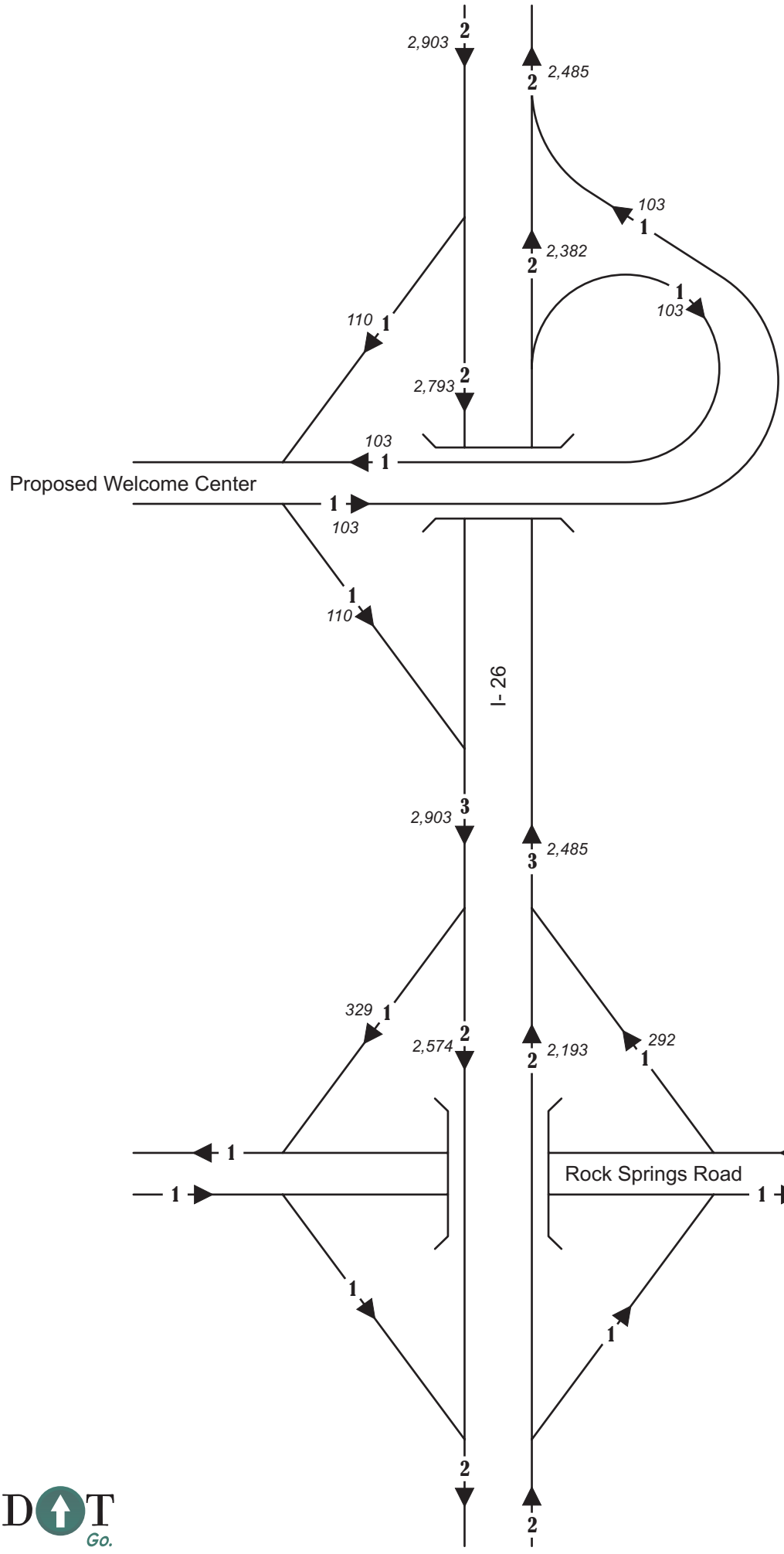
3 Number of Lanes

386 Traffic Volumes

Option "A"

2030 AM

TDOT Go.



Legend

3 Number of Lanes

386 Traffic Volumes

Option "A"

2030 PM

TDOT Go.

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/24/2007
Analysis time period:	2010 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt A

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2251	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	86	vph
Length of first accel/decel lane	820	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2251	86		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	625	24		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2589	99	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM}) =$ 2589 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2688	4700	No
v_{R12}	2688	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A =$ 21.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.313	
Space mean speed in ramp influence area,	S_R = 57.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.8	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/24/2007
Analysis time period:	2010 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt A

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1986	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	86	vph
Length of first accel/decel lane	820	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1986	86		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	552	24		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2284	99	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2284 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2383	4700	No
v_{R12}	2383	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 18.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.298	
Space mean speed in ramp influence area,	S_R = 58.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 58.2	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/24/2007
Analysis time period:	2030 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt A

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2698	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	103	vph
Length of first accel/decel lane	820	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2698	103		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	749	29		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3103	118	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM}) =$ 3103 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3221	4700	No
v_{R12}	3221	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 25.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.353	
Space mean speed in ramp influence area,	S_R = 56.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 56.9	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/24/2007
Analysis time period:	2030 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt A

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2382	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	103	vph
Length of first accel/decel lane	820	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2382	103		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	662	29		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2739	118	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM}) =$ 2739 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2857	4700	No
v_{R12}	2857	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 22.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.323	
Space mean speed in ramp influence area,	S_R = 57.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.6	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/23/2007
Analysis time period:	2010 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt A

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2387	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	92	vph
Length of first accel/decel lane	660	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2387	92		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	663	26		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2745	106	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2745 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2745	4700	No
v_{12}	2745	4400	No
$v_{FO} = v_F - v_R$	2639	4700	No
v_R	106	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 21.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.438	
Space mean speed in ramp influence area,	S_R = 54.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/23/2007
Analysis time period:	2010 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt A

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2448	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	92	vph
Length of first accel/decel lane	660	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2448	92		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	680	26		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2815	106	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2815 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2815	4700	No
v_{12}	2815	4400	No
$v_{FO} = v_F - v_R$	2709	4700	No
v_R	106	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 22.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.438	
Space mean speed in ramp influence area,	S_R = 54.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/23/2007
Analysis time period:	2030 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt A

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2896	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	110	vph
Length of first accel/decel lane	660	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2896	110		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	804	31		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3330	126	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3330 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3330	4700	No
v_{12}	3330	4400	No
$v_{FO} = v_F - v_R$	3204	4700	No
v_R	126	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 27.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.439	
Space mean speed in ramp influence area,	S_R = 54.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/23/2007
Analysis time period:	2030 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt A

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2903	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	110	vph
Length of first accel/decel lane	660	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2903	110		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	806	31		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3338	126	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3338 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3338	4700	No
v_{12}	3338	4400	No
$v_{FO} = v_F - v_R$	3212	4700	No
v_R	126	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 27.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.439	
Space mean speed in ramp influence area,	S_R = 54.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.9	mph

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2010 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt A

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	2200	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.14	
Weaving ratio, R	0.26	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2010	0	86	241	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	558	0	24	67	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2311	0	98	277	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.31	0.13
Weaving and non-weaving speeds, Si	57.01	63.83
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.74
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	62.78	mph
Weaving segment density, D	14.26	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6772	pc/h
Capacity as a 15-minute flow rate, c	6543	pc/h
Capacity as a full-hour volume, ch	5889	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	375	2800	a
Average flow rate (pcphpl)	895	2350	b
Volume ratio, VR	0.14	0.45	c
Weaving ratio, R	0.26	N/A	d
Weaving length (ft)	2200	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2010 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt A

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	2200	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.16	
Weaving ratio, R	0.26	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	1743	0	86	243	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	484	0	24	68	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2004	0	98	279	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.29	0.12
Weaving and non-weaving speeds, Si	57.79	64.31
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.79
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	63.18	mph
Weaving segment density, D	12.56	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6686	pc/h
Capacity as a 15-minute flow rate, c	6460	pc/h
Capacity as a full-hour volume, ch	5814	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	377	2800	a
Average flow rate (pcphpl)	793	2350	b
Volume ratio, VR	0.16	0.45	c
Weaving ratio, R	0.26	N/A	d
Weaving length (ft)	2200	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2030 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt A

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	2200	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.14	
Weaving ratio, R	0.26	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2409	0	103	289	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	669	0	29	80	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2770	0	118	332	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.37	0.16
Weaving and non-weaving speeds, Si	55.18	62.41
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.75
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	61.29	mph
Weaving segment density, D	17.51	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6771	pc/h
Capacity as a 15-minute flow rate, c	6542	pc/h
Capacity as a full-hour volume, ch	5888	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	450	2800	a
Average flow rate (pcphpl)	1073	2350	b
Volume ratio, VR	0.14	0.45	c
Weaving ratio, R	0.26	N/A	d
Weaving length (ft)	2200	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
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Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2030 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt A

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	2200	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.16	
Weaving ratio, R	0.26	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2090	0	103	292	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	581	0	29	81	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2403	0	118	335	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.34	0.15
Weaving and non-weaving speeds, Si	56.03	62.98
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.81
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	61.77	mph
Weaving segment density, D	15.41	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6684	pc/h
Capacity as a 15-minute flow rate, c	6458	pc/h
Capacity as a full-hour volume, ch	5812	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	453	2800	a
Average flow rate (pcphpl)	952	2350	b
Volume ratio, VR	0.16	0.45	c
Weaving ratio, R	0.26	N/A	d
Weaving length (ft)	2200	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2010 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt A

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1750	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.09	
Weaving ratio, R	0.42	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2166	0	129	92	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	602	0	36	26	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2490	0	148	105	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.35	0.13
Weaving and non-weaving speeds, Si	55.88	63.67
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.56
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	62.86	mph
Weaving segment density, D	14.55	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6755	pc/h
Capacity as a 15-minute flow rate, c	6527	pc/h
Capacity as a full-hour volume, ch	5874	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	253	2800	a
Average flow rate (pcphpl)	914	2350	b
Volume ratio, VR	0.09	0.45	c
Weaving ratio, R	0.42	N/A	d
Weaving length (ft)	1750	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2010 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt A

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1750	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.15	
Weaving ratio, R	0.25	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2082	0	274	92	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	578	0	76	26	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2394	0	315	105	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.40	0.16
Weaving and non-weaving speeds, Si	54.40	62.21
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.75
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	60.91	mph
Weaving segment density, D	15.40	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6516	pc/h
Capacity as a 15-minute flow rate, c	6296	pc/h
Capacity as a full-hour volume, ch	5666	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	420	2800	a
Average flow rate (pcphpl)	938	2350	b
Volume ratio, VR	0.15	0.45	c
Weaving ratio, R	0.25	N/A	d
Weaving length (ft)	1750	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

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Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2030 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt A

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1750	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.09	
Weaving ratio, R	0.41	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2631	0	155	110	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	731	0	43	31	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	3025	0	178	126	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.42	0.17
Weaving and non-weaving speeds, Si	53.84	62.14
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.57
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	61.27	mph
Weaving segment density, D	18.11	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6755	pc/h
Capacity as a 15-minute flow rate, c	6527	pc/h
Capacity as a full-hour volume, ch	5874	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	304	2800	a
Average flow rate (pcphpl)	1109	2350	b
Volume ratio, VR	0.09	0.45	c
Weaving ratio, R	0.41	N/A	d
Weaving length (ft)	1750	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
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Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2030 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt A

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1750	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.15	
Weaving ratio, R	0.25	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2464	0	329	110	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	684	0	91	31	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2833	0	378	126	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.47	0.21
Weaving and non-weaving speeds, Si	52.45	60.56
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.76
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	59.18	mph
Weaving segment density, D	18.80	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6507	pc/h
Capacity as a 15-minute flow rate, c	6287	pc/h
Capacity as a full-hour volume, ch	5658	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	504	2800	a
Average flow rate (pcphpl)	1112	2350	b
Volume ratio, VR	0.15	0.45	c
Weaving ratio, R	0.25	N/A	d
Weaving length (ft)	1750	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: DCD
Agency/Co: Neel-Schaffer
Date: 7/26/2007
Analysis Period: 2010 DHV AM Peak
Highway: Interstate 26
From/To: north of Rock Springs Road
Jurisdiction:
Analysis Year: 2010
Project ID: Kingsport Welcome Center - Opt A

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	60.0	mph	60.0	mph

VOLUME

Direction	1		2	
Volume, V	2337	vph	2387	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	649		663	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.966		0.966	
Flow rate, vp	1343	pcphpl	1372	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1343	pcphpl	1372	pcphpl
Free-flow speed, FFS	60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	60.0	mph	60.0	mph
Level of service, LOS	C		C	
Density, D	22.4	pc/mi/ln	22.9	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DCD
Agency/Co:	Neel-Schaffer
Date:	7/26/2007
Analysis Period:	2010 DHV PM Peak
Highway:	Interstate 26
From/To:	north of Rock Springs Road
Jurisdiction:	
Analysis Year:	2010
Project ID:	Kingsport Welcome Center - Opt A

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	60.0	mph	60.0	mph

VOLUME

Direction	1		2	
Volume, V	2072	vph	2448	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	576		680	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.966		0.966	
Flow rate, vp	1191	pcphpl	1407	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1191	pcphpl	1407	pcphpl
Free-flow speed, FFS	60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	60.0	mph	60.0	mph
Level of service, LOS	C		C	
Density, D	19.9	pc/mi/ln	23.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS2000: Multilane Highways Release 4.1f

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: DCD
Agency/Co: Neel-Schaffer
Date: 7/26/2007
Analysis Period: 2030 DHV AM Peak
Highway: Interstate 26
From/To: north of Rock Springs Road
Jurisdiction:
Analysis Year: 2030
Project ID: Kingsport Welcome Center - Opt A

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	60.0	mph	60.0	mph

VOLUME

Direction	1		2	
Volume, V	2801	vph	2896	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	778		804	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.966		0.966	
Flow rate, vp	1610	pcphpl	1665	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1610	pcphpl	1665	pcphpl
Free-flow speed, FFS	60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	59.1	mph	58.8	mph
Level of service, LOS	D		D	
Density, D	27.2	pc/mi/ln	28.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS2000: Multilane Highways Release 4.1f

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: DCD
Agency/Co: Neel-Schaffer
Date: 7/26/2007
Analysis Period: 2030 DHV PM Peak
Highway: Interstate 26
From/To: north of Rock Springs Road
Jurisdiction:
Analysis Year: 2030
Project ID: Kingsport Welcome Center - Opt A

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	60.0	mph	60.0	mph

VOLUME

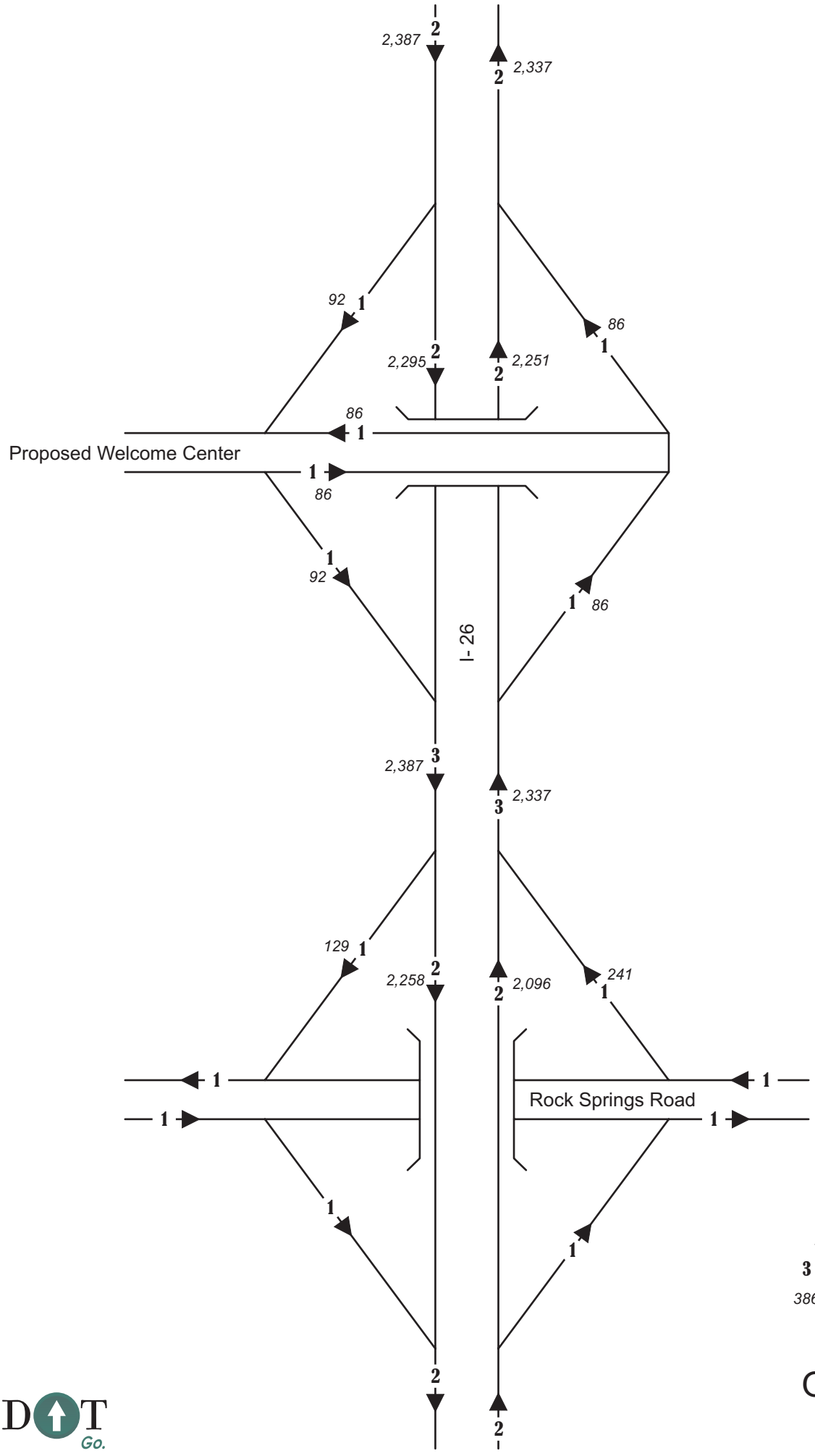
Direction	1		2	
Volume, V	2485	vph	2903	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	690		806	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.966		0.966	
Flow rate, vp	1428	pcphpl	1669	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1428	pcphpl	1669	pcphpl
Free-flow speed, FFS	60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	59.9	mph	58.8	mph
Level of service, LOS	C		D	
Density, D	23.8	pc/mi/ln	28.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

OPTION B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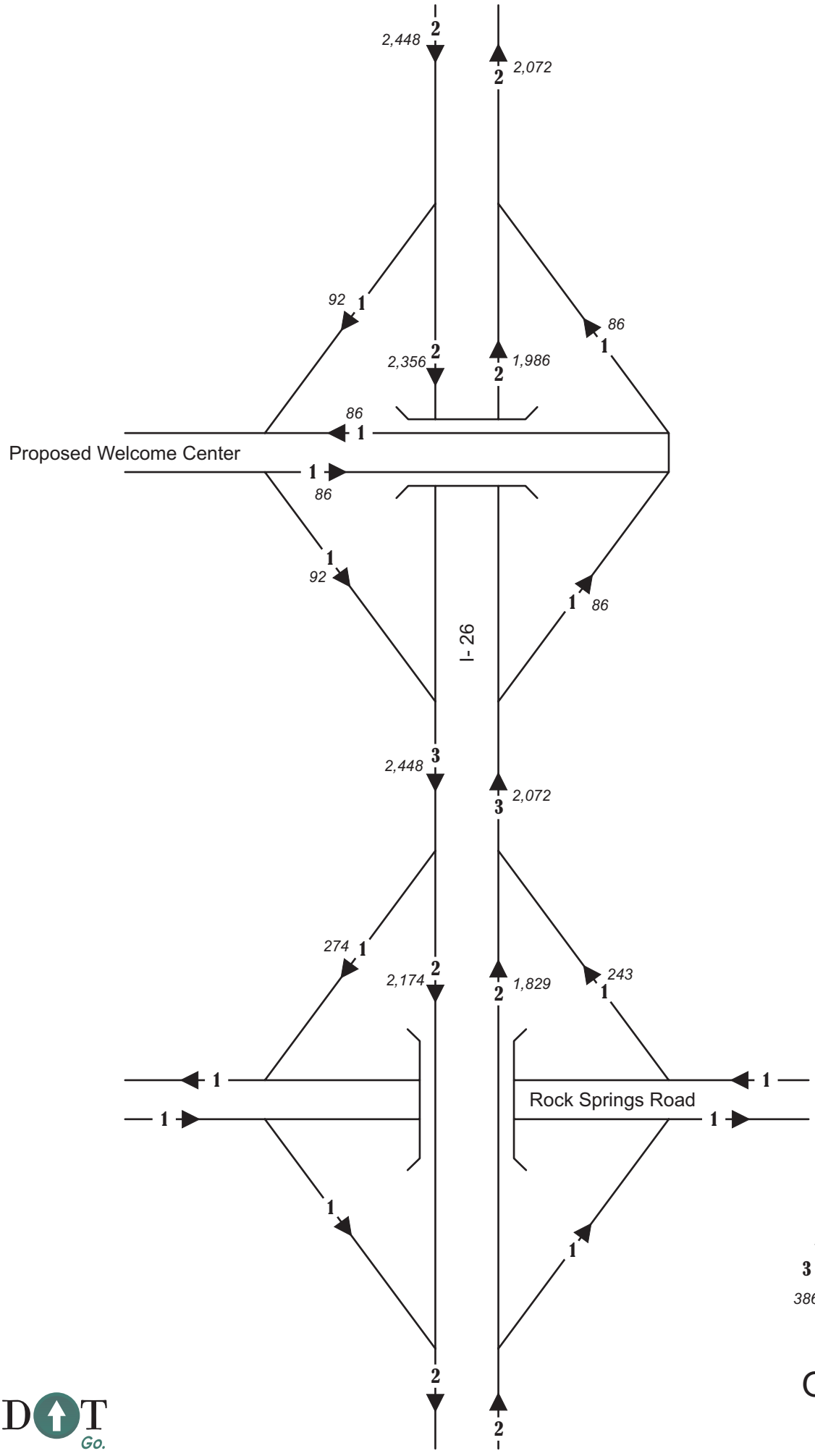
2,387
2
2
2,337
92
1
86
1
2,295
2
2
2,251
86
1
Proposed Welcome Center
1
86
1
92
1
86
I- 26
2,387
3
3
2,337
129
1
241
1
2,258
2
2
2,096
1
1
Rock Springs Road
1
1
1
1
2
2
Legend
3 Number of Lanes
386 Traffic Volumes
Option "B"
2010 AM
TDOT
Go.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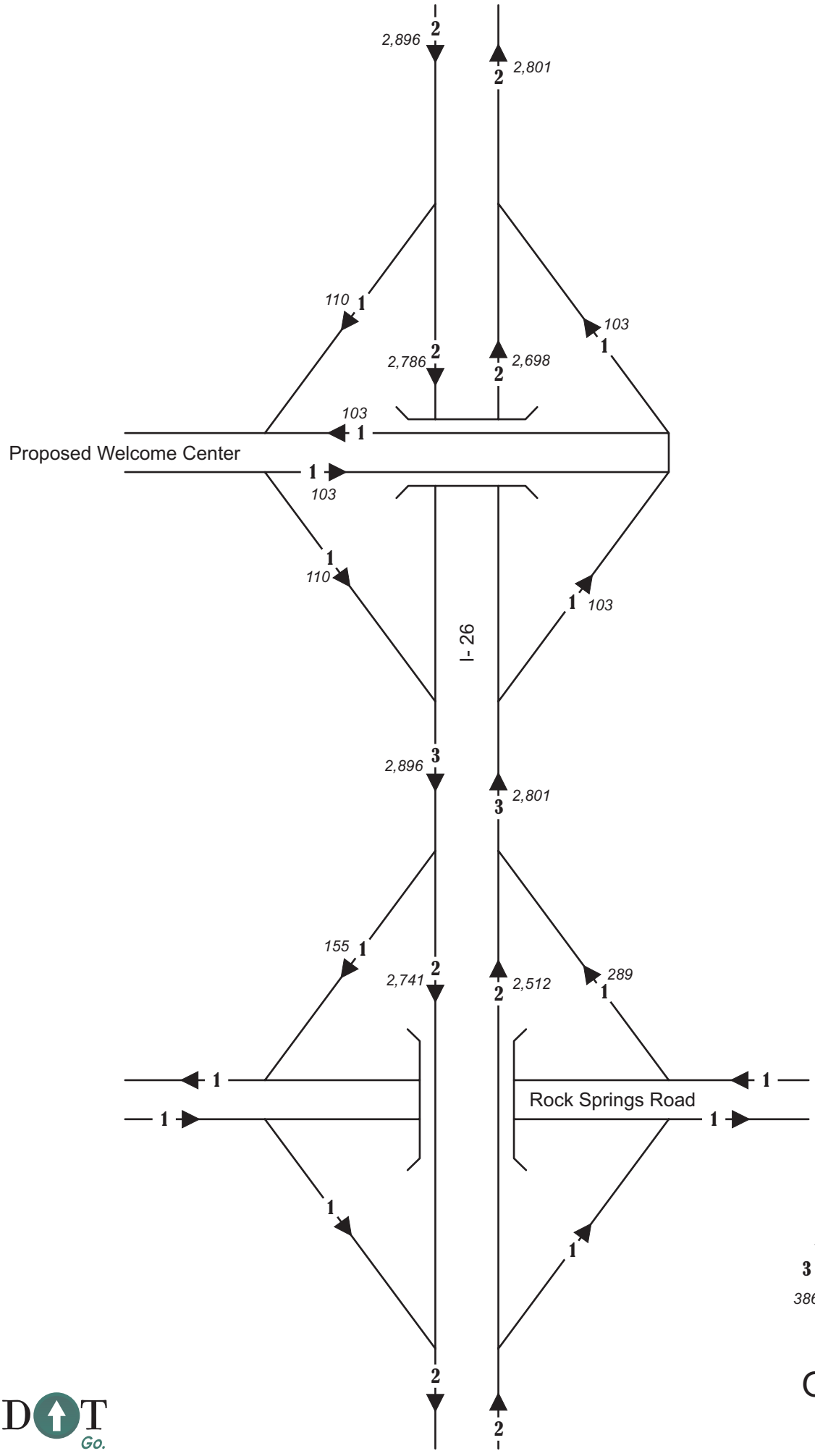
2,448
2
2
2,072
92
1
86
1
2,356
2
2
1,986
86
1
Proposed Welcome Center
1
86
1
92
1
86
I- 26
2,448
3
3
2,072
274
1
2,174
2
2
1,829
243
1
1
1
Rock Springs Road
1
1
1
1
2
2
Legend
3 Number of Lanes
386 Traffic Volumes
Option "B"
2010 PM
TDOT
Go.



Legend

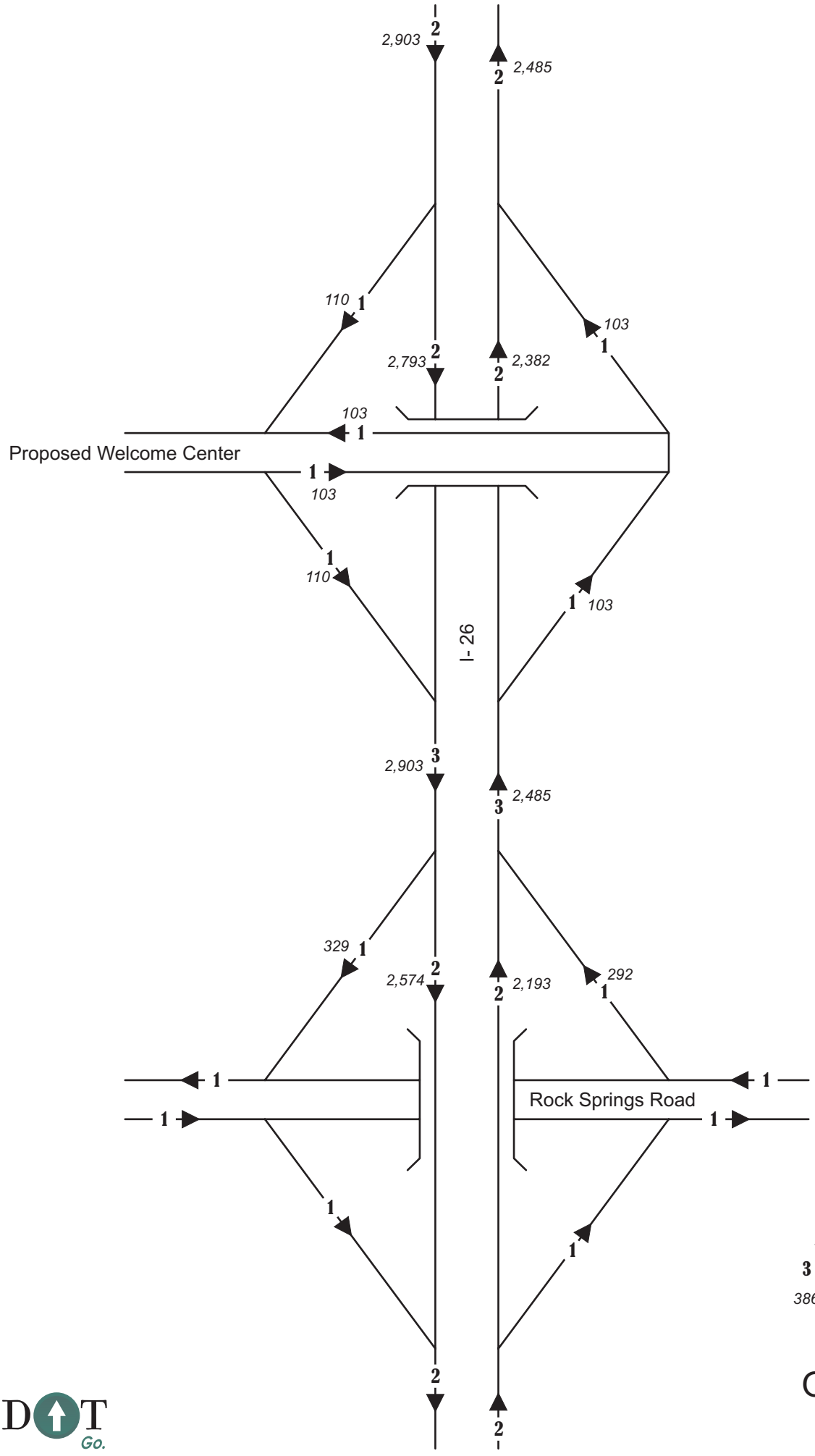
3 Number of Lanes

386 Traffic Volumes

Option "B"

2030 AM

TDOT Go.



Legend

3 Number of Lanes

386 Traffic Volumes

Option "B"

2030 PM

TDOT Go.

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/24/2007
Analysis time period:	2010 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt B

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2251	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	86	vph
Length of first accel/decel lane	820	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2251	86		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	625	24		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2589	99	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM}) =$ 2589 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2688	4700	No
v_{R12}	2688	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A =$ 21.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.313	
Space mean speed in ramp influence area,	S_R = 57.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.8	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/24/2007
Analysis time period:	2010 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt B

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1986	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	86	vph
Length of first accel/decel lane	820	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1986	86		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	552	24		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2284	99	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2284 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2383	4700	No
v_{R12}	2383	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 18.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.298	
Space mean speed in ramp influence area,	S_R = 58.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 58.2	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/24/2007
Analysis time period:	2030 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt B

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2698	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	103	vph
Length of first accel/decel lane	820	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2698	103		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	749	29		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3103	118	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM}) =$ 3103 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3221	4700	No
v_{R12}	3221	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 25.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.353	
Space mean speed in ramp influence area,	S_R = 56.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 56.9	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/24/2007
Analysis time period:	2030 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt B

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2382	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	103	vph
Length of first accel/decel lane	820	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2382	103		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	662	29		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2739	118	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM}) =$ 2739 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2857	4700	No
v_{R12}	2857	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 22.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.323	
Space mean speed in ramp influence area,	S_R = 57.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.6	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/23/2007
Analysis time period:	2010 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt B

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2387	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	92	vph
Length of first accel/decel lane	660	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2387	92		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	663	26		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2745	106	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2745 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2745	4700	No
v_{12}	2745	4400	No
$v_{FO} = v_F - v_R$	2639	4700	No
v_R	106	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 21.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.438	
Space mean speed in ramp influence area,	S_R = 54.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/23/2007
Analysis time period:	2010 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt B

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2448	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	92	vph
Length of first accel/decel lane	660	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2448	92		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	680	26		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2815	106	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2815 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2815	4700	No
v_{12}	2815	4400	No
$v_{FO} = v_F - v_R$	2709	4700	No
v_R	106	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 22.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.438	
Space mean speed in ramp influence area,	S_R = 54.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/23/2007
Analysis time period:	2030 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt B

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2896	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	110	vph
Length of first accel/decel lane	660	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2896	110		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	804	31		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3330	126	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3330 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3330	4700	No
v_{12}	3330	4400	No
$v_{FO} = v_F - v_R$	3204	4700	No
v_R	126	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 27.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.439	
Space mean speed in ramp influence area,	S_R = 54.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date performed:	7/23/2007
Analysis time period:	2030 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Junction:	Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt B

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	2903	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	110	vph
Length of first accel/decel lane	660	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2903	110		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	806	31		v
Trucks and buses	7	7		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.966	0.966	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3338	126	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3338 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3338	4700	No
v_{12}	3338	4400	No
$v_{FO} = v_F - v_R$	3212	4700	No
v_R	126	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 27.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.439	
Space mean speed in ramp influence area,	S_R = 54.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.9	mph

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2010 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt B

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1250	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.14	
Weaving ratio, R	0.26	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2010	0	86	241	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	558	0	24	67	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2311	0	98	277	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.49	0.19
Weaving and non-weaving speeds, Si	52.01	61.09
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.68
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	59.64	mph
Weaving segment density, D	15.01	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6231	pc/h
Capacity as a 15-minute flow rate, c	6020	pc/h
Capacity as a full-hour volume, ch	5418	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	375	2800	a
Average flow rate (pcphpl)	895	2350	b
Volume ratio, VR	0.14	0.45	c
Weaving ratio, R	0.26	N/A	d
Weaving length (ft)	1250	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2010 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt B

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1250	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.16	
Weaving ratio, R	0.26	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	1743	0	86	243	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	484	0	24	68	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2004	0	98	279	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.45	0.18
Weaving and non-weaving speeds, Si	52.97	61.76
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.72
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	60.18	mph
Weaving segment density, D	13.19	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6139	pc/h
Capacity as a 15-minute flow rate, c	5931	pc/h
Capacity as a full-hour volume, ch	5338	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	377	2800	a
Average flow rate (pcphpl)	793	2350	b
Volume ratio, VR	0.16	0.45	c
Weaving ratio, R	0.26	N/A	d
Weaving length (ft)	1250	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2030 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt B

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1250	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.14	
Weaving ratio, R	0.26	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2409	0	103	289	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	669	0	29	80	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2770	0	118	332	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.58	0.24
Weaving and non-weaving speeds, Si	49.81	59.19
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.69
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	57.67	mph
Weaving segment density, D	18.61	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6230	pc/h
Capacity as a 15-minute flow rate, c	6019	pc/h
Capacity as a full-hour volume, ch	5417	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	450	2800	a
Average flow rate (pcphpl)	1073	2350	b
Volume ratio, VR	0.14	0.45	c
Weaving ratio, R	0.26	N/A	d
Weaving length (ft)	1250	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2030 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 NB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt B

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1250	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.16	
Weaving ratio, R	0.26	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2090	0	103	292	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	581	0	29	81	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2403	0	118	335	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.54	0.22
Weaving and non-weaving speeds, Si	50.83	59.95
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.74
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	58.29	mph
Weaving segment density, D	16.33	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6138	pc/h
Capacity as a 15-minute flow rate, c	5930	pc/h
Capacity as a full-hour volume, ch	5337	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	453	2800	a
Average flow rate (pcphpl)	952	2350	b
Volume ratio, VR	0.16	0.45	c
Weaving ratio, R	0.26	N/A	d
Weaving length (ft)	1250	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2010 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt B

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1750	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.09	
Weaving ratio, R	0.42	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2166	0	129	92	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	602	0	36	26	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2490	0	148	105	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.35	0.13
Weaving and non-weaving speeds, Si	55.88	63.67
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.56
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	62.86	mph
Weaving segment density, D	14.55	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6755	pc/h
Capacity as a 15-minute flow rate, c	6527	pc/h
Capacity as a full-hour volume, ch	5874	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	253	2800	a
Average flow rate (pcphpl)	914	2350	b
Volume ratio, VR	0.09	0.45	c
Weaving ratio, R	0.42	N/A	d
Weaving length (ft)	1750	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2010 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2010
Description:	Kingsport Welcome Center - Opt B

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1750	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.15	
Weaving ratio, R	0.25	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2082	0	274	92	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	578	0	76	26	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2394	0	315	105	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.40	0.16
Weaving and non-weaving speeds, Si	54.40	62.21
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.75
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	60.91	mph
Weaving segment density, D	15.40	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6516	pc/h
Capacity as a 15-minute flow rate, c	6296	pc/h
Capacity as a full-hour volume, ch	5666	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	420	2800	a
Average flow rate (pcphpl)	938	2350	b
Volume ratio, VR	0.15	0.45	c
Weaving ratio, R	0.25	N/A	d
Weaving length (ft)	1750	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2030 DHV AM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt B

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1750	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.09	
Weaving ratio, R	0.41	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2631	0	155	110	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	731	0	43	31	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	3025	0	178	126	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.42	0.17
Weaving and non-weaving speeds, Si	53.84	62.14
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.57
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	61.27	mph
Weaving segment density, D	18.11	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6755	pc/h
Capacity as a 15-minute flow rate, c	6527	pc/h
Capacity as a full-hour volume, ch	5874	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	304	2800	a
Average flow rate (pcphpl)	1109	2350	b
Volume ratio, VR	0.09	0.45	c
Weaving ratio, R	0.41	N/A	d
Weaving length (ft)	1750	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	DCD
Agency/Co.:	Neel-Schaffer
Date Performed:	7/24/2007
Analysis Time Period:	2030 DHV PM Peak
Freeway/Dir of Travel:	Interstate 26 SB
Weaving Location:	Rock Springs to Welcome Center
Jurisdiction:	
Analysis Year:	2030
Description:	Kingsport Welcome Center - Opt B

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1750	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.15	
Weaving ratio, R	0.25	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	2464	0	329	110	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	684	0	91	31	v
Trucks and buses	7	7	7	7	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.966	0.966	0.966	0.966	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2833	0	378	126	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.47	0.21
Weaving and non-weaving speeds, Si	52.45	60.56
Number of lanes required for		

unconstrained operation, Nw (Exhibit 24-7)	0.76
Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	59.18	mph
Weaving segment density, D	18.80	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	6507	pc/h
Capacity as a 15-minute flow rate, c	6287	pc/h
Capacity as a full-hour volume, ch	5658	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	504	2800	a
Average flow rate (pcphpl)	1112	2350	b
Volume ratio, VR	0.15	0.45	c
Weaving ratio, R	0.25	N/A	d
Weaving length (ft)	1750	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DCD
Agency/Co:	Neel-Schaffer
Date:	7/26/2007
Analysis Period:	2010 DHV AM Peak
Highway:	Interstate 26
From/To:	north of Rock Springs Road
Jurisdiction:	
Analysis Year:	2010
Project ID:	Kingsport Welcome Center - Opt B

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	60.0	mph	60.0	mph

VOLUME

Direction	1		2	
Volume, V	2337	vph	2387	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	649		663	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.966		0.966	
Flow rate, vp	1343	pcphpl	1372	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1343	pcphpl	1372	pcphpl
Free-flow speed, FFS	60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	60.0	mph	60.0	mph
Level of service, LOS	C		C	
Density, D	22.4	pc/mi/ln	22.9	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	DCD
Agency/Co:	Neel-Schaffer
Date:	7/26/2007
Analysis Period:	2010 DHV PM Peak
Highway:	Interstate 26
From/To:	north of Rock Springs Road
Jurisdiction:	
Analysis Year:	2010
Project ID:	Kingsport Welcome Center - Opt B

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	60.0	mph	60.0	mph

VOLUME

Direction	1		2	
Volume, V	2072	vph	2448	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	576		680	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.966		0.966	
Flow rate, vp	1191	pcphpl	1407	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1191	pcphpl	1407	pcphpl
Free-flow speed, FFS	60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	60.0	mph	60.0	mph
Level of service, LOS	C		C	
Density, D	19.9	pc/mi/ln	23.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS2000: Multilane Highways Release 4.1f

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: DCD
Agency/Co: Neel-Schaffer
Date: 7/26/2007
Analysis Period: 2030 DHV AM Peak
Highway: Interstate 26
From/To: north of Rock Springs Road
Jurisdiction:
Analysis Year: 2030
Project ID: Kingsport Welcome Center - Opt B

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	60.0	mph	60.0	mph

VOLUME

Direction	1		2	
Volume, V	2801	vph	2896	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	778		804	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.966		0.966	
Flow rate, vp	1610	pcphpl	1665	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1610	pcphpl	1665	pcphpl
Free-flow speed, FFS	60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	59.1	mph	58.8	mph
Level of service, LOS	D		D	
Density, D	27.2	pc/mi/ln	28.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS2000: Multilane Highways Release 4.1f

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: DCD
Agency/Co: Neel-Schaffer
Date: 7/26/2007
Analysis Period: 2030 DHV PM Peak
Highway: Interstate 26
From/To: north of Rock Springs Road
Jurisdiction:
Analysis Year: 2030
Project ID: Kingsport Welcome Center - Opt B

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	0		0	
Median type				
Free-flow speed:	Measured		Measured	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	0.0	mph	0.0	mph
Free-flow speed	60.0	mph	60.0	mph

VOLUME

Direction	1		2	
Volume, V	2485	vph	2903	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	690		806	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.966		0.966	
Flow rate, vp	1428	pcphpl	1669	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1428	pcphpl	1669	pcphpl
Free-flow speed, FFS	60.0	mph	60.0	mph
Avg. passenger-car travel speed, S	59.9	mph	58.8	mph
Level of service, LOS	C		D	
Density, D	23.8	pc/mi/ln	28.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

COST ANALYSIS WORKSHEETS

Project:Corridor B Welcome Center: Preferred Site - Option A
Length: Addition of Full Interchange Ramps & Cross-Street

Right-of-Way			
Land, Improvements and Damages (Acres)	9 acres		$243,600.00
Incidentals (5 Tracts)			$15,600.00
Relocation Payments (Residentials)		0	$0.00
(Businesses)		0	
(Non-Profit)		0	
Total Right-of-Way Cost			$259,200.00
Utility Relocation			
Reimbursable			$84,480.00
Non-Reimbursable			$7,680.00
Total Adjustment Cost			$92,160.00
Construction Cost			
Clearing and Grubbing			$50,000.00
Earthwork			$2,997,000.00
Pavement Removal			$0.00
Drainage			$515,000.00
Major Items	$182,000.00		
Other Drainage	$77,000.00		
Erosion Control	$256,000.00		
Structures			$1,188,000.00
Railroad Crossing or Separation Structure			$0.00
Paving			$1,210,000.00
Retaining Walls			$45,000.00
Maintenance of Traffic			$50,000.00
Topsoil			$75,000.00
Seeding			$24,000.00
Sodding			$297,000.00
Signing			$108,000.00
Signalization			$0.00
Fence			$80,000.00
Guardrail			$11,000.00
Rip-Rap or Slope Protection			$0.00
Other Const. Items (8.5%)			$565,000.00
Sub-Total Construction			$7,215,000.00
Mobilization			$319,000.00
Sub-Total Construction			$7,534,000.00
10% Engineering and Contingencies			$753,000.00
Total Construction Cost			$8,287,000.00
Preliminary Engineering (15%)			$1,130,000.00
TOTAL PROJECT COST			$9,768,360.00

Cost Estimate Worksheet

Route:	Corridor B Welcome Center: Preferred Site - Alt A					Section		
From:						To:		
Length (Mi)	Addition of Full Interchange Ramps & Cross-Street					(Ft.)		
1. Clearing and Grubbing								
Acreage	10.00	X Cost/Acre	$5,000.00					$50,000.00
2. Earthwork								
Average Cut/Fill	Variable							
Type of Excavation	Unc.							
Yardage Factor	128.90	X Length	0.00	X Percentage	0.70			
= C.Y.	333000	X Unit Price	$9.00				$2,997,000.00	
Subtotal for Earthwork								$2,997,000.00
3. Pavement Removal								
No. of Roads	0	X Length	500	X unit price	$15.00			$0.00
4. Drainage								
Catch Basins	1	X $3,000					$3,000.00	
Pipe 18"		Length	1700	X unit price	$60.00		$102,000.00	
Pipe 24"		Length	860	X unit price	$60.00		$51,600.00	
Pipe 30"		Length	690	X unit price	$30.00		$20,700.00	
Culverts; L	0	X Width	24	X unit price	$45.00		$0.00	
L	0	X Width	48	X unit price	$45.00		$0.00	
L	0	X Width	0	X unit price	$45.00		$0.00	
Paved Ditches; L	850	X unit price	$15.00				$4,462.50	
Side Drains; No.	0	X 36'	X unit price	$15.00			$0.00	
Other Drainage	(1.5% of Constr.)						$76,931.44	
Erosion Control	(5% of Constr.)						$256,438.13	
Subtotal for Drainage								$515,000.00
5. Structures								
(New) L	300	X Width	44	X unit price	$90.00		$1,188,000.00	
(New) L	0	X Width	0	X unit price	$50.00		$0.00	
(New) L	0	X Width	0	X unit price	$50.00		$0.00	
(Widen) L	0	X Width	24	X unit price	$45.00			
	+($100 x Len 0		X 2				$0.00	
Major Structures: Length			0				$0.00	
Major Structures: Length			0				$0.00	
Subtotal for Structures								$1,188,000.00
6. Railroad Crossing:								
Surface: Length	0	X Unit Price	$780.00				$0.00	
Length	0	X Unit Price	$0.00				$0.00	
CWT or MD: No.	0	X Unit Price	$12,000.00				$0.00	
Signals: No.	0	X Unit Price	$72,000.00				$0.00	
No.	0	X Unit Price	$0.00				$0.00	
Signing: No.	0	X Unit Price	$200.00				$0.00	
Separation Structure								
L	0	X Width	0	X unit price	$45.00		$0.00	
Run-around= $200/ft. + $50,000 for								
relocation of communication equipment							$0.00	
Subtotal for Railroad Crossing								$0.00
7. Paving								
Mainline= L (ft.)	6800	X unit price	$160.00				$1,088,000.00	
Sideroads= No.	1	X Length	680	X unit price	$180.00		$122,400.00	
Overlay(L)	0	X unit price	$60.00				$0.00	
Sidewalk(sq ft)	0	X unit price	$3.00				$0.00	
Driveways= No.	0	X Avg. Length	20.00	X unit price	$30.00		$0.00	
Subtotal for Paving								$1,210,000.00

8. Retaining Walls								
Sq. Ft.	1000	X unit price	$45.00			$45,000.00		
Subtotal for Retaining Walls								$45,000.00
9. Maintenance of Traffic								
New Location	$0.00							
Existing Location	$50,000.00							
Detour	$0.00							$50,000.00
Subtotal for Maintenance of Traffic								
10. Topsoil								
Avg. Fill	10							
Factor	0.536	X Length	3400	X unit price*2	$12.00	$43,737.60		
Avg. Cut	10							
Factor	0.383	X Length	3400	X unit price*2	$12.00	$31,252.80		
Subtotal for Topsoil								$75,000.00
11. Seeding								
Avg. Fill	10							
Factor	0.058	X Length	3400	X unit price*2	$35.00	$13,804.00		
Avg. Cut	10							
Factor	0.041	X Length	3400	X unit price*2	$35.00	$9,758.00		
Subtotal for Seeding								$24,000.00
12. Sodding								
Avg. Fill	10							
Factor	6.778	X Length	2620	X unit price*2	$5.00	$177,583.60		
Avg. Cut	10							
Factor	4.556	X Length	2620	X unit price*2	$5.00	$119,367.20		
Subtotal for Sodding								$297,000.00
13. Signing								
L (Mi.)	1.00	X Cost/Mile	$3,000.00			$3,000.00		
No. Int.	1	X Cost/Int.	$5,000.00			$5,000.00		
	2	X unit price	$50,000.00			$100,000.00		
Subtotal for Signing								$108,000.00
14. Signalization								
No. + signals	0	X unit price	$75,000.00			$0.00		
No. T signals	0	X unit price	$45,000.00			$0.00		
Subtotal for Signalization								$0.00
15. Fence								
L (ft.)	4000	X 2 X u/p	$5.00			$40,000.00		
No. int.	1	X cost/int.	$40,000.00			$40,000.00		
Subtotal for Fence								$80,000.00
16. Guardrail								
L (ft.)	500	X unit price	$10.00			$5,000.00		
# end treatments	4	X unit price	$1,500.00			$6,000.00		
Subtotal for Guardrail								$11,000.00
17. Rip/Rap Slope Protection								
L (ft.)	0	X slope dist.	20	X 0.074				
X 2 tons X unit price/ton		$14.00						$0.00
18. Subtotal for Items #1 - #17								$6,650,000.00
19. Other Const. Items (Line #18 X 8.5%)								$565,000.00
20. Sub-Total for Construction (18 + 19)								$7,215,000.00
21. Mobilization								
0 to 1 million (5%)								
1 to 5 million $50,000 + 4.5% in excess of 1 million								$319,000.00
5 to 10 million $230,000 + 4.0% in excess of 5 million								
10 to 20 million $430,000 + 3.5% in excess of 10 million								
over 20 million $780,000 + 3.0% in excess of 20 million								
Subtotal for Mobilization								

Project:Corridor B Welcome Center: Preferred Site - Option B
Length: Addition of Full Interchange Ramps & Cross-Street

Right-of-Way			
Land, Improvements and Damages (Acres)	9 acres		$243,600.00
Incidentals (00 Tracts)			$15,600.00
Relocation Payments (Residentials)		0	$0.00
(Businesses)		0	
(Non-Profit)		0	
Total Right-of-Way Cost			$259,200.00
Utility Relocation			
Reimbursable			$84,480.00
Non-Reimbursable			$7,680.00
Total Adjustment Cost			$92,160.00
Construction Cost			
Clearing and Grubbing			$50,000.00
Earthwork			$2,583,000.00
Pavement Removal			$0.00
Drainage			$504,000.00
Major Items	$200,000.00		
Other Drainage	$70,000.00		
Erosion Control	$234,000.00		
Structures			$1,089,000.00
Railroad Crossing or Separation Structure			$0.00
Paving			$1,215,000.00
Retaining Walls			$45,000.00
Maintenance of Traffic			$50,000.00
Topsoil			$75,000.00
Seeding			$24,000.00
Sodding			$247,000.00
Signing			$108,000.00
Signalization			$0.00
Fence			$80,000.00
Guardrail			$11,000.00
Rip-Rap or Slope Protection			$0.00
Other Const. Items (8.5%)			$517,000.00
Sub-Total Construction			$6,598,000.00
Mobilization			$294,000.00
Sub-Total Construction			$6,892,000.00
10% Engineering and Contingencies			$689,000.00
Total Construction Cost			$7,581,000.00
Preliminary Engineering (15%)			$1,034,000.00
TOTAL PROJECT COST			$8,966,360.00

Cost Estimate Worksheet

Route:	Corridor B Welcome Center: Preferred Site - Alt B					Section		
From:						To:		
Length (Mi)	Addition of Full Interchange Ramps & Cross-Street					(Ft.)		
1. Clearing and Grubbing								
Acreage	10.00	X Cost/Acre	$5,000.00					$50,000.00
2. Earthwork								
Average Cut/Fill	Variable							
Type of Excavation	Unc.							
Yardage Factor	128.90	X Length	6800.00	X Percentage	0.70			
= C.Y.	287000	X Unit Price	$9.00				$2,583,000.00	
Subtotal for Earthwork								$2,583,000.00
3. Pavement Removal								
No. of Roads	0	X Length	500	X unit price	$15.00			$0.00
4. Drainage								
Catch Basins	0	X $2,000					$0.00	
Pipe 18"		Length	1430	X unit price	$60.00		$85,800.00	
Pipe 24"		Length	860	X unit price	$60.00		$51,600.00	
Pipe 30"		Length	690	X unit price	$90.00		$62,100.00	
Culverts; L	0	X Width	24	X unit price	$45.00		$0.00	
L	0	X Width	48	X unit price	$45.00		$0.00	
L	0	X Width	0	X unit price	$45.00		$0.00	
Paved Ditches; L	0	X unit price	$15.00				$0.00	
Side Drains; No.	0	X 36'	X unit price	$15.00			$0.00	
Other Drainage	(1.5% of Constr.)						$70,312.50	
Erosion Control	(3.5% of Constr.)						$234,375.00	
Subtotal for Drainage								$504,000.00
5. Structures								
(New) L	275	X Width	44	X unit price	$90.00		$1,089,000.00	
(New) L	0	X Width	0	X unit price	$50.00		$0.00	
(New) L	0	X Width	0	X unit price	$50.00		$0.00	
(Widen) L	0	X Width	24	X unit price	$45.00			
	+($100 x Len 0		X 2				$0.00	
Major Structures: Length			0				$0.00	
Major Structures: Length			0				$0.00	
Subtotal for Structures								$1,089,000.00
6. Railroad Crossing:								
Surface: Length	0	X Unit Price	$780.00				$0.00	
Length	0	X Unit Price	$0.00				$0.00	
CWT or MD: No.	0	X Unit Price	$12,000.00				$0.00	
Signals: No.	0	X Unit Price	$72,000.00				$0.00	
No.	0	X Unit Price	$0.00				$0.00	
Signing: No.	0	X Unit Price	$200.00				$0.00	
Separation Structure								
L	0	X Width	0	X unit price	$45.00		$0.00	
Run-around= $200/ft. + $50,000 for								
relocation of communication equipment							$0.00	
Subtotal for Railroad Crossing								$0.00
7. Paving								
Mainline= L (ft.)	6800	X unit price	$160.00				$1,088,000.00	
Sideroads= No.	1	X Length	705	X unit price	$180.00		$126,900.00	
Overlay(L)	0	X unit price	$60.00				$0.00	
Sidewalk(sq ft)	0	X unit price	$3.00				$0.00	
Driveways= No.	0	X Avg. Length	20.00	X unit price	$30.00		$0.00	
Subtotal for Paving								$1,215,000.00

8. Retaining Walls								
Sq. Ft.	1000	X unit price	$45.00			$45,000.00		
Subtotal for Retaining Walls								$45,000.00
9. Maintenance of Traffic								
New Location	$0.00							
Existing Location	$50,000.00							
Detour	$0.00							$50,000.00
Subtotal for Maintenance of Traffic								
10. Topsoil								
Avg. Fill	10							
Factor	0.536	X Length	3400	X unit price*2	$12.00	$43,737.60		
Avg. Cut	10							
Factor	0.383	X Length	3400	X unit price*2	$12.00	$31,252.80		
Subtotal for Topsoil								$75,000.00
11. Seeding								
Avg. Fill	10							
Factor	0.058	X Length	3400	X unit price*2	$35.00	$13,804.00		
Avg. Cut	10							
Factor	0.041	X Length	3400	X unit price*2	$35.00	$9,758.00		
Subtotal for Seeding								$24,000.00
12. Sodding								
Avg. Fill	10							
Factor	6.778	X Length	2180	X unit price*2	$5.00	$147,760.40		
Avg. Cut	10							
Factor	4.556	X Length	2180	X unit price*2	$5.00	$99,320.80		
Subtotal for Sodding								$247,000.00
13. Signing								
L (Mi.)	1.00	X Cost/Mile	$3,000.00			$3,000.00		
No. Int.	1	X Cost/Int.	$5,000.00			$5,000.00		
	2	X unit price	$50,000.00			$100,000.00		
Subtotal for Signing								$108,000.00
14. Signalization								
No. + signals	0	X unit price	$75,000.00			$0.00		
No. T signals	0	X unit price	$45,000.00			$0.00		
Subtotal for Signalization								$0.00
15. Fence								
L (ft.)	4000	X 2 X u/p	$5.00			$40,000.00		
No. int.	1	X cost/int.	$40,000.00			$40,000.00		
Subtotal for Fence								$80,000.00
16. Guardrail								
L (ft.)	500	X unit price	$10.00			$5,000.00		
# end treatments	4	X unit price	$1,500.00			$6,000.00		
Subtotal for Guardrail								$11,000.00
17. Rip/Rap Slope Protection								
L (ft.)	0	X slope dist.	20	X 0.074				
X 2 tons X unit price/ton		$14.00						$0.00
18. Subtotal for Items #1 - #17								$6,081,000.00
19. Other Const. Items (Line #18 X 8.5%)								$517,000.00
20. Sub-Total for Construction (18 + 19)								$6,598,000.00
21. Mobilization								
0 to 1 million (5%)								
1 to 5 million $50,000 + 4.5% in excess of 1 million								$294,000.00
5 to 10 million $230,000 + 4.0% in excess of 5 million								
10 to 20 million $430,000 + 3.5% in excess of 10 million								
over 20 million $780,000 + 3.0% in excess of 20 million								
Subtotal for Mobilization								

FULLY DEVELOPED CONCEPT PLANS FOR OPTION B

TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TENN.	YEAR	SHEET NO.
	2009	1
FED. AID PROJ. NO.		
STATE PROJ. NO.		

Index Of Sheets

SHEET NO. DESCRIPTION

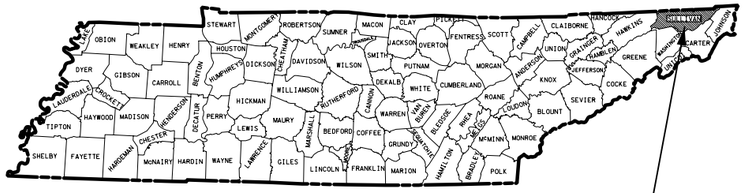
1.....TITLE SHEET
2.....TYPICAL SECTIONS
3.....PROPOSED LAYOUT
4.....PROPOSED LAYOUT
5.....PROPOSED LAYOUT
6.....PROPOSED LAYOUT

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING

SULLIVAN COUNTY

INTERCHANGE JUSTIFICATION STUDY
I-26 WELCOME CENTER

STATE HIGHWAY NO. F.A.H.S. NO.



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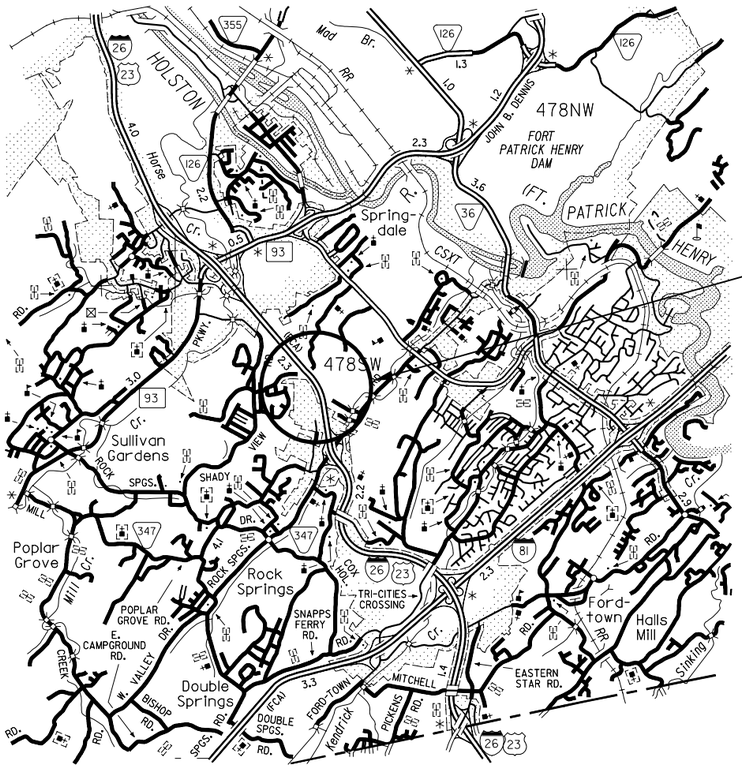
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FORT
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JOHN B. DENNIS
Spring-
dale
FT.
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CSXT
478SW
Sullivan
Gardens
Poplar
Grove
Rock
Springs
Double
Springs
Ford-
town
Halls
Mill
TRI-CITIES
CROSSING
SNAPPS
FERRY
RD.
POPLAR
GROVE RD.
E.
CAMPGROUND
RD.
W. VALLEY
BISHOP
RD.
DOUBLE
SPGS.
RD.
FORD-TOWN
RD.
MITCHELL
RD.
PICKENS
RD.
EASTERN
STAR RD.
SHADY
VIEW
DR.
ROCK
SPGS.
MILL
CREEK
Sinking
Cr.
PKWY.
HOSP.
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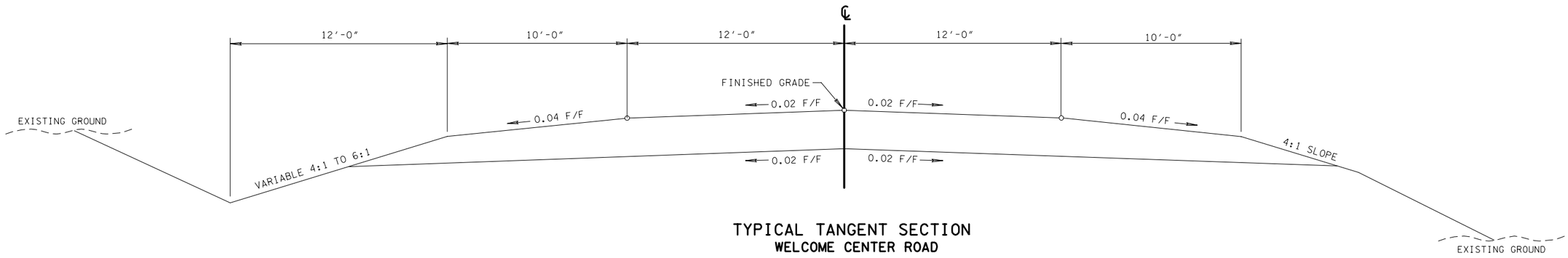
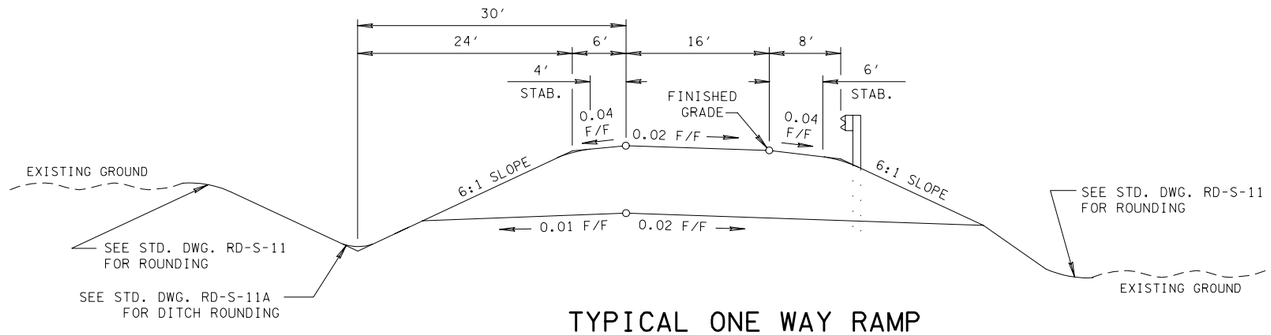
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO. ---

TYPE	YEAR	PROJECT NO.	SHEET NO.
CONCEPT	2009		2



TYPICAL TANGENT SECTION
WELCOME CENTER ROAD
(BASED ON STD. DWG. RD-TS-2)



TYPICAL ONE WAY RAMP
(BASED ON STD. DWG. RD-TS-4)

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SULLIVAN COUNTY

INTERCHANGE JUSTIFICATION STUDY

12/2/2009
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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
CONCEPT	2009		3

0 50′ 100′ 150′

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SULLIVAN COUNTY

INTERCHANGE JUSTIFICATION STUDY

1/21/2009
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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
CONCEPT	2009		4

0 50′ 100′ 150′

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SULLIVAN COUNTY

INTERCHANGE JUSTIFICATION STUDY

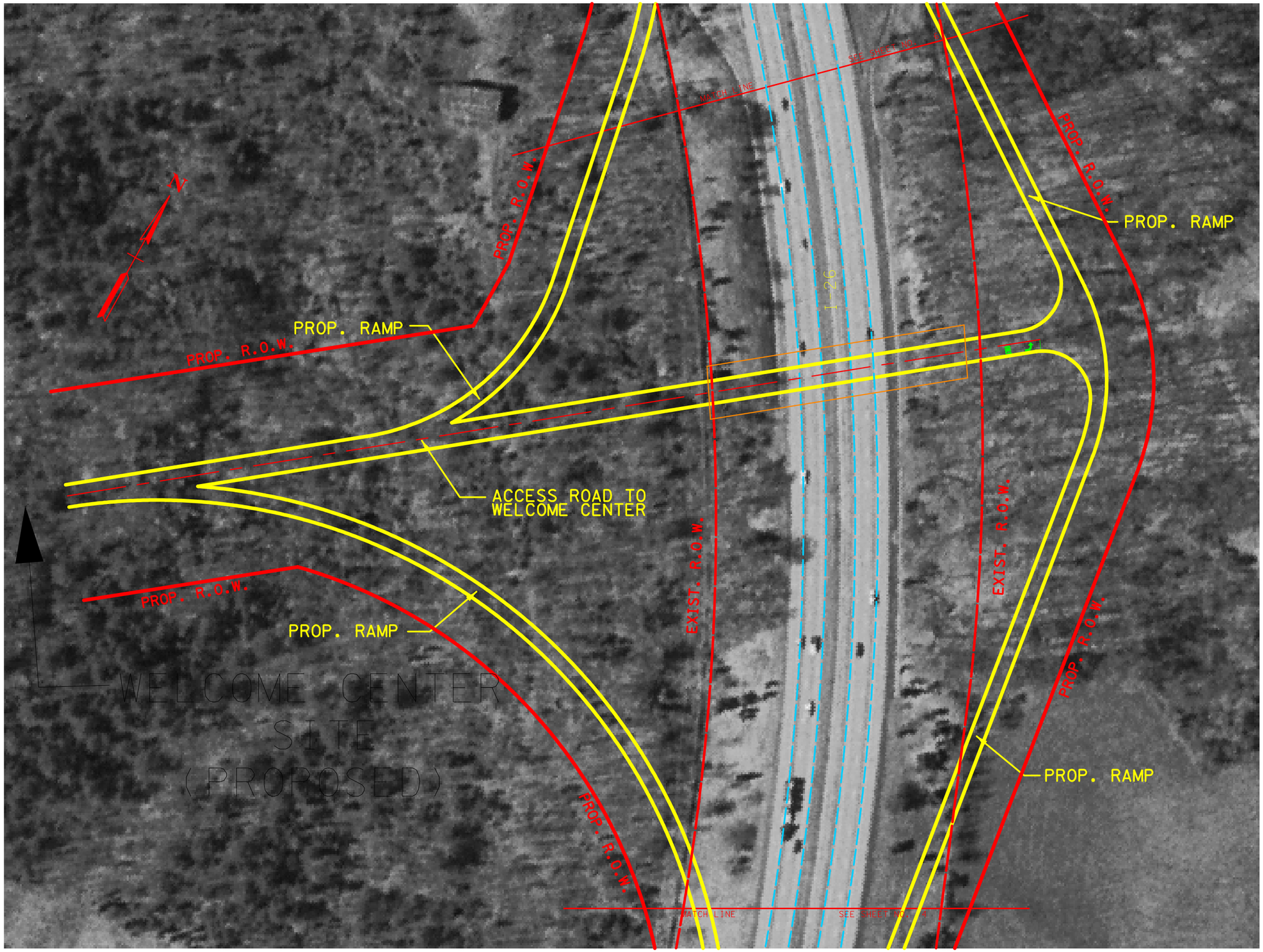
/21/2009
N:\6285 TDOT Planning\07 I-26 Rest Area\DGN\V8\Sht 4.dgn

TENNESSEE D.O.T.

DESIGN DIVISION

FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
CONCEPT	2009		5



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STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SULLIVAN COUNTY

INTERCHANGE JUSTIFICATION STUDY

1/26/2009
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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

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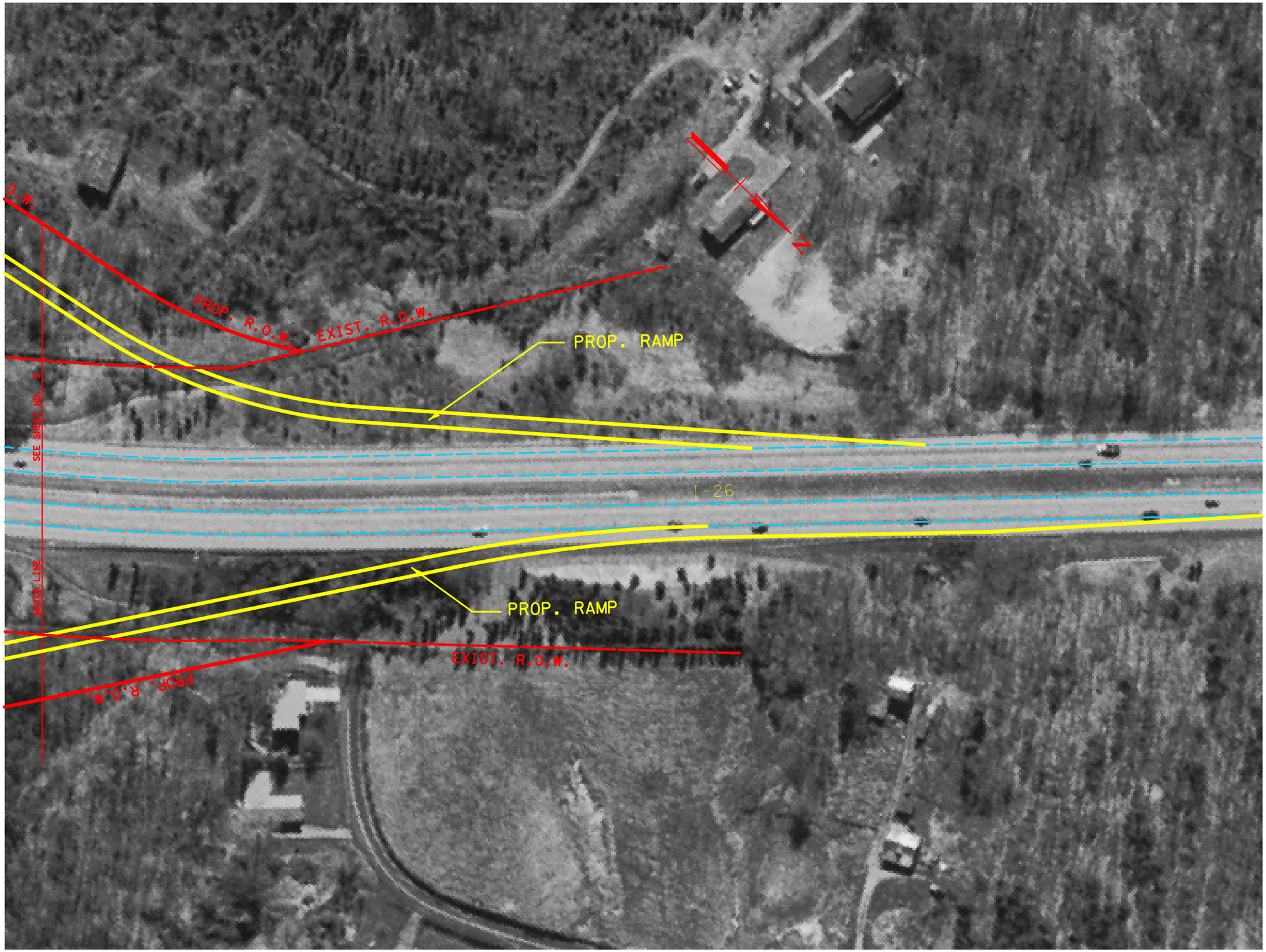
CONCEPT	2009		6



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STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SULLIVAN COUNTY

INTERCHANGE JUSTIFICATION STUDY

/21/2009
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