INTERCHANGE JUSTIFICATION STUDY

INTERSTATE 40
AT
O'NEIL ROAD

COCKE COUNTY, TENNESSEE

PREPARED BY
PBS&J

FOR
TENNESSEE DEPARTMENT OF TRANSPORTATION
PLANNING DIVISION

June, 2003

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

A. PURPOSE OF STUDY 3
B. DESCRIPTION OF PROJECT LOCATION 3
C. BACKGROUND 3

CHAPTER 2

PRELIMINARY PLANNING DATA

A. LAND USE 7
B. TRAFFIC SERVED 7
C. PROPOSED INTERCHANGE AND DESIGN ALTERNATIVES 8
D. ENVIRONMENTAL CONCERNS 13
   i. Checklist of Determinants for Location Study

CHAPTER 3

ENGINEERING INVESTIGATIONS

A. TRAFFIC OPERATIONS 15
B. COST 26
   i. Construction Cost Estimate (Interchange Only)
   ii. Construction Cost Estimate (O'Neil Road)
C. ACCESS ANALYSIS 26

CHAPTER 4

SUMMARY AND CONCLUSIONS

FUNCTIONAL PLANS

LIST OF FIGURES

FIGURE 1: PROJECT VICINITY MAP....5
FIGURE 2: PROJECT LOCATION MAP....6
FIGURE 3: TRAFFIC VOLUMES FOR EXISTING SYSTEM W/OUT PROP. DEVELOPMENT....10
FIGURE 4: TRAFFIC VOLUMES FOR EXISTING SYSTEM W/ PROP. DEVELOPMENT....11
FIGURE 5: TRAFFIC VOLUMES FOR PROPOSED SYSTEM W/ PROP. DEVELOPMENT....12
FIGURE 6: EXISTING SYSTEM W/OUT PROP. DEVELOPMENT LOS....21
FIGURE 7: EXISTING SYSTEM W/ PROP. DEVELOPMENT LOS....22
FIGURE 8: PROPOSED SYSTEM W/ PROP. DEVELOPMENT LOS....23

LIST OF TABLES

TABLE 1: MERGE & DIVERGE AREAS (RAMPS) 15
TABLE 2: BASIC FREEWAY SEGMENTS 15
TABLE 3: TWO-WAY STOP-CONTROLLED INTERSECTIONS....15
TABLE 4: TWO-LANE HIGHWAYS (CLASS I) 16
TABLE 5: MULTILANE HIGHWAYS 16
TABLE 6: HIGHWAY CAPACITY ANALYSIS RESULTS....19
TABLE 7: FACILITY DESIGN LIFE 24

LIST OF APPENDICES (SEPARATE VOLUME)

APPENDIX A: CONCEPT PLAN
APPENDIX B: TRAFFIC DATA
APPENDIX C: HCS RESULTS
APPENDIX D: COST ESTIMATES
APPENDIX E: CORRESPONDENCE

CHAPTER 1
INTRODUCTION

A. PURPOSE OF STUDY

The purpose of this study is to determine the need and justification for a new interchange on Interstate 40 (I-40) to serve the future development along O'Neil Road to the north of the Pleasant Grove community and just south of Newport in Cocke County, Tennessee.

This report analyzes the existing and projected traffic operations for the design years of 2007 and 2027. Additional analyses and design concepts within this document include right-of-way (ROW) requirements, construction estimates, land use impacts, functional plans and environmental concerns. This study was initiated at the request of State Senator Tommy Haun, State Representative Ronnie Davis and County Executive Charles Moore.

B. DESCRIPTION OF PROJECT LOCATION

The study area consists of the I-40 corridor south of the City of Newport in Cocke County, Tennessee. The proposed interchange is located approximately 800' north of the existing O'Neil Road overpass along I-40 between Exit 435 (US 321, SR 32) and Exit 440 (SR 73). This segment of I-40 is north of the Great Smoky Mountains National Park and to the west of the Cherokee National Forest.

I-40 is a four-lane interstate highway serving as a major east-west traffic artery connecting locally the cities of Knoxville, Tennessee and Asheville, North Carolina. The alignment of I-40 generally follows a north-south direction in the vicinity of the study area.

O'Neil Road is a two-lane substandard local road that generally follows an east-west direction. The location of the proposed O'Neil Road interchange is approximately 3.3 miles south of I-40 Exit 435 and 1.71 miles north of I-40 Exit 440.

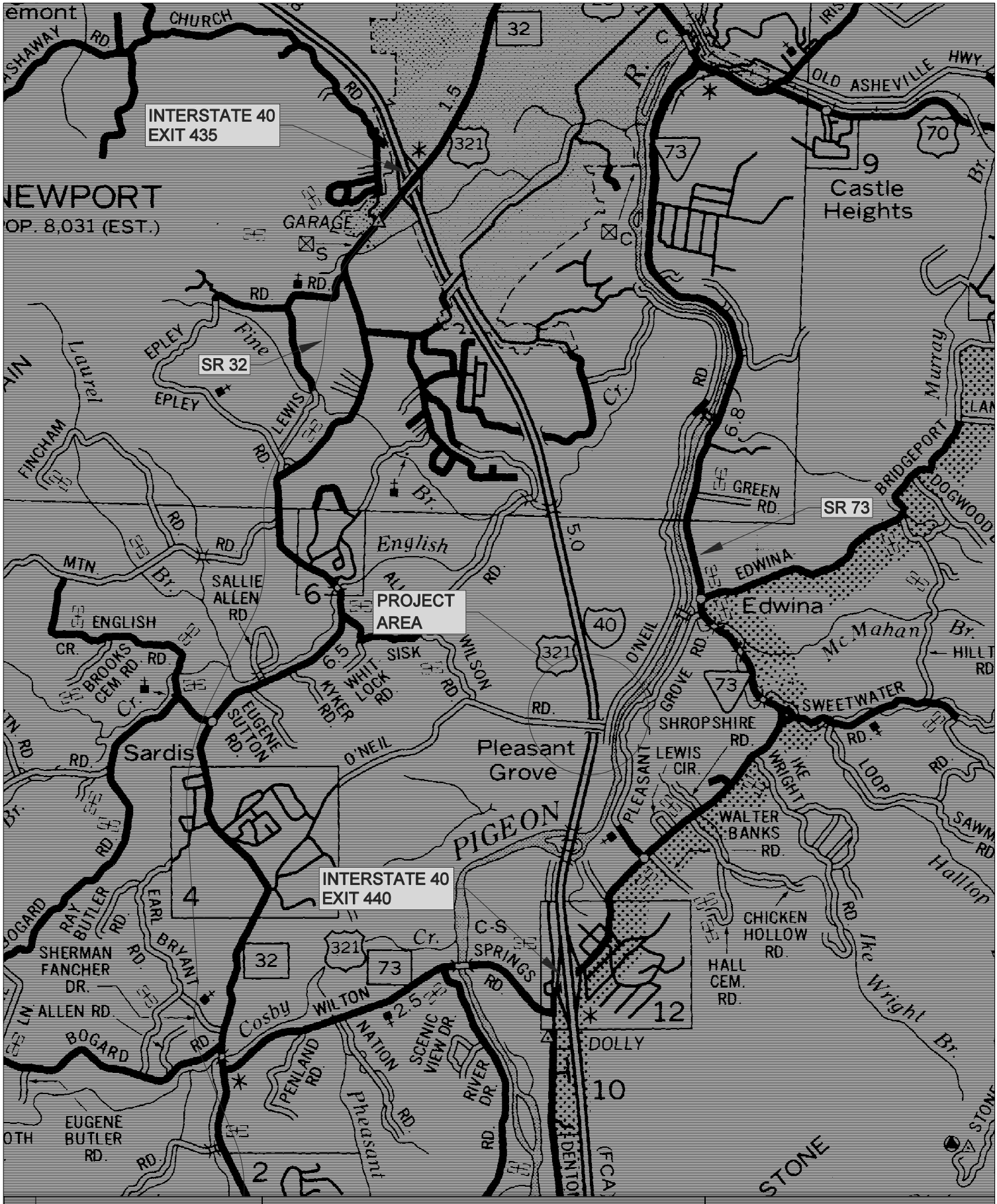
The general study area is shown on the Cocke County Highway Map in **Figure 1**. The project location is shown on the USGS Newport Quadrangle Map in **Figure 2**.

C. BACKGROUND

The general area of the proposed interchange is sparsely developed with farming operations and residential housing. The City of Newport, located just to the north of the proposed interchange, contains the majority of the commercial and retail development that supports the area. The development of the 1000-plus acres surrounding the proposed interchange has the potential to accommodate a variety of land uses and create a base for economic development and jobs in the area (refer to **Appendix A** for the conceptual land

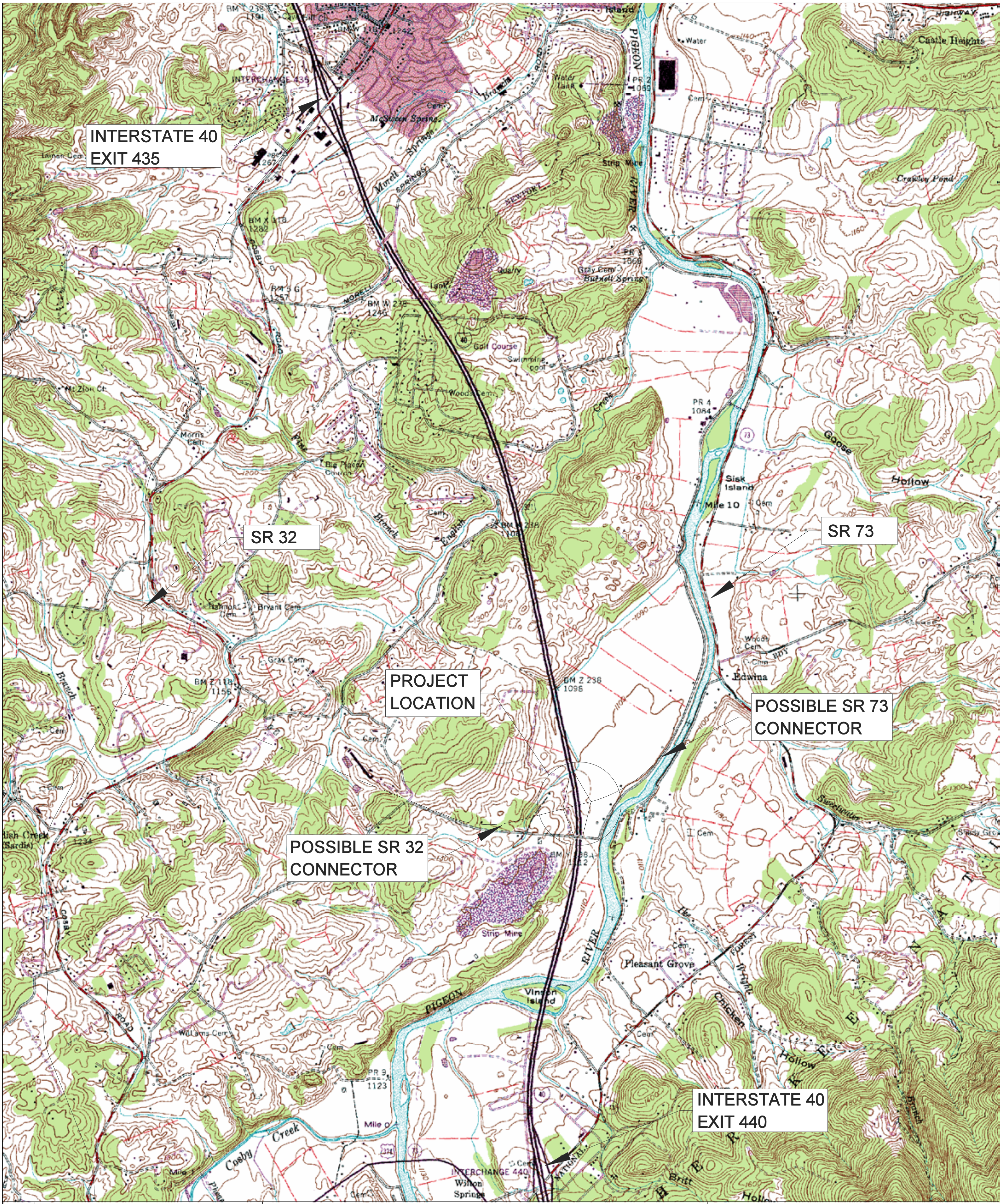
use plan). The Newport Utilities have committed to providing appropriate services to the area.

An "Access Justification Study" was prepared for this location in 1975 to serve a proposed recreational park. The proposed park, called "Seven Peaks Entertainment Park" was to be located on a 700-acre site adjacent to I-40. The park was to consist of live shows, rides, and exhibits; and attract some 1.3 million visitors per year. Due to problems with financing the proposed park was never constructed.



Project Vicinity Map
Interstate 40 between
Exit 435 and Exit 440

FIGURE 1.
COUNTY STREET MAP
COCKE COUNTY, TN



N

1000 0 1000 2000 3000

Scale In Feet

Project Location Map for Interstate 40 between Exit 435 and Exit 440 Cocke County, Tennessee

FIGURE 2.
USGS QUADRANGLE
NEWPORT, TN

CHAPTER 2
PRELIMINARY PLANNING DATA

A. LAND USE

The proposed interchange is located south of the City of Newport and just north of the existing O'Neil Road overpass. The prevailing landscape of the study area consists of rolling countryside. The project site is located amidst mostly agricultural and undeveloped land uses. There is a golf course and some residential homes located along the I-40 corridor between Exit 435 and Exit 440. A farmhouse and several barns are located in the northeast quadrant of the proposed interchange. The west bank of the Pigeon River is located near the southeast quadrant of the proposed interchange. The northwest and southwest quadrants consist of open fields and a local access road running parallel and adjacent to I-40. The 100-year floodplain encroaches onto the eastern edge of the proposed interchange and on the section of proposed O'Neil Road along the Pigeon River.

The proposed development is located in the vicinity of the proposed interchange and encompasses 1000 plus acres. Land uses include retail, restaurants, residential housing, motels, golf course, offices and professional space, and RV/camping sites. A concept plan for the area surrounding the proposed interchange, shows a 103,000 square foot antique mall, 500,000 square foot of retail, 15,000 square foot restaurant and 140-room motel, all located in the northeast quadrant of the proposed interchange. In the northwest quadrant of the proposed interchange, the concept plan shows 800,000 square foot of retail and a professional office building. In the southwest quadrant, the concept plan shows 450,000 square foot of retail, 20,000 square foot restaurant, 200,000 square foot convenience center, 192 RV/camping sites, and residential housing. To the west of I-40 and the proposed development surrounding the proposed interchange, there is a 250-acre site with a golf course, 85,000 square foot clubhouse, and 185 residential units (condos and single-family).

This conceptual development is shown on parcels located on both sides of I-40 in the vicinity of the proposed interchange. These parcels would require rezoning from agricultural to their respective land use.

B. TRAFFIC SERVED

The realignment and improvement of O'Neil Road is anticipated in conjunction with the proposed interchange and the corresponding proposed development of the area. Initially, O'Neil Road will be improved to a 3-lane typical section with additional lanes added at the intersections and provisions made for a future 5-lane typical section. The structure over I-40 will be designed and constructed to accommodate a 5-lane typical section, however it will be striped and marked for 3-lanes with one travel lane in each direction and a left turn lane (as shown on sheet 3 of the functionals). The transition from the 3-lane typical section to the 5-lane typical section will be dependent on the timing and level of development around the proposed interchange. This improvement of O'Neil

Road will facilitate regional east-west travel by serving as a connector between US Highway 321/State Route 32 and State Route 73.

Traffic was generated for this study based on the conceptual land use plan included in **Appendix A** under separate cover. Traffic projections include the phased 2007 and total 2027 forecast for the existing system without the proposed development; the phased 2007 and total 2027 forecast traffic for the existing system with the proposed development and the phased 2007 and total 2027 traffic for the proposed system (including proposed interchange) with the proposed development. **Figures 3 – 5** show the average daily traffic (ADT) volumes for the various conditions in the project area. All of the traffic data, including peak hour volumes and turning movement sheets, are provided in **Appendix B** under separate cover.

With the existing roadway system and without the proposed development, the 2007 ADT volume on I-40 between Exit 435 and Exit 440 is 27,640. In the design year, 2027, the ADT volume is projected to increase to 44,220. Refer to **Figure 3**.

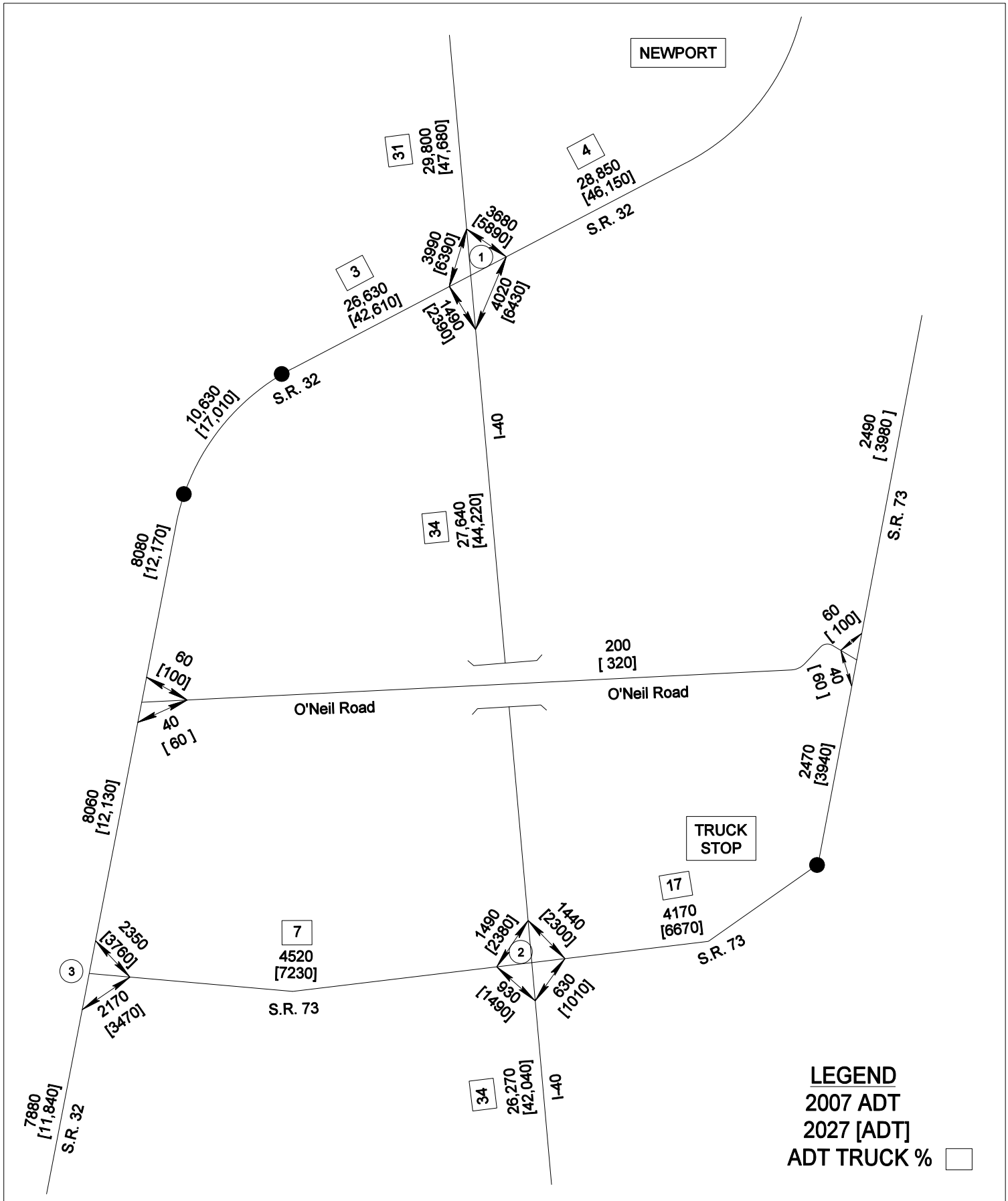
Under the second scenario, the existing system with the proposed development, the 2007 and 2027 ADT volumes on I-40 between Exit 435 and Exit 440 are the same as without the proposed development. All of the proposed development traffic accesses the development via SR 32 and SR 73 utilizing the interchanges at Exit 435 and Exit 440. Therefore, the actual traffic volumes on I-40 between the two interchanges are projected to remain the same, since no improvements have been made to the interstate, i.e. new interchange. Refer to **Figure 4**.

For the proposed system with the proposed development, the phased 2007 ADT volume for the section of I-40 between Exit 435 (SR 32) and the proposed interchange with O'Neil Road is 41,170 and the 2027 ADT is projected to be 78,850. For the section of I-40 between the proposed O'Neil Road interchange and Exit 440 (SR 73), the phased 2007 ADT is projected to be 33,790 and the 2027 ADT is projected to be 59,960. Refer to **Figure 5**.

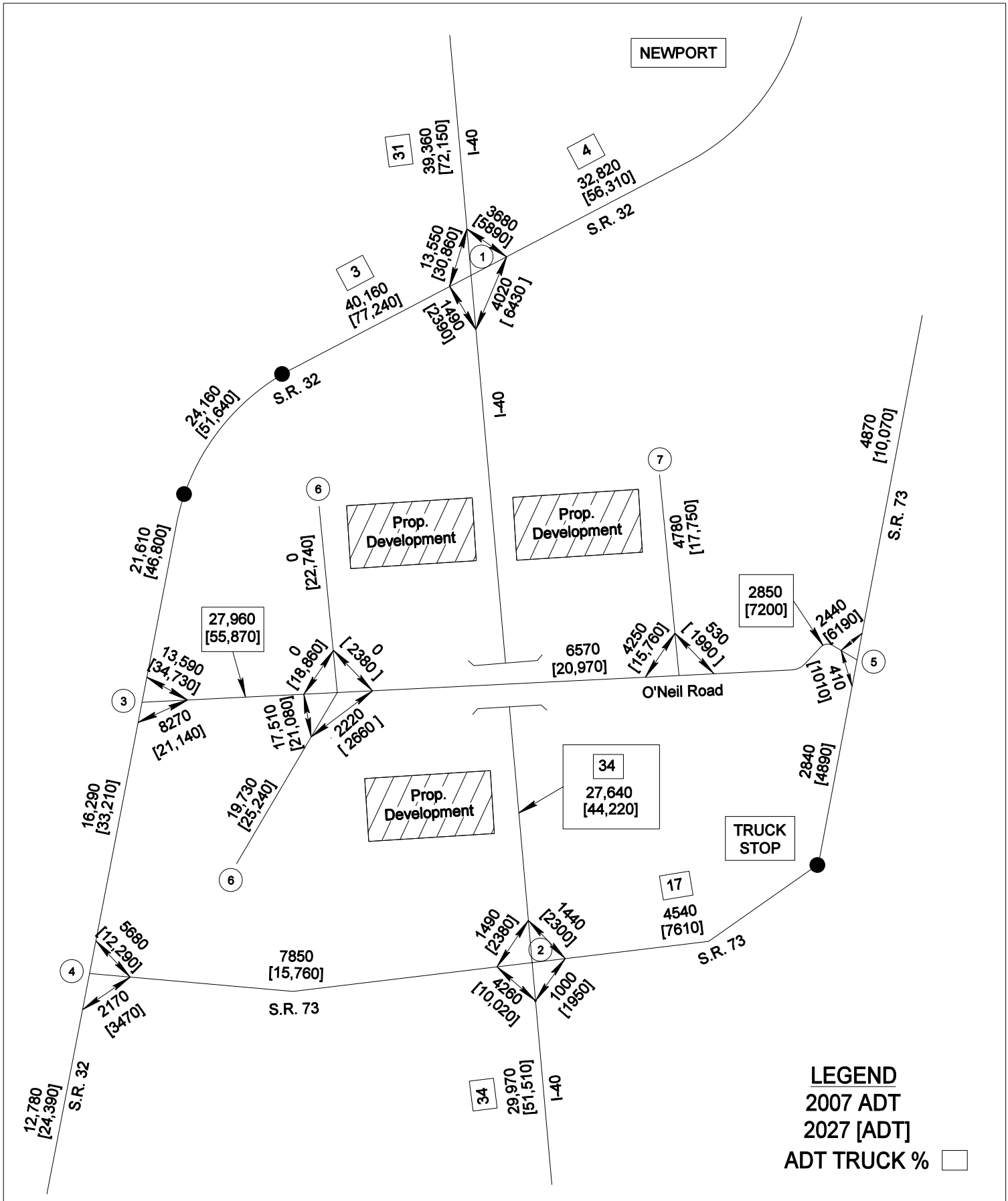
C. PROPOSED INTERCHANGE AND DESIGN ALTERNATIVES

Based on the current land use plan, physical constraints, and analysis conducted for this project, a full diamond interchange is proposed at O'Neil Road and I-40. The previous "Access Justification Study" completed in 1975, studied the construction of a trumpet interchange and a diamond interchange. At the preliminary stages of this study, these two alternative designs along with partial cloverleaf interchange types were discussed and considered. Based on the forecast traffic and the development land use plan, a partial cloverleaf design would require more right-of-way than the diamond interchange with only slight operational improvements. The trumpet interchange configuration that was discussed in the previous study does not accommodate all of the traffic movements required by the development land use plan. Therefore, the trumpet interchange was eliminated from consideration.

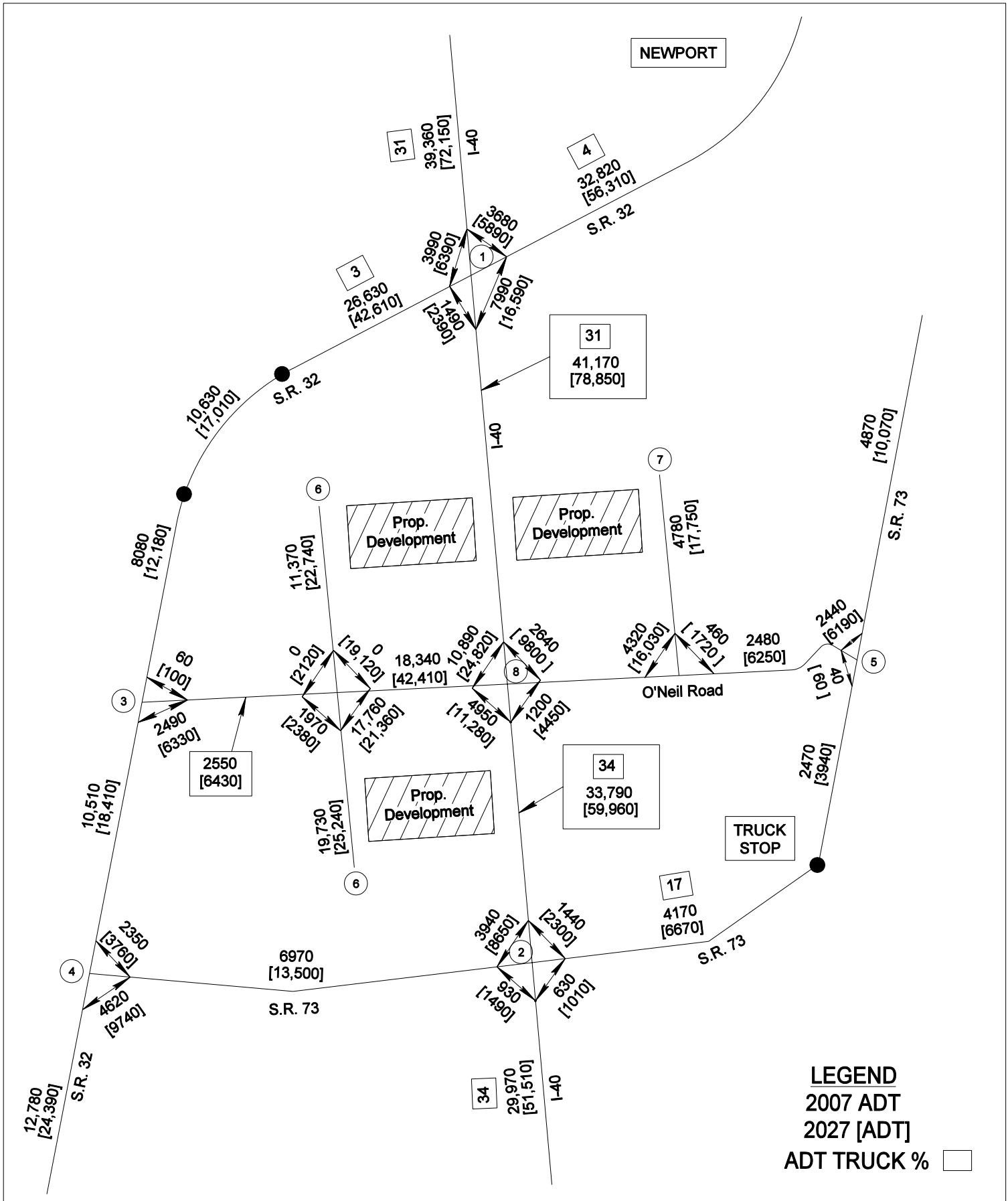
Currently, O'Neil Road is a two-lane substandard local road that primarily gives access to the sparsely developed residential and farming area. Improvements to O'Neil Road will be required with the construction of the proposed interchange at I-40 and the development of the surrounding area, based on the conceptual development land use plan shown in **Appendix A**. O'Neil Road will be improved to three-12' lanes through the interchange with additional lanes as required at the intersections, and improved to two-12' travel lanes both east and west of the proposed interchange. The two lane cross section will be continued to the east and west to intersections with SR 32 and SR 73.



N	N.T.S.	FIGURE 3 Existing System Without Proposed Development I-40 @ O'Neil Road	Cocke County Newport



N	N.T.S.	FIGURE 4 Existing System With Proposed Development I-40 @ O'Neil Road	Cocke County Newport



N	N.T.S.	FIGURE 5 Proposed System With Proposed Development I-40 @ O'Neil Road	Cocke County Newport

D. ENVIRONMENTAL CONCERNS

While detailed environmental technical studies were not conducted for this phase of the interchange study, preliminary investigations were done to identify site-specific environmentally sensitive areas for historic, archaeological, and ecological considerations. A detailed environmental assessment (EA) will be required in subsequent development phases pursuant FHWA/NEPA requirements. The detailed EA will specifically address the impact of the proposed interchange and include further coordination with resource agencies as well as public involvement. The "Checklist of Determinants for Location Study" is shown on page 13.

INTERSTATE 40 AT O'NEIL ROAD

CHECKLIST OF DETERMINANTS FOR LOCATION STUDY

If preliminary field reviews indicate the presence of any of the following facilities or ESE categories, place a "X" in the blank opposite the item. Where more than one alternate is to be considered, place its letter designation in the blank.

1. Agricultural land usage X

2. Airport (existing or proposed) X

3. Commercial area, shopping center (proposed) X

4. Floodplains X

5. Forested land ..... _____

6. Historical, archaeological, cultural, or natural landmark, or cemeteries .. _____

7. Industrial park, factory ..... _____

8. Institutional usage's
- **a. School or other educational institution ..... _____**
- **b. Church or other religious institution ..... _____**
- **c. Hospital or other medical facility ..... _____**
- **d. Public building, e.g., fire station ..... _____**
- **e. Defense installation ..... _____**

9. Recreational usage's
- **a. Park or recreational area, State Natural Area ..... _____**
- **b. Wildlife refuge or wildlife management area ..... _____**

10. Residential establishment ..... _____

11. Urban area, town, city, or community ..... _____

12. Waterway, lake, pond, river, stream, spring, wetland X
Permit required: Coast Guard_____ Section 404_____Section 10_____
TVA Section 26a review_____NPDES_____
Aquatic Resource Alteration Permit_____Class V Injection Wells_____

13. Location coordinated with local officials X

14. Railroad Crossings ..... _____

15. Hazardous Material Site ..... _____
(Underground Storage Tanks - U.S.T.)

16. Other_____ ..... _____

CHAPTER 3
ENGINEERING INVESTIGATIONS

A. TRAFFIC OPERATIONS

Operational Characteristics

Capacity analyses were conducted on the various development/improvement scenarios as discussed in **Chapter 2**, **Section B** for both the 2007 and the 2027 forecast years. Analyses were conducted on ramps, freeway sections, two-way stop controlled intersections, two-lane highways and multilane highways. As defined in the TRB Highway Capacity Manual 2000, level of service for each of these facilities is shown in the following tables:

TABLE 1
MERGE AND DIVERGE AREAS (RAMPS)

LOS	Density (pc/mi/ln)
A	≤ 10
B	> 10–20
C	> 20–28
D	> 28–35
E	> 35
F	Demand exceeds capacity

TABLE 2
BASIC FREEWAY SEGMENTS

LOS	Density Range (pc/mi/ln)
A	0–11
B	> 11–18
C	> 18–26
D	> 26–35
E	> 35–45
F	> 45

TABLE 3
TWO-WAY STOP-CONTROLLED INTERSECTIONS

Level of Service	Average Control Delay (s/veh)
A	0–10
B	> 10–15
C	> 15–25
D	> 25–35
E	> 35–50
F	> 50

TABLE 4
TWO-LANE HIGHWAYS (CLASS I)

LOS	Percent Time-Spent-Following	Average Travel Speed (mi/h)
A	≤ 35	> 55
B	> 35–50	> 50–55
C	> 50–65	> 45–50
D	> 65–80	> 40–45
E	> 80	≤ 40

Note:
LOS F applies whenever the flow rate exceeds the segment capacity.

TABLE 5
MULTILANE HIGHWAYS

		LOS				
Free-Flow Speed	Criteria	A	B	C	D	E
60 mi/h	Maximum density (pc/mi/ln)	11	18	26	35	40
	Average speed (mi/h)	60.0	60.0	59.4	56.7	55.0
	Maximum volume to capacity ratio (v/c)	0.30	0.49	0.70	0.90	1.00
	Maximum service flow rate (pc/h/ln)	660	1080	1550	1980	2200
55 mi/h	Maximum density (pc/mi/ln)	11	18	26	35	41
	Average speed (mi/h)	55.0	55.0	54.9	52.9	51.2
	Maximum v/c	0.29	0.47	0.68	0.88	1.00
	Maximum service flow rate (pc/h/ln)	600	990	1430	1850	2100
50 mi/h	Maximum density (pc/mi/ln)	11	18	26	35	43
	Average speed (mi/h)	50.0	50.0	50.0	48.9	47.5
	Maximum v/c	0.28	0.45	0.65	0.86	1.00
	Maximum service flow rate (pc/h/ln)	550	900	1300	1710	2000
45 mi/h	Maximum density (pc/mi/ln)	11	18	26	35	45
	Average speed (mi/h)	45.0	45.0	45.0	44.4	42.2
	Maximum v/c	0.26	0.43	0.62	0.82	1.00
	Maximum service flow rate (pc/h/ln)	490	810	1170	1550	1900

The criteria defined in the above tables for each of the facilities was applied using the latest version of the Highway Capacity Software to determine the level of service for each of the scenarios.

Highway Capacity Analysis Results

In the existing system without the proposed development scenario, the capacity analyses were conducted on the adjacent interchanges at Exit 435 and Exit 440 (ramps and ramp intersections), the freeway segment between the interchanges, on the section of SR 32 between I-40 at Exit 435 and SR 73, on the SR 73 between SR 32 and I-40 at Exit 440, on SR 73 to the east of I-40, and the intersection of SR 32 and SR 73. For the existing system with the proposed development, the capacity analyses were conducted on the same facilities as the scenario above. Additional analyses included the intersections of O'Neil Road with SR 32 and O'Neil Road with SR 73. The third and final development/improvement scenario was the proposed system (new interchange) with the proposed development. Capacity analyses were conducted on the same facilities as the first two, with additional analysis on the new interchange (ramps and ramp intersections) and the freeway segments between Exit 435 and the proposed interchange and Exit 440 and the proposed interchange.

The results of the analyses for all three-development scenarios are summarized in **Table 6** and in **Figures 6 - 8**. The HCS analyses are contained in **Appendix C**.

As shown in the table, for the existing system without proposed development, the facilities that are operating at a poor level of service (less than LOS D) with 2007 traffic volumes are the two-way stop controlled intersections of the ramp termini at SR 32. The facilities operating at a poor level of service in 2027 include those from the 2007 analysis and, the intersection of SR 32 and SR 73, the I-40 westbound freeway segment, the I-40 westbound off-ramp at SR 73 and one direction of the multilane section of SR 32 to the southwest of I-40.

For the existing system with proposed development, in 2007, the same two intersections as with the first scenario plus the two-way stop controlled intersections of SR 32 at SR 73 and SR 32 at O'Neil are operating at an unacceptable level of service (less than LOS D). In the 2027 PM peak analysis, all of the facilities that are operating poorly in 2007, plus the I-40 eastbound off-ramp at SR 32, I-40 westbound on-ramp at SR 32, I-40 westbound off-ramp at SR 73, the I-40 westbound freeway segment, the two-way stop controlled intersections at the ramp termini at SR 73 and I-40, the two-lane sections along SR 32, the two-lane sections of O'Neil Road and SR 73 between SR 32 and I-40, and the multilane section of SR 32 near I-40.

The final development scenario of the proposed system with proposed development had few capacity deficiencies in 2007. The only unacceptable level of service results in 2007 are the two-way stop controlled intersections of SR 32 at the ramp termini of I-40, the intersection of SR 32 at SR 73, and the intersection of O'Neil Road at the westbound ramp termini of I-40. As for the analyses of 2027, the majority of the facilities operate at an unacceptable level of service in the PM peak period.

The analyses showed several of the poorly operating facilities were the two-way stop controlled intersections at the I-40 ramp termini. Based on the traffic volumes and

geometrics, in order to improve these locations, warrants for signalization should be studied. Primarily, the proposed roadway system (with proposed interchange and signalization at some intersections) should be able to accommodate the development traffic in 2007, but may have deficiencies in 2027 at the freeway segments and ramps on the interchanges due to the projected increase in traffic volumes.

Facility Design Life

The design life of a specific roadway facility is defined by the number of years into the future the facility operates satisfactorily (better than LOS F) considering increases in traffic demand volumes. Generally, the design life can be determined by using the projected traffic volumes for future years given an annualized growth rate. For a project of this nature, not only does the background traffic and subsequent annual growth have to be considered but also the increase in proposed development traffic. Therefore, to determine the actual projected traffic on a given facility, the background traffic and the annual growth must be combined with the proposed project traffic. In order to estimate the proposed project traffic, it was assumed the increase in development traffic would be linear from the 2007 phased traffic to the 2027 buildout year of the development. The yearly calculated proposed project traffic was added to the background plus annual growth traffic to determine a volume for each year between 2007 and 2027. These yearly volumes were used to determine the design life of each failing facility.

As shown in **Table 6**, several facilities failed based on the HCS analysis conducted for the three scenarios. The design life for each of these facilities was determined using the capacity software and the results are shown in **Table 7**.

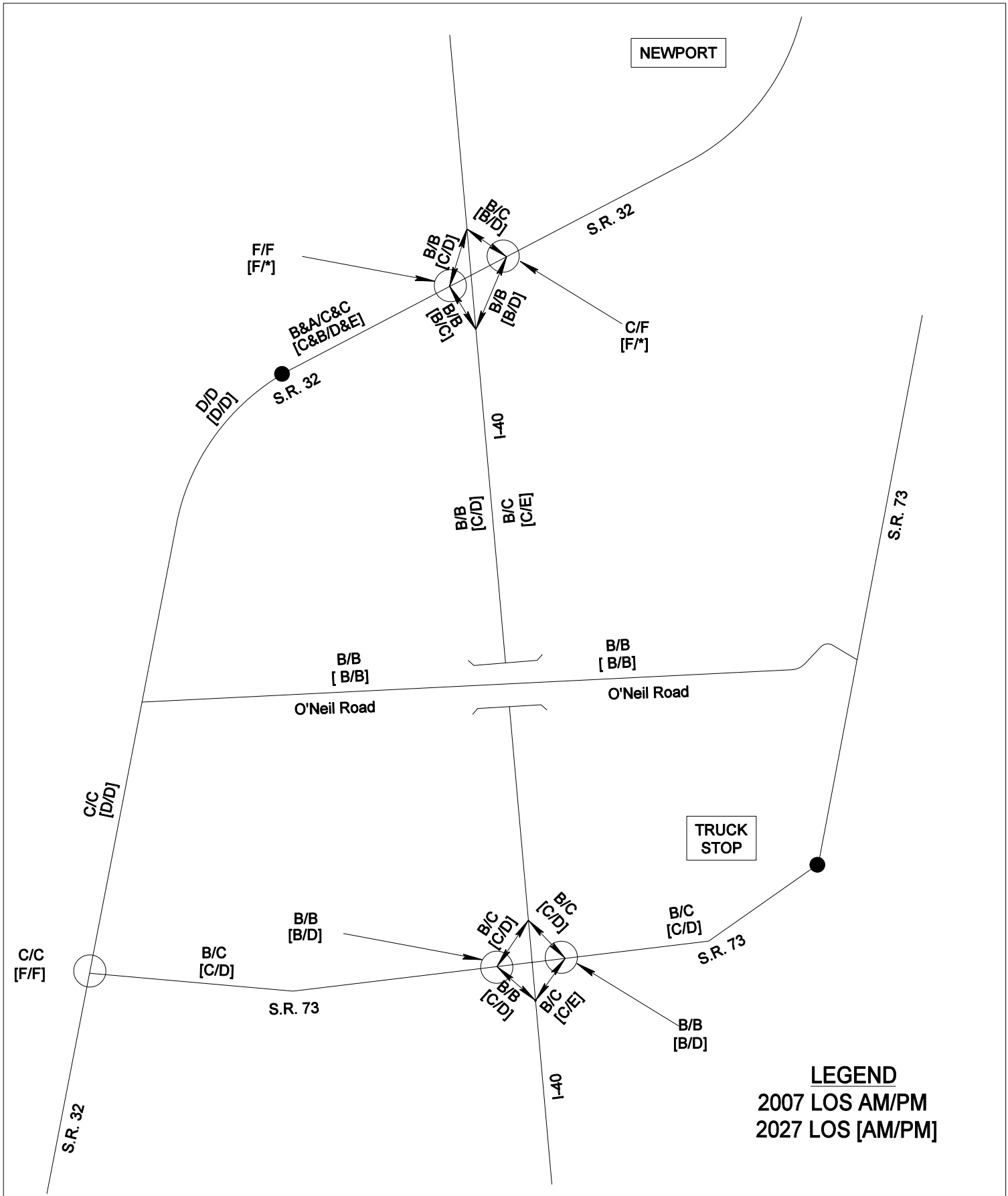
TABLE 6
HIGHWAY CAPACITY ANALYSIS RESULTS

Facility	Type	Existing System w/out Proposed Development				Existing System with Proposed Development				Proposed System with Proposed Development			
		2007		2027		2007		2027		2007		2027	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
I-40 EB Off-ramp at SR 32	Ramp & ramp area	B	B	C	D	B	C	C	**F**	B	C	C	**F**
I-40 EB On-ramp at SR 32	Ramp & ramp area	B	B	B	C	B	B	B	C	B	C	C	**F**
I-40 WB Off-ramp at SR 32	Ramp & ramp area	B	B	B	D	B	B	B	D	B	C	C	**F**
I-40 WB On-ramp at SR 32	Ramp & ramp area	B	C	B	D	B	C	C	**F**	B	C	C	**F**
I-40 EB Off-ramp at SR 73	Ramp & ramp area	B	C	C	D	B	C	C	D	B	C	C	**F**
I-40 EB On-ramp at SR 73	Ramp & ramp area	B	B	C	D	B	C	C	D	B	C	C	D
I-40 WB Off-ramp at SR 73	Ramp & ramp area	B	C	C	**E**	B	C	C	**F**	B	C	C	**F**
I-40 WB On-ramp at SR 73	Ramp & ramp area	B	C	C	D	B	C	C	D	B	C	C	**F**
I-40 EB Off-ramp at O'Neil	Ramp & ramp area									B	B	C	**F**
I-40 EB On-ramp at O'Neil	Ramp & ramp area									B	B	C	D
I-40 WB Off-ramp at O'Neil	Ramp & ramp area									B	C	C	**E**
I-40 WB On-ramp at O'Neil	Ramp & ramp area									B	C	C	**F**
I-40 Eastbound – SR 32 to SR 73	Basic Freeway Segment	B	B	C	D	B	B	C	D				
I-40 Westbound – SR 73 to SR 32	Basic Freeway Segment	B	C	C	**E**	B	C	C	**E**				
I-40 EB – SR 32 to O'Neil	Basic Freeway Segment									B	C	D	**F**
I-40 WB – SR 32 to O'Neil	Basic Freeway Segment									B	D	C	**F**
I-40 EB – SR 73 to O'Neil	Basic Freeway Segment									B	C	C	**F**
I-40 WB – SR 73 to O'Neil	Basic Freeway Segment									B	C	C	**F**

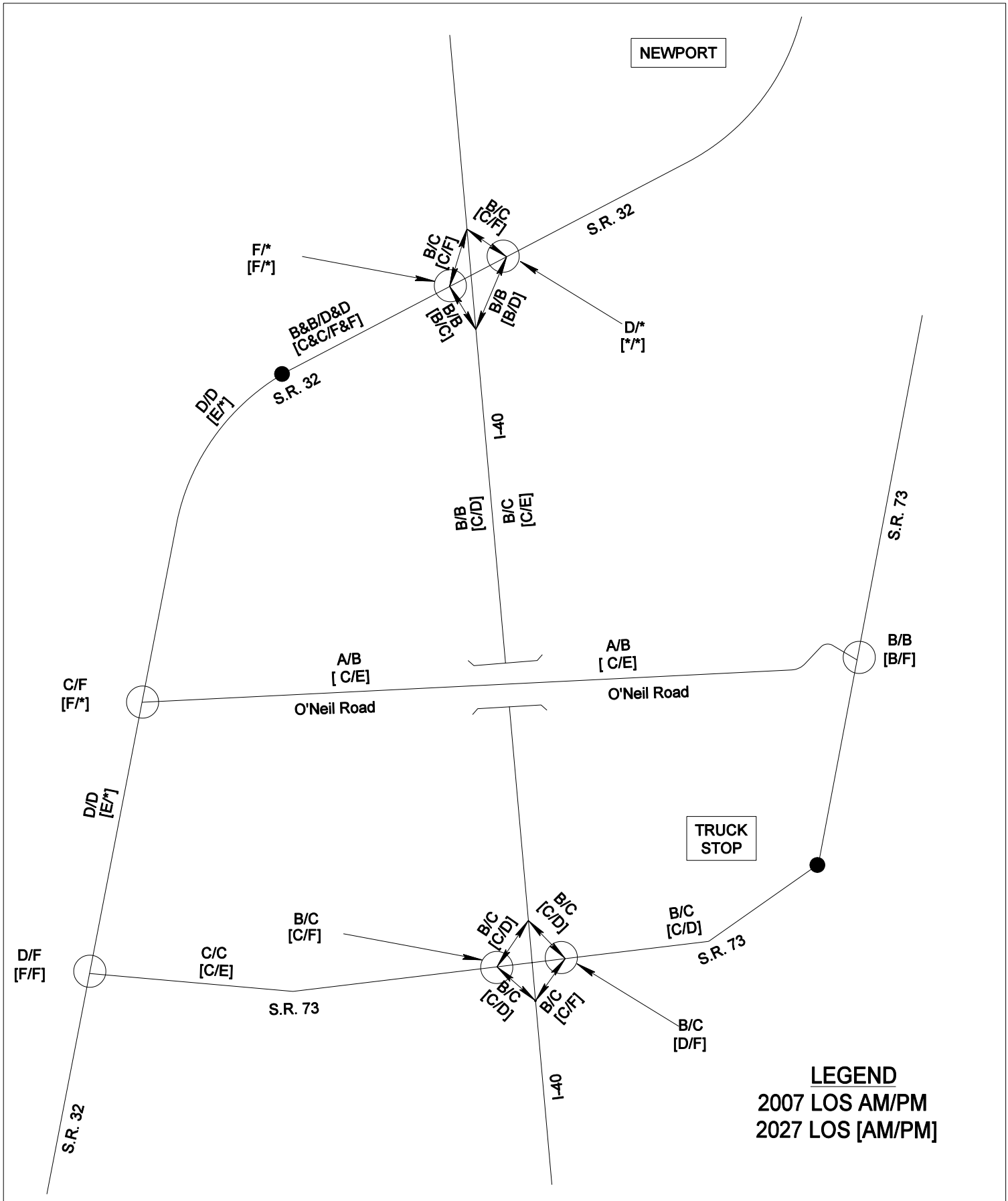
TABLE 6
HIGHWAY CAPACITY ANALYSIS RESULTS
(CONTINUED)

Facility	Type	Existing System w/out Proposed Development				Existing System with Proposed Development				Proposed System with Proposed Development			
		2007		2027		2007		2027		2007		2027	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
SR 32 and I-40 EB Ramps	Two-way Stop	**F**	**F**	**F**	*	**F**	*	**F**	*	**F**	*	**F**	*
SR 32 and I-40 WB Ramps	Two-way Stop	C	**F**	**F**	*	D	*	*	*	C	**F**	**F**	*
SR 32 and SR 73	Two-way Stop	C	C	**F**	**F**	D	**F**	**F**	**F**	C	**F**	**F**	**F**
SR 73 and I-40 EB Ramps	Two-way Stop	B	B	B	D	B	C	C	**F**	B	B	B	**F**
SR 73 and I-40 WB Ramps	Two-way Stop	B	B	B	D	B	C	D	**F**	B	C	C	**F**
SR 32 and O'Neil	Two-way Stop					C	**F**	**F**	*	C	C	**E**	**F**
SR 73 and O'Neil	Two-way Stop					B	B	B	**F**	B	B	B	D
O'Neil and I-40 EB Ramps	Two-way Stop									A	C	C	**F**
O'Neil and I-40 WB Ramps	Two-way Stop									B	**F**	D	*
SR 32 – SR 73 to O'Neil	Two-lane Highway	C	C	D	D	D	D	**E**	*	D	D	D	**E**
SR 32 – O'Neil to Morrell	Two-lane Highway	D	D	D	D	D	D	**E**	*	C	C	D	D
SR 73 – SR 32 to I-40	Two-lane Highway	B	C	C	D	C	C	C	**E**	C	C	C	D
SR 73 – I-40 to O'Neil	Two-lane Highway	B	C	C	D	B	C	C	D	B	C	C	D
O'Neil – West of I-40	Two-lane Highway	B	B	B	B	A	B	C	**E**	B	D	D	*
O'Neil – East of I-40	Two-lane Highway	B	B	B	B	A	B	C	**E**	A	B	C	**E**
SR 32 – Morrell to I-40	Multilane Highway	B/A	C/C	C/B	D/**E**	B/B	D/D	C/C	**F/F**	B/A	C/C	C/B	D/**E**

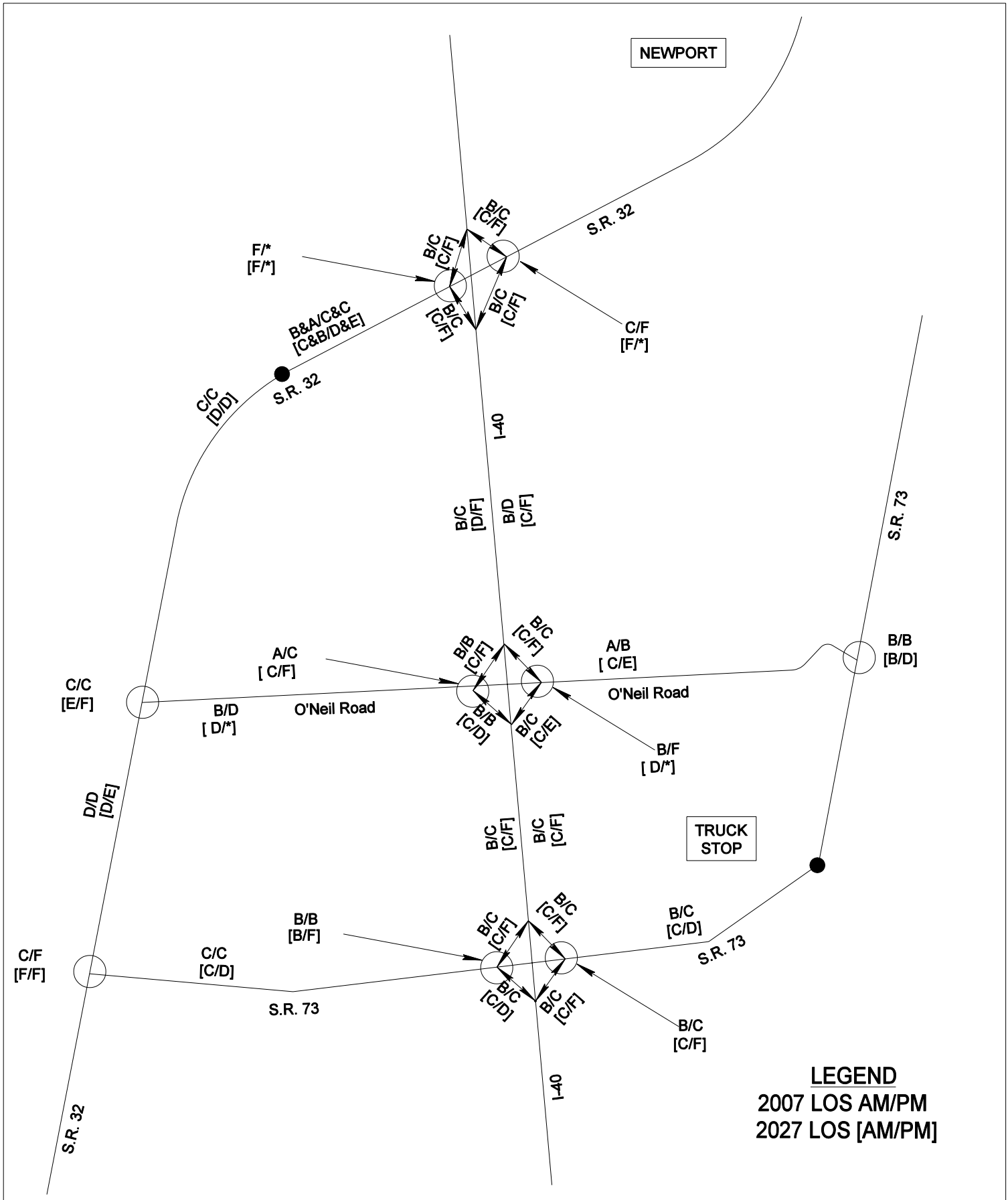
* The asterisk is used in the Highway Capacity Software to represent an oversaturated condition that exceeds the criteria for level of service F.



N	N.T.S.	FIGURE 6. Existing System Without Proposed Development LOS RESULTS	Cocke County Newport



N	N.T.S.	FIGURE 7. Existing System With Proposed Development LOS RESULTS	Cocke County Newport



N	N.T.S.	FIGURE 8. Proposed System With Proposed Development LOS RESULTS	Cocke County Newport

TABLE 7
FACILITY DESIGN LIFE

Facility	Type	Existing System w/out Proposed Development		Existing System with Proposed Development		Proposed System with Proposed Development	
		AM	PM	AM	PM	AM	PM
I-40 EB Off-ramp at SR 32	Ramp & ramp area				**2025**		**2026**
I-40 EB On-ramp at SR 32	Ramp & ramp area						**2026**
I-40 WB Off-ramp at SR 32	Ramp & ramp area						**2019**
I-40 WB On-ramp at SR 32	Ramp & ramp area				**2023**		**2023**
I-40 EB Off-ramp at SR 73	Ramp & ramp area						**2026**
I-40 EB On-ramp at SR 73	Ramp & ramp area						
I-40 WB Off-ramp at SR 73	Ramp & ramp area				**2025**		**2025**
I-40 WB On-ramp at SR 73	Ramp & ramp area						**2022**
I-40 EB Off-ramp at O'Neil	Ramp & ramp area						**2024**
I-40 EB On-ramp at O'Neil	Ramp & ramp area						
I-40 WB Off-ramp at O'Neil	Ramp & ramp area						
I-40 WB On-ramp at O'Neil	Ramp & ramp area						**2021**
I-40 Eastbound – SR 32 to SR 73	Basic Freeway Segment						
I-40 Westbound – SR 73 to SR 32	Basic Freeway Segment						
I-40 EB – SR 32 to O'Neil	Basic Freeway Segment						**2017**
I-40 WB – SR 32 to O'Neil	Basic Freeway Segment						**2013**
I-40 EB – SR 73 to O'Neil	Basic Freeway Segment						**2023**
I-40 WB – SR 73 to O'Neil	Basic Freeway Segment						**2018**

TABLE 7
FACILITY DESIGN LIFE
(CONTINUED)

Facility	Type	Existing System w/out Proposed Development		Existing System with Proposed Development		Proposed System with Proposed Development	
		AM	PM	AM	PM	AM	PM
SR 32 and I-40 EB Ramps	Two-way Stop	**Failed Before 2007**		**Failed Before 2007**		**Failed Before 2007**	
SR 32 and I-40 WB Ramps	Two-way Stop	**2014**	**Failed Before 2007**	**2009**	**Failed Before 2007**	**2013**	**Failed Before 2007**
SR 32 and SR 73	Two-way Stop	**2016**	**2014**	**2009**	**Failed Before 2007**	**2012**	**Failed Before 2007**
SR 73 and I-40 EB Ramps	Two-way Stop				**2016**		**2026**
SR 73 and I-40 WB Ramps	Two-way Stop				**2012**		**2017**
SR 32 and O'Neil	Two-way Stop			**2010**	**Failed Before 2007**		**2014**
SR 73 and O'Neil	Two-way Stop				**2026**		
O'Neil and I-40 EB Ramps	Two-way Stop						**2011**
O'Neil and I-40 WB Ramps	Two-way Stop						**Failed Before 2007**
SR 32 – SR 73 to O'Neil	Two-lane Highway				**2022**		
SR 32 – O'Neil to Morrell	Two-lane Highway				**2015**		
SR 73 – SR 32 to I-40	Two-lane Highway						
SR 73 – I-40 to O'Neil	Two-lane Highway						
O'Neil – West of I-40	Two-lane Highway						**2015**
O'Neil – East of I-40	Two-lane Highway						
SR 32 – Morrell to I-40	Multilane Highway				**2016**		

* The shaded blocks represent the facilities that did not fail based on the HCS analysis, therefore having a projected service life greater than the 20-year design horizon. The year shown in the other blocks represent the projected year prior to failure of the facility.

B. COST

The total estimated construction cost (excluding right-of-way) for the recommended full diamond interchange is $6,676,000. Additionally, it is estimated to cost $952,000 (excluding right-of-way) to construct the improvements to O'Neil Road and other access roads. The estimated right-of-way cost for the interchange improvements is $905,000 and the O'Neil Road improvements are $219,000. The owner/developer of the land has stated that all right-of-way required for the construction of the interchange and other necessary roadway improvements resulting from the interchange will be donated to the appropriate agency. However, the estimated right-of-way cost has been determined and is included in this study. Since there is no existing development in the general area of the proposed interchange, there are no estimated utility costs associated with the interchange improvement. Therefore, the total project cost is estimated to be $8,752,000. The cost data sheets are contained on pages 27 and 28 of the report with corresponding details in the **Appendix D**.

C. ACCESS ANALYSIS

This study has been developed in accordance with the Federal Highway Administration's (FHWA) policy for granting new or modified interstate access. The FHWA national policy was originally issued in 1990, and was revised in February 1998. Section 111 of Title 23, United States Code (23 USC 111) requires that proposed new or revised interstate access must be approved by the FHWA.

The FHWA Policy Statement reads, "It is in the national interest to maintain the Interstate System to provide the highest level of service in terms of safety and mobility. Adequate control of access is critical to providing such service." The FHWA policy states that new or revised access points to the existing Interstate System should satisfy eight requirements. These eight requirements are discussed below with appropriate discussion for this proposed interchange.

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.***

   If the full development proposed for the 1000+ acres is constructed, O'Neil Road and the other local roads cannot accommodate the development traffic out to SR 32 (US Highway 321). Another connection to a main roadway is required to handle the forecasted traffic of the development. This connection would be the proposed interchange.

CONSTRUCTION COST ESTIMATE

Route:		Interchange at Interstate 40 and O'Neil Road
Alternate		Interchange Only
Description:	**From:**	n/a
	To:	n/a
County:		Cocke
Length:		± Miles
Date:		June 2, 2003

Right-of-Way

Land, Improvements and Damages (22.5 Acres)	$	900,000	
Incidentals (2 Tracts)	$	5,000	
Relocation Payments (0 Residences)	$	-	
(0 Businesses)	$	-	
*Total Right-of-Way Cost			$ 905,000

*Right-of-way to be donated

Utility Relocation

Reimbursable	$	-	
Non-Reimbursable	$	-	
Total Utility Cost			$0

Construction Cost

Clear and Grubbing	$	30,000	
Earthwork	$	930,000	
Pavement Removal	$	15,000	
Drainage (including Erosion Control)	$	175,000	
Structures	$	2,160,000	
Railroad Crossing or Separation	$	-	
Paving	$	1,250,000	
Interchanges	$	-	
Maintenance of Traffic	$	100,000	
Topsoil	$	65,000	
Seeding	$	15,000	
Sodding	$	-	
Signing	$	70,000	
Lighting	$	-	
Signalization	$	-	
Fence	$	30,000	
Guardrail	$	60,000	
Rip Rap or Slope Protection	$	-	
Other Construction Items (8.5%)	$	417,000	
Mobilization	$	245,000	
Total Construction Cost			$ 5,562,000
10% Engineering and Cont.			$ 557,000
Total Construction Cost w/ Engineering and Cont.			$ 6,119,000
10% Preliminary Engineering			$ 557,000
TOTAL COST			$ 7,581,000

CONSTRUCTION COST ESTIMATE

Route:		Interchange at Interstate 40 and O'Neil Road
Alternate		O'Neil Road Improvements
Description:	**From:**	3000' West of Eastbound I-40 Ramp Termini
	To:	1000' East of Westbound I-40 Ramp Termini
County:		Cocke
Length:		0.92 ± Miles
Date:		June 2, 2003

Right-of-Way

Land, Improvements and Damages (5.4 Acres)	$	216,000	
Incidentals (1 Tracts)	$	3,000	
Relocation Payments (0 Residences)	$	-	
(0 Businesses)	$	-	
*Total Right-of-Way Cost			$ 219,000

* Right-of-way to be donated

Utility Relocation

Reimbursable	$	-	
Non-Reimbursable	$	-	
Total Utility Cost			$0

Construction Cost

Clear and Grubbing	$	10,000	
Earthwork	$	105,000	
Pavement Removal	$	15,000	
Drainage (including Erosion Control)	$	50,000	
Structures	$	-	
Railroad Crossing or Separation	$	-	
Paving	$	425,000	
Interchanges	$	-	
Maintenance of Traffic	$	25,000	
Topsoil	$	30,000	
Seeding	$	10,000	
Sodding	$	-	
Signing	$	5,000	
Lighting	$	-	
Signalization	$	-	
Fence	$	-	
Guardrail	$	20,000	
Rip Rap or Slope Protection	$	-	
Other Construction Items (8.5%)	$	59,000	
Mobilization	$	38,000	
Total Construction Cost			$ 792,000
10% Engineering and Cont.			$ 80,000
Total Construction Cost w/ Engineering and Cont.			$ 872,000
10% Preliminary Engineering			$ 80,000
TOTAL COST			$ 1,171,000

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.***

   At the preliminary study stages of this project, alternative schemes were discussed and design alternatives considered in the previous report were reviewed. Those alternative schemes consisted of:

   1. *A trumpet-type interchange oriented to the west;*
   2. *Improving existing interchanges to the east and west;*
   3. *Improving the local road network; and*
   4. *Construction of a diamond interchange with a connector route to SR 32 to the west and a connector route to SR 73 to the east.*

   Alternative 4 was chosen as the appropriate design scheme for this location due to the proposed development plans and making logical connections to the state highway system.

   The general area surrounding the proposed interchange is rural with the exception of the City of Newport. Due to the characteristics of the area, the low population density, and the proximity to no major metropolitan area, ramp metering, mass transit and HOV lanes are currently not applicable for this area.

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 an analysis of sections of Interstate to and including at least the first adjacent existing or proposed interchange on each 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 the new or revised access points.***

   The operational analyses of the projected phased 2007and projected 2027 traffic under three roadway development scenarios were made on the section of I-40, the adjacent interchanges (including ramps, ramp termini intersections, and cross street mainlines), and the local network intersections that would be impacted by the additional traffic with the development of the land and construction of the interchange.

   The results of the operational analyses are discussed in Chapter 3 of this report and the data sheets are contained in the Appendix.

4. ***The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" for special purpose 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.

The proposed interchange is a full diamond interchange and will provide for all traffic movements. The recommended interchange design will meet all American Association of State Highway and Transportation Officials (AASHTO) criteria, including "A Policy on Geometric Design of Highways and Streets" and "A Policy on Design Standards – Interstate System".

5. ***The proposal considers and is consistent with local and regional land use and transportation plans. Prior to final approval, all requests for new or revised access must be consistent with the metropolitan and or statewide transportation plan, as appropriate, the applicable provisions of 23 CFR part 450 and transportation conformity requirements of 40 CFR parts 51 and 93.***

   As discussed previously in the report, the undeveloped land surrounding the proposed interchange has the potential to accommodate a variety of land uses and stimulate the economic growth of this area. The construction of the proposed interchange is vital to the development of the land and stimulating economic growth. Local officials, including planning and zoning agencies fully support the proposed interchange. The Newport Utilities have committed to supplying the utility network to the proposed development.

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.***

   Due to the topography of the area, the locations of existing interchanges and the limitations due to the National Parks surrounding this location, there is no potential for future multiple interchange additions on I-40 near the proposed interchange.

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.***

   The primary objective of the proposed interchange is to provide safe and adequate facilities for the projected traffic volumes generated by the development planned for the area surrounding the interchange. Without the proposed interchange, the proposed development will not have access to a main roadway network to adequately disperse the traffic and minimize congestion.

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.

This proposal has been coordinated closely with local officials and meets the planning requirements for projects in rural areas. A preliminary environmental site assessment was conducted as part of this study. As shown in the "Checklist of Determinants for Location Study," the preliminary site assessment did not reveal the presence of any environmentally sensitive areas for historic, archeological and ecological considerations. A more detailed environmental assessment will be conducted in a later phase, if the proposed interchange is found to be warranted and compatible with Interstate System requirements.

CHAPTER 4
SUMMARY AND CONCLUSION

This study was conducted in accordance with the requirements outlined in the Federal Highway Administration's Policy Statement "Additional Interchanges to the Interstate System", Federal Register Vol. 63, No. 28, dated February 11, 1998.

The development of the 1000-plus acres surrounding the proposed interchange has the potential to accommodate a variety of land uses and create a base for economic development and jobs in the area, however this is dependent on direct access to I-40 near the current location of the O'Neil Road overpass. This study analyzed the traffic operations on the mainline of I-40 along with the adjacent interchange operations. As shown in **Chapter 3, Section A**, the analyses show some deficiencies in the future (2027) result. However, some of these deficiencies can be corrected with intersection signalization and other minor improvements. The proposed full-diamond interchange will serve the future traffic demands created by the proposed development.

The construction of the proposed interchange and the connections of O'Neil Road through the development to SR 32 and SR 73 is an essential part of the overall transportation network with the inclusion of the proposed development.

Based on the information and analyses contained in this report, it is recommended that the additional access point to serve the proposed development near the existing O'Neil Road overpass be approved as part of the Interstate Highway System.

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

TENN.	YEAR	SHEET NO.
	2003	1
FED. AID PROJ. NO.		
STATE PROJ. NO.		

Index Of Sheets

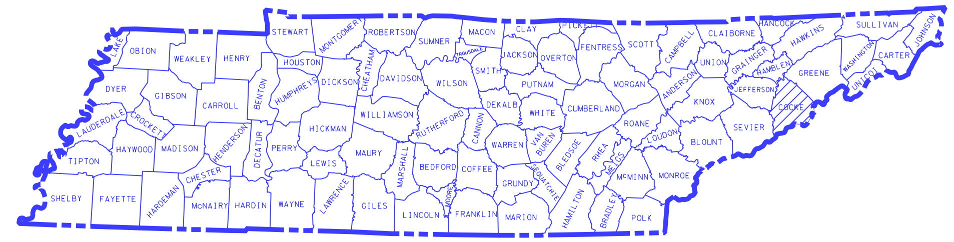
SHEET NO.	DESCRIPTION
1	.... TITLE SHEET
2	.... PROPOSED TYPICAL SECTIONS
3-6	.... PROPOSED INTERCHANGE LAYOUT

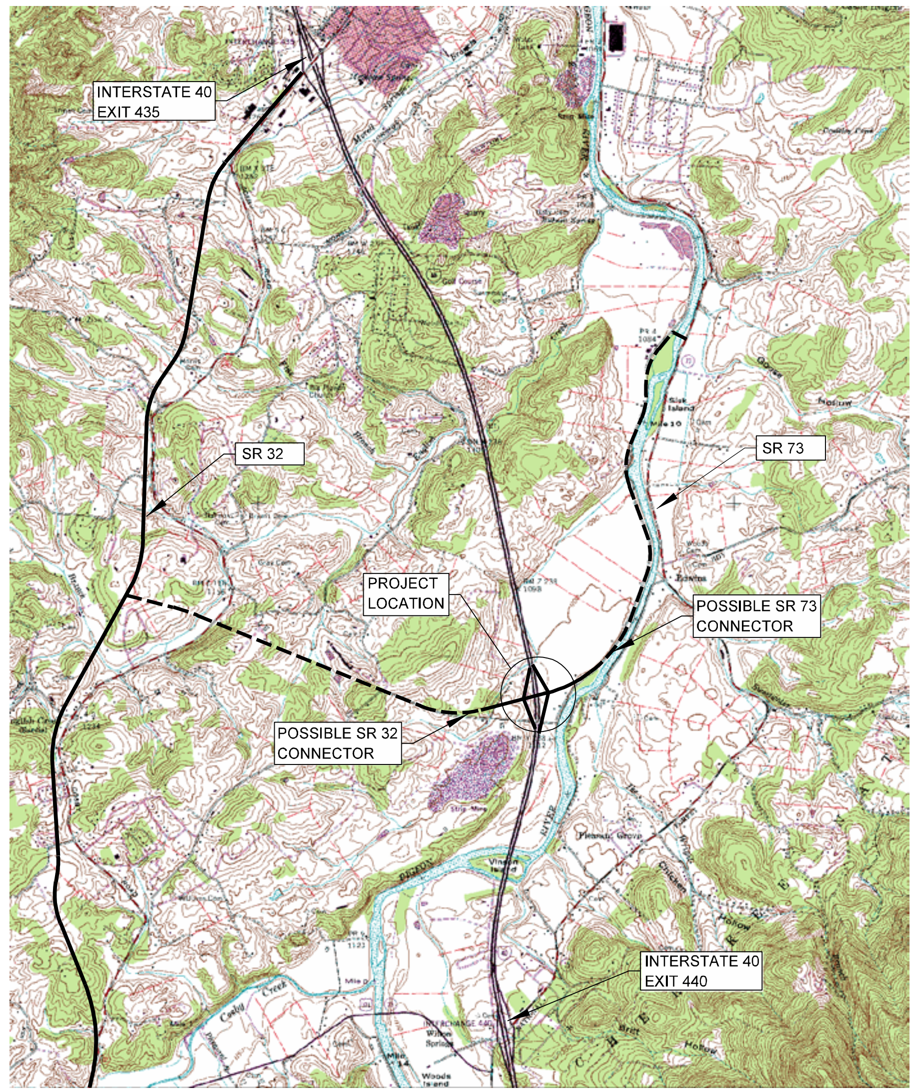
STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING AND DEVELOPMENT

COCKE COUNTY

INTERCHANGE JUSTIFICATION STUDY
INTERSTATE 40 AT O'NEIL ROAD

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





SCALE: 1"= 5000'

N

APPROVED: ______________________
DIRECTOR, DESIGN DIVISION

DATE: ______________________

APPROVED: ______________________
COMMISSIONER

SPECIAL NOTES

PROPOSALS MAY BE REJECTED BY THE COMMISSIONER IF ANY OF THE UNIT PRICES CONTAINED THEREIN ARE OBVIOUSLY UNBALANCED, EITHER EXCESSIVE OR BELOW THE REASONABLE COST ANALYSIS VALUE.

THIS PROJECT TO BE CONSTRUCTED UNDER THE STANDARD SPECIFICATIONS OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION DATED MARCH 1, 1995 AND ADDITIONAL SPECIFICATIONS AND SPECIAL PROVISIONS CONTAINED IN THE PLANS AND IN THE PROPOSAL CONTRACT

TDOT ROAD SP. SV. 2 ______________________

DESIGNER PBS&J ______________________ CHECKED BY ______________________

P.E. NO. ______________________

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

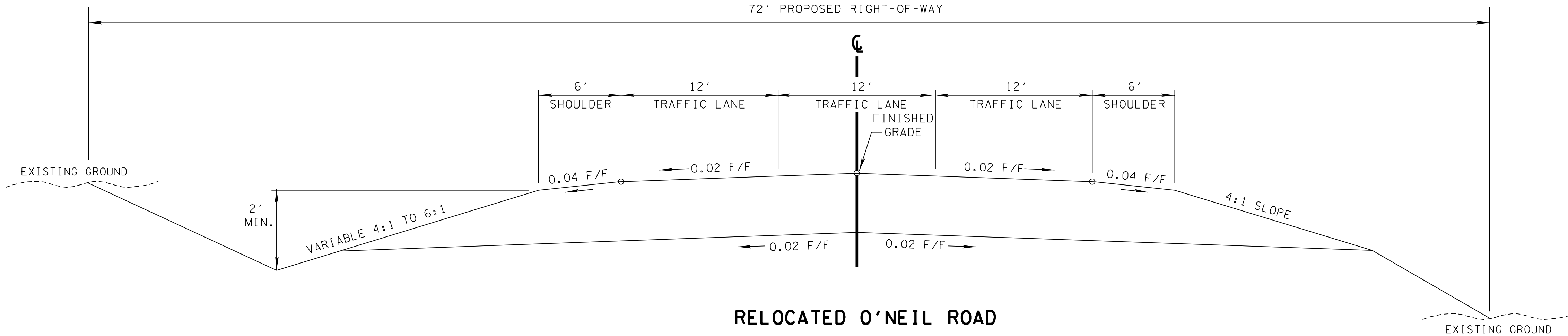
APPROVED:

______________________ DIVISION ADMINISTRATOR ______ DATE

$$DGNSPEC$$$$
$$$$SYTIME$$$$$$$$

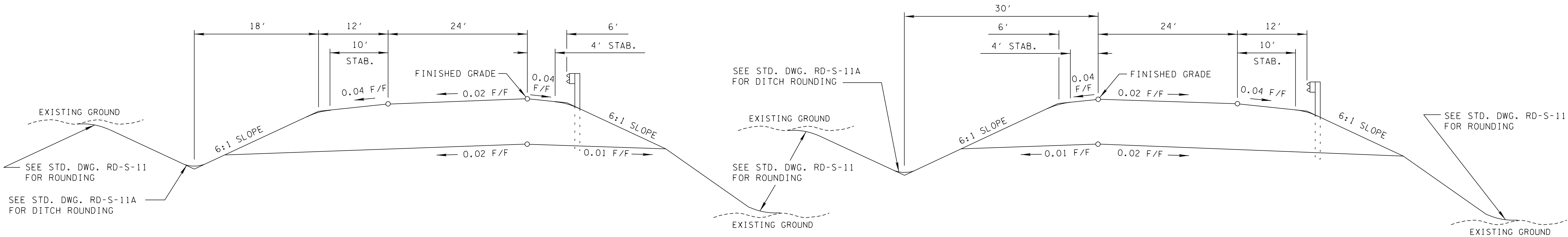
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
IJS	2003		2



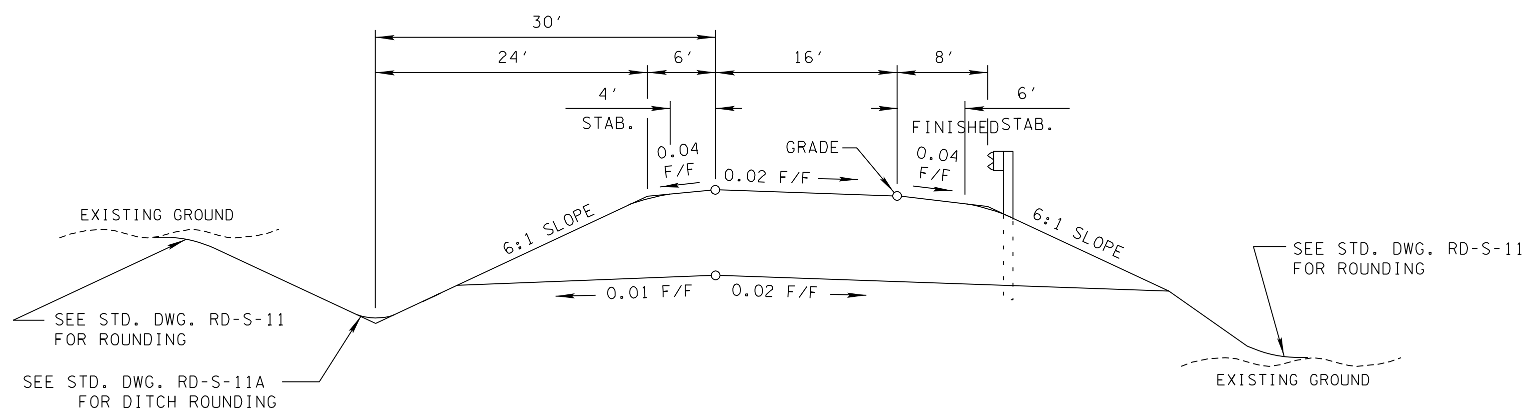
RELOCATED O'NEIL ROAD

(BASED ON STD. DWG. RD-TS-7)



INTERSTATE 40

(BASED ON STD. DWG. RD-TS-3B)



RAMP SECTIONS AT INTERCHANGE

(BASED ON STD. DWG. RD-TS-4)

$$$$SYTIME$$$$$$
$$$$DGNSPEC$$$

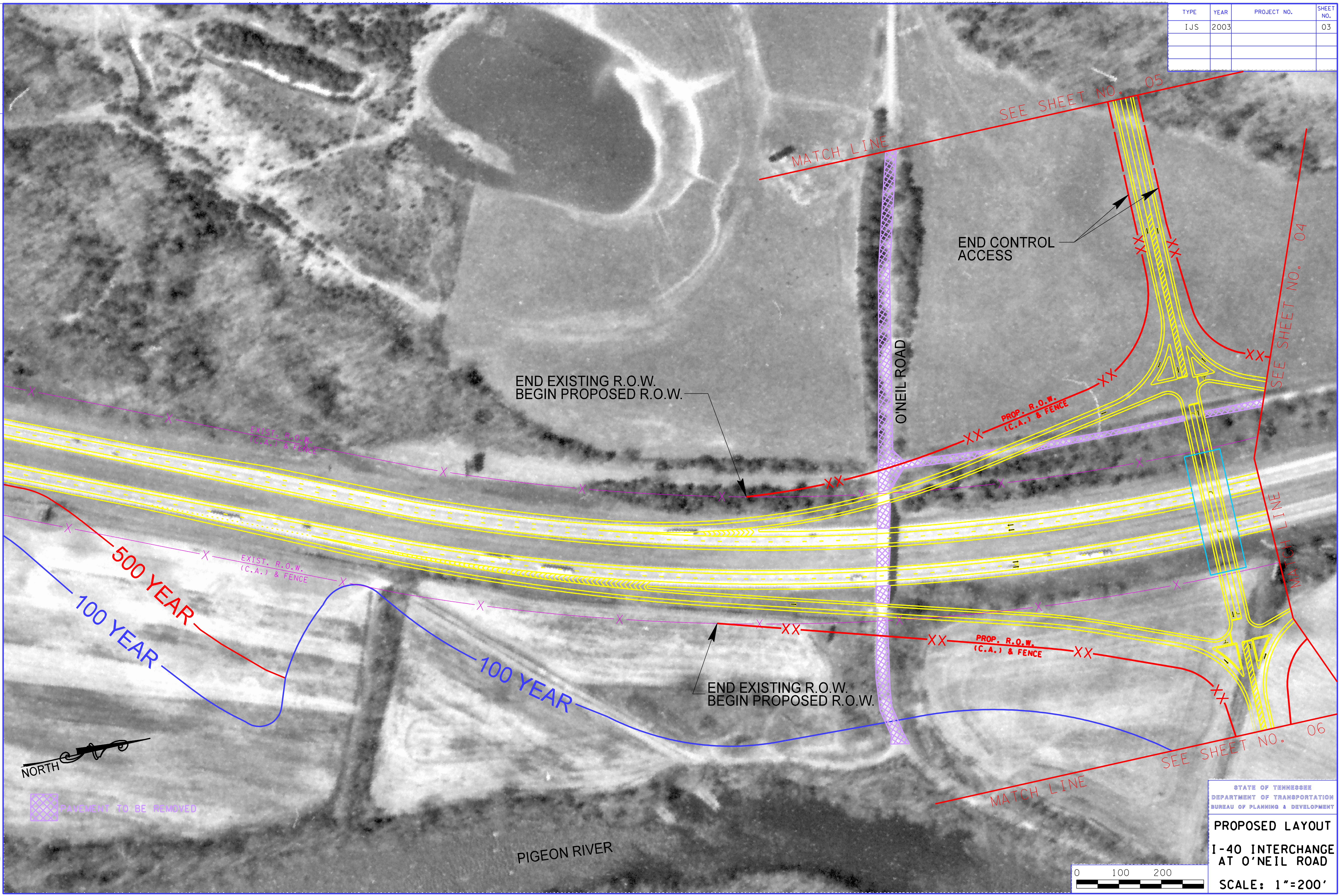
Survey & Design Division

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

TYPICAL SECTIONS

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

TYPE	YEAR	PROJECT NO.	SHEET NO.
IJS	2003		03



$$$$SYTIME$$$$$$
$$$$DGNSPEC$$$$

Survey & Design Division

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

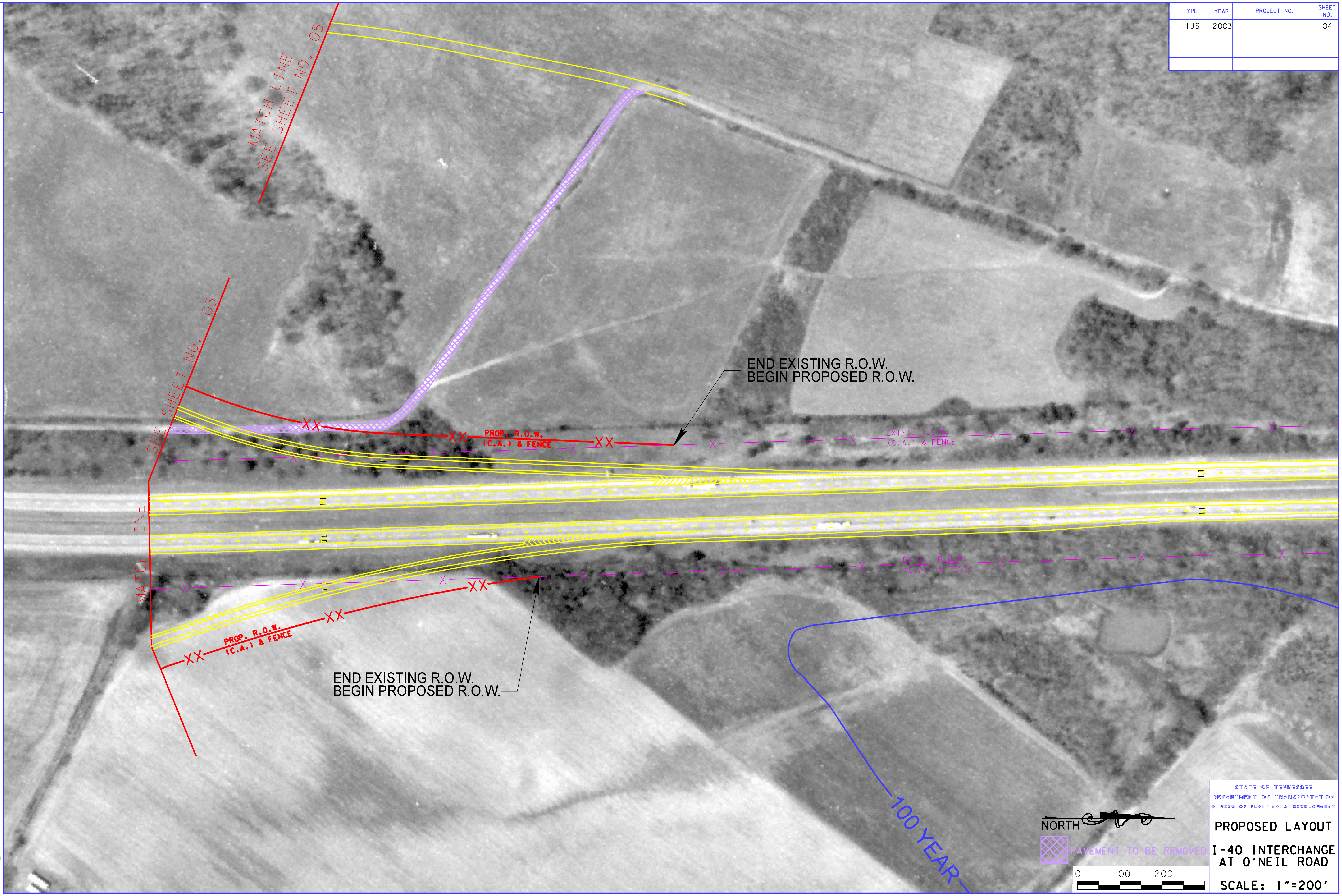
PROPOSED LAYOUT

I-40 INTERCHANGE
AT O'NEIL ROAD

SCALE: 1"=200'

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

TYPE	YEAR	PROJECT NO.	SHEET NO.
IJS	2003		04



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

PROPOSED LAYOUT

I-40 INTERCHANGE AT O'NEIL ROAD

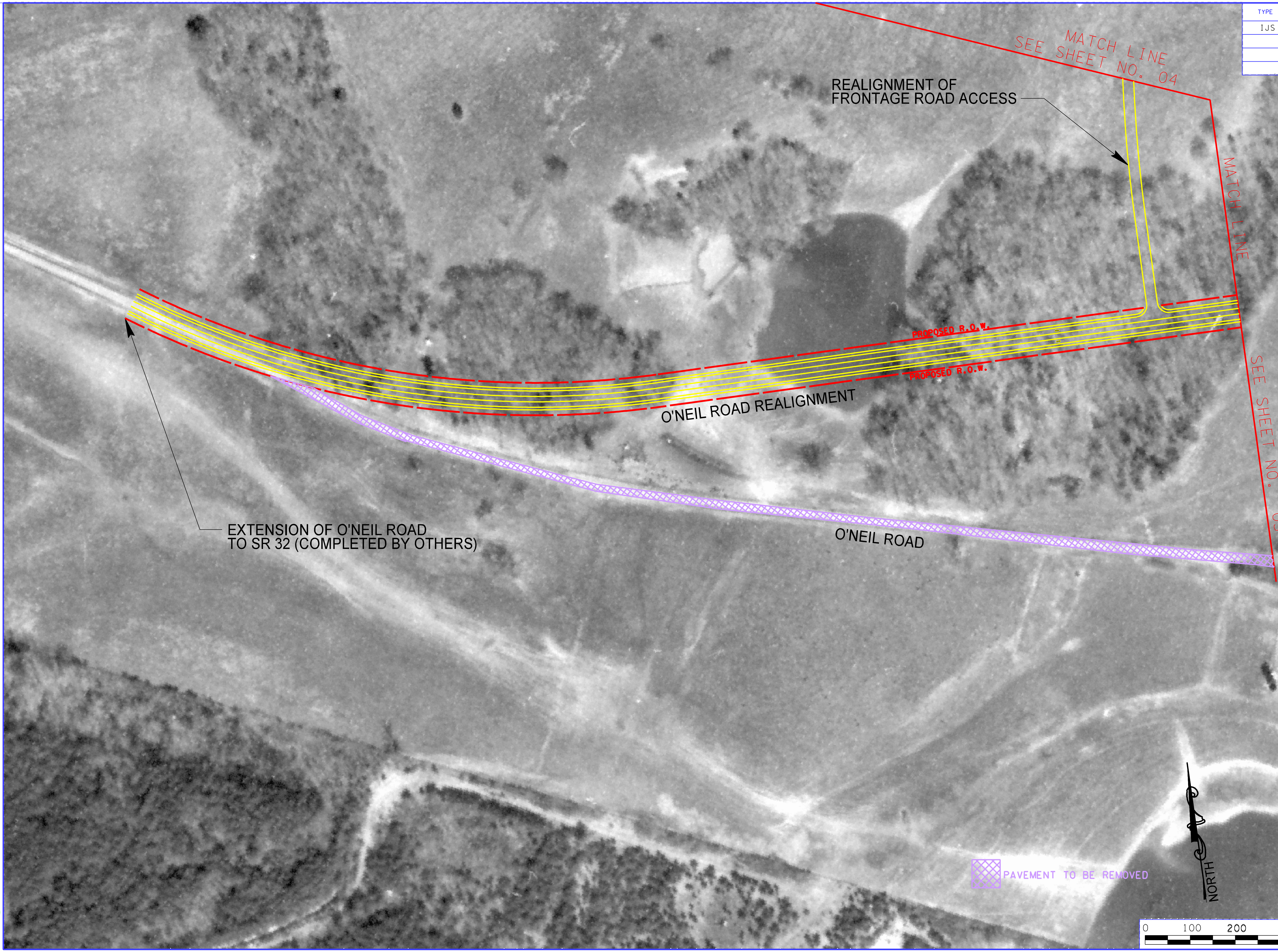
SCALE: 1"=200'

$$$$SYTIME$$$$$$
$$$$DGNSPEC$$

Survey & Design Division

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

TYPE	YEAR	PROJECT NO.	SHEET NO.
IJS	2003		05



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

PROPOSED LAYOUT

I-40 INTERCHANGE
AT O'NEIL ROAD

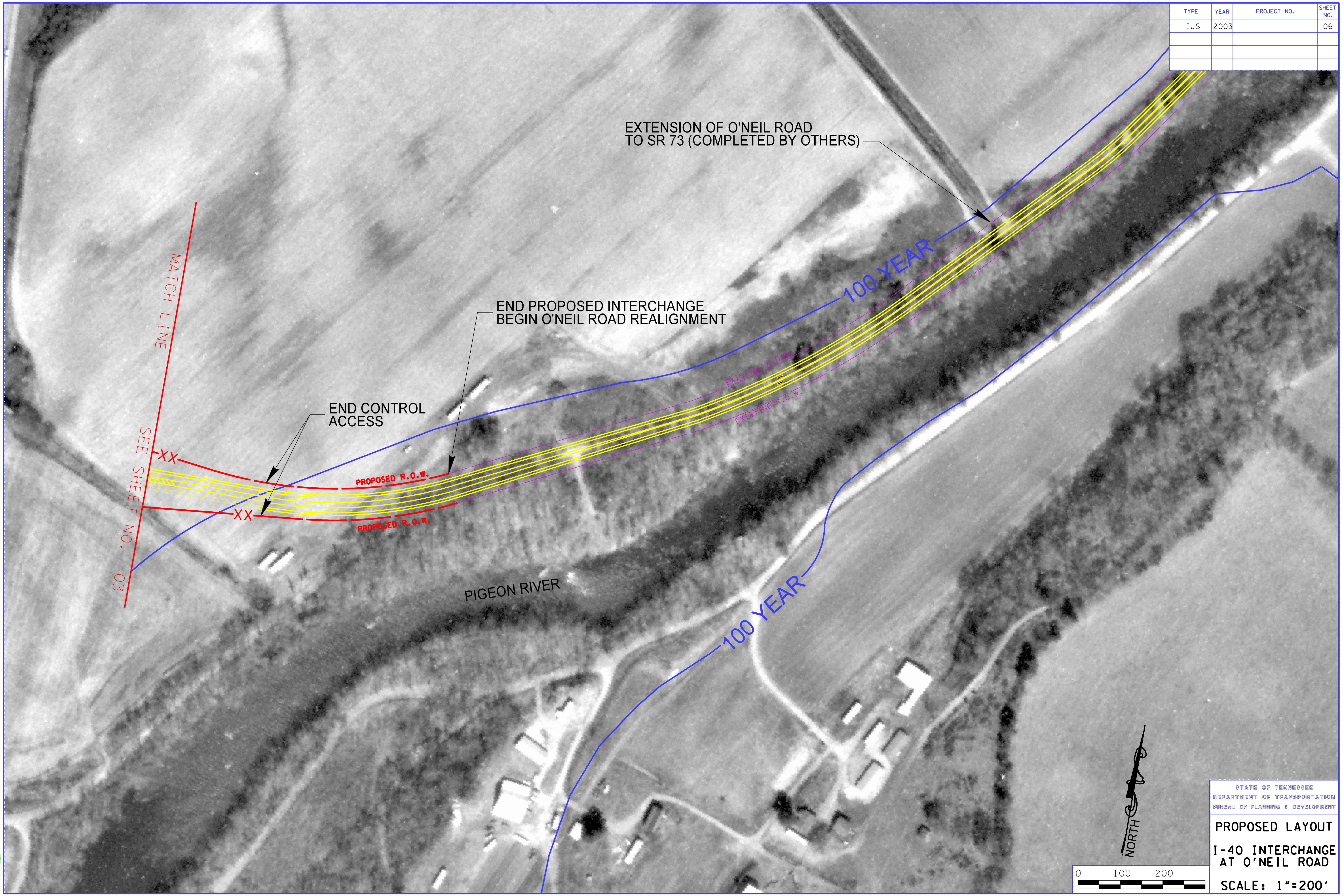
SCALE: 1"=200'

$$$$SYTIME$$$$$$
$$$$DGNSPEC$$

Survey & Design Division

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

TYPE	YEAR	PROJECT NO.	SHEET NO.
IJS	2003		06



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

PROPOSED LAYOUT

I-40 INTERCHANGE
AT O'NEIL ROAD

SCALE: 1"=200'

$$$$SYTIME$$$$$$$
$$$$DGNSPEC$$$

Survey & Design Division

APPENDICES

INTERCHANGE JUSTIFICATION STUDY

INTERSTATE 40
AT
O'NEIL ROAD

COCKE COUNTY, TENNESSEE

PREPARED BY
PBS&J

FOR
TENNESSEE DEPARTMENT OF TRANSPORTATION
PLANNING DIVISION

June, 2003

APPENDIX A
CONCEPT PLAN

TO GATLINBURG

O'NEIL RD.

GOLF COURSE
250 ACRES
120 CONDO UNITS
65 SINGLE FAMILY RESIDENCES
85,000 SQFT. CLUB HOUSE
RESTRICTED

HOUSING SITES

PROFESSIONAL BLDG.

OFFICES

RETAIL SITE B
450,000 SQ. FT.

PROPERTY LINES

AREO CLUB
85 RESIDENCES

EXEMPLARY LOT DIVISIONS

AIR STRIP

192 RV
CAMPING SITES

EATING
ESTABLISHMENT
SITE 20,000
SQ. FT.

140
ROOM
MOTEL SITE

AVIATION
SERVICE / STORAGE

200,000 SQ. FT.
CONVENIENCE
CENTER SITE

O'NEIL RD.

RETAIL SITE A
600,000 SQ. FT.

I-40 TO NEWPORT

FRONTAGE RD.

FRONTAGE RD.

I-40

WHISTLE STOP MALL SITE
100,000 SQ. FT.

EATING
ESTABLISHMENT
SITE 15,000 SQ. FT.

RETAIL SITE C
500,000 SQ. FT.

140 ROOM
MOTEL SITE

O'NEIL RD.

PIGEON RIVER

PIGEON RIVER

J. Coulter Design assumes no liability for any structure constructed on this plan. It is the responsibility of the owner or other person to plan to perform the following before beginning the actual construction.
1) Builder or contractor must verify ALL DIMENSIONS prior to construction.
2) Builder, along with construction, must verify compliance with all local building codes in the area where the home is constructed.
3) Plans indicate design intent only. It is the responsibility of the owner, builder or contractor to incorporate all engineering and electrical aspects.
This drawing is the property of J. COULTER DESIGN and may not be used or reproduced without their written permision.

DRAWN BY:
JEANA B. COULTER
96 BURNETTE HILL RD., FRANKLIN, NC 28734
PH. 828-349-3051 FX. 828-349-9111 jcoulter@dnet.net

SCALE: NO SCALE
DATE: 07-02-02
DRAWN BY: JBC

A Conceptual Plan for:

TENNESSEE DEVELOPMENT PROJECT

prepared for: JAMES VANDERWOUDE

SHEET #
1

APPENDIX B
TRAFFIC DATA

TENNESSEE DEPARTMENT OF TRANSPORTATION
MAPPING AND STATISTICS OFFICE
TRAFFIC AND SAFETY PLANNING SECTION

(REV. 2/7/02)

PROJECT NO.: _____ ROUTE: I-40 @ O'NEIL ROAD
COUNTY: COCKE CITY: NEWPORT
PROJECT DESCRIPTION: INTERCHANGE JUSTIFICATION STUDY OF NEW INTERCHANGE AT I-40 & O'NEIL ROAD. [INCLUDES TRAFFIC FOR PROPOSED DEVELOPMENT AT THIS INTERCHANGE.]

DIVISION REQUESTING:

MAINTENANCE	☐	SPECIAL DESIGN	☐
PLANNING	☒	STRUCTURES	☐
PROG. DEVELOPMENT & ADM.	☐	SURVEY & DESIGN	☐
PUBLIC TRANS. & AERO.	☐	OTHER _____	☐

YEAR PROJECT PROGRAMMED FOR CONSTRUCTION: _____
PROJECTED LETTING DATE: _____

TRAFFIC ASSIGNMENT:

BASE YEAR		[SEE ATTACHMENTS] DESIGN YEAR					DESIGN ROADWAY % TRUCKS		DESIGN AVERAGE DAILY LOADS	
ADT	YEAR	ADT	DHV	%	YEAR	DIR.DIST.	DHV	ADT	FLEX	RIGID
	2007				2027					

REQUESTED BY: NAME MATT ASHBY DATE 3-21-03
DIVISION FACILITIES PLANNING
ADDRESS 900 J. K. POLK BUILDING
NASHVILLE TN. 37243

REVIEWED BY: TONY ARMSTRONG Tony Armstrong DATE 3·28·03
TRANSPORTATION MANAGER 1
SUITE 1000, JAMES K. POLK BUILDING

APPROVED BY: STEVE ALLEN DATE 3-28-03
TRANSPORTATION MANAGER 2
SUITE 1000, JAMES K. POLK BUILDING

COMMENTS:

THIS PROJECT VOIDS THE PREVIOUS PROJECT DATED 10-7-2002. ALL 2007 TRAFFIC DATA WAS REDUCED BASED ON A FEASIBLE DEVELOPMENT PHASE FOR 2007 AS SHOWN IN THE LETTER FROM P.B.S.& J. DATED 3-20-2003.

THIS TRAFFIC INCLUDES SCHEMES FOR THE FOLLOWING :
[1] EXISTING SYSTEM WITHOUT PROPOSED DEVELOPMENT.
[2] EXISTING SYSTEM WITH PROPOSED DEVELOPMENT.
[3] PROPOSED SYSTEM WITH PROPOSED DEVELOPMENT.

DHV'S ARE NOT REQUIRED FOR SIDE ROADS LESS THAN 1000 ADT.

NOTE: FOR BRIDGE REPLACEMENT PROJECTS, ADLs ARE NOT REQUIRED FOR ADTs OF 1000 OR LESS AND PERCENTAGE OF TRUCKS OF 7% OR LESS.
SEE ATTACHMENTS FOR TURNING MOVEMENTS AND/OR OTHER DETAILS.

PBS&J

An employee-owned company

March 20, 2003

Mr. Steve Allen
Tennessee Department of Transportation
Mapping and Statistics Office
Suite 1000, James K. Polk Building
Nashville, TN 37243

Subject: Interchange Justification Study, I-40 @ O'Neil Road, Cocke County

Dear Steve:

We have discussed the traffic issues presented at the project review meeting on March 12, 2003. Per the comments in the meeting, we have determined a feasible development phase for 2007 of the proposed development. This phase includes:

- 100,000 sq. ft. Whistle Stop Mall (northeast quadrant);
- 20,000 sq. ft. Eating Establishment (southwest quadrant);
- 15,000 sq. ft. Eating Establishment (northeast quadrant);
- 140 Room Motel (northeast quadrant); and
- 450,000 sq. ft. Retail (Site B) (southwest quadrant).

In order to complete the revisions to the IJS, the traffic data for a 2007 phase of the development plan is required. The remaining trips generated by the proposed development will be assigned to the 2027 design year. Your timely development of the revised traffic is greatly appreciated. If you have any questions or need additional information, please let me know.

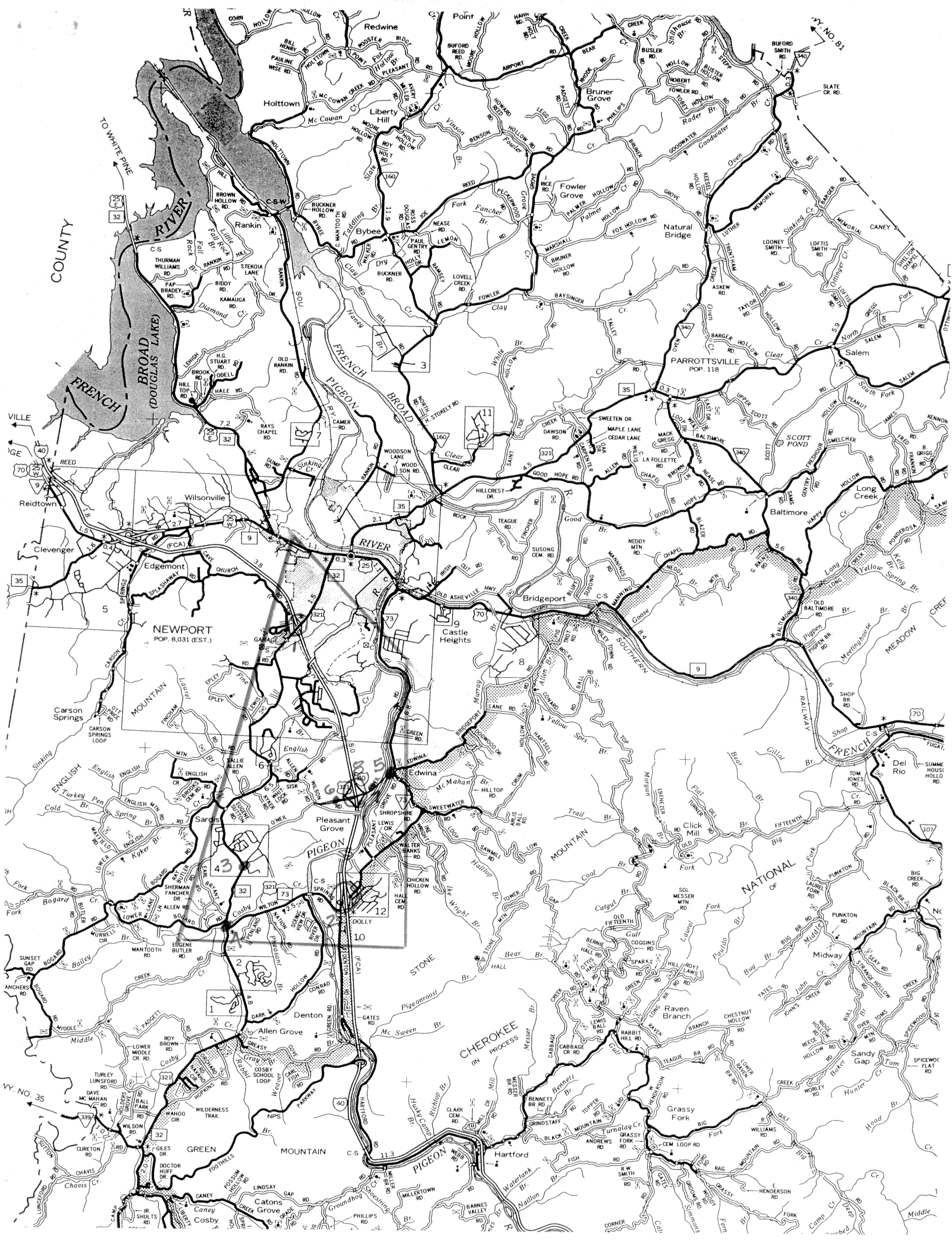
Sincerely.

PBS&J

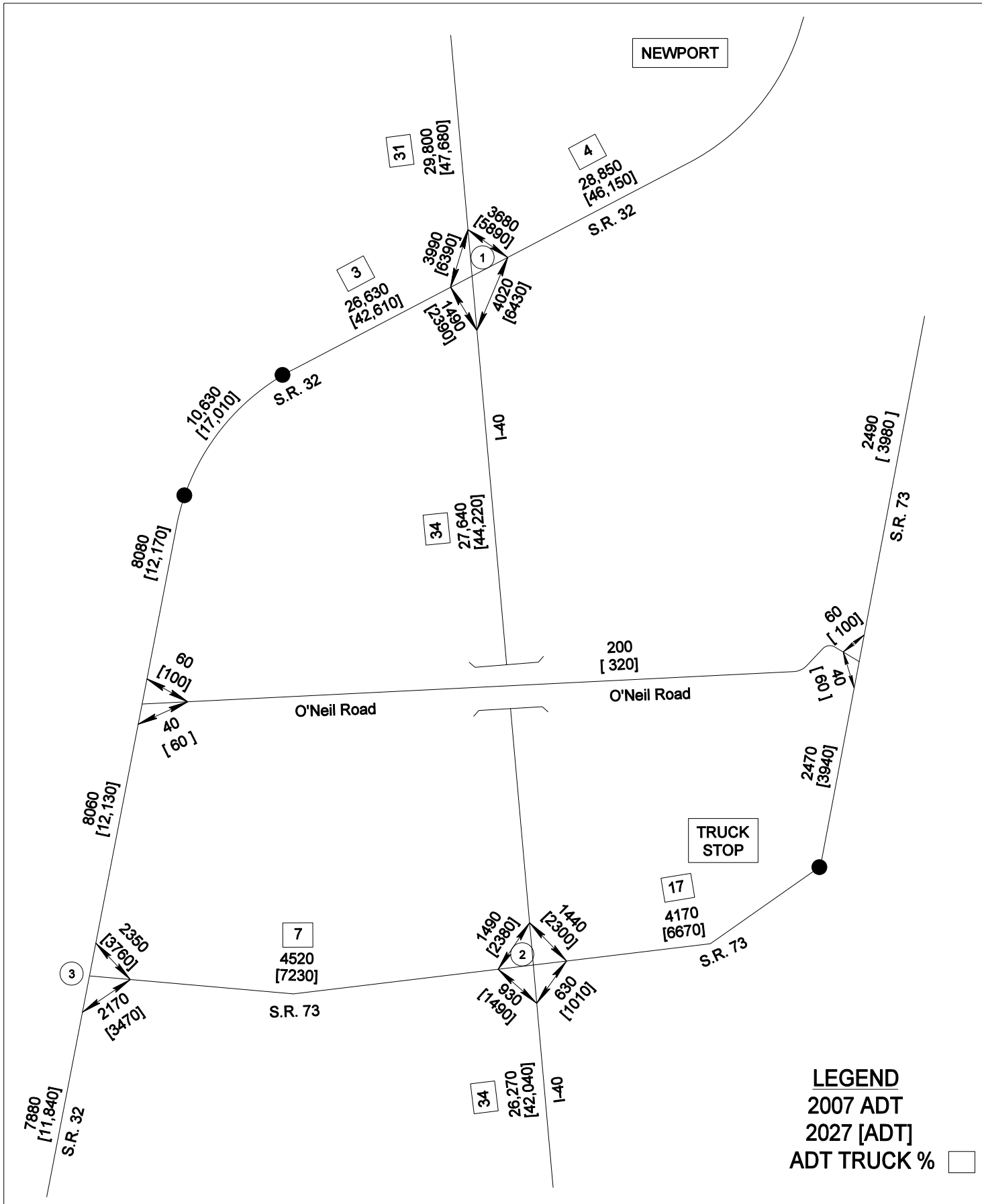
Gerald Bolden, P.E.
Senior Engineer I

Cc: Mr. Bill Wallace
File

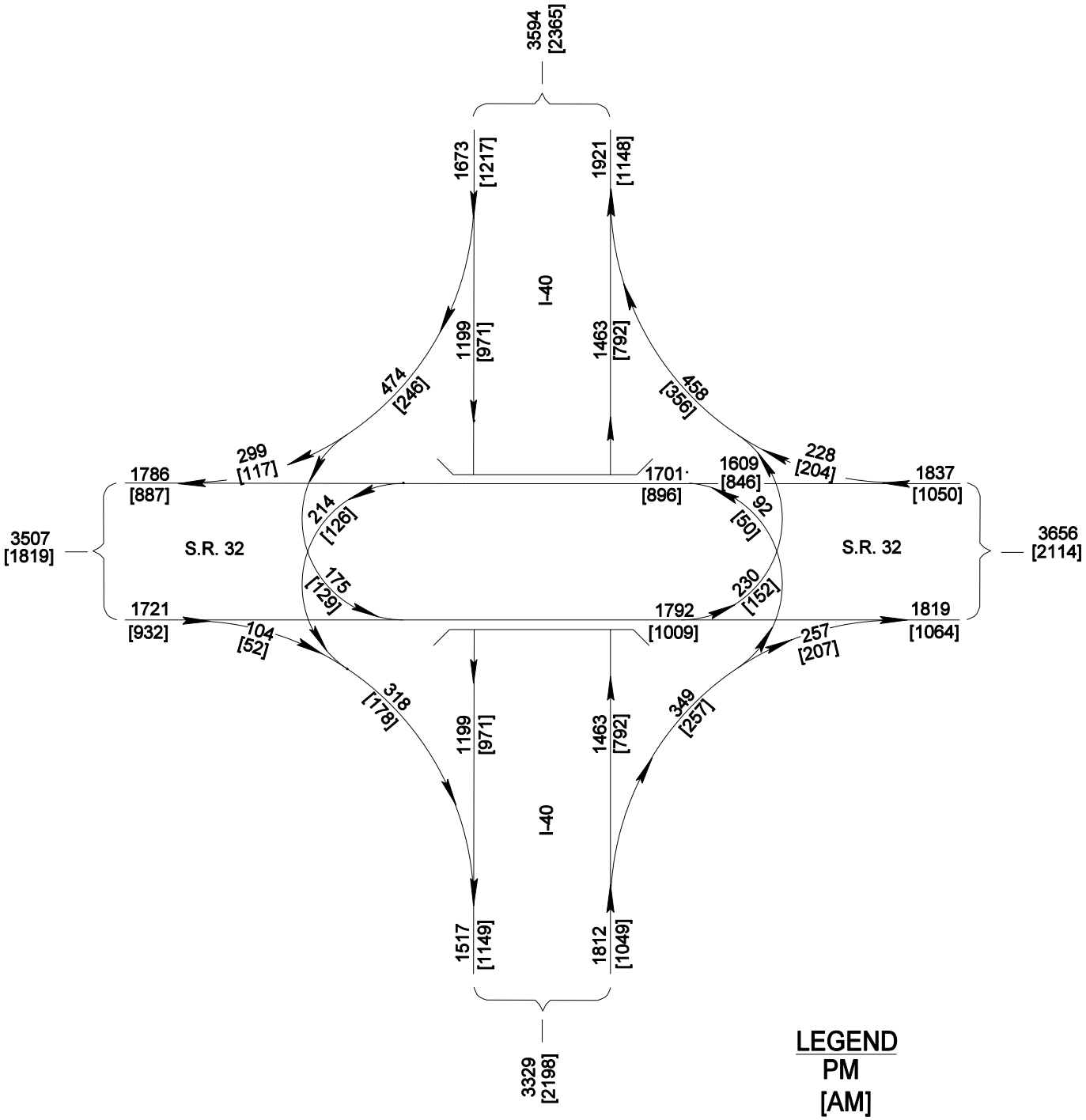
Two International Plaza Drive, Suite 810 • Nashville, Tennessee 37217 • Telephone: 615.399.0298 • Fax: 615.399.0263 • www.pbsj.com



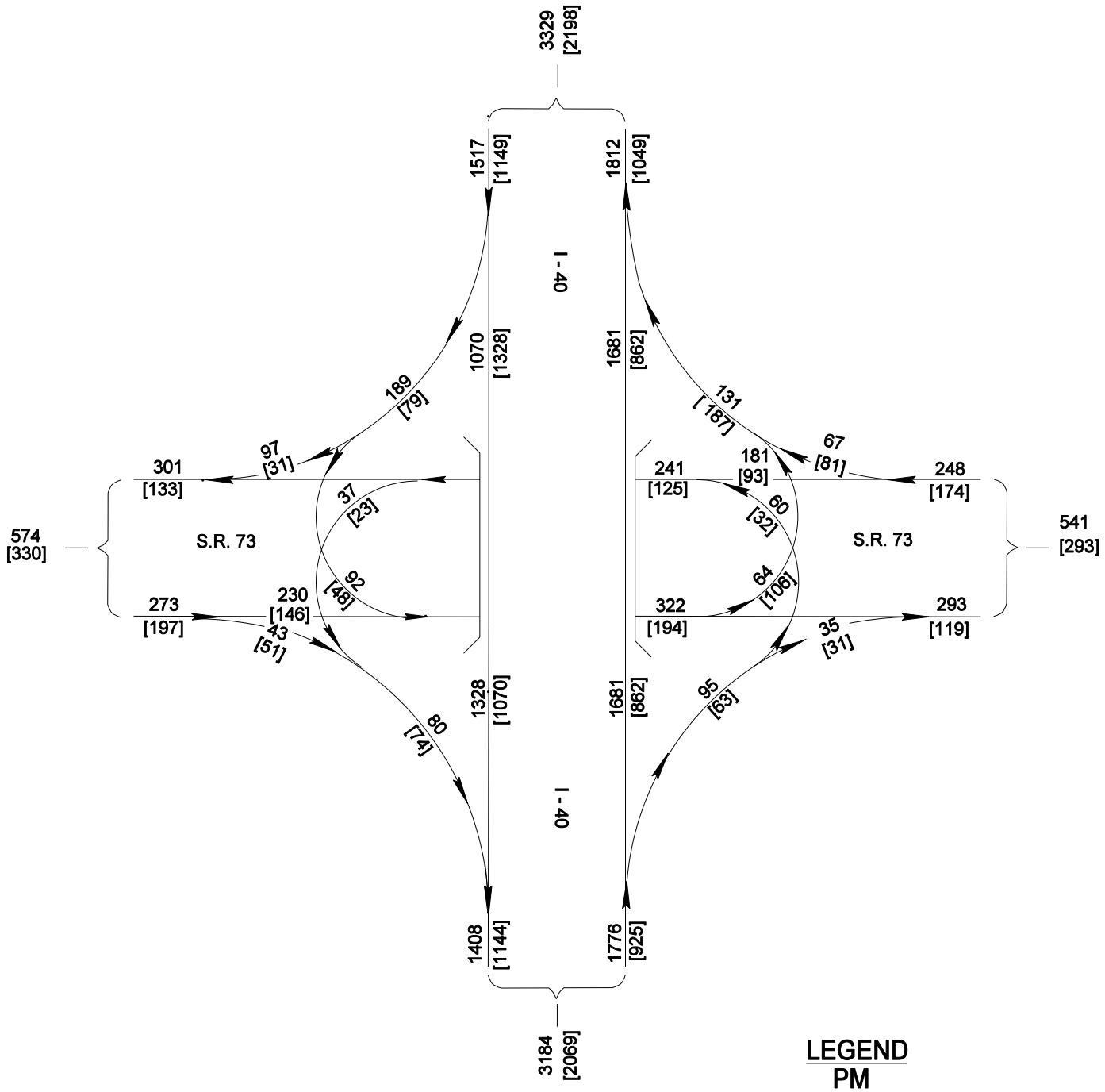
COUNTY
TO WHITE PINE
FRENCH BROAD (DOUGLAS LAKE)
RIVER
Redwine
Holttown
Liberty Hill
Bruner Grove
Fowler Grove
Natural Bridge
Rankin
Bybee
PARROTTSVILLE
POP. 118
Salem
Baltimore
Long Creek
Reidtown
Wilsonville
Clevenger
Edgemont
NEWPORT
POP. 8,031 (EST.)
Castle Heights
Bridgeport
Carson Springs
Edwina
Pleasant Grove
Sardis
Cosby
Denton
Allen Grove
Click Mill
Raven Branch
Grassy Fork
Hartford
Del Rio
Midway
Sandy Gap
Catons Grove
Cosby
STONE MOUNTAIN
CHEROKEE (IN PROCESS)
NATIONAL
GREEN MOUNTAIN
ENGLISH MOUNTAIN
MEADOW
PIGEON RIVER
SOUTHERN RAILWAY
FRENCH
SCOTT POND
HWY. NO. 81
HWY. NO. 35



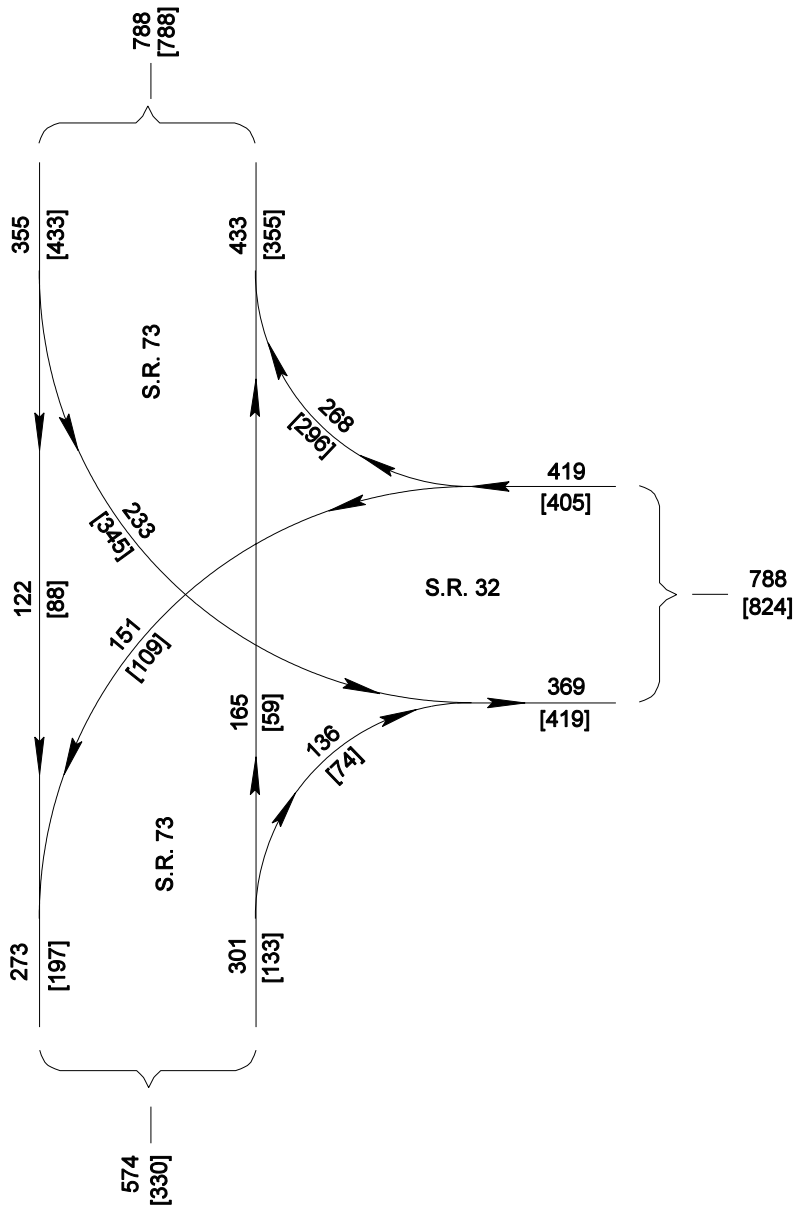
N	N.T.S.	Existing System Without Proposed Development I-40 @ O'Neil Road	Cocke County Newport



N	N.T.S.	Existing System Without Proposed Development I-40 @ S.R. 32 2007 DHV	Cocke County Newport



N	N.T.S.	Existing System Without Proposed Development I-40 @ S.R. 73 2007 DHV	Cocke County Newport

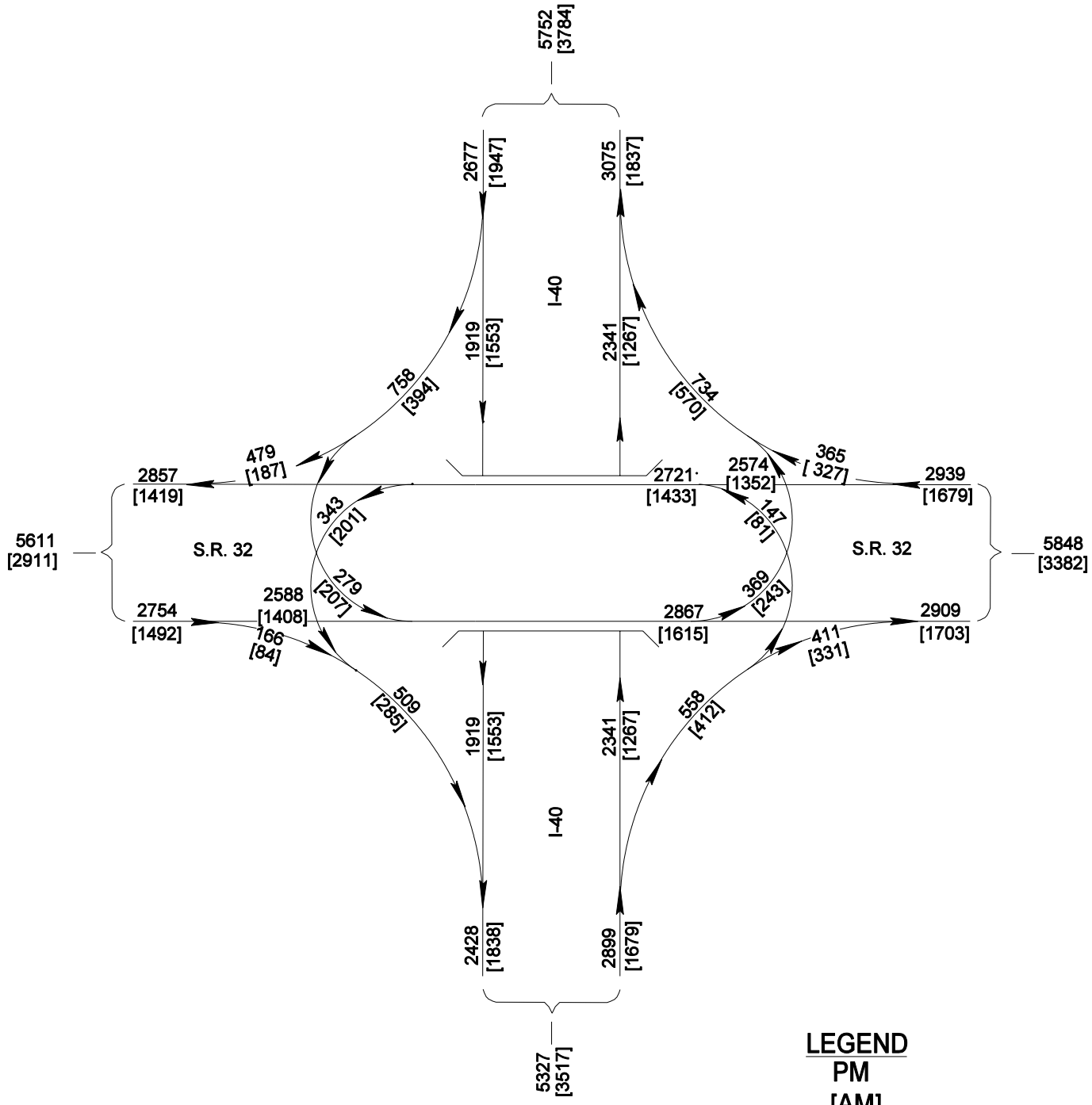


LEGEND

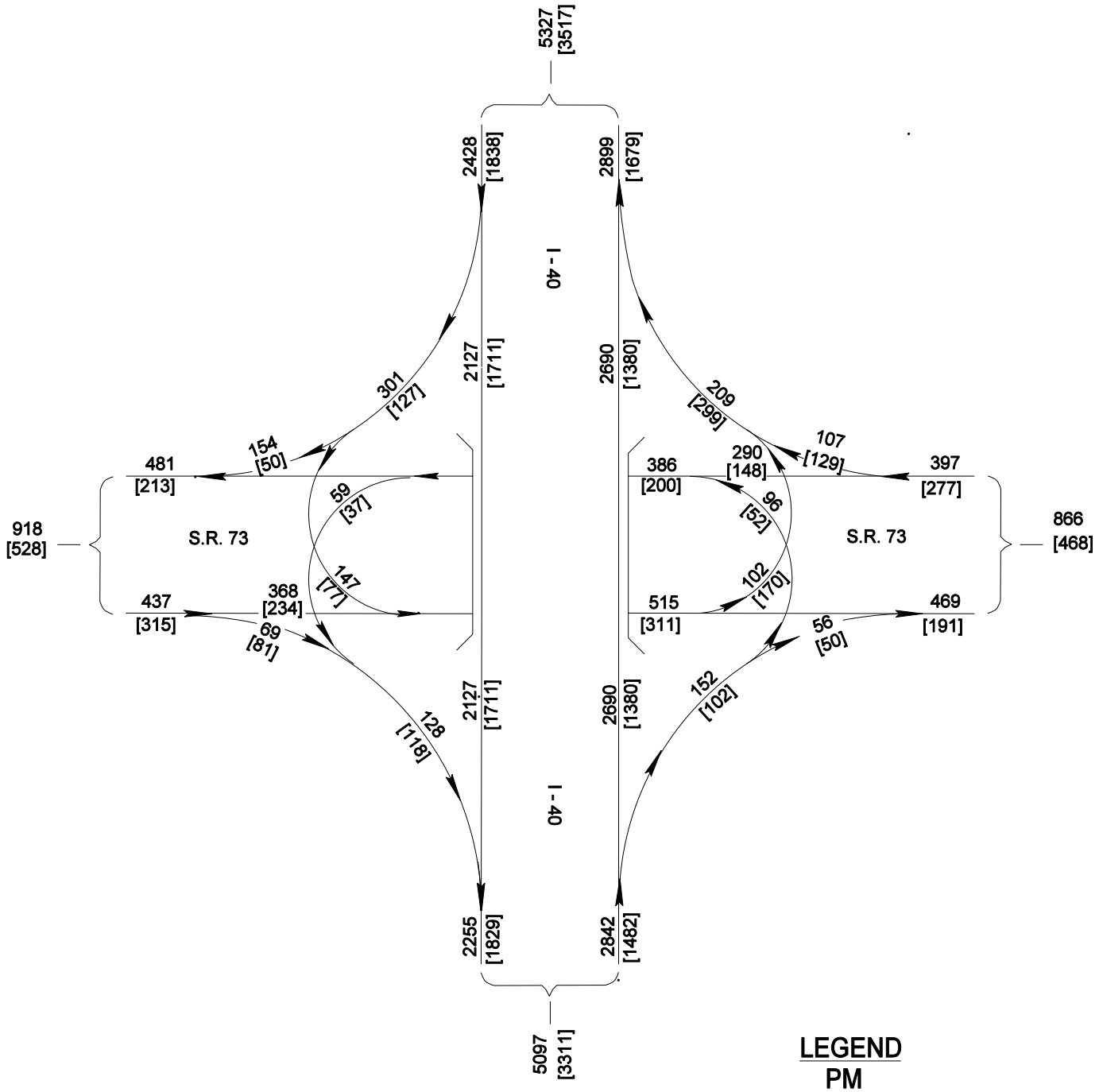
PM

[AM]

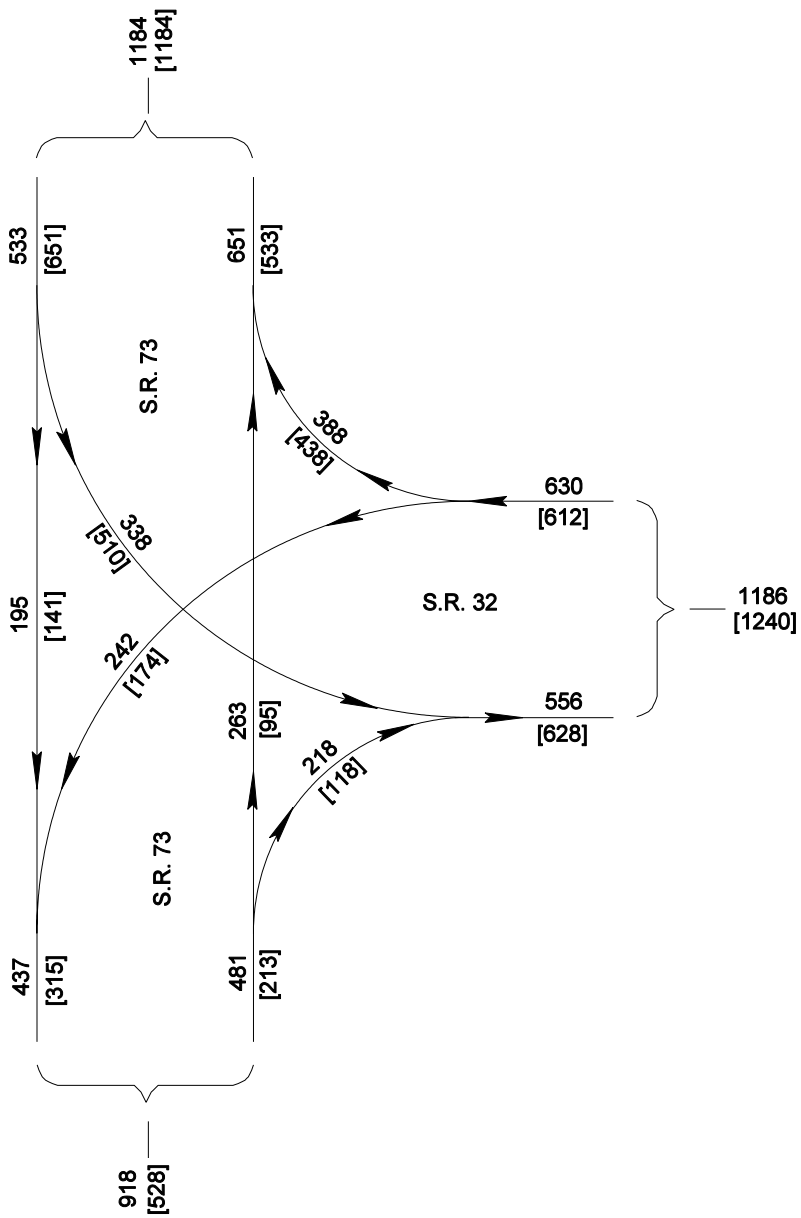
	N.T.S.	Existing System With Proposed Development S.R. 32 @ S.R. 73 2007 DHV	Cocke County Newport



N	N.T.S.	Existing System Without Proposed Development I-40 @ S.R. 32 2027 DHV	Cocke County Newport



N	N.T.S.	Existing System Without Proposed Development I-40 @ S.R. 73 2027 DHV	Cocke County Newport

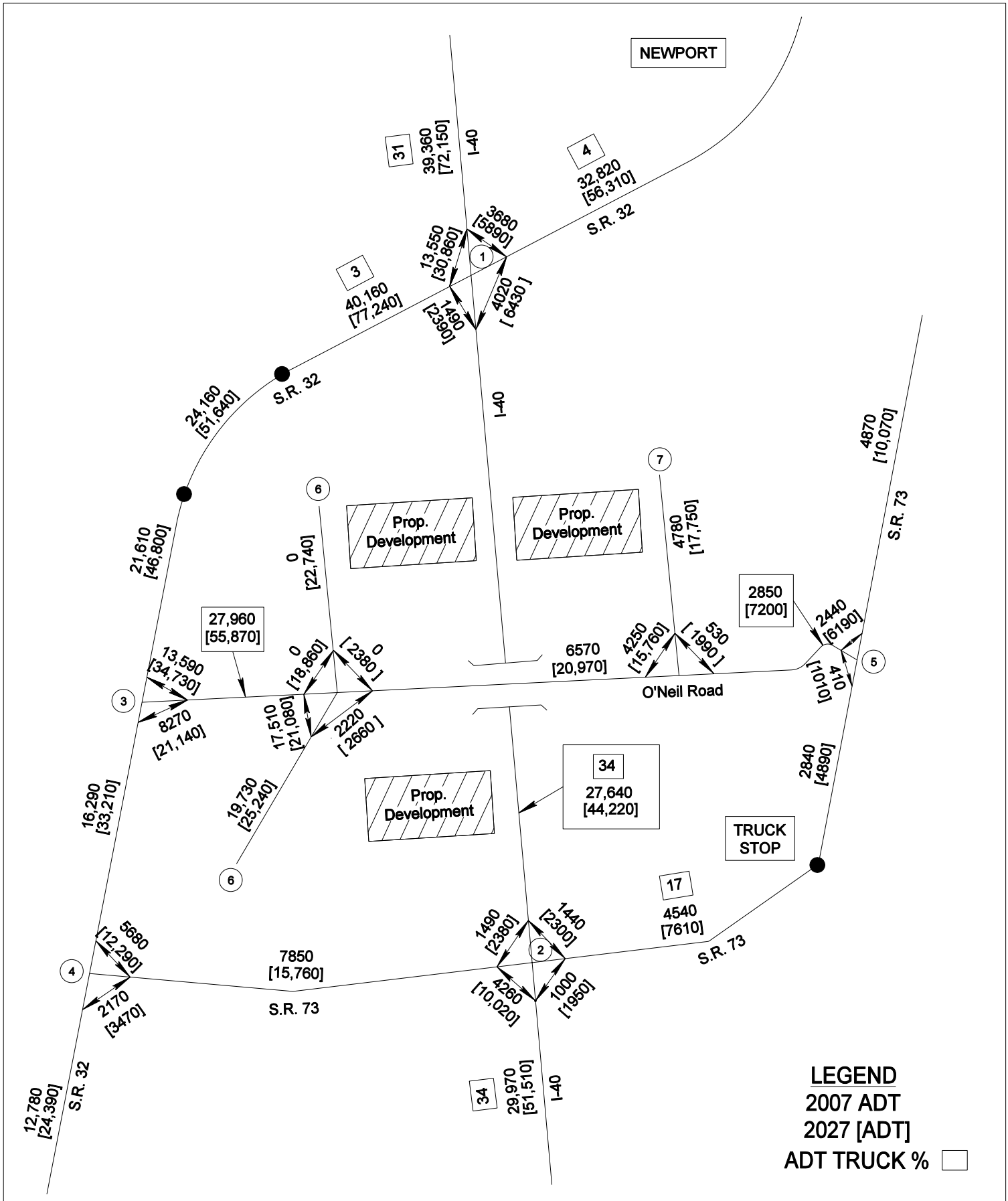


LEGEND

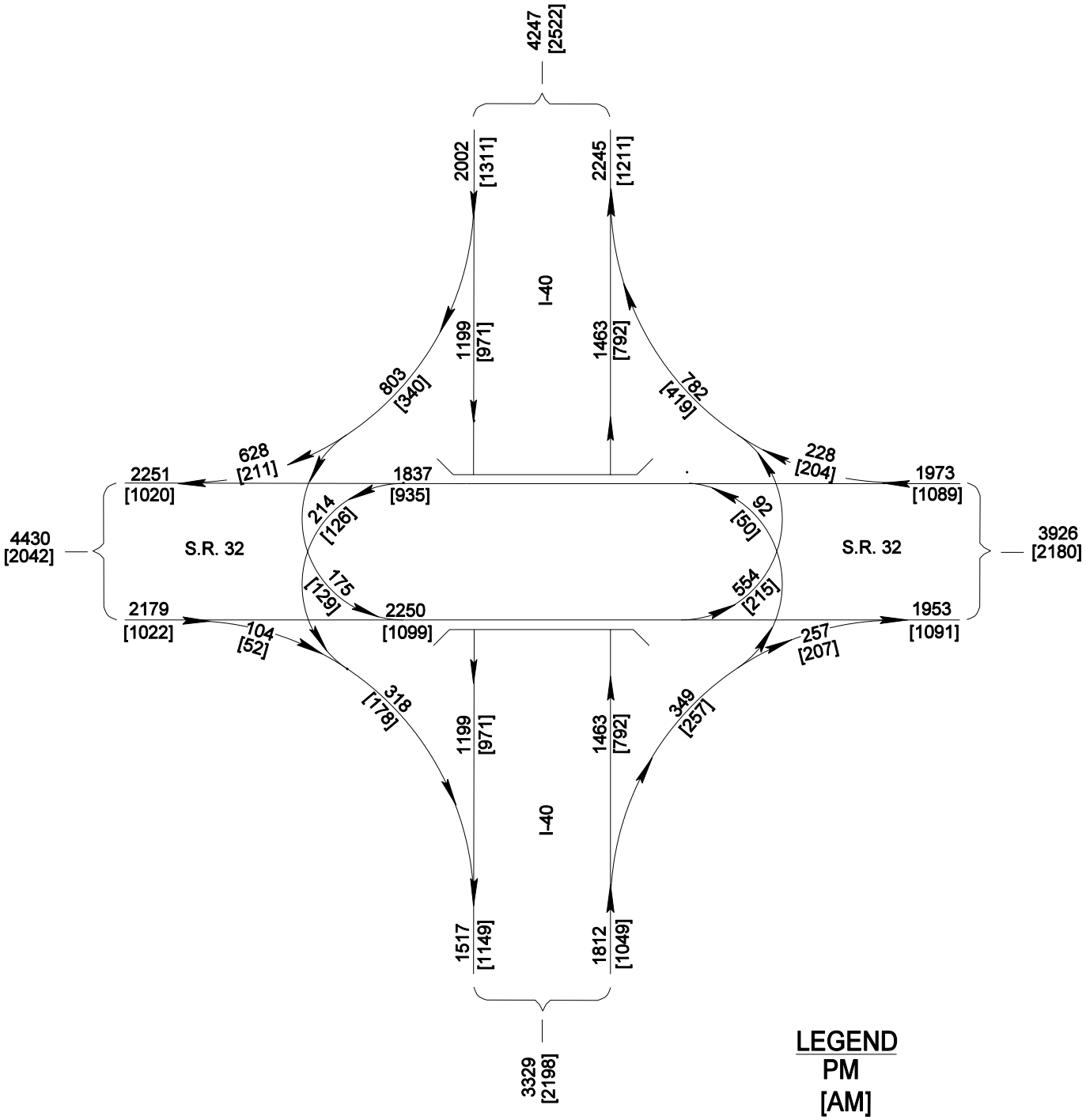
PM

[AM]

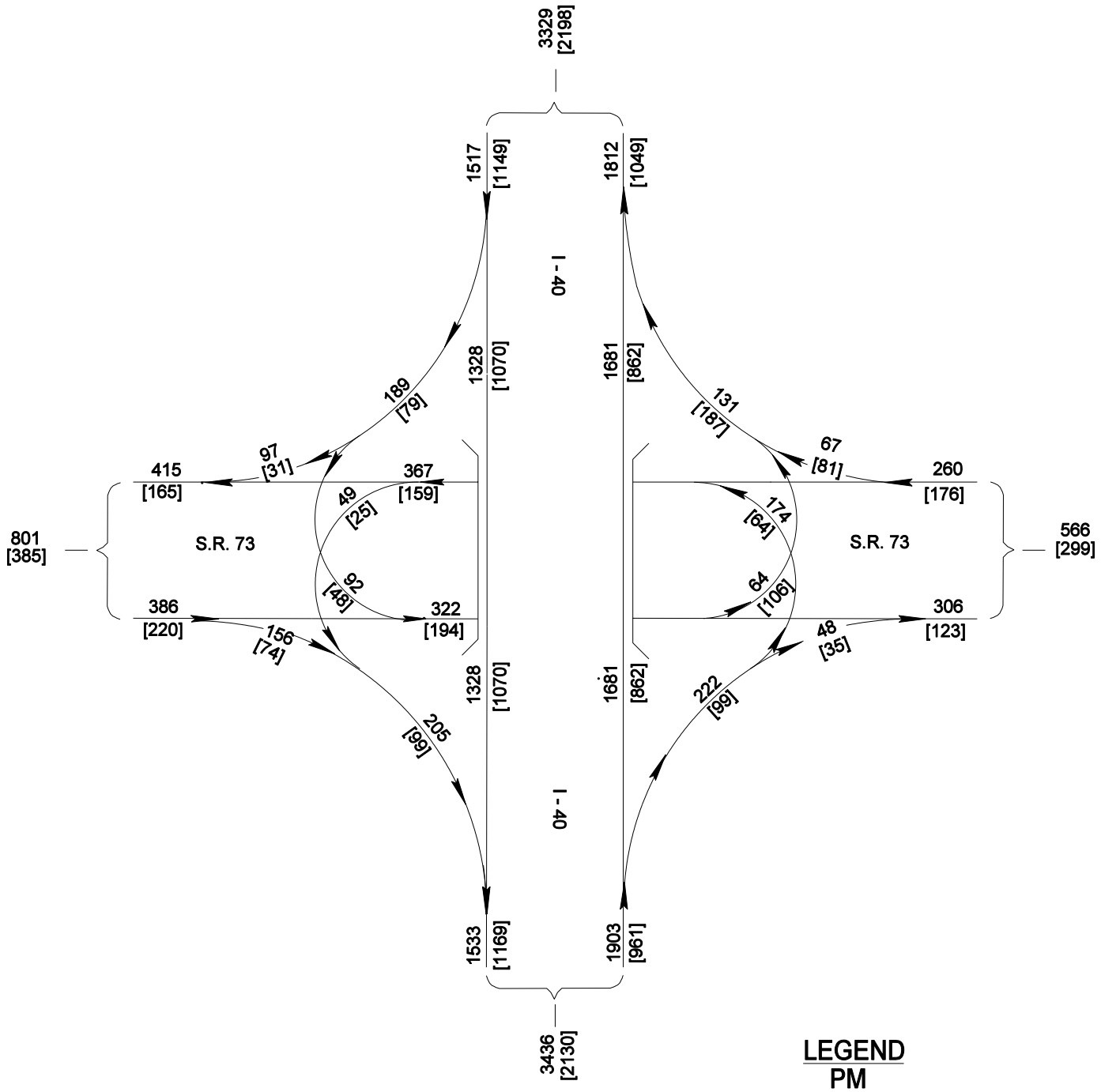
	N.T.S.	Existing System Without Proposed Development S.R. 32 @ S.R. 73 2027 DHV	Cocke County Newport



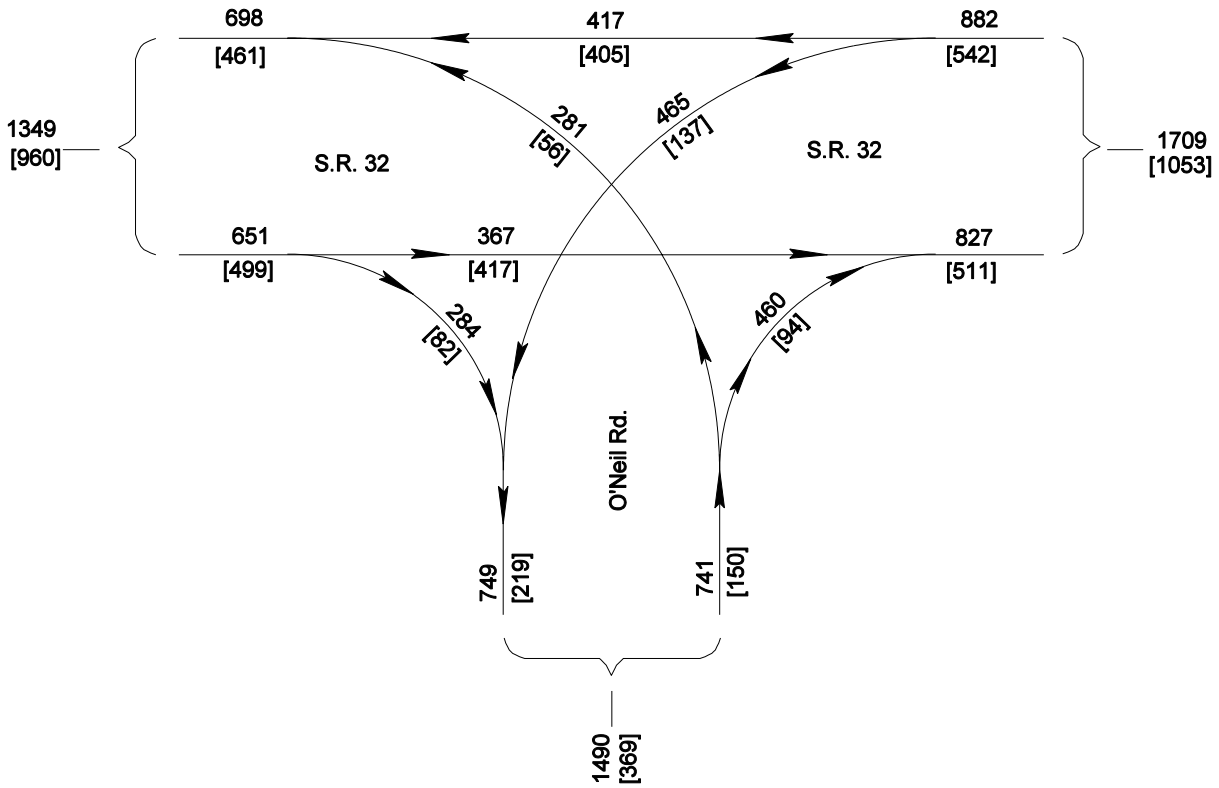
N	N.T.S.	Existing System With Proposed Development I-40 @ O'Neil Road	Cocke County Newport



N	N.T.S.	Existing System With Proposed Development I-40 @ S.R. 32 2007 DHV	Cocke County Newport



N	N.T.S.	Existing System With Proposed Development I-40 @ S.R. 73 2007 DHV	Cocke County Newport

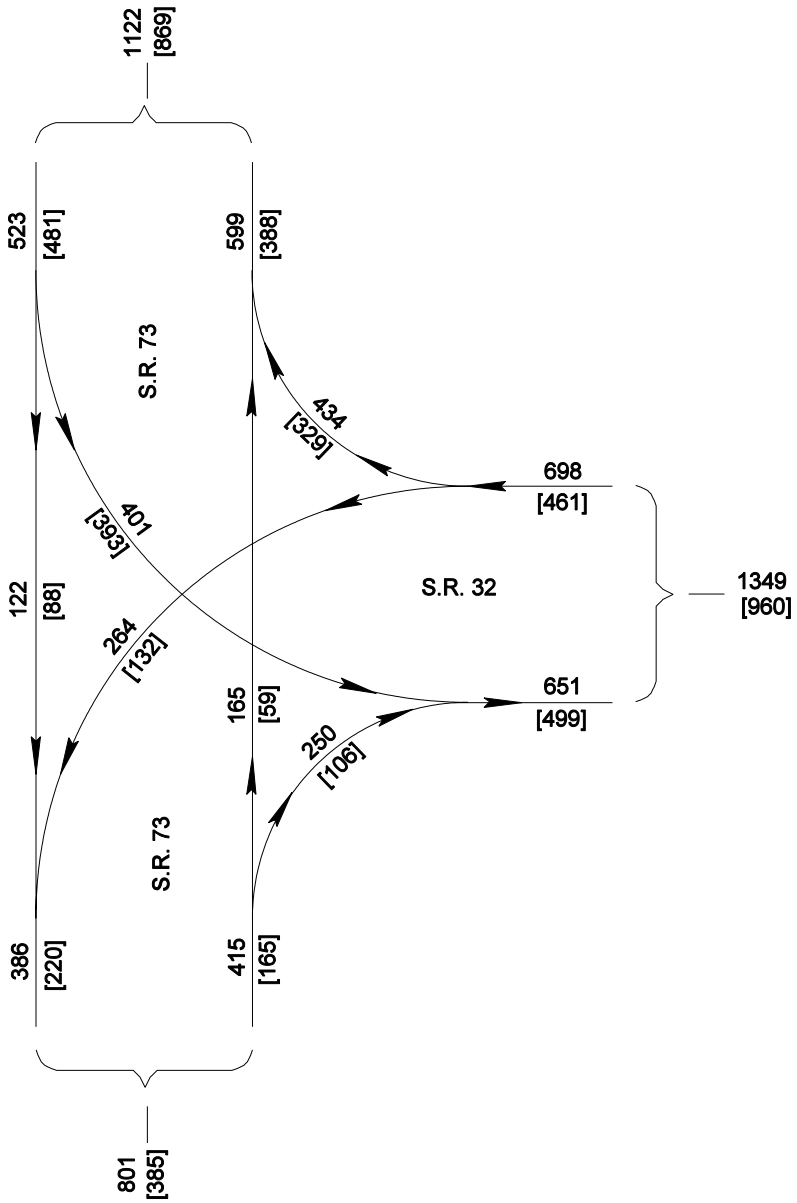


LEGEND

PM

[AM]

	N.T.S.	Existing System With Proposed Development S.R. 32 @ O'Neil Road 2007 DHV	Cocke County Newport

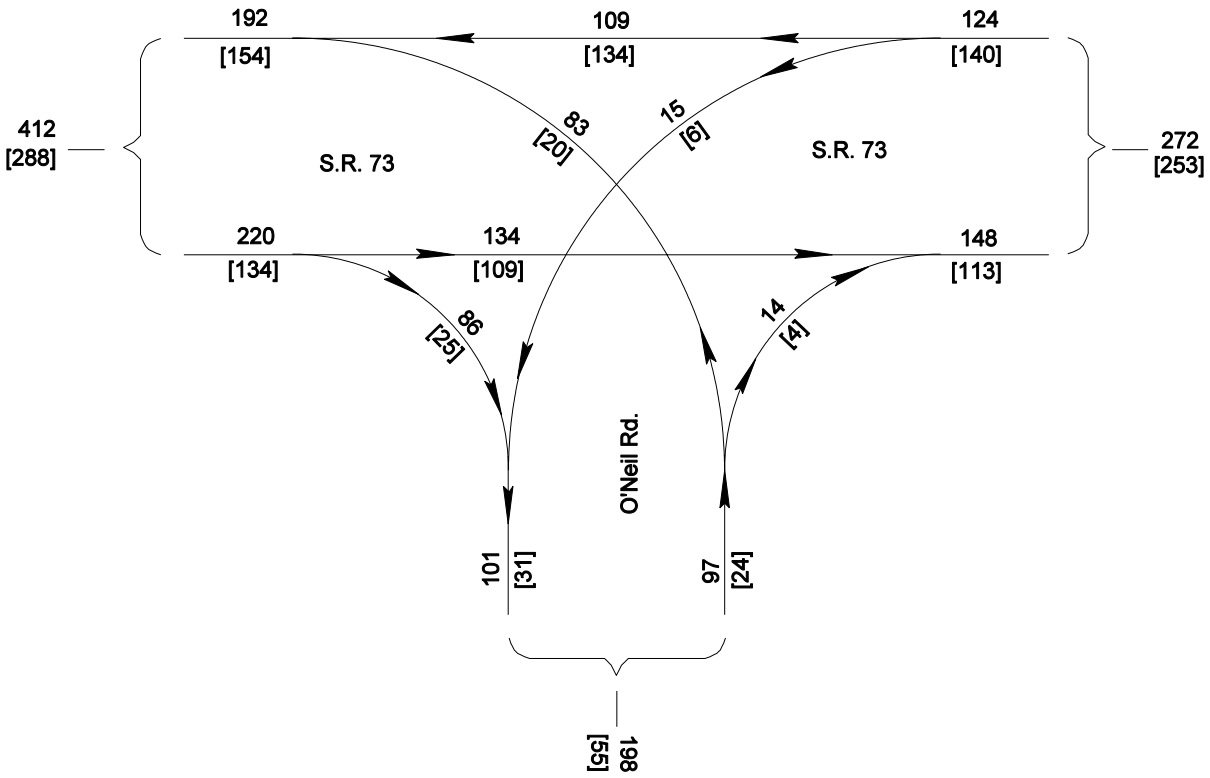


LEGEND

PM

[AM]

	N.T.S.	Proposed System With Proposed Development S.R. 32 @ S.R. 73 2007 DHV	Cocke County Newport

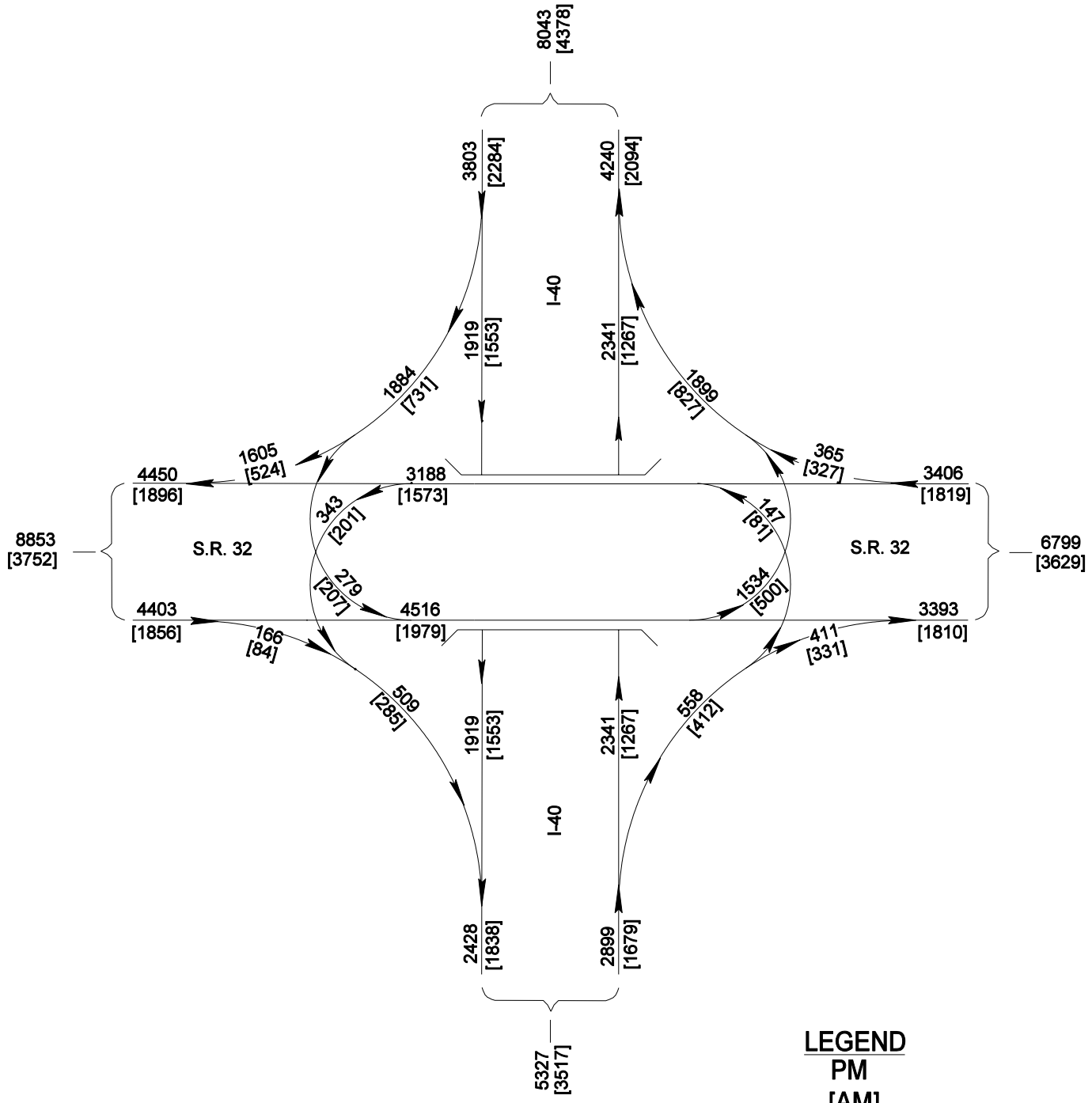


LEGEND

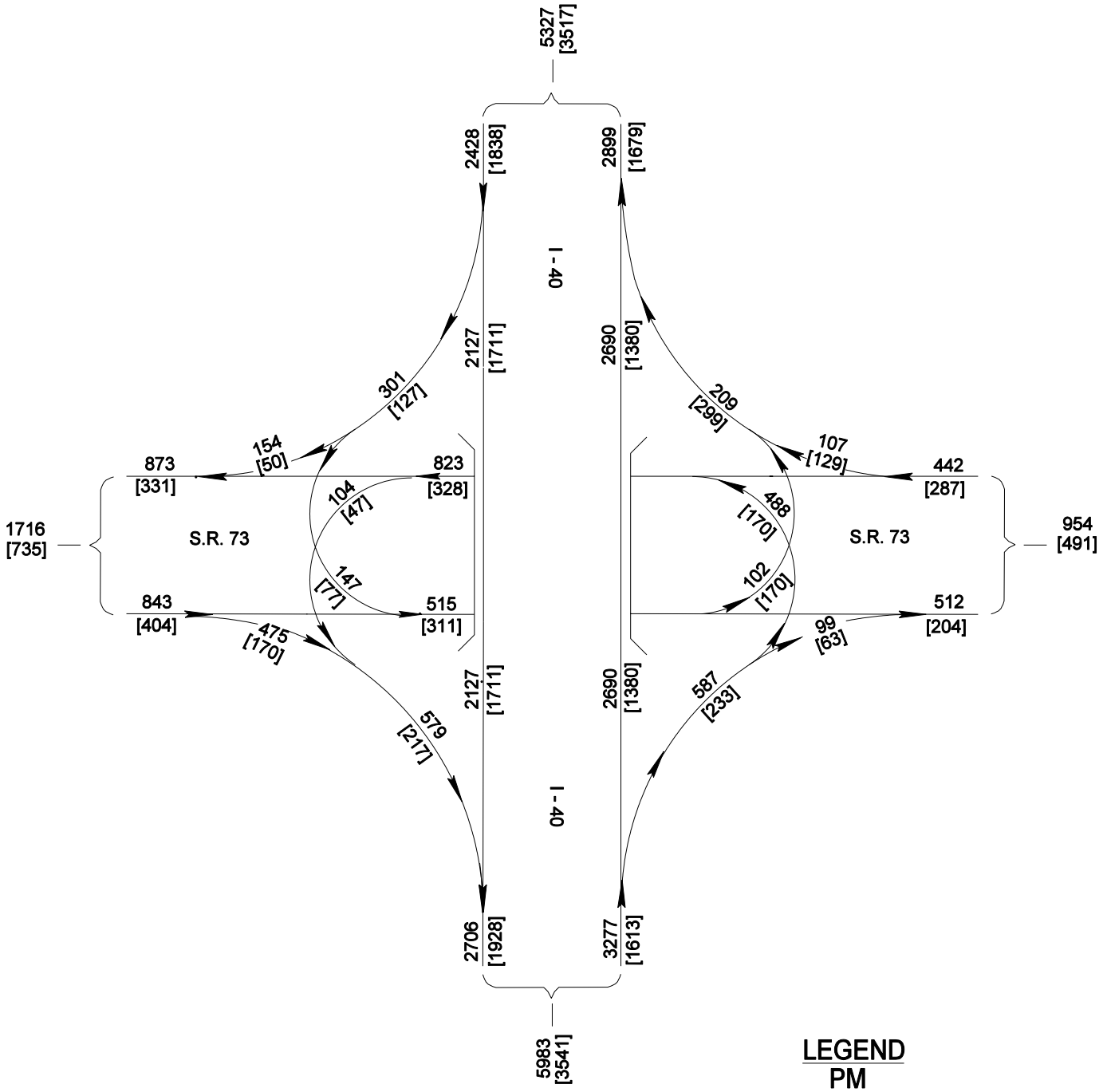
PM

[AM]

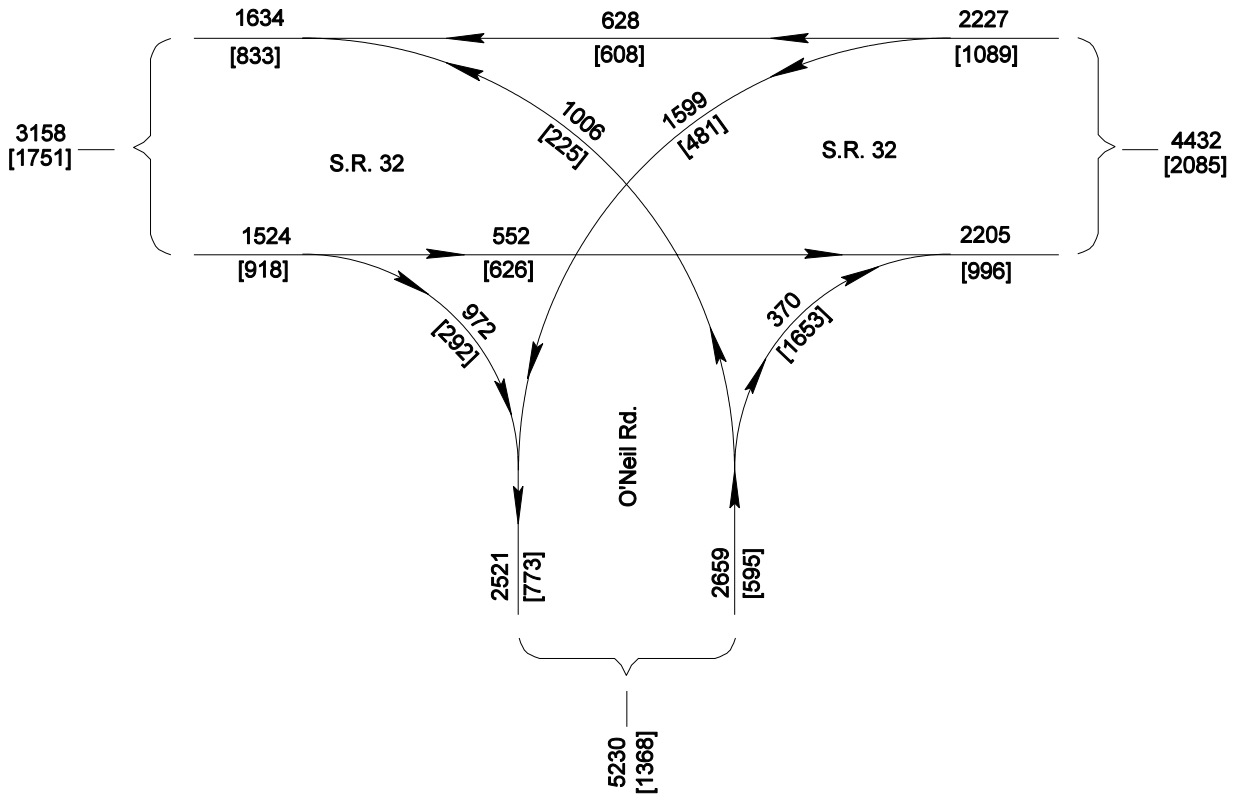
	N.T.S.	Existing System With Proposed Development S.R. 73 @ O'Neil Road 2007 DHV	Cocke County Newport



N	N.T.S.	Existing System With Proposed Development I-40 @ S.R. 32 2027 DHV	Cocke County Newport



N	N.T.S.	Existing System With Proposed Development I-40 @ S.R. 73 2027 DHV	Cocke County Newport

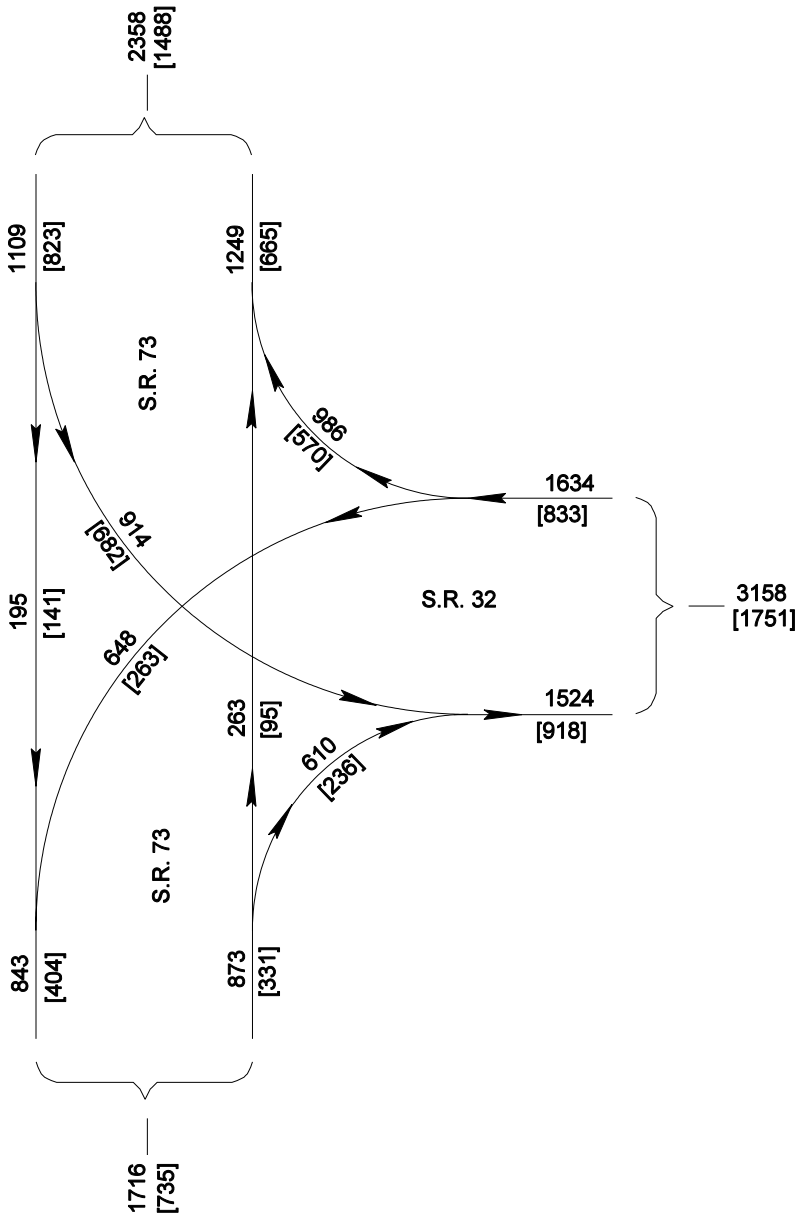


LEGEND

PM

[AM]

N	N.T.S.	Existing System With Proposed Development S.R. 32 @ O'Neil Road 2027 DHV	Cocke County Newport

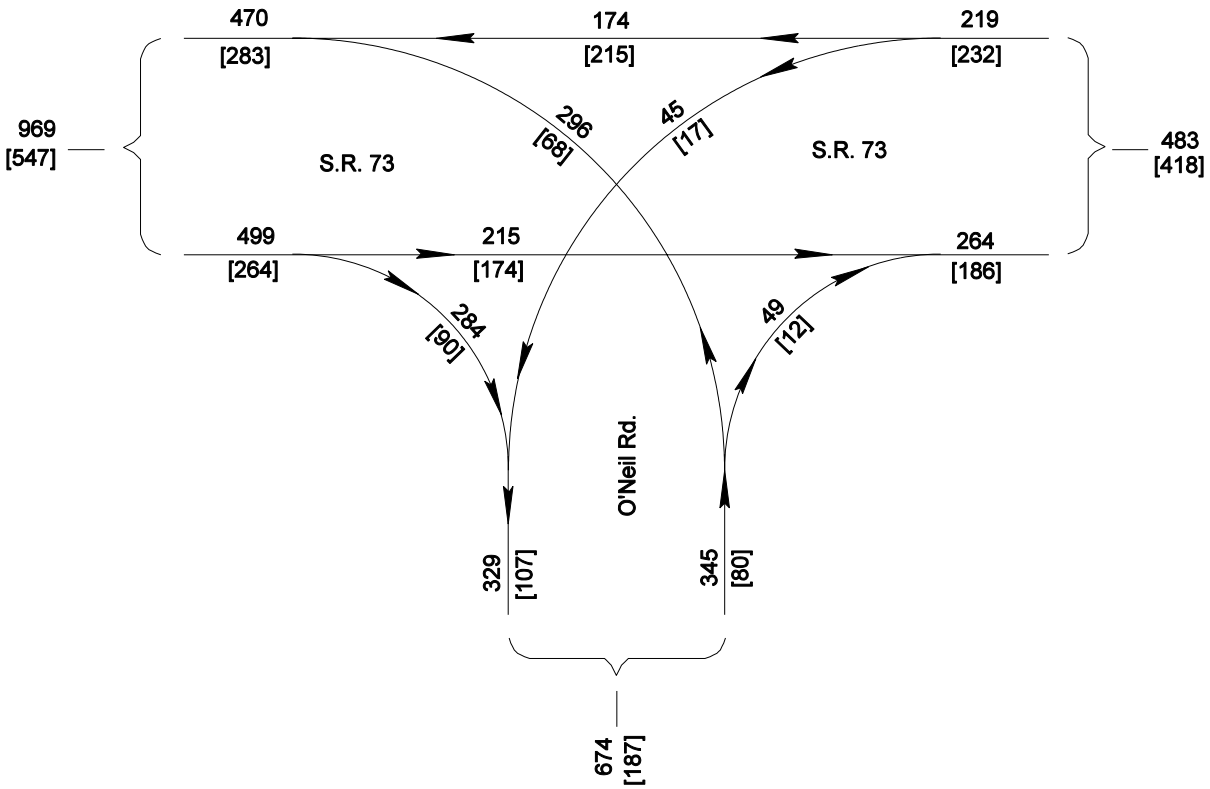


LEGEND

PM

[AM]

	N.T.S.	Existing System With Proposed Development S.R. 32 @ S.R. 73 2027 DHV	Cocke County Newport

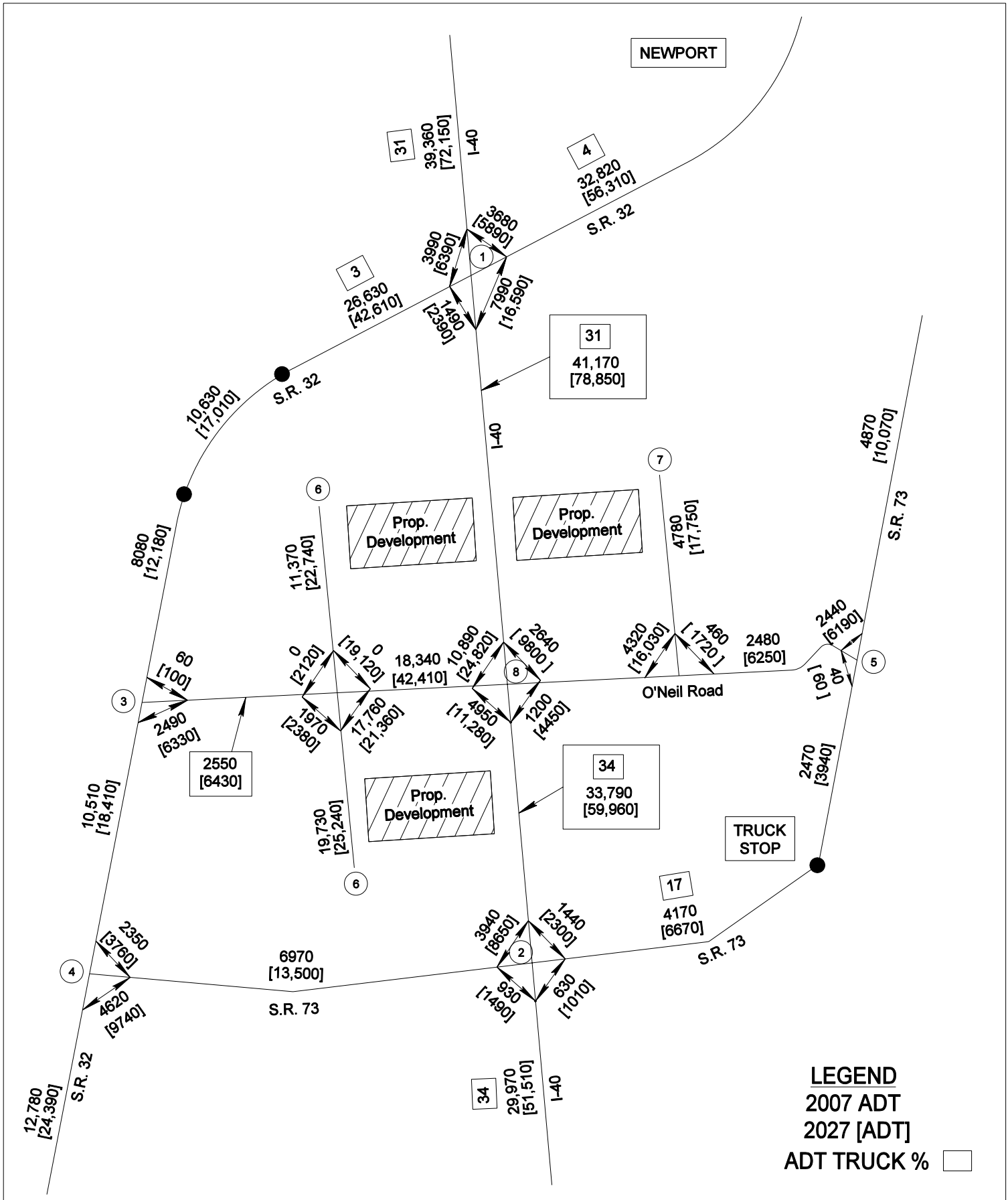


LEGEND

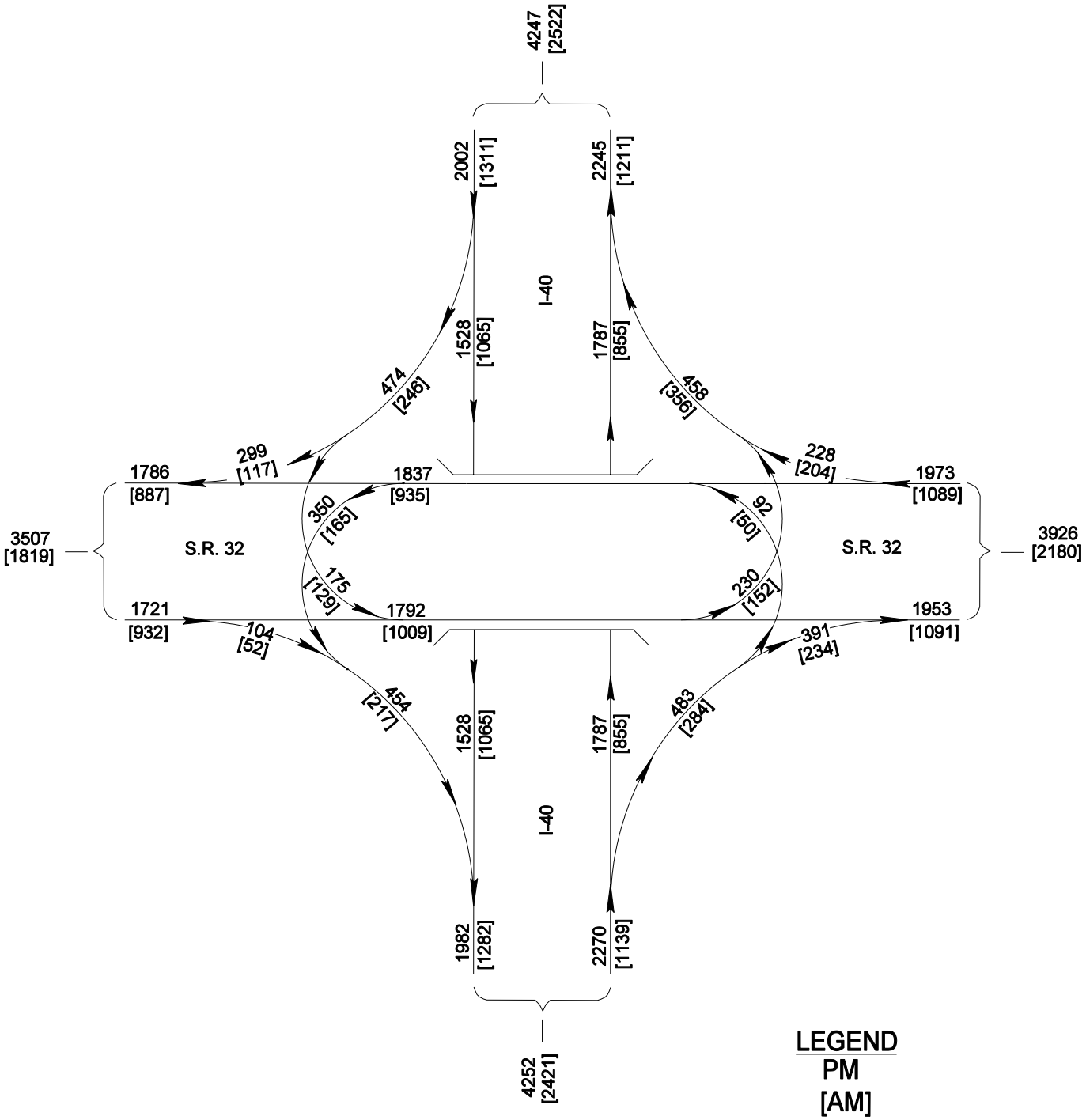
PM

[AM]

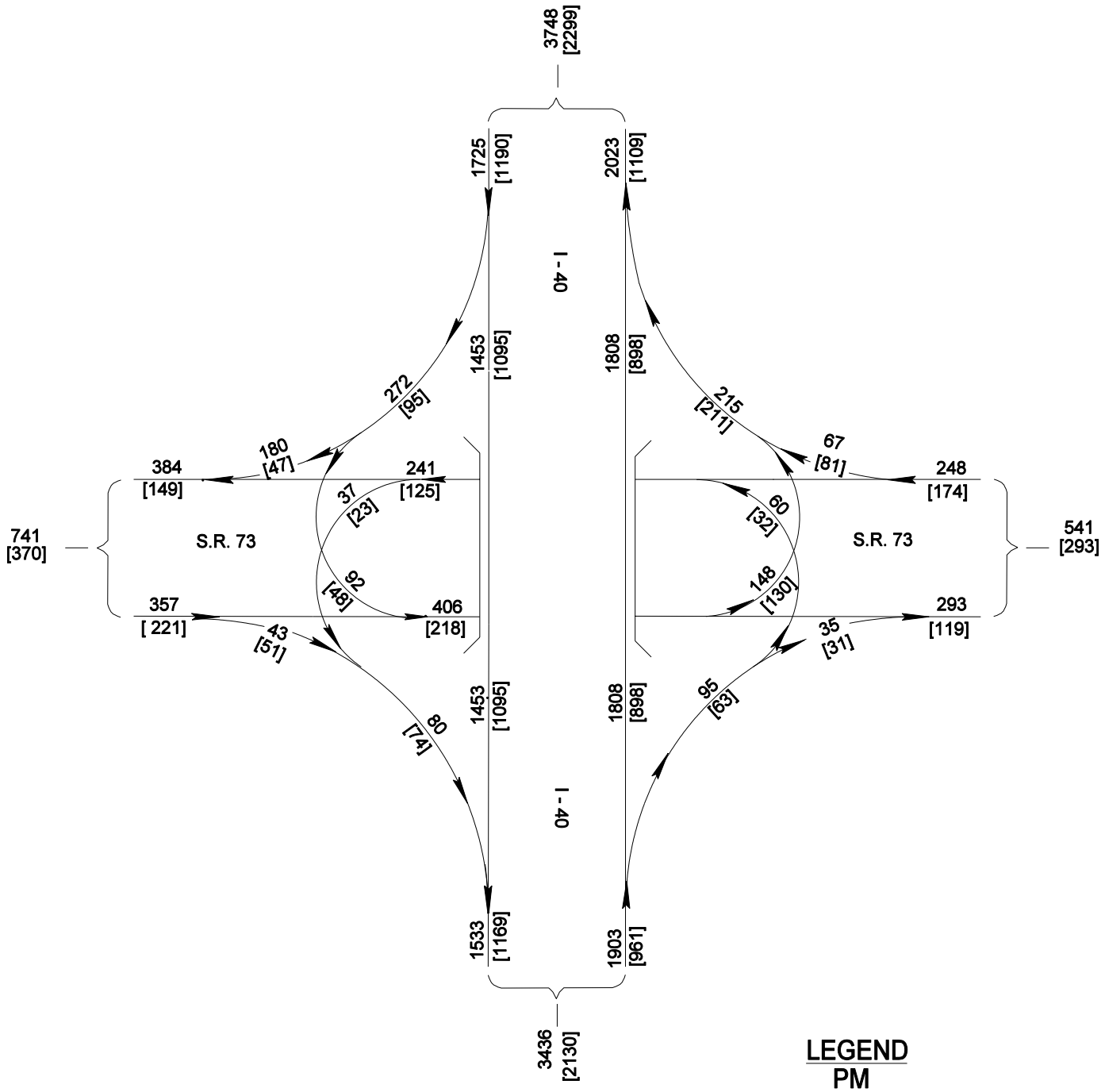
	N.T.S.	Existing System With Proposed Development S.R. 73 @ O'Neil Road 2027 DHV	Cocke County Newport



N	N.T.S.	Proposed System With Proposed Development I-40 @ O'Neil Road	Cocke County Newport

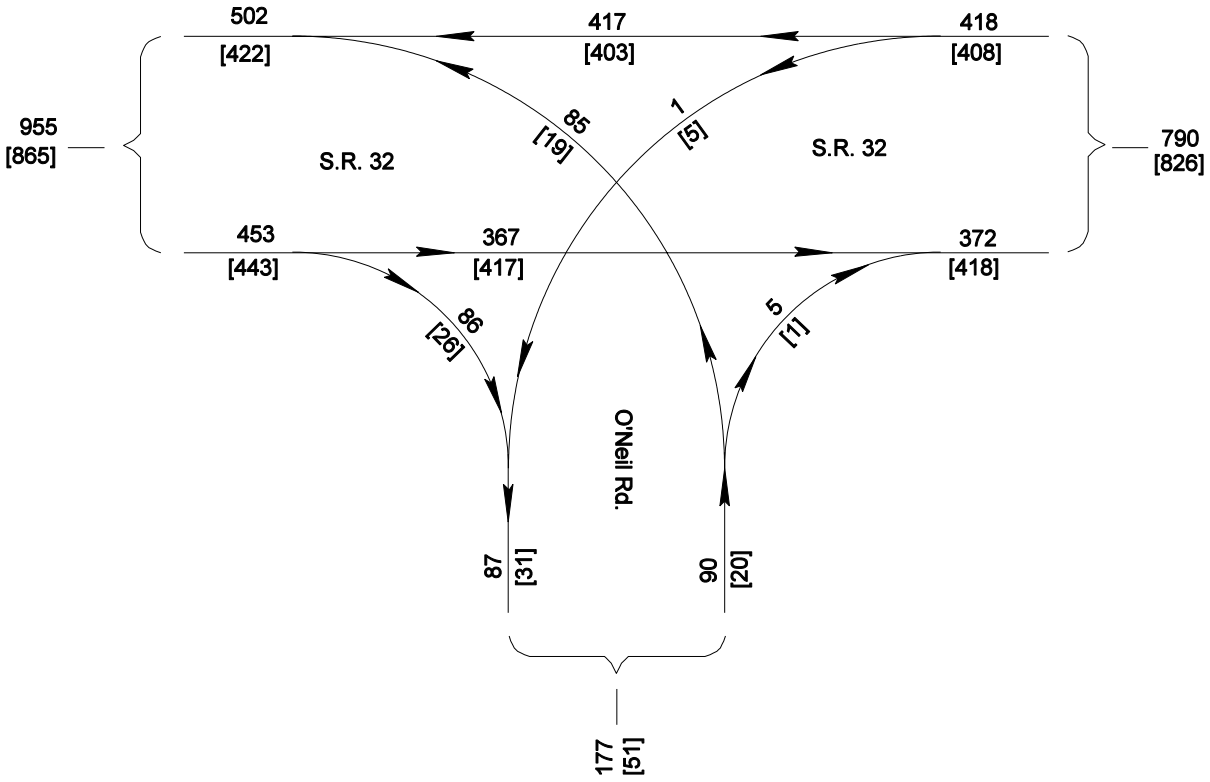


N	N.T.S.	Proposed System With Proposed Development I-40 @ S.R. 32 2007 DHV	Cocke County Newport



LEGEND
PM
[AM]

N	N.T.S.	Proposed System With Proposed Development I-40 @ S.R. 73 2007 DHV	Cocke County Newport

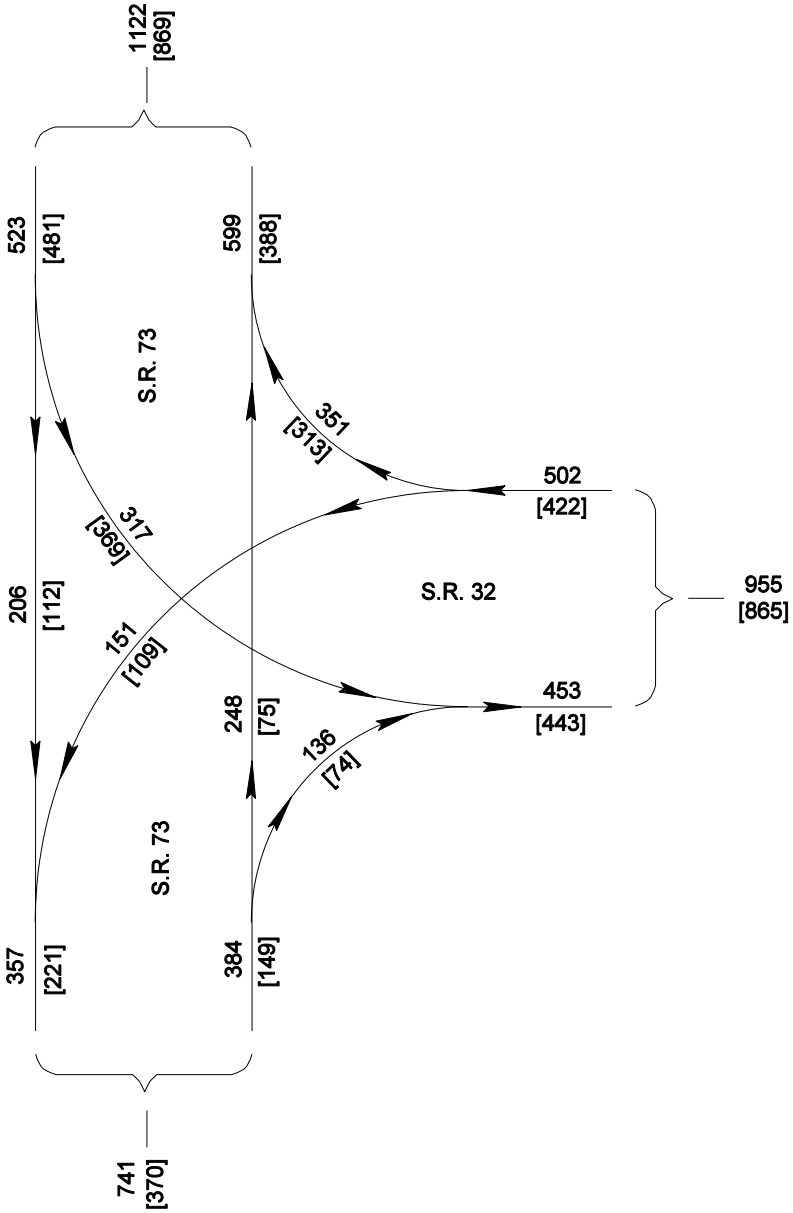


LEGEND

PM

[AM]

	N.T.S.	Proposed System With Proposed Development S.R. 32 @ O'Neil Road 2007 DHV	Cocke County Newport

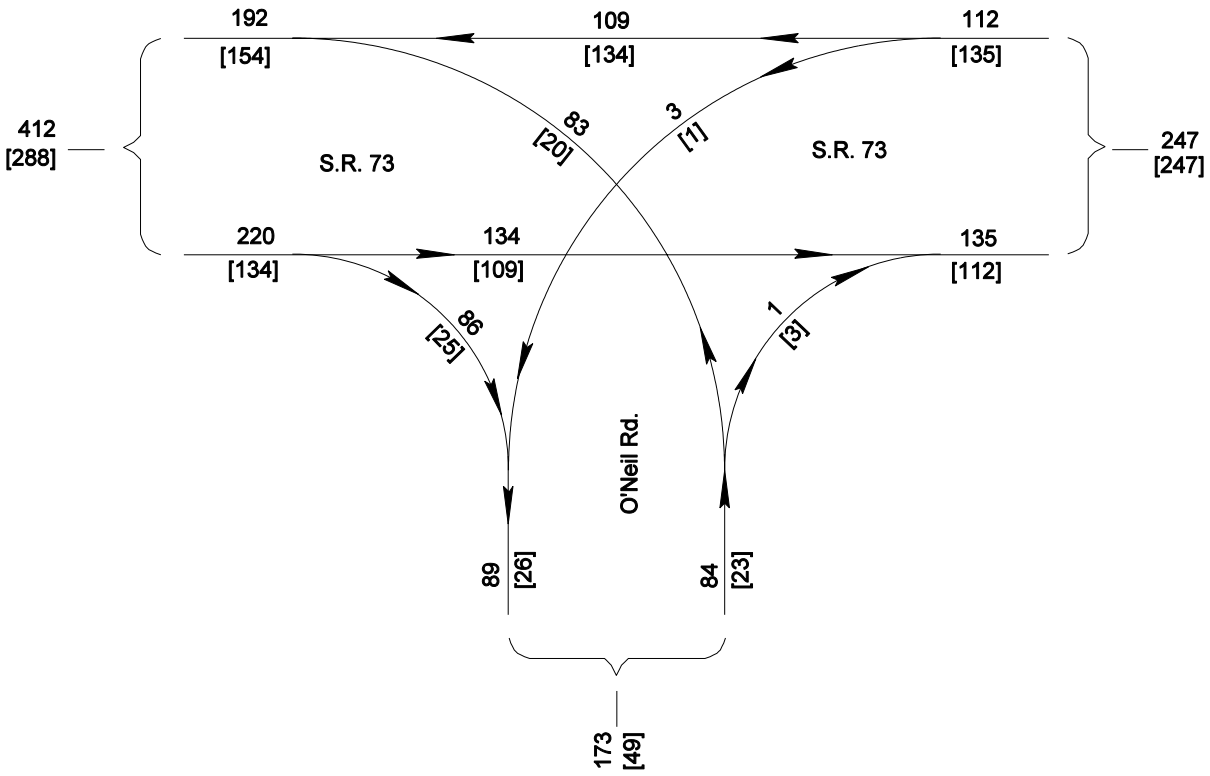


LEGEND

PM

[AM]

	N.T.S.	Proposed System With Proposed Development S.R. 32 @ S.R. 73 2007 DHV	Cocke County Newport

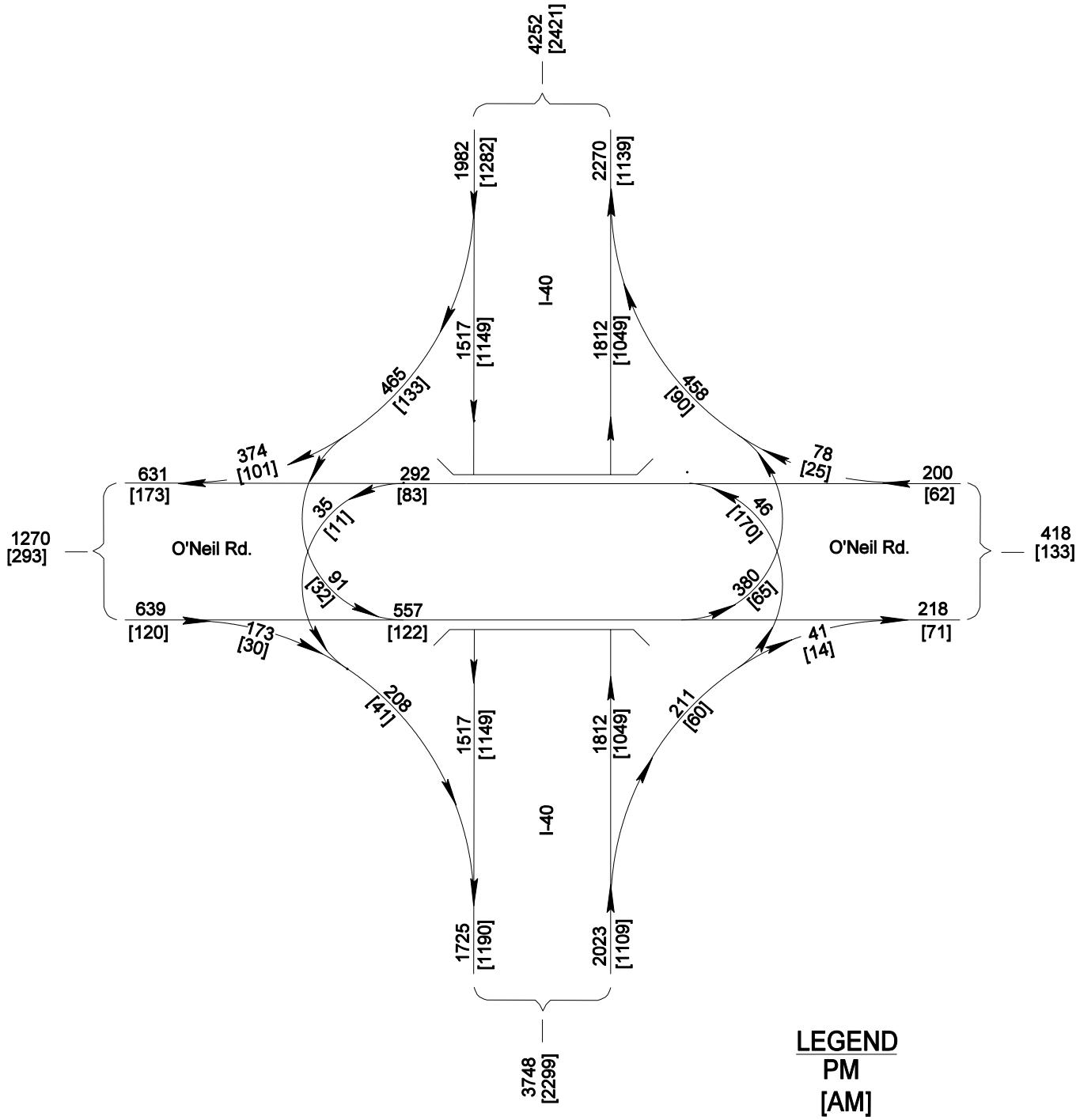


LEGEND

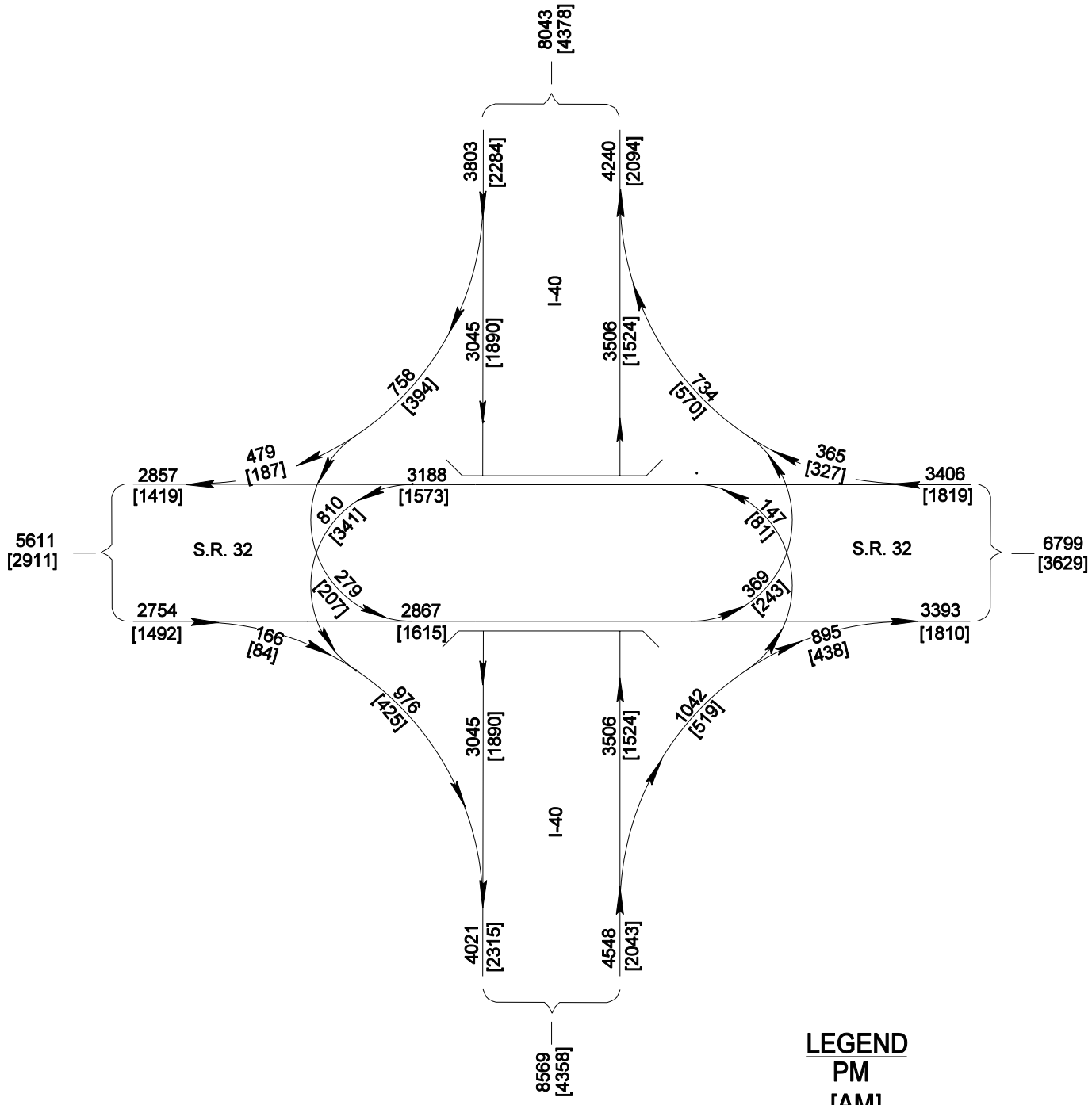
PM

[AM]

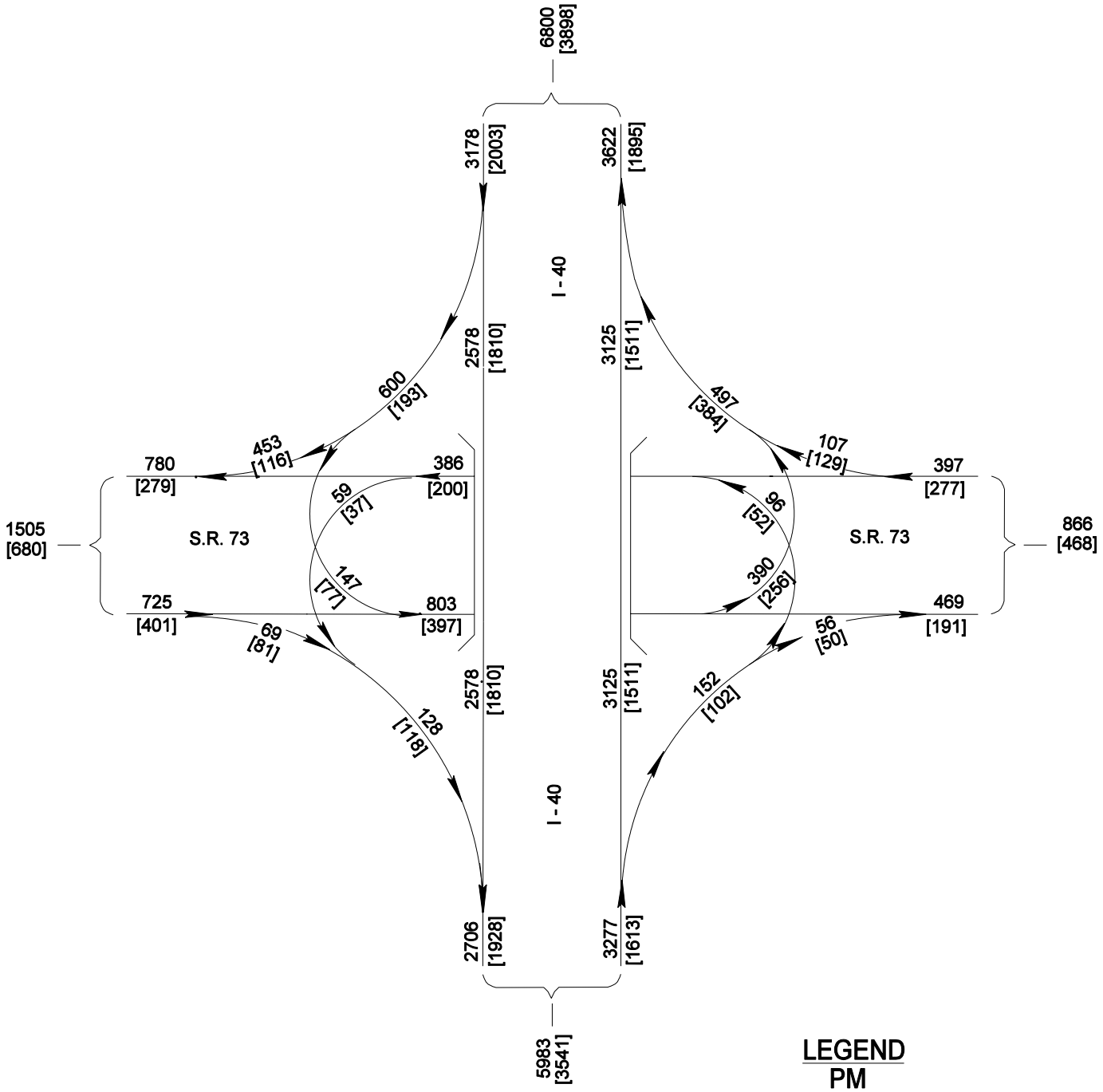
	N.T.S.	Proposed System With Proposed Development S.R. 73 @ O'Neil Road 2007 DHV	Cocke County Newport



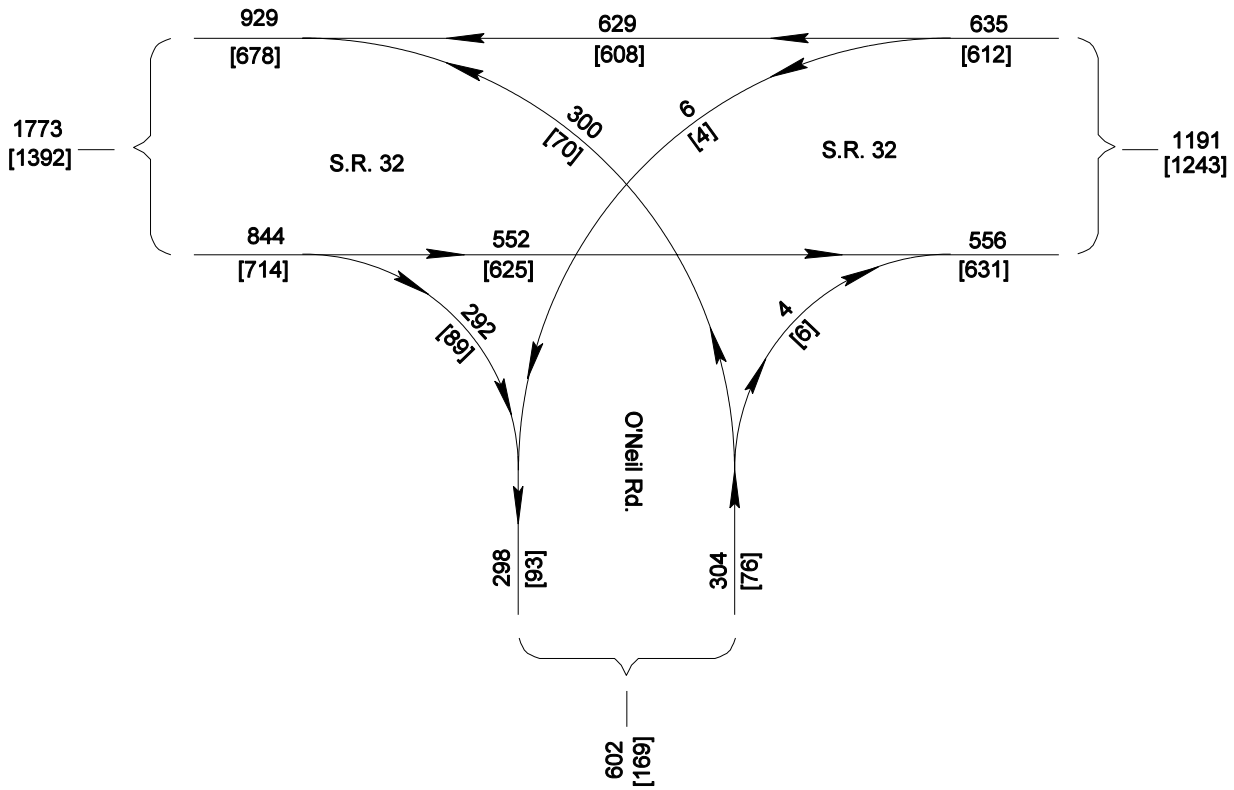
N	N.T.S.	Proposed System With Proposed Development I-40 @ O'Neil Road 2007 DHV	Cocke County Newport



N	N.T.S.	Proposed System With Proposed Development I-40 @ S.R. 32 2027 DHV	Cocke County Newport



N	N.T.S.	Proposed System With Proposed Development I-40 @ S.R. 73 2027 DHV	Cocke County Newport

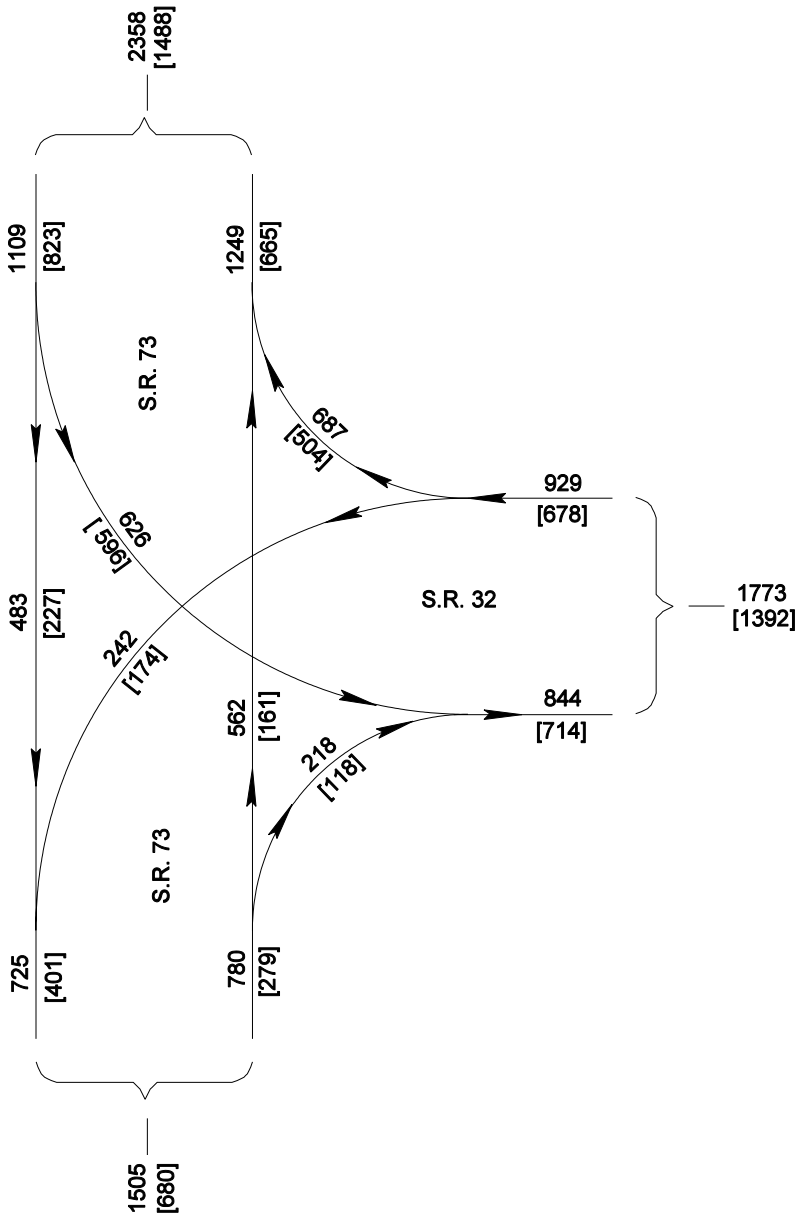


LEGEND

PM

[AM]

	N.T.S.	Proposed System With Proposed Development S.R. 32 @ O'Neil Road 2027 DHV	Cocke County Newport

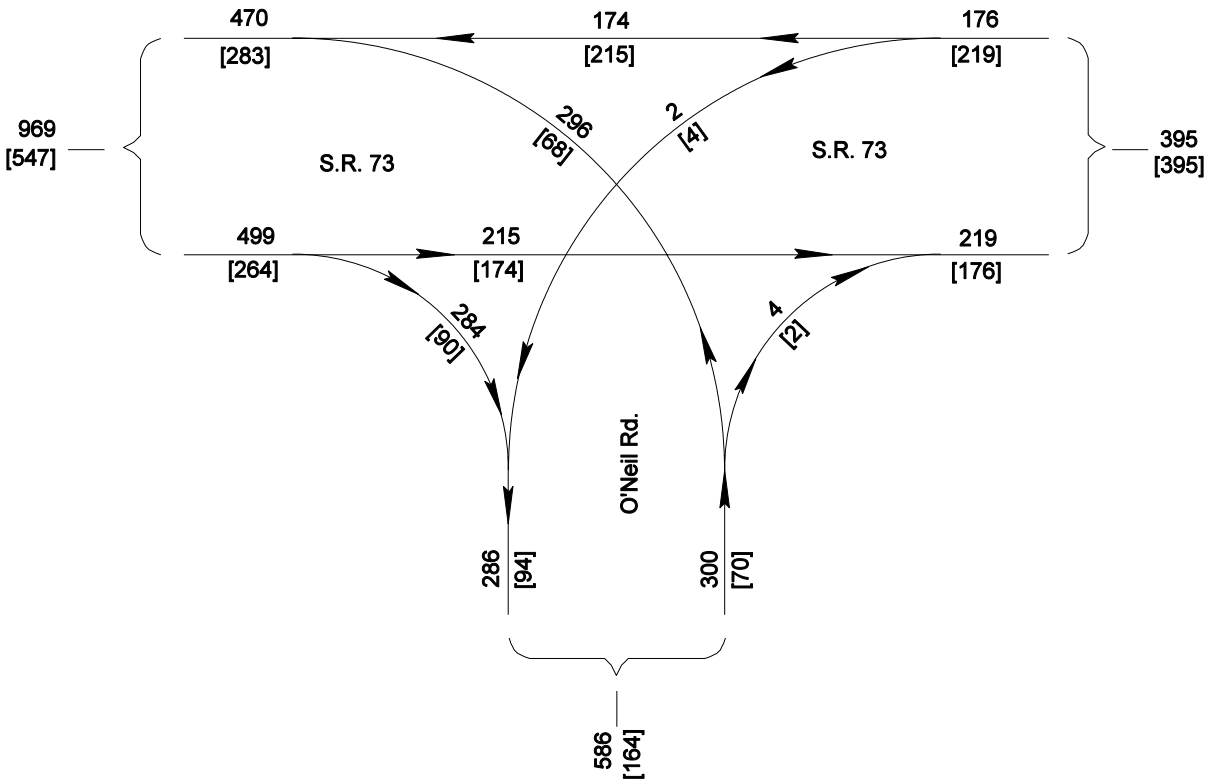


LEGEND

PM

[AM]

	N.T.S.	Proposed System With Proposed Development S.R. 32 @ S.R. 73 2027 DHV	Cocke County Newport

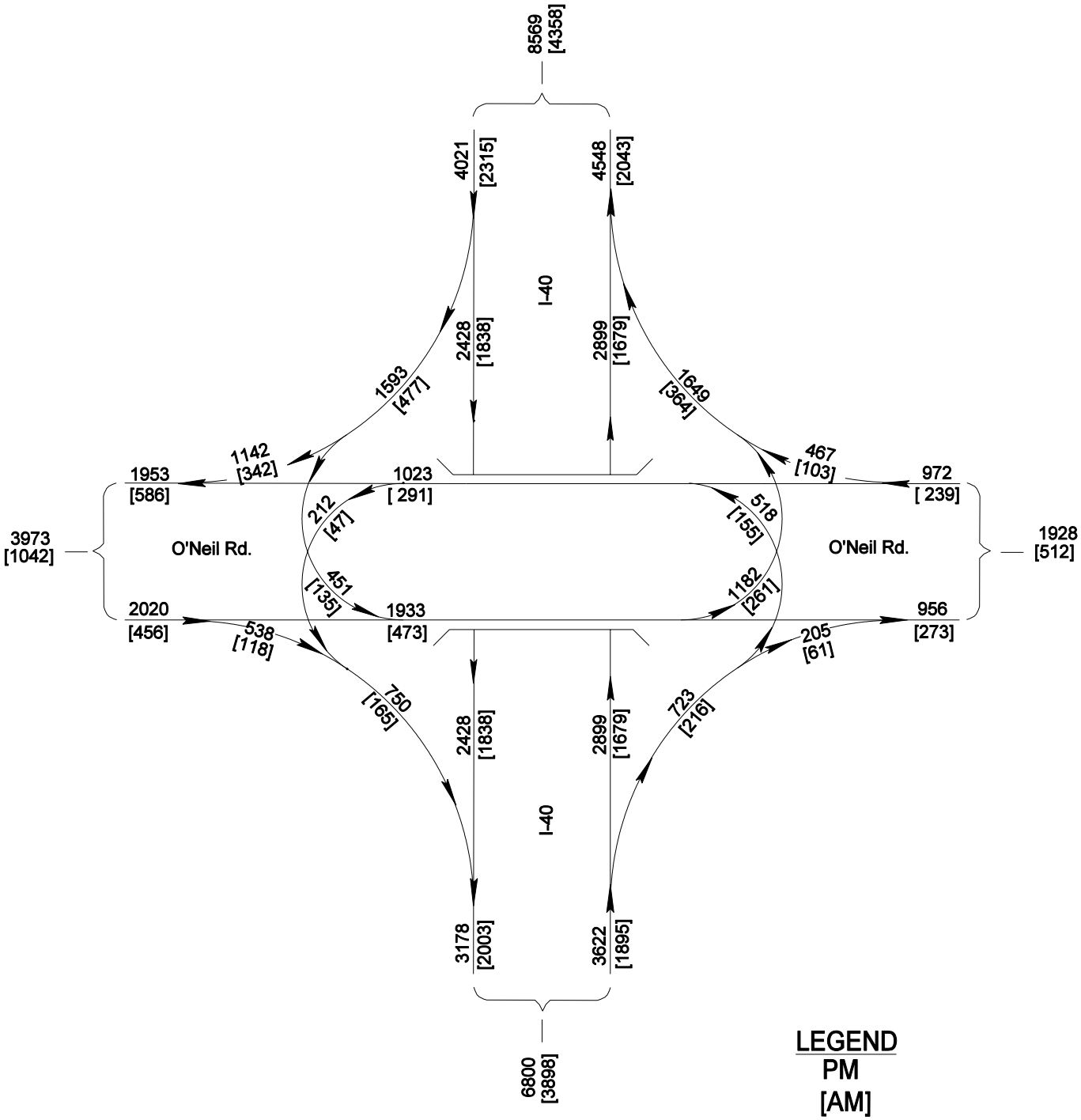


LEGEND

PM

[AM]

	N.T.S.	Proposed System With Proposed Development S.R. 73 @ O'Neil Road 2027 DHV	Cocke County Newport



N	N.T.S.	Proposed System With Proposed Development I-40 @ O'Neil Road 2027 DHV	Cocke County Newport

APPENDIX C
HCS RESULTS

2007 Existing System without Proposed Development

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1217	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	246	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	178	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1217	246	178	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	338	68	49	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1413	286	207	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1413 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1413	4800	No
v_{12}	1413	4400	No
$v_{FO} = v_F - v_R$	1127	4800	No
v_R	286	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 14.2 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.324

Space mean speed in ramp influence area, S_R = 61 mph

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

Space mean speed for all vehicles, S = 60.9 mph

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1673	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	474	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	318	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1673	474	318	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	465	132	88	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1943	550	369	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1943 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1943	4800	No
v_{12}	1943	4400	No
$v_{FO} = v_F - v_R$	1393	4800	No
v_R	550	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 18.7 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.347	
Space mean speed in ramp influence area,	S_R = 60	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.3	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	971	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	178	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	246	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	971	178	246	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	270	49	68	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1127	207	286	pcph

Estimation of V12 Merge Areas

$L_{EQ} = 0.00$ (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1127 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1334	4800	No
v_{R12}	1334	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A = 13.6 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, M_S = 0.304

Space mean speed in ramp influence area, S_R = 61.5 mph

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

Space mean speed for all vehicles, S = 61.5 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1199	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	318	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	474	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1199	318	474	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	333	88	132	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1392	369	550	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P = 1.000 Using Equation 0
 FM
v = v (P) = 1392 pc/h
 12   F   FM

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1761	4800	No
v_{R12}	1761	4600	No

Level of Service Determination (if not F)

Density, $D = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 16.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.312

Space mean speed in ramp influence area, S_R = 61.3 mph

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

Space mean speed for all vehicles, S = 61.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1049	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	257	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	356	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1049	257	356	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	291	71	99	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	

Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		
Heavy vehicle adjustment, fHV	0.943		0.943		0.943		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	1235		303		419		pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1235 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1235	4800	No
v_{12}	1235	4400	No
$v_{FO} = v_F - v_R$	932	4800	No
v_R	303	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 11.7 pc/mi/

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

Speed Estimation

Intermediate speed variable, D_S = 0.325

Space mean speed in ramp influence area, S_R = 61 mph

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

Space mean speed for all vehicles, S = 60.9 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1812	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	349	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	458	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1812	349	458	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	503	97	127	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	

Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		
Heavy vehicle adjustment, fHV	0.943		0.943		0.943		
Driver population factor, fP	1.00		1.00		1.00		
Flow rate, vp	2134		411		539		pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2134 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2134	4800	No
v_{12}	2134	4400	No
$v_{FO} = v_F - v_R$	1723	4800	No
v_R	411	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 19.5 pc/mi/

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

Speed Estimation

Intermediate speed variable, D_S = 0.335

Space mean speed in ramp influence area, S_R = 61 mph

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

Space mean speed for all vehicles, S = 60.6 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	792	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	356	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	257	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	792	356	257	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	220	99	71	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	

Length		mi	mi	mi
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	933	419	303	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 933 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1352	4800	No
v_{R12}	1352	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 13.6 pc/mi

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

Speed Estimation

Intermediate speed variable, M_S = 0.305

Space mean speed in ramp influence area, S_R = 61.5 mph

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

Space mean speed for all vehicles, S = 61.5 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1463	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	458	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	349	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1463	458	349	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	406	127	97	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	

Length		mi	mi	mi
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1723	539	411	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1723 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2262	4800	No
v_{R12}	2262	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 20.7 pc/mi

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

Speed Estimation

Intermediate speed variable,	M_S = 0.327	
Space mean speed in ramp influence area,	S_R = 60.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.8	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1149	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	79	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	74	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1149	79	74	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	319	22	21	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1602	110	103	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1602 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1602	4800	No
v_{12}	1602	4400	No
$v_{FO} = v_F - v_R$	1492	4800	No
v_R	110	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.308

Space mean speed in ramp influence area, S_R = 61 mph

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

Space mean speed for all vehicles, S = 61.4 mph

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1517	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	189	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	80	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1517	189	80	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	421	53	22	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2115	264	112	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2115 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2115	4800	No
v_{12}	2115	4400	No
$v_{FO} = v_F - v_R$	1851	4800	No
v_R	264	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 20.2 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.322	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.0	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System wo Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1070	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	74	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	79	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1070	74	79	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	297	21	22	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1492	103	110	pcph

Estimation of V12 Merge Areas

$L_{EQ} = 0.00$ (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1492 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1595	4800	No
v_{R12}	1595	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A = 16.0 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, M_S = 0.313

Space mean speed in ramp influence area, S_R = 61.2 mph

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

Space mean speed for all vehicles, S = 61.2 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System wo Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1328	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	80	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	189	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1328	80	189	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	369	22	53	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1852	112	264	pcph

Estimation of V12 Merge Areas

$L_{EQ} = 0.00$ (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1852 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1964	4800	No
v_{R12}	1964	4600	No

Level of Service Determination (if not F)

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

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

Speed Estimation

Intermediate speed variable, M_S = 0.322

Space mean speed in ramp influence area, S_R = 61.0 mph

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

Space mean speed for all vehicles, S = 61.0 mph

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	925	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	63	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	187	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	925	63	187	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	257	18	52	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1290	88	261	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1290 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1290	4800	No
v_{12}	1290	4400	No
$v_{FO} = v_F - v_R$	1202	4800	No
v_R	88	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 13.5 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.306

Space mean speed in ramp influence area, S_R = 61 mph

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

Space mean speed for all vehicles, S = 61.4 mph

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1776	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	95	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	131	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1776	95	131	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	493	26	36	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2477	132	183	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2477 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2477	4800	No
v_{12}	2477	4400	No
$v_{FO} = v_F - v_R$	2345	4800	No
v_R	132	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 23.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.310

Space mean speed in ramp influence area, S_R = 61 mph

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

Space mean speed for all vehicles, S = 61.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System wo Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	862	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	187	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	63	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	862	187	63	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	239	52	18	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1202	261	88	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1202 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1463	4800	No
v_{R12}	1463	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A = 14.9 \text{ pc/mi/ln}$$

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

Speed Estimation

Intermediate speed variable, M_S = 0.311

Space mean speed in ramp influence area, S_R = 61.3 mph

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

Space mean speed for all vehicles, S = 61.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/21/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System wo Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1681	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	131	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	95	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1681	131	95	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	467	36	26	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2344	183	132	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2344 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2527	4800	No
v_{R12}	2527	4600	No

Level of Service Determination (if not F)

$$\text{Density, } D = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A = 23.2 \text{ pc/mi/ln}$$

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

Speed Estimation

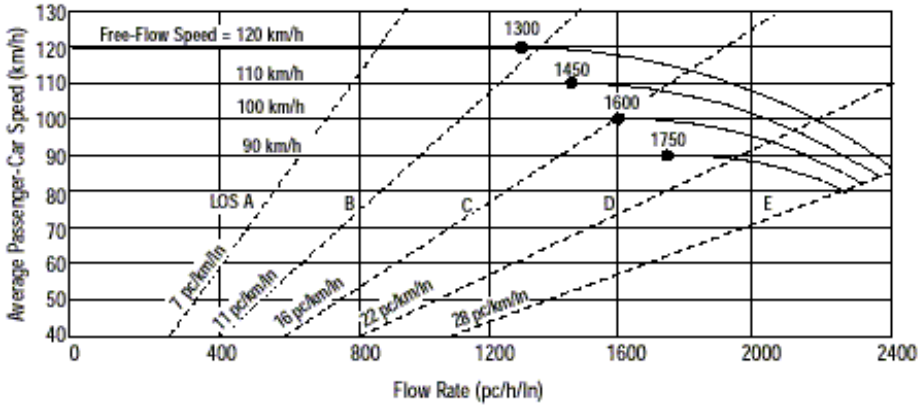
Intermediate speed variable, M_S = 0.343

Space mean speed in ramp influence area, S_R = 60.4 mph

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

Space mean speed for all vehicles, S = 60.4 mph

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/21/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	SR 32 to SR 73
Jurisdiction	
Analysis Year	2007

Project Description Existing System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1149 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	935	pc/h/ln
S	70.0	mi/h
D = v_p / S	13.4	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

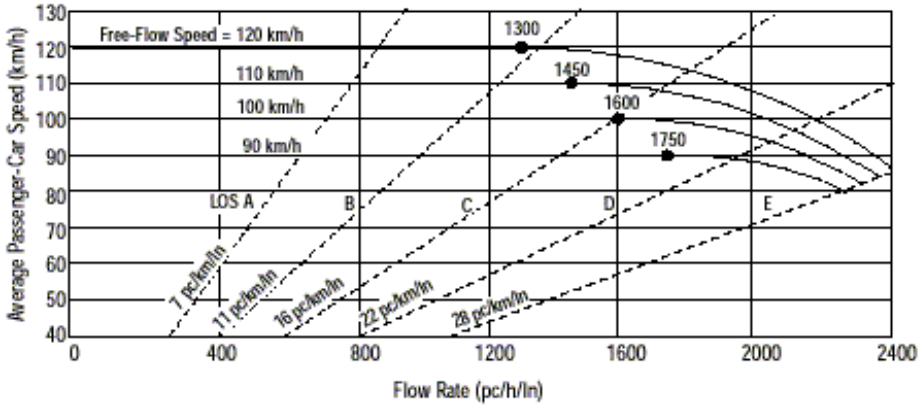
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/21/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	SR 32 to SR 73
Jurisdiction	
Analysis Year	2007

Project Description Existing System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1517 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1235	pc/h/ln
S	70.0	mi/h
D = v_p / S	17.6	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

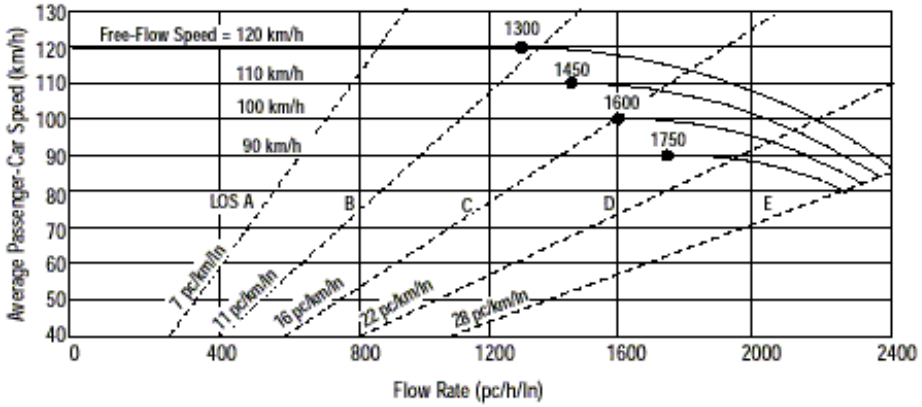
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/21/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	SR 73 to SR 32
Jurisdiction	
Analysis Year	2007

Project Description Existing System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1049 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	854	pc/h/ln
S	70.0	mi/h
D = v_p / S	12.2	pc/mi/ln
LOS	B	

Design (N)

Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

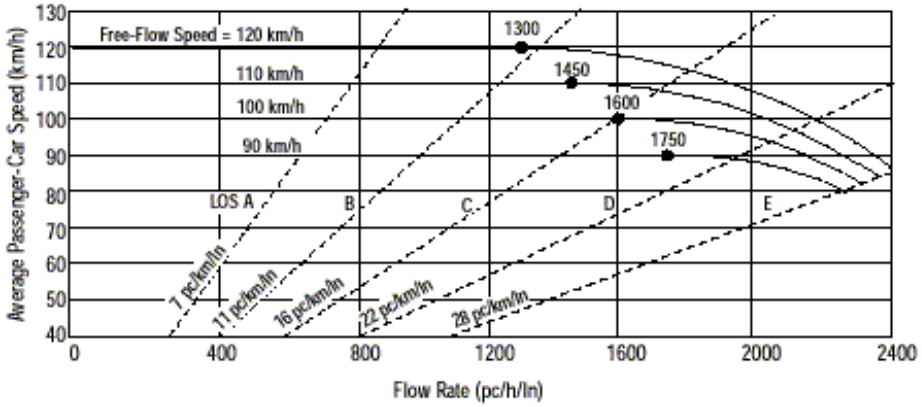
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/21/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	SR 73 to SR 32
Jurisdiction	
Analysis Year	2007

Project Description Existing System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1812 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1475	pc/h/ln
S	69.9	mi/h
D = v_p / S	21.1	pc/mi/ln
LOS	C	

Design (N)

Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/21/2002*	Analysis Year	*2007*
Analysis Time Period	*AM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*880*	*52*	*126*	*770*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*977*	*57*	*140*	*855*	*0*
Percent Heavy Vehicles	*0*	--	--	*4*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*129*	*0*	*117*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*143*	*0*	*130*
Percent Heavy Vehicles	*0*	*0*	*0*	*4*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*140*				*143*		*130*
C (m) (vph)		*690*				*157*		*572*
v/c		*0.20*				*0.91*		*0.23*
95% queue length		*0.76*				*6.50*		*0.87*
Control Delay		*11.5*				*106.9*		*13.1*
LOS		*B*				*F*		*B*
Approach Delay	--	--				*62.2*		
Approach LOS	--	--				*F*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/21/2002*	Analysis Year	*2007*
Analysis Time Period	*PM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*1617*	*104*	*214*	*1487*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*1796*	*115*	*237*	*1652*	*0*
Percent Heavy Vehicles	*0*	--	--	*4*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*175*	*0*	*299*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*194*	*0*	*332*
Percent Heavy Vehicles	*0*	*0*	*0*	*4*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*237*				*194*		*332*
C (m) (vph)		*332*				*17*		*313*
v/c		*0.71*				*11.41*		*1.06*
95% queue length		*5.20*				*25.03*		*12.41*
Control Delay		*38.8*						*105.5*
LOS		*E*				*F*		*F*
Approach Delay	--	--						
Approach LOS	--	--				*F*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/21/2002*	Analysis Year	*2007*
Analysis Time Period	*AM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*152*	*857*	*0*	*0*	*846*	*204*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*168*	*952*	*0*	*0*	*940*	*226*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*50*	*0*	*207*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*55*	*0*	*230*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*168*		*55*		*230*			
C (m) (vph)	*719*		*130*		*530*			
v/c	*0.23*		*0.42*		*0.43*			
95% queue length	*0.90*		*1.84*		*2.17*			
Control Delay	*11.5*		*51.6*		*16.9*			
LOS	*B*		*F*		*C*			
Approach Delay	--	--	*23.6*					
Approach LOS	--	--	*C*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/21/2002*	Analysis Year	*2007*
Analysis Time Period	*PM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*230*	*1562*	*0*	*0*	*1609*	*228*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*255*	*1735*	*0*	*0*	*1787*	*253*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*92*	*0*	*257*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*102*	*0*	*285*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*255*		*102*		*285*			
C (m) (vph)	*339*		*13*		*292*			
v/c	*0.75*		*7.85*		*0.98*			
95% queue length	*5.85*		*13.88*		*9.91*			
Control Delay	*41.7*				*85.7*			
LOS	*E*		*F*		*F*			
Approach Delay	--	--						
Approach LOS	--	--	*F*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & SR 73*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/21/2002*	Analysis Year	*2007*
Analysis Time Period	*AM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *SR 32* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*345*	*88*	*0*	*0*	*59*	*74*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*383*	*97*	*0*	*0*	*65*	*82*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*109*	*0*	*296*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*121*	*0*	*328*
Percent Heavy Vehicles	*0*	*0*	*0*	*7*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (vph)	*383*					*121*		*328*
C (m) (vph)	*1506*					*217*		*985*
v/c	*0.25*					*0.56*		*0.33*
95% queue length	*1.02*					*3.02*		*1.47*
Control Delay	*8.2*					*40.7*		*10.5*
LOS	*A*					*E*		*B*
Approach Delay	--	--				*18.6*		
Approach LOS	--	--				*C*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & SR 73*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/21/2002*	Analysis Year	*2007*
Analysis Time Period	*PM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *SR 32* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*233*	*122*	*0*	*0*	*165*	*136*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*258*	*135*	*0*	*0*	*183*	*151*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*151*	*0*	*268*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*167*	*0*	*297*
Percent Heavy Vehicles	*0*	*0*	*0*	*7*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (vph)	*258*					*167*		*297*
C (m) (vph)	*1362*					*269*		*847*
v/c	*0.19*					*0.62*		*0.35*
95% queue length	*0.70*					*3.79*		*1.58*
Control Delay	*8.3*					*38.0*		*11.5*
LOS	*A*					*E*		*B*
Approach Delay	--	--				*21.1*		
Approach LOS	--	--				*C*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/21/2002*	Analysis Year	*2007*
Analysis Time Period	*AM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 EB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*146*	*51*	*23*	*102*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*162*	*56*	*25*	*113*	*0*
Percent Heavy Vehicles	*0*	--	--	*17*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*48*	*0*	*31*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*53*	*0*	*34*
Percent Heavy Vehicles	*0*	*0*	*0*	*17*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*				*L*		*R*
v (vph)		*25*				*53*		*34*
C (m) (vph)		*1268*				*604*		*926*
v/c		*0.02*				*0.09*		*0.04*
95% queue length		*0.06*				*0.29*		*0.11*
Control Delay		*7.9*				*11.5*		*9.0*
LOS		*A*				*B*		*A*
Approach Delay	--	--				*10.6*		
Approach LOS	--	--				*B*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/21/2002*	Analysis Year	*2007*
Analysis Time Period	*PM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *I-40 EB ramps* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*230*	*43*	*37*	*204*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*255*	*47*	*41*	*226*	*0*
Percent Heavy Vehicles	*0*	--	--	*17*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*92*	*0*	*97*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*102*	*0*	*107*
Percent Heavy Vehicles	*0*	*0*	*0*	*17*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*				*L*		*R*
v (vph)		*41*				*102*		*107*
C (m) (vph)		*1178*				*433*		*801*
v/c		*0.03*				*0.24*		*0.13*
95% queue length		*0.11*				*0.90*		*0.46*
Control Delay		*8.2*				*15.9*		*10.2*
LOS		*A*				*C*		*B*
Approach Delay	--	--				*13.0*		
Approach LOS	--	--				*B*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 and I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/21/2002*	Analysis Year	*2007*
Analysis Time Period	*AM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 WB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*106*	*88*	*0*	*0*	*93*	*81*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*117*	*97*	*0*	*0*	*103*	*90*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*32*	*0*	*31*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*35*	*0*	*34*	*0*	*0*	*0*
Percent Heavy Vehicles	*7*	*0*	*17*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*		*L*		*R*			
v (vph)	*117*		*35*		*34*			
C (m) (vph)	*1351*		*490*		*920*			
v/c	*0.09*		*0.07*		*0.04*			
95% queue length	*0.28*		*0.23*		*0.12*			
Control Delay	*7.9*		*12.9*		*9.1*			
LOS	*A*		*B*		*A*			
Approach Delay	--	--	*11.0*					
Approach LOS	--	--	*B*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 and I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/21/2002*	Analysis Year	*2007*
Analysis Time Period	*PM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 WB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*64*	*258*	*0*	*0*	*181*	*67*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*71*	*286*	*0*	*0*	*201*	*74*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*60*	*0*	*35*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*66*	*0*	*38*	*0*	*0*	*0*
Percent Heavy Vehicles	*7*	*0*	*17*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*		*L*		*R*			
v (vph)	*71*		*66*		*38*			
C (m) (vph)	*1260*		*394*		*719*			
v/c	*0.06*		*0.17*		*0.05*			
95% queue length	*0.18*		*0.60*		*0.17*			
Control Delay	*8.0*		*16.0*		*10.3*			
LOS	*A*		*C*		*B*			
Approach Delay	--	--	*13.9*					
Approach LOS	--	--	*B*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period AM DHV
Highway SR 32
From/To SR 73 to O'Neil Road
Jurisdiction
Analysis Year 2007
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 824 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.941
Two-way flow rate,(note-1) vp 1046 pc/h
Highest directional split proportion (note-2) 523 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.7 mi/h
Average travel speed, ATS 31.4 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 1008 pc/h
Highest directional split proportion (note-2) 504
Base percent time-spent-following, BPTSF 58.8 %
Adj.for directional distribution and no-passing zones, fd/np 10.7
Percent time-spent-following, PTSF 69.5 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.33	
Peak 15-min vehicle-miles of travel, VMT15	687	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2472	veh-mi
Peak 15-min total travel time, TT15	21.9	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period PM DHV
Highway SR 32
From/To SR 73 to O'Neil Road
Jurisdiction
Analysis Year 2007
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 788 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.941
Two-way flow rate,(note-1) vp 1001 pc/h
Highest directional split proportion (note-2) 501 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.8 mi/h
Average travel speed, ATS 31.6 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 964 pc/h
Highest directional split proportion (note-2) 482
Base percent time-spent-following, BPTSF 57.1 %
Adj.for directional distribution and no-passing zones, fd/np 11.3
Percent time-spent-following, PTSF 68.4 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.31	
Peak 15-min vehicle-miles of travel, VMT15	657	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2364	veh-mi
Peak 15-min total travel time, TT15	20.8	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period AM DHV
Highway SR 32
From/To O'Neil Road to Morrell Springs
Jurisdiction
Analysis Year 2007
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 3 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1000 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.985
Two-way flow rate,(note-1) vp 1139 pc/h
Highest directional split proportion (note-2) 570 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.5 mi/h
Average travel speed, ATS 30.8 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.985
Two-way flow rate,(note-1) vp 1200 pc/h
Highest directional split proportion (note-2) 600
Base percent time-spent-following, BPTSF 65.2 %
Adj.for directional distribution and no-passing zones, fd/np 8.5
Percent time-spent-following, PTSF 73.6 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.36	
Peak 15-min vehicle-miles of travel, VMT15	833	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3000	veh-mi
Peak 15-min total travel time, TT15	27.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period PM DHV
Highway SR 32
From/To O'Neil Road to Morrell Springs
Jurisdiction
Analysis Year 2007
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 3 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1000 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.985
Two-way flow rate,(note-1) vp 1139 pc/h
Highest directional split proportion (note-2) 570 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.5 mi/h
Average travel speed, ATS 30.8 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.985
Two-way flow rate,(note-1) vp 1200 pc/h
Highest directional split proportion (note-2) 600
Base percent time-spent-following, BPTSF 65.2 %
Adj.for directional distribution and no-passing zones, fd/np 8.5
Percent time-spent-following, PTSF 73.6 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.36	
Peak 15-min vehicle-miles of travel, VMT15	833	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3000	veh-mi
Peak 15-min total travel time, TT15	27.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period AM DHV
Highway SR 73
From/To SR 32 to 40
Jurisdiction
Analysis Year 2007
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 2.4 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 330 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
PCE for trucks, ET 2.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.905
Two-way flow rate,(note-1) vp 571 pc/h
Highest directional split proportion (note-2) 343 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 2.8 mi/h
Average travel speed, ATS 34.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.77
PCE for trucks, ET 1.8
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.947
Two-way flow rate,(note-1) vp 503 pc/h
Highest directional split proportion (note-2) 302
Base percent time-spent-following, BPTSF 35.7 %
Adj.for directional distribution and no-passing zones, fd/np 17.7
Percent time-spent-following, PTSF 53.5 %

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.18	
Peak 15-min vehicle-miles of travel, VMT15	220	veh-mi
Peak-hour vehicle-miles of travel, VMT60	792	veh-mi
Peak 15-min total travel time, TT15	6.5	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	GGB
Agency/Co.	PBSJ
Date Performed	10/21/2002
Analysis Time Period	PM DHV
Highway	SR 73
From/To	SR 32 to 40
Jurisdiction	
Analysis Year	2007
Description	Existing System wo Prop. Devel.

Input Data

Highway class	Class 2				
Shoulder width	4.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	7	%
Segment length	2.4	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V	574	veh/h
Directional split	50 / 50	%

Average Travel Speed

Grade adjustment factor, fG	0.93
PCE for trucks, ET	1.9
PCE for RVs, ER	1.1
Heavy-vehicle adjustment factor,	0.941
Two-way flow rate,(note-1) vp	729 pc/h
Highest directional split proportion (note-2)	365 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h

Estimated Free-Flow Speed:

Base free-flow speed, BFFS	45.0 mi/h
Adj. for lane and shoulder width, fLS	1.3 mi/h
Adj. for access points, fA	2.5 mi/h
Free-flow speed, FFS	41.2 mi/h
Adjustment for no-passing zones, fnp	2.3 mi/h
Average travel speed, ATS	33.2 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94
PCE for trucks, ET	1.5
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.966
Two-way flow rate,(note-1) vp	702 pc/h
Highest directional split proportion (note-2)	351
Base percent time-spent-following, BPTSF	46.0 %
Adj.for directional distribution and no-passing zones, fd/np	15.2
Percent time-spent-following, PTSF	61.3 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.23	
Peak 15-min vehicle-miles of travel, VMT15	383	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1378	veh-mi
Peak 15-min total travel time, TT15	11.5	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period AM DHV
Highway SR 73
From/To 40 to O'Neil Road
Jurisdiction
Analysis Year 2007
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 17 %
Segment length 4.5 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 293 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
PCE for trucks, ET 2.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.797
Two-way flow rate,(note-1) vp 575 pc/h
Highest directional split proportion (note-2) 345 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 2.8 mi/h
Average travel speed, ATS 34.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.77
PCE for trucks, ET 1.8
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.880
Two-way flow rate,(note-1) vp 480 pc/h
Highest directional split proportion (note-2) 288
Base percent time-spent-following, BPTSF 34.4 %
Adj.for directional distribution and no-passing zones, fd/np 17.9
Percent time-spent-following, PTSF 52.3 %

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.18	
Peak 15-min vehicle-miles of travel, VMT15	366	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1319	veh-mi
Peak 15-min total travel time, TT15	10.8	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period PM DHV
Highway SR 73
From/To 40 to O'Neil Road
Jurisdiction
Analysis Year 2007
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 17 %
Segment length 4.5 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 541 veh/h
Directional split 55 / 45 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.867
Two-way flow rate,(note-1) vp 745 pc/h
Highest directional split proportion (note-2) 410 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 2.3 mi/h
Average travel speed, ATS 33.1 mi/h

Percent Time-Spent-Following

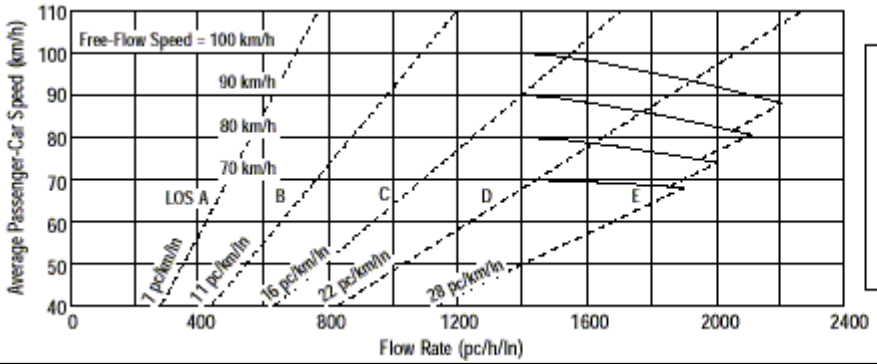
Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.922
Two-way flow rate,(note-1) vp 694 pc/h
Highest directional split proportion (note-2) 382
Base percent time-spent-following, BPTSF 45.7 %
Adj.for directional distribution and no-passing zones, fd/np 15.0
Percent time-spent-following, PTSF 60.6 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.23	
Peak 15-min vehicle-miles of travel, VMT15	676	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2435	veh-mi
Peak 15-min total travel time, TT15	20.4	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/23/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2007

Project Description Exist. System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	887	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

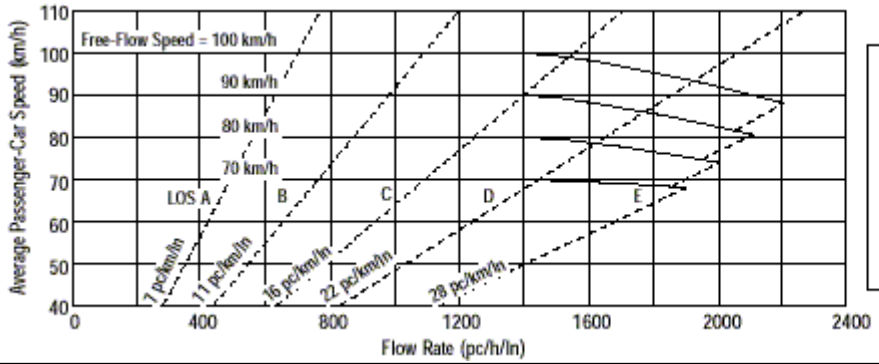
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	541	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	11.4	Max Service Flow Rate (pc/h/ln)	
LOS	B	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/23/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2007

Project Description Exist. System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	887	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

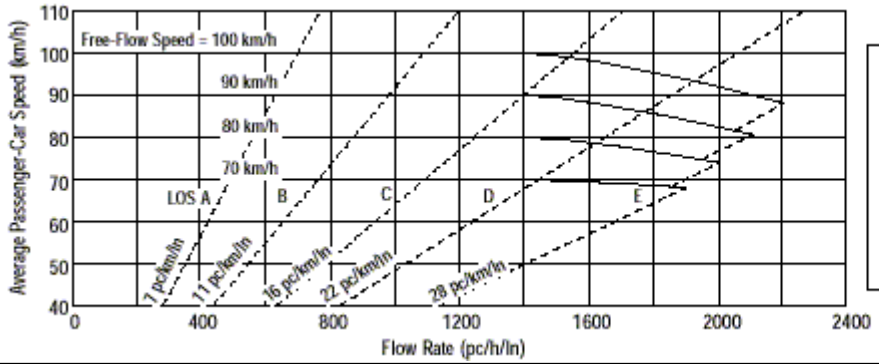
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	514	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	10.8	Max Service Flow Rate (pc/h/ln)	
LOS	A	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/23/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2007

Project Description Exist. System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1786	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

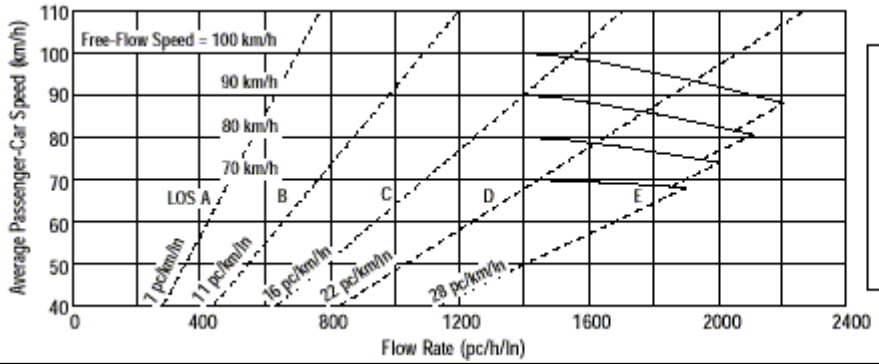
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	999	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	21.0	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/23/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2007

Project Description Exist. System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1786	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	1036	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	21.8	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period AM DHV and PM DHV
Highway O'Neil Road
From/To SR 32 to SR 73
Jurisdiction
Analysis Year 2007
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 2.0 ft Peak-hour factor, PHF 0.90
Lane width 9.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 200 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
PCE for trucks, ET 2.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.905
Two-way flow rate,(note-1) vp 346 pc/h
Highest directional split proportion (note-2) 208 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 4.8 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 37.7 mi/h

Adjustment for no-passing zones, fnp 2.8 mi/h
Average travel speed, ATS 32.2 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.77
PCE for trucks, ET 1.8
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.947
Two-way flow rate,(note-1) vp 305 pc/h
Highest directional split proportion (note-2) 183
Base percent time-spent-following, BPTSF 23.5 %
Adj.for directional distribution and no-passing zones, fd/np 17.2
Percent time-spent-following, PTSF 40.7 %

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.11	
Peak 15-min vehicle-miles of travel, VMT15	167	veh-mi
Peak-hour vehicle-miles of travel, VMT60	600	veh-mi
Peak 15-min total travel time, TT15	5.2	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

2027 Existing System without Proposed Development

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1947	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	394	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	285	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1947	394	285	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	541	109	79	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2261	457	331	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2261 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2261	4800	No
v_{12}	2261	4400	No
$v_{FO} = v_F - v_R$	1804	4800	No
v_R	457	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 21.4 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.339	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.5	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2677	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	758	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	509	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2677	758	509	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	744	211	141	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3108	880	591	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3108 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3108	4800	No
v_{12}	3108	4400	No
$v_{FO} = v_F - v_R$	2228	4800	No
v_R	880	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 28.7 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.377	
Space mean speed in ramp influence area,	S_R = 59	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 59.4	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1553	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	285	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	394	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1553	285	394	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	431	79	109	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1803	331	457	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1803 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2134	4800	No
v_{R12}	2134	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 19.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.322

Space mean speed in ramp influence area, S_R = 61.0 mph

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

Space mean speed for all vehicles, S = 61.0 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1919	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	509	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	758	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1919	509	758	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	533	141	211	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, f_{HV}	0.957	0.957	0.957	
Driver population factor, f_P	1.00	1.00	1.00	
Flow rate, v_p	2228	591	880	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2228 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2819	4800	No
v_{R12}	2819	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 25.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.355

Space mean speed in ramp influence area, S_R = 60.1 mph

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

Space mean speed for all vehicles, S = 60.1 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1679	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	412	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	570	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1679	412	570	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	466	114	158	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1977	485	671	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1977 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1977	4800	No
v_{12}	1977	4400	No
$v_{FO} = v_F - v_R$	1492	4800	No
v_R	485	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 18.1 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.342

Space mean speed in ramp influence area, S_R = 60 mph

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

Space mean speed for all vehicles, S = 60.4 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2899	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	558	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	734	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2899	558	734	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	805	155	204	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3414	657	864	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3414 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3414	4800	No
v_{12}	3414	4400	No
$v_{FO} = v_F - v_R$	2757	4800	No
v_R	657	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 30.5 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.357

Space mean speed in ramp influence area, S_R = 60 mph

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

Space mean speed for all vehicles, S = 60.0 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1267	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	570	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	412	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1267	570	412	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	352	158	114	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1492	671	485	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1492 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2163	4800	No
v_{R12}	2163	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 19.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.323

Space mean speed in ramp influence area, S_R = 60.9 mph

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

Space mean speed for all vehicles, S = 60.9 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2341	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	734	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	558	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2341	734	558	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	650	204	155	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2757	864	657	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2757 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3621	4800	No
v_{R12}	3621	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 31.1 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.435

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

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1838	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	127	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	118	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1838		127		118		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	511		35		33		v
Trucks and buses	17		17		17		%
Recreational vehicles	0		0		0		%
Terrain type:	Rolling		Rolling		Rolling		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2563	177	165	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2563 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2563	4800	No
v_{12}	2563	4400	No
$v_{FO} = v_F - v_R$	2386	4800	No
v_R	177	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 24.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.314	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.2	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2428	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	301	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	128	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2428	301	128	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	674	84	36	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3386	420	178	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3386 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3386	4800	No
v_{12}	3386	4400	No
$v_{FO} = v_F - v_R$	2966	4800	No
v_R	420	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 31.1 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.336	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.6	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System wo Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1711	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	118	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	127	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1711	118	127	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	475	33	35	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2386	165	177	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2386 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2551	4800	No
v_{R12}	2551	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 23.4 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.344

Space mean speed in ramp influence area, S_R = 60.4 mph

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

Space mean speed for all vehicles, S = 60.4 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System wo Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2127	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	128	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	301	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2127	128	301	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	591	36	84	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2966	178	420	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2966 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3144	4800	No
v_{R12}	3144	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 28.0+ pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.384

Space mean speed in ramp influence area, S_R = 59.2 mph

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

Space mean speed for all vehicles, S = 59.2 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1482	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	102	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	299	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1482	102	299	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	412	28	83	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2067	142	417	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2067 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2067	4800	No
v_{12}	2067	4400	No
$v_{FO} = v_F - v_R$	1925	4800	No
v_R	142	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 20.2 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.311	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.3	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System w/o Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2842	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	152	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	209	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2842	152	209	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	789	42	58	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3963	212	291	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3963 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3963	4800	No
v_{12}	3963	4400	No
$v_{FO} = v_F - v_R$	3751	4800	No
v_R	212	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 36.5 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.317

Space mean speed in ramp influence area, S_R = 61 mph

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

Space mean speed for all vehicles, S = 61.1 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System wo Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1380	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	299	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	102	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1380	299	102	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	383	83	28	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1924	417	142	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1924 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2341	4800	No
v_{R12}	2341	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 21.7 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.335

Space mean speed in ramp influence area, S_R = 60.6 mph

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

Space mean speed for all vehicles, S = 60.6 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/23/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System wo Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2690	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	209	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	152	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2690	209	152	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	747	58	42	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3751	291	212	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3751 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4042	4800	No
v_{R12}	4042	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 35.0- pc/mi/ln

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

Speed Estimation

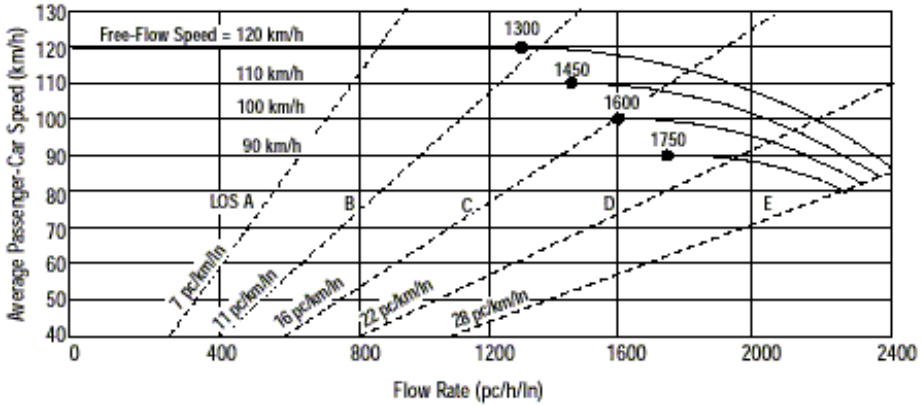
Intermediate speed variable, M_S = 0.516

Space mean speed in ramp influence area, S_R = 55.6 mph

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

Space mean speed for all vehicles, S = 55.6 mph

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/21/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	SR 32 to SR 73
Jurisdiction	
Analysis Year	2027

Project Description Existing System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1838 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1496	pc/h/ln
S	69.8	mi/h
D = v_p / S	21.4	pc/mi/ln
LOS	C	

Design (N)

Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

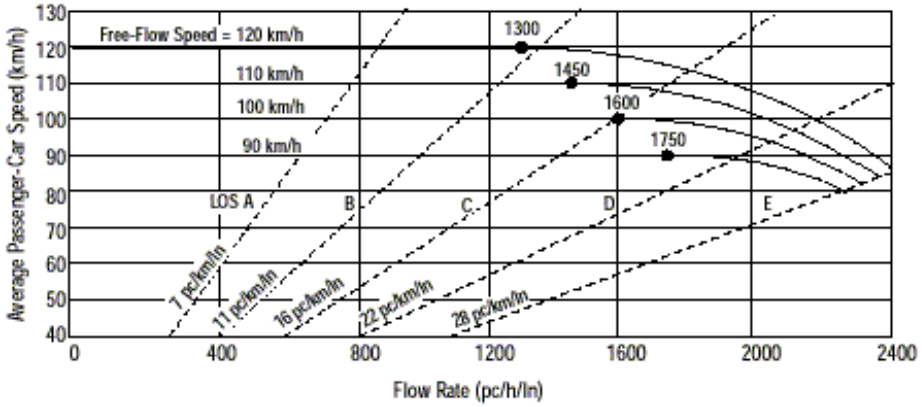
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/21/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	SR 32 to SR 73
Jurisdiction	
Analysis Year	2027

Project Description Existing System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	2428 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1976	pc/h/ln
S	65.3	mi/h
D = v_p / S	30.3	pc/mi/ln
LOS	D	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

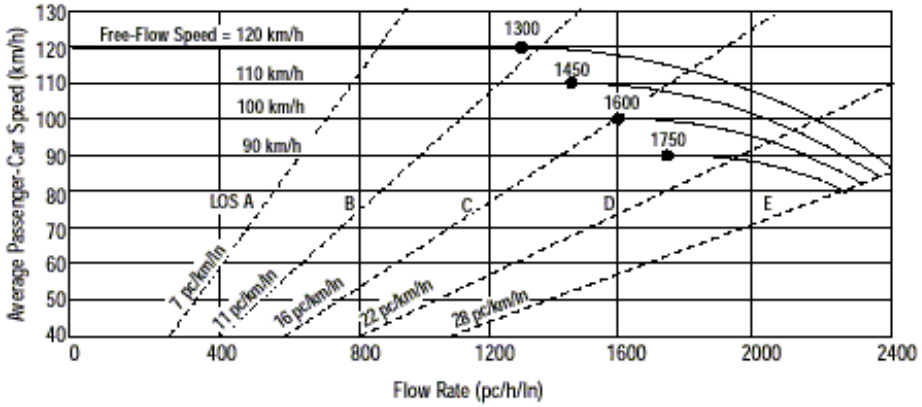
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/21/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	SR 73 to SR 32
Jurisdiction	
Analysis Year	2027

Project Description Existing System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1679 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1367	pc/h/ln
S	70.0	mi/h
D = v_p / S	19.5	pc/mi/ln
LOS	C	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

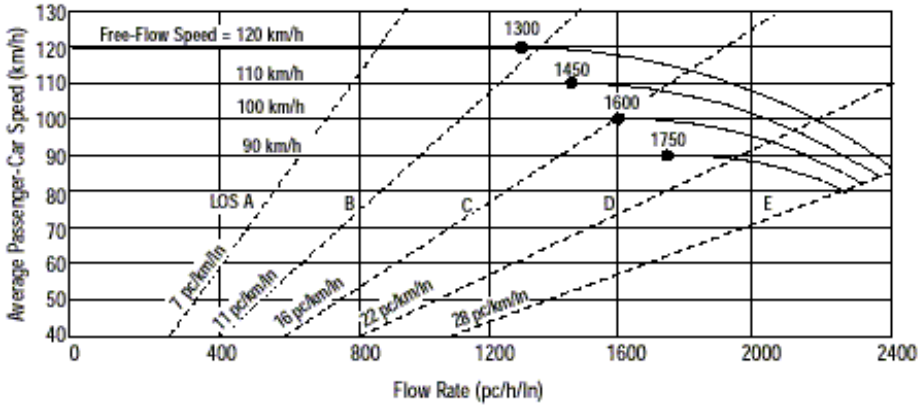
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/21/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	SR 73 to SR 32
Jurisdiction	
Analysis Year	2027

Project Description Existing System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	2899 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures		
Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	2359	pc/h/ln
S	54.9	mi/h
D = v_p / S	43.0	pc/mi/ln
LOS	E	

Design (N)	
Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/23/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*1408*	*84*	*201*	*1232*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*1564*	*93*	*223*	*1368*	*0*
Percent Heavy Vehicles	*0*	--	--	*4*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*207*	*0*	*187*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*230*	*0*	*207*
Percent Heavy Vehicles	*0*	*0*	*0*	*4*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*223*				*230*		*207*
C (m) (vph)		*409*				*39*		*389*
v/c		*0.55*				*5.90*		*0.53*
95% queue length		*3.17*				*27.06*		*3.01*
Control Delay		*23.9*						*24.3*
LOS		*C*				*F*		*C*
Approach Delay	--	--						
Approach LOS	--	--				*F*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/23/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*2588*	*166*	*343*	*2378*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*2875*	*184*	*381*	*2642*	*0*
Percent Heavy Vehicles	*0*	--	--	*4*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*279*	*0*	*479*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*310*	*0*	*532*
Percent Heavy Vehicles	*0*	*0*	*0*	*4*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*381*				*310*		*532*
C (m) (vph)		*123*				*0*		*146*
v/c		*3.10*						*3.64*
95% queue length		*36.20*						*52.08*
Control Delay								
LOS		*F*				*F*		*F*
Approach Delay	--	--						
Approach LOS	--	--						

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/23/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*243*	*1372*	*0*	*0*	*1352*	*327*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*270*	*1524*	*0*	*0*	*1502*	*363*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*81*	*0*	*331*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*90*	*0*	*367*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*270*		*90*		*367*			
C (m) (vph)	*437*		*25*		*343*			
v/c	*0.62*		*3.60*		*1.07*			
95% queue length	*4.06*		*11.15*		*13.33*			
Control Delay	*25.7*				*104.0*			
LOS	*D*		*F*		*F*			
Approach Delay	--	--	*377.5*					
Approach LOS	--	--	*F*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/23/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*369*	*2498*	*0*	*0*	*2574*	*365*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*410*	*2775*	*0*	*0*	*2860*	*405*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*147*	*0*	*411*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*163*	*0*	*456*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*410*		*163*		*456*			
C (m) (vph)	*126*		*0*		*130*			
v/c	*3.25*				*3.51*			
95% queue length	*39.40*				*44.59*			
Control Delay								
LOS	*F*		*F*		*F*			
Approach Delay	--	--						
Approach LOS	--	--						

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & SR 73*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/23/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *SR 32* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*510*	*141*	*0*	*0*	*95*	*118*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*566*	*156*	*0*	*0*	*105*	*131*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*174*	*0*	*438*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*193*	*0*	*486*
Percent Heavy Vehicles	*0*	*0*	*0*	*7*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (vph)	*566*					*193*		*486*
C (m) (vph)	*1456*					*93*		*936*
v/c	*0.39*					*2.08*		*0.52*
95% queue length	*1.88*					*16.81*		*3.07*
Control Delay	*9.0*					*593.4*		*12.9*
LOS	*A*					*F*		*B*
Approach Delay	--	--				*177.9*		
Approach LOS	--	--				*F*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & SR 73*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/23/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *SR 32* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*338*	*195*	*0*	*0*	*263*	*218*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*375*	*216*	*0*	*0*	*292*	*242*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*242*	*0*	*388*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*268*	*0*	*431*
Percent Heavy Vehicles	*0*	*0*	*0*	*7*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (vph)	*375*					*268*		*431*
C (m) (vph)	*1242*					*128*		*736*
v/c	*0.30*					*2.09*		*0.59*
95% queue length	*1.28*					*22.06*		*3.85*
Control Delay	*9.1*					*574.3*		*16.6*
LOS	*A*					*F*		*C*
Approach Delay	--	--				*230.4*		
Approach LOS	--	--				*F*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/23/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 EB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*234*	*81*	*37*	*163*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*260*	*90*	*41*	*181*	*0*
Percent Heavy Vehicles	*0*	--	--	*17*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*77*	*0*	*50*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*85*	*0*	*55*
Percent Heavy Vehicles	*0*	*0*	*0*	*17*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*				*L*		*R*
v (vph)		*41*				*85*		*55*
C (m) (vph)		*1130*				*443*		*849*
v/c		*0.04*				*0.19*		*0.06*
95% queue length		*0.11*				*0.70*		*0.21*
Control Delay		*8.3*				*15.0+*		*9.5*
LOS		*A*				*C*		*A*
Approach Delay	--	--				*12.9*		
Approach LOS	--	--				*B*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/23/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *I-40 EB ramps* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*368*	*69*	*59*	*327*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*408*	*76*	*65*	*363*	*0*
Percent Heavy Vehicles	*0*	--	--	*17*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*147*	*0*	*154*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*163*	*0*	*171*
Percent Heavy Vehicles	*0*	*0*	*0*	*17*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*				*L*		*R*
v (vph)		*65*				*163*		*171*
C (m) (vph)		*1005*				*257*		*671*
v/c		*0.06*				*0.63*		*0.25*
95% queue length		*0.21*				*3.90*		*1.01*
Control Delay		*8.8*				*40.5*		*12.2*
LOS		*A*				*E*		*B*
Approach Delay	--	--				*26.0*		
Approach LOS	--	--				*D*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 and I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/23/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 WB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*170*	*141*	*0*	*0*	*148*	*129*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*188*	*156*	*0*	*0*	*164*	*143*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*52*	*0*	*50*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*57*	*0*	*55*	*0*	*0*	*0*
Percent Heavy Vehicles	*7*	*0*	*17*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*		*L*		*R*			
v (vph)	*188*		*57*		*55*			
C (m) (vph)	*1226*		*307*		*852*			
v/c	*0.15*		*0.19*		*0.06*			
95% queue length	*0.54*		*0.67*		*0.21*			
Control Delay	*8.5*		*19.4*		*9.5*			
LOS	*A*		*C*		*A*			
Approach Delay	--	--	*14.5*					
Approach LOS	--	--	*B*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 and I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/23/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Existing System wo Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 WB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*102*	*413*	*0*	*0*	*290*	*107*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*113*	*458*	*0*	*0*	*322*	*118*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*96*	*0*	*56*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*106*	*0*	*62*	*0*	*0*	*0*
Percent Heavy Vehicles	*7*	*0*	*17*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*		*L*		*R*			
v (vph)	*113*		*106*		*62*			
C (m) (vph)	*1094*		*216*		*573*			
v/c	*0.10*		*0.49*		*0.11*			
95% queue length	*0.34*		*2.45*		*0.36*			
Control Delay	*8.7*		*36.7*		*12.0*			
LOS	*A*		*E*		*B*			
Approach Delay	--	--	*27.6*					
Approach LOS	--	--	*D*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/23/2002
Analysis Time Period AM DHV
Highway SR 32
From/To SR 73 to O'Neil Road
Jurisdiction
Analysis Year 2027
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1240 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 1440 pc/h
Highest directional split proportion (note-2) 720 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.0 mi/h
Average travel speed, ATS 29.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1378 pc/h
Highest directional split proportion (note-2) 689
Base percent time-spent-following, BPTSF 70.2 %
Adj.for directional distribution and no-passing zones, fd/np 6.4
Percent time-spent-following, PTSF 76.6 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.45	
Peak 15-min vehicle-miles of travel, VMT15	1033	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3720	veh-mi
Peak 15-min total travel time, TT15	35.6	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/23/2002
Analysis Time Period PM DHV
Highway SR 32
From/To SR 73 to O'Neil Road
Jurisdiction
Analysis Year 2027
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1186 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 1378 pc/h
Highest directional split proportion (note-2) 689 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.1 mi/h
Average travel speed, ATS 29.4 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1318 pc/h
Highest directional split proportion (note-2) 659
Base percent time-spent-following, BPTSF 68.6 %
Adj.for directional distribution and no-passing zones, fd/np 7.1
Percent time-spent-following, PTSF 75.7 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.43	
Peak 15-min vehicle-miles of travel, VMT15	988	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3558	veh-mi
Peak 15-min total travel time, TT15	33.6	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/23/2002
Analysis Time Period AM DHV
Highway SR 32
From/To O'Neil Road to Morrell Springs
Jurisdiction
Analysis Year 2027
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 3 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1500 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.985
Two-way flow rate,(note-1) vp 1709 pc/h
Highest directional split proportion (note-2) 855 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 0.9 mi/h
Average travel speed, ATS 27.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1667 pc/h
Highest directional split proportion (note-2) 834
Base percent time-spent-following, BPTSF 76.9 %
Adj.for directional distribution and no-passing zones, fd/np 4.9
Percent time-spent-following, PTSF 81.8 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	1250	veh-mi
Peak-hour vehicle-miles of travel, VMT60	4500	veh-mi
Peak 15-min total travel time, TT15	46.2	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/23/2002
Analysis Time Period PM DHV
Highway SR 32
From/To O'Neil Road to Morrell Springs
Jurisdiction
Analysis Year 2027
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 3 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1500 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.985
Two-way flow rate,(note-1) vp 1709 pc/h
Highest directional split proportion (note-2) 855 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 0.9 mi/h
Average travel speed, ATS 27.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1667 pc/h
Highest directional split proportion (note-2) 834
Base percent time-spent-following, BPTSF 76.9 %
Adj.for directional distribution and no-passing zones, fd/np 4.9
Percent time-spent-following, PTSF 81.8 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	1250	veh-mi
Peak-hour vehicle-miles of travel, VMT60	4500	veh-mi
Peak 15-min total travel time, TT15	46.2	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/23/2002
Analysis Time Period AM DHV
Highway SR 73
From/To SR 32 to 40
Jurisdiction
Analysis Year 2027
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 2.4 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 528 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.941
Two-way flow rate,(note-1) vp 671 pc/h
Highest directional split proportion (note-2) 403 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 2.5 mi/h
Average travel speed, ATS 33.5 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 646 pc/h
Highest directional split proportion (note-2) 388
Base percent time-spent-following, BPTSF 43.3 %
Adj.for directional distribution and no-passing zones, fd/np 15.8
Percent time-spent-following, PTSF 59.1 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.21	
Peak 15-min vehicle-miles of travel, VMT15	352	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1267	veh-mi
Peak 15-min total travel time, TT15	10.5	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/23/2002
Analysis Time Period PM DHV
Highway SR 73
From/To SR 32 to 40
Jurisdiction
Analysis Year 2027
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 2.4 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 918 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.941
Two-way flow rate,(note-1) vp 1166 pc/h
Highest directional split proportion (note-2) 583 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.5 mi/h
Average travel speed, ATS 30.7 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 1123 pc/h
Highest directional split proportion (note-2) 562
Base percent time-spent-following, BPTSF 62.7 %
Adj.for directional distribution and no-passing zones, fd/np 9.4
Percent time-spent-following, PTSF 72.1 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.36	
Peak 15-min vehicle-miles of travel, VMT15	612	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2203	veh-mi
Peak 15-min total travel time, TT15	19.9	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/23/2002
Analysis Time Period AM DHV
Highway SR 73
From/To 40 to O'Neil Road
Jurisdiction
Analysis Year 2027
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 17 %
Segment length 4.5 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 468 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.867
Two-way flow rate,(note-1) vp 645 pc/h
Highest directional split proportion (note-2) 387 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 2.6 mi/h
Average travel speed, ATS 33.6 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.922
Two-way flow rate,(note-1) vp 600 pc/h
Highest directional split proportion (note-2) 360
Base percent time-spent-following, BPTSF 41.0 %
Adj.for directional distribution and no-passing zones, fd/np 17.0
Percent time-spent-following, PTSF 58.0 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.20	
Peak 15-min vehicle-miles of travel, VMT15	585	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2106	veh-mi
Peak 15-min total travel time, TT15	17.4	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/23/2002
Analysis Time Period PM DHV
Highway SR 73
From/To 40 to O'Neil Road
Jurisdiction
Analysis Year 2027
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 17 %
Segment length 4.5 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 866 veh/h
Directional split 55 / 45 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.867
Two-way flow rate,(note-1) vp 1193 pc/h
Highest directional split proportion (note-2) 656 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.4 mi/h
Average travel speed, ATS 30.5 mi/h

Percent Time-Spent-Following

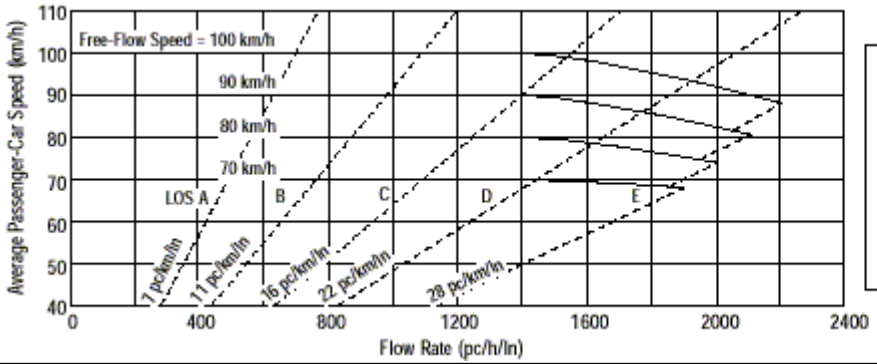
Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.922
Two-way flow rate,(note-1) vp 1111 pc/h
Highest directional split proportion (note-2) 611
Base percent time-spent-following, BPTSF 62.3 %
Adj.for directional distribution and no-passing zones, fd/np 9.2
Percent time-spent-following, PTSF 71.5 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.37	
Peak 15-min vehicle-miles of travel, VMT15	1083	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3897	veh-mi
Peak 15-min total travel time, TT15	35.5	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/23/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2027

Project Description Exist. System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1419	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

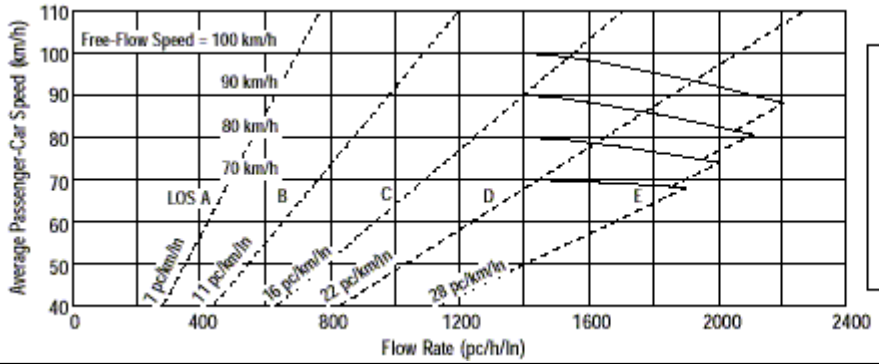
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	866	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	18.2	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/23/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2027

Project Description Exist. System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1419	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

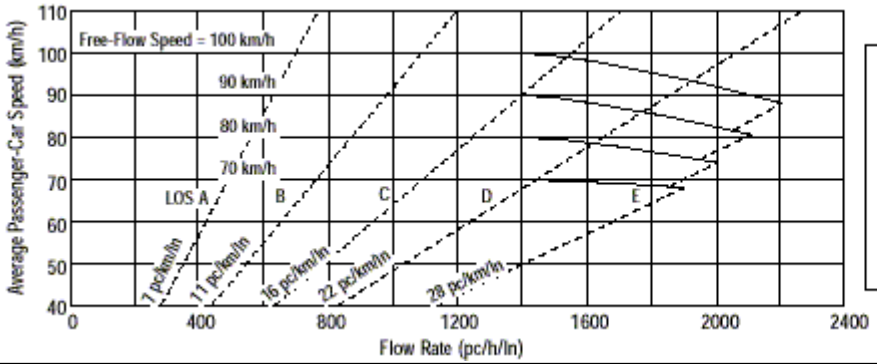
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	823	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	17.3	Max Service Flow Rate (pc/h/ln)	
LOS	B	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/23/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2027

Project Description Exist. System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	2857	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

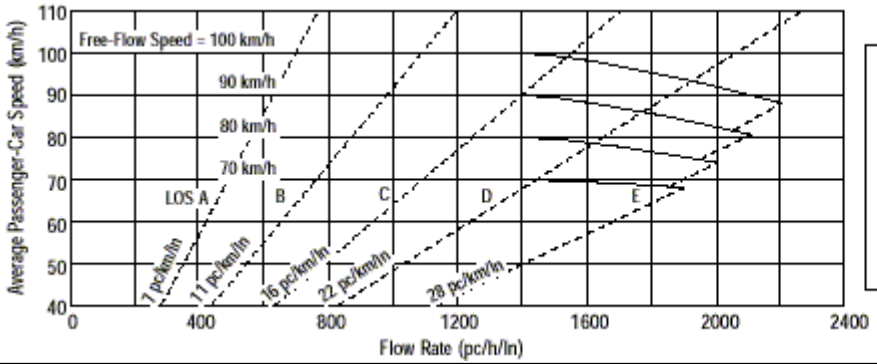
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		**Design**	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	1598	Required Number of Lanes, N	
Speed, S (mi/h)	46.7	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	34.2	Max Service Flow Rate (pc/h/ln)	
LOS	D	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/23/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2027

Project Description Exist. System w/o Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	2857	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	1658	Required Number of Lanes, N	
Speed, S (mi/h)	46.4	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	35.7	Max Service Flow Rate (pc/h/ln)	
LOS	E	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period AM DHV and PM DHV
Highway O'Neil Road
From/To SR 32 to SR 73
Jurisdiction
Analysis Year 2027
Description Existing System wo Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 2.0 ft Peak-hour factor, PHF 0.90
Lane width 9.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 320 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
PCE for trucks, ET 2.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.905
Two-way flow rate,(note-1) vp 553 pc/h
Highest directional split proportion (note-2) 332 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 4.8 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 37.7 mi/h

Adjustment for no-passing zones, fnp 2.8 mi/h
Average travel speed, ATS 30.6 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.77
PCE for trucks, ET 1.8
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.947
Two-way flow rate,(note-1) vp 488 pc/h
Highest directional split proportion (note-2) 293
Base percent time-spent-following, BPTSF 34.9 %
Adj.for directional distribution and no-passing zones, fd/np 17.8
Percent time-spent-following, PTSF 52.7 %

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.17	
Peak 15-min vehicle-miles of travel, VMT15	267	veh-mi
Peak-hour vehicle-miles of travel, VMT60	960	veh-mi
Peak 15-min total travel time, TT15	8.7	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

2007 Existing System with Proposed Development

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/22/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1311	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	340	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	178	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1311	340	178	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	364	94	49	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1522	395	207	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1522 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1522	4800	No
v_{12}	1522	4400	No
$v_{FO} = v_F - v_R$	1127	4800	No
v_R	395	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.1 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.334	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.7	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2002	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	803	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	318	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	2002		803		318		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	556		223		88		v
Trucks and buses	3		3		3		%
Recreational vehicles	0		0		0		%
Terrain type:	Rolling		Rolling		Rolling		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2325	932	369	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2325 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2325	4800	No
v_{12}	2325	4400	No
$v_{FO} = v_F - v_R$	1393	4800	No
v_R	932	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 22.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.382

Space mean speed in ramp influence area, S_R = 59 mph

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

Space mean speed for all vehicles, S = 59.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/22/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	971	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	178	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	340	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	971	178	340	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	270	49	94	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1127	207	395	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1127 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1334	4800	No
v_{R12}	1334	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 13.6 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.304

Space mean speed in ramp influence area, S_R = 61.5 mph

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

Space mean speed for all vehicles, S = 61.5 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1199	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	318	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	803	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1199	318	803	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	333	88	223	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1392	369	932	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1392 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1761	4800	No
v_{R12}	1761	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 16.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.312

Space mean speed in ramp influence area, S_R = 61.3 mph

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

Space mean speed for all vehicles, S = 61.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/22/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1049	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	257	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	419	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1049		257		419	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	291		71		116	v
Trucks and buses	4		4		4	%
Recreational vehicles	0		0		0	%
Terrain type:	Rolling		Rolling		Rolling	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	2.5		2.5		2.5	
Recreational vehicle PCE, ER	2.0		2.0		2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1235	303	493	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1235 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1235	4800	No
v_{12}	1235	4400	No
$v_{FO} = v_F - v_R$	932	4800	No
v_R	303	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 11.7 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.325	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.9	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1812	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	349	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	782	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1812		349		782		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	503		97		217		v
Trucks and buses	4		4		4		%
Recreational vehicles	0		0		0		%
Terrain type:	Rolling		Rolling		Rolling		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2134	411	921	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2134 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2134	4800	No
v_{12}	2134	4400	No
$v_{FO} = v_F - v_R$	1723	4800	No
v_R	411	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 19.5 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.335	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.6	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/22/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	792	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	419	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	257	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	792	419	257	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	220	116	71	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	933	493	303	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 933 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1426	4800	No
v_{R12}	1426	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 14.2 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.306

Space mean speed in ramp influence area, S_R = 61.4 mph

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

Space mean speed for all vehicles, S = 61.4 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1463	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	782	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	349	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1463	782	349	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	406	217	97	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1723	921	411	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1723 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2644	4800	No
v_{R12}	2644	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 23.5 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.344

Space mean speed in ramp influence area, S_R = 60.4 mph

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

Space mean speed for all vehicles, S = 60.4 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/22/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1149	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	79	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	99	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1149		79		99		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	319		22		28		v
Trucks and buses	17		17		17		%
Recreational vehicles	0		0		0		%
Terrain type:	Rolling		Rolling		Rolling		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1602	110	138	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1602 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1602	4800	No
v_{12}	1602	4400	No
$v_{FO} = v_F - v_R$	1492	4800	No
v_R	110	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.308	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.4	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1517	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	189	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	205	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1517	189	205	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	421	53	57	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2115	264	286	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2115 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2115	4800	No
v_{12}	2115	4400	No
$v_{FO} = v_F - v_R$	1851	4800	No
v_R	264	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 20.2 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.322	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.0	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/22/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1070	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	99	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	79	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1070	99	79	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	297	28	22	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1492	138	110	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1492 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1630	4800	No
v_{R12}	1630	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 16.2 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.314

Space mean speed in ramp influence area, S_R = 61.2 mph

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

Space mean speed for all vehicles, S = 61.2 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1328	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	205	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	189	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1328	205	189	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	369	57	53	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1852	286	264	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1852 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2138	4800	No
v_{R12}	2138	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 20.1 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.327

Space mean speed in ramp influence area, S_R = 60.8 mph

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

Space mean speed for all vehicles, S = 60.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/22/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	961	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	99	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	187	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	961	99	187	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	267	28	52	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1340	138	261	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1340 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1340	4800	No
v_{12}	1340	4400	No
$v_{FO} = v_F - v_R$	1202	4800	No
v_R	138	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 14.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.310	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.3	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1903	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	222	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	131	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1903		222		131		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	529		62		36		v
Trucks and buses	17		17		17		%
Recreational vehicles	0		0		0		%
Terrain type:	Rolling		Rolling		Rolling		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2654	310	183	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2654 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2654	4800	No
v_{12}	2654	4400	No
$v_{FO} = v_F - v_R$	2344	4800	No
v_R	310	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 25.3 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.326	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.9	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/22/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	862	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	187	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	99	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	862	187	99	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	239	52	28	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1202	261	138	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1202 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1463	4800	No
v_{R12}	1463	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 14.9 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.311

Space mean speed in ramp influence area, S_R = 61.3 mph

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

Space mean speed for all vehicles, S = 61.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1681	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	131	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	222	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1681	131	222	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	467	36	62	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2344	183	310	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2344 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2527	4800	No
v_{R12}	2527	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 23.2 pc/mi/ln

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

Speed Estimation

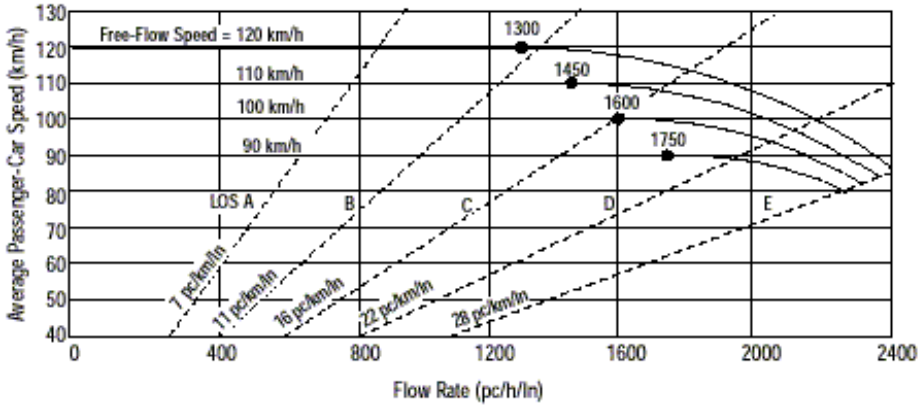
Intermediate speed variable, M_S = 0.343

Space mean speed in ramp influence area, S_R = 60.4 mph

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

Space mean speed for all vehicles, S = 60.4 mph

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	4/22/2003
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	SR 32 to SR 73
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Existing System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1149 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	935	pc/h/ln
S	70.0	mi/h
D = v_p / S	13.4	pc/mi/ln
LOS	B	

Design (N)

Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

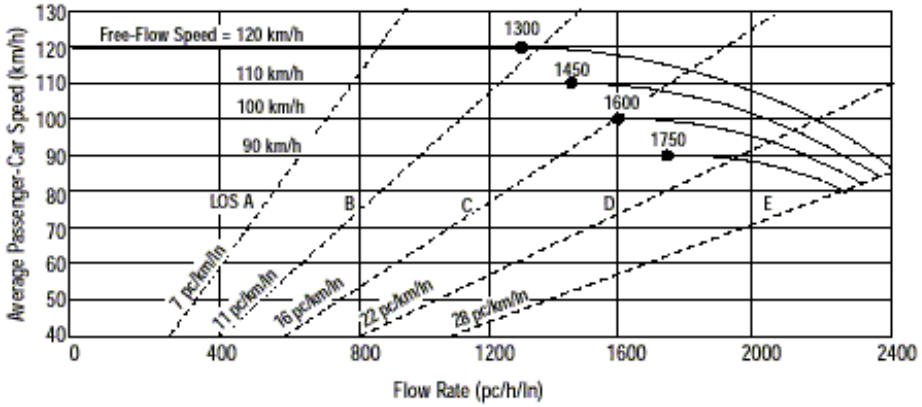
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	4/29/2003
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	SR 32 to SR 73
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Existing System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1517 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1235	pc/h/ln
S	70.0	mi/h
D = v_p / S	17.6	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

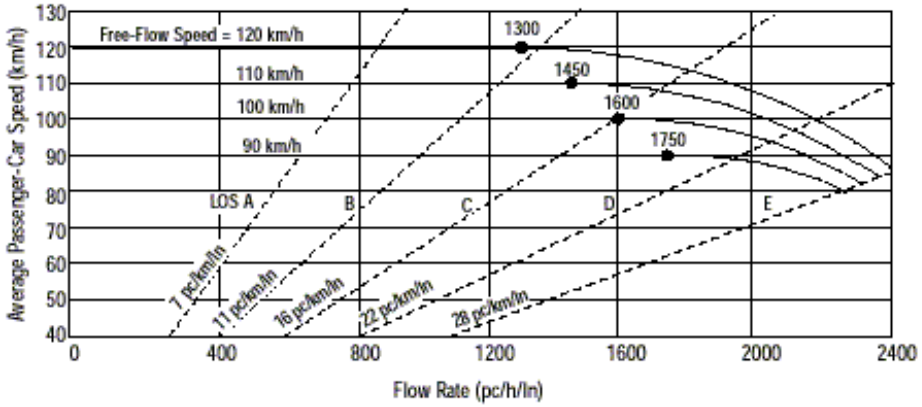
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	4/22/2003
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	SR 73 to SR 32
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Existing System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1049 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	854	pc/h/ln
S	70.0	mi/h
D = v_p / S	12.2	pc/mi/ln
LOS	B	

Design (N)

Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

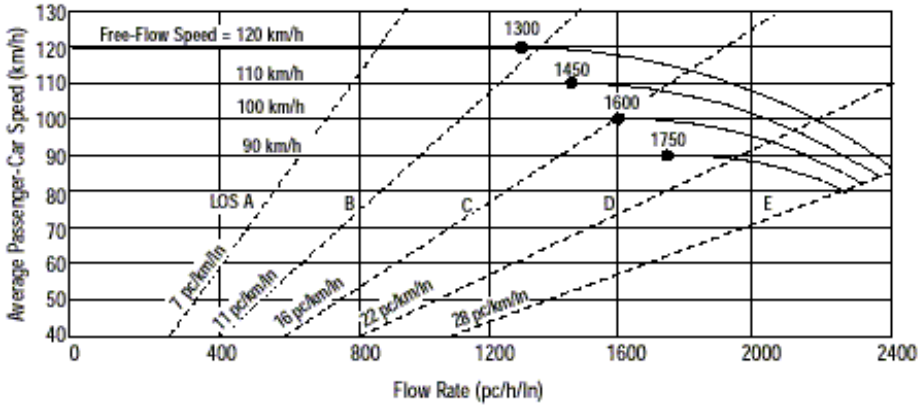
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	4/29/2003
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	SR 73 to SR 32
Jurisdiction	
Analysis Year	2007- Revised

Project Description Existing System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1812 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1475	pc/h/ln
S	69.9	mi/h
D = v_p / S	21.1	pc/mi/ln
LOS	C	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/24/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*970*	*52*	*126*	*809*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*1077*	*57*	*140*	*898*	*0*
Percent Heavy Vehicles	*0*	--	--	*4*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*129*	*0*	*211*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*143*	*0*	*234*
Percent Heavy Vehicles	*0*	*0*	*0*	*4*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*140*				*143*		*234*
C (m) (vph)		*632*				*144*		*555*
v/c		*0.22*				*0.99*		*0.42*
95% queue length		*0.84*				*7.26*		*2.08*
Control Delay		*12.3*				*134.1*		*16.1*
LOS		*B*				*F*		*C*
Approach Delay	--	--				*60.9*		
Approach LOS	--	--				*F*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/29/2003*	Analysis Year	*2007 - revised*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*2075*	*104*	*214*	*1623*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*2305*	*115*	*237*	*1803*	*0*
Percent Heavy Vehicles	*0*	--	--	*4*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*175*	*0*	*628*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*194*	*0*	*697*
Percent Heavy Vehicles	*0*	*0*	*0*	*4*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*237*				*194*		*697*
C (m) (vph)		*208*				*0*		*279*
v/c		*1.14*						*2.50*
95% queue length		*11.41*						*56.85*
Control Delay		*153.0*						*713.0*
LOS		*F*				*F*		*F*
Approach Delay	--	--						
Approach LOS	--	--						

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/24/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*215*	*884*	*0*	*0*	*885*	*204*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*238*	*982*	*0*	*0*	*983*	*226*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*50*	*0*	*207*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*55*	*0*	*230*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*238*		*55*		*230*			
C (m) (vph)	*692*		*92*		*518*			
v/c	*0.34*		*0.60*		*0.44*			
95% queue length	*1.53*		*2.78*		*2.25*			
Control Delay	*12.9*		*90.4*		*17.4*			
LOS	*B*		*F*		*C*			
Approach Delay	--	--	*31.5*					
Approach LOS	--	--	*D*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/29/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*554*	*1696*	*0*	*0*	*1745*	*228*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*615*	*1884*	*0*	*0*	*1938*	*253*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*92*	*0*	*257*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*102*	*0*	*285*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*615*		*102*		*285*			
C (m) (vph)	*295*		*0*		*260*			
v/c	*2.08*				*1.10*			
95% queue length	*45.11*				*12.02*			
Control Delay	*527.8*				*125.9*			
LOS	*F*		*F*		*F*			
Approach Delay	--	--						
Approach LOS	--	--						

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & SR 73*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/24/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *SR 32* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*393*	*88*	*0*	*0*	*59*	*106*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*436*	*97*	*0*	*0*	*65*	*117*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*132*	*0*	*329*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*146*	*0*	*365*
Percent Heavy Vehicles	*0*	*0*	*0*	*7*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (vph)	*436*					*146*		*365*
C (m) (vph)	*1506*					*179*		*985*
v/c	*0.29*					*0.82*		*0.37*
95% queue length	*1.21*					*5.62*		*1.73*
Control Delay	*8.4*					*79.0*		*10.8*
LOS	*A*					*F*		*B*
Approach Delay	--	--				*30.3*		
Approach LOS	--	--				*D*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & SR 73*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/29/2003*	Analysis Year	*2007- Revised*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *SR 32* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*401*	*122*	*0*	*0*	*165*	*250*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*445*	*135*	*0*	*0*	*183*	*277*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*264*	*0*	*434*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*293*	*0*	*482*
Percent Heavy Vehicles	*0*	*0*	*0*	*7*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (vph)	*445*					*293*		*482*
C (m) (vph)	*1362*					*133*		*847*
v/c	*0.33*					*2.20*		*0.57*
95% queue length	*1.44*					*24.49*		*3.67*
Control Delay	*8.9*					*619.1*		*14.7*
LOS	*A*					*F*		*B*
Approach Delay	--	--				*243.2*		
Approach LOS	--	--				*F*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/24/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 EB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*146*	*74*	*25*	*134*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*162*	*82*	*27*	*148*	*0*
Percent Heavy Vehicles	*0*	--	--	*17*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*48*	*0*	*31*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*53*	*0*	*34*
Percent Heavy Vehicles	*0*	*0*	*0*	*17*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*				*L*		*R*
v (vph)		*27*				*53*		*34*
C (m) (vph)		*1239*				*561*		*886*
v/c		*0.02*				*0.09*		*0.04*
95% queue length		*0.07*				*0.31*		*0.12*
Control Delay		*8.0*				*12.1*		*9.2*
LOS		*A*				*B*		*A*
Approach Delay	--	--				*11.0*		
Approach LOS	--	--				*B*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/29/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *I-40 EB ramps* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*230*	*156*	*49*	*318*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*255*	*173*	*54*	*353*	*0*
Percent Heavy Vehicles	*0*	--	--	*17*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*92*	*0*	*97*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*102*	*0*	*107*
Percent Heavy Vehicles	*0*	*0*	*0*	*17*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*				*L*		*R*
v (vph)		*54*				*102*		*107*
C (m) (vph)		*1056*				*316*		*680*
v/c		*0.05*				*0.32*		*0.16*
95% queue length		*0.16*				*1.36*		*0.56*
Control Delay		*8.6*				*21.7*		*11.3*
LOS		*A*				*C*		*B*
Approach Delay	--	--				*16.4*		
Approach LOS	--	--				*C*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 and I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/24/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 WB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*106*	*88*	*0*	*0*	*95*	*81*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*117*	*97*	*0*	*0*	*105*	*90*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*64*	*0*	*35*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*71*	*0*	*38*	*0*	*0*	*0*
Percent Heavy Vehicles	*7*	*0*	*17*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*		*L*		*R*			
v (vph)	*117*		*71*		*38*			
C (m) (vph)	*1349*		*489*		*920*			
v/c	*0.09*		*0.15*		*0.04*			
95% queue length	*0.28*		*0.50*		*0.13*			
Control Delay	*7.9*		*13.6*		*9.1*			
LOS	*A*		*B*		*A*			
Approach Delay	--	--	*12.0*					
Approach LOS	--	--	*B*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 and I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/29/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 WB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*64*	*258*	*0*	*0*	*193*	*67*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*71*	*286*	*0*	*0*	*214*	*74*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*174*	*0*	*48*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*193*	*0*	*53*	*0*	*0*	*0*
Percent Heavy Vehicles	*7*	*0*	*17*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*		*L*		*R*			
v (vph)	*71*		*193*		*53*			
C (m) (vph)	*1246*		*387*		*719*			
v/c	*0.06*		*0.50*		*0.07*			
95% queue length	*0.18*		*2.69*		*0.24*			
Control Delay	*8.1*		*23.2*		*10.4*			
LOS	*A*		*C*		*B*			
Approach Delay	--	--	*20.4*					
Approach LOS	--	--	*C*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/24/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*417*	*82*	*137*	*405*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*463*	*91*	*152*	*450*	*0*
Percent Heavy Vehicles	*0*	--	--	*3*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*1*	*1*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*56*	*0*	*94*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*62*	*0*	*104*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*	*L*		*R*			
v (vph)		*152*	*62*		*104*			
C (m) (vph)		*1011*	*169*		*597*			
v/c		*0.15*	*0.37*		*0.17*			
95% queue length		*0.53*	*1.56*		*0.63*			
Control Delay		*9.2*	*38.2*		*12.3*			
LOS		*A*	*E*		*B*			
Approach Delay	--	--	*22.0*					
Approach LOS	--	--	*C*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/29/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*367*	*284*	*465*	*417*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*407*	*315*	*516*	*463*	*0*
Percent Heavy Vehicles	*0*	--	--	*3*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*1*	*1*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*281*	*0*	*460*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*312*	*0*	*511*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*	*L*		*R*			
v (vph)		*516*	*312*		*511*			
C (m) (vph)		*875*	*31*		*642*			
v/c		*0.59*	*10.06*		*0.80*			
95% queue length		*3.96*	*38.19*		*7.90*			
Control Delay		*14.8*			*28.9*			
LOS		*B*	*F*		*D*			
Approach Delay	--	--						
Approach LOS	--	--	*F*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/24/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*6*	*134*	*0*	*0*	*109*	*25*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*6*	*148*	*0*	*0*	*121*	*27*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*20*	*0*	*4*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*22*	*0*	*4*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*6*						*26*	
C (m) (vph)	*1427*						*719*	
v/c	*0.00*						*0.04*	
95% queue length	*0.01*						*0.11*	
Control Delay	*7.5*						*10.2*	
LOS	*A*						*B*	
Approach Delay	--	--				*10.2*		
Approach LOS	--	--				*B*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/29/2003*	Analysis Year	*2007 - revised*
Analysis Time Period	*PM DHV*		

Project Description	*Existing System with Prop. Devel.*
East/West Street: *O'Neil*	North/South Street: *SR 73*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*15*	*109*	*0*	*0*	*134*	*86*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*16*	*121*	*0*	*0*	*148*	*95*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*83*	*0*	*14*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*92*	*0*	*15*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*16*						*107*	
C (m) (vph)	*1317*						*661*	
v/c	*0.01*						*0.16*	
95% queue length	*0.04*						*0.57*	
Control Delay	*7.8*						*11.5*	
LOS	*A*						*B*	
Approach Delay	--	--					*11.5*	
Approach LOS	--	--					*B*	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/24/2003
Analysis Time Period AM DHV
Highway SR 32
From/To SR 73 to O'Neil Road
Jurisdiction
Analysis Year 2007 - Revised
Description Existing System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 960 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 1115 pc/h
Highest directional split proportion (note-2) 558 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.6 mi/h
Average travel speed, ATS 31.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 1174 pc/h
Highest directional split proportion (note-2) 587
Base percent time-spent-following, BPTSF 64.4 %
Adj.for directional distribution and no-passing zones, fd/np 8.8
Percent time-spent-following, PTSF 73.1 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.35	
Peak 15-min vehicle-miles of travel, VMT15	800	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2880	veh-mi
Peak 15-min total travel time, TT15	25.8	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/29/2003
Analysis Time Period PM DHV
Highway SR 32
From/To SR 73 to O'Neil Road
Jurisdiction
Analysis Year 2007 - Revised
Description Existing System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1349 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 1567 pc/h
Highest directional split proportion (note-2) 784 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.0 mi/h
Average travel speed, ATS 28.1 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1499 pc/h
Highest directional split proportion (note-2) 750
Base percent time-spent-following, BPTSF 73.2 %
Adj.for directional distribution and no-passing zones, fd/np 5.6
Percent time-spent-following, PTSF 78.9 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.49	
Peak 15-min vehicle-miles of travel, VMT15	1124	veh-mi
Peak-hour vehicle-miles of travel, VMT60	4047	veh-mi
Peak 15-min total travel time, TT15	40.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/24/2003
Analysis Time Period AM DHV
Highway SR 32
From/To O'Neil Road to Morrell Springs
Jurisdiction
Analysis Year 2007 - Revised
Description Existing System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 3 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1053 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.985
Two-way flow rate,(note-1) vp 1200 pc/h
Highest directional split proportion (note-2) 600 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.4 mi/h
Average travel speed, ATS 30.5 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1170 pc/h
Highest directional split proportion (note-2) 585
Base percent time-spent-following, BPTSF 64.2 %
Adj.for directional distribution and no-passing zones, fd/np 8.8
Percent time-spent-following, PTSF 73.1 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.38	
Peak 15-min vehicle-miles of travel, VMT15	878	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3159	veh-mi
Peak 15-min total travel time, TT15	28.8	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/29/2003
Analysis Time Period PM DHV
Highway SR 32
From/To O'Neil Road to Morrell Springs
Jurisdiction
Analysis Year 2007 - Revised
Description Existing System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 3 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1709 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.985
Two-way flow rate,(note-1) vp 1947 pc/h
Highest directional split proportion (note-2) 974 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 0.8 mi/h
Average travel speed, ATS 25.3 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1899 pc/h
Highest directional split proportion (note-2) 950
Base percent time-spent-following, BPTSF 81.2 %
Adj.for directional distribution and no-passing zones, fd/np 3.8
Percent time-spent-following, PTSF 84.9 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.61	
Peak 15-min vehicle-miles of travel, VMT15	1424	veh-mi
Peak-hour vehicle-miles of travel, VMT60	5127	veh-mi
Peak 15-min total travel time, TT15	56.3	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	GGB
Agency/Co.	PBSJ
Date Performed	4/24/2003
Analysis Time Period	AM DHV
Highway	SR 73
From/To	SR 32 to 40
Jurisdiction	
Analysis Year	2007 - Revised
Description	Existing System with Prop. Devel.

Input Data

Highway class	Class 2				
Shoulder width	4.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	7	%
Segment length	2.4	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V	385	veh/h
Directional split	60 / 40	%

Average Travel Speed

Grade adjustment factor, fG	0.93
PCE for trucks, ET	1.9
PCE for RVs, ER	1.1
Heavy-vehicle adjustment factor,	0.941
Two-way flow rate,(note-1) vp	489 pc/h
Highest directional split proportion (note-2)	293 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h

Estimated Free-Flow Speed:

Base free-flow speed, BFFS	45.0 mi/h
Adj. for lane and shoulder width, fLS	1.3 mi/h
Adj. for access points, fA	2.5 mi/h
Free-flow speed, FFS	41.2 mi/h
Adjustment for no-passing zones, fnp	2.9 mi/h
Average travel speed, ATS	34.5 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.77
PCE for trucks, ET	1.8
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.947
Two-way flow rate,(note-1) vp	587 pc/h
Highest directional split proportion (note-2)	352
Base percent time-spent-following, BPTSF	40.3 %
Adj.for directional distribution and no-passing zones, fd/np	17.1
Percent time-spent-following, PTSF	57.4 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.15	
Peak 15-min vehicle-miles of travel, VMT15	257	veh-mi
Peak-hour vehicle-miles of travel, VMT60	924	veh-mi
Peak 15-min total travel time, TT15	7.5	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	GGB
Agency/Co.	PBSJ
Date Performed	4/29/2003
Analysis Time Period	PM DHV
Highway	SR 73
From/To	SR 32 to 40
Jurisdiction	
Analysis Year	2007 - Revised
Description	Existing System with Prop. Devel.

Input Data

Highway class	Class 2				
Shoulder width	4.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	7	%
Segment length	2.4	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 801 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG	0.93
PCE for trucks, ET	1.9
PCE for RVs, ER	1.1
Heavy-vehicle adjustment factor,	0.941
Two-way flow rate,(note-1) vp	1017 pc/h
Highest directional split proportion (note-2)	509 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h

Estimated Free-Flow Speed:

Base free-flow speed, BFFS	45.0 mi/h
Adj. for lane and shoulder width, fLS	1.3 mi/h
Adj. for access points, fA	2.5 mi/h
Free-flow speed, FFS	41.2 mi/h
Adjustment for no-passing zones, fnp	1.8 mi/h
Average travel speed, ATS	31.5 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94
PCE for trucks, ET	1.5
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.966
Two-way flow rate,(note-1) vp	980 pc/h
Highest directional split proportion (note-2)	490
Base percent time-spent-following, BPTSF	57.7 %
Adj.for directional distribution and no-passing zones, fd/np	11.1
Percent time-spent-following, PTSF	68.8 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.32	
Peak 15-min vehicle-miles of travel, VMT15	534	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1922	veh-mi
Peak 15-min total travel time, TT15	16.9	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/24/2003
Analysis Time Period AM DHV
Highway SR 73
From/To 40 to O'Neil Road
Jurisdiction
Analysis Year 2007 - Revised
Description Existing System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 17 %
Segment length 4.5 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 299 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
PCE for trucks, ET 2.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.797
Two-way flow rate,(note-1) vp 587 pc/h
Highest directional split proportion (note-2) 352 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 2.7 mi/h
Average travel speed, ATS 33.9 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.77
PCE for trucks, ET 1.8
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.880
Two-way flow rate,(note-1) vp 490 pc/h
Highest directional split proportion (note-2) 294
Base percent time-spent-following, BPTSF 35.0 %
Adj.for directional distribution and no-passing zones, fd/np 17.8
Percent time-spent-following, PTSF 52.8 %

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.18	
Peak 15-min vehicle-miles of travel, VMT15	374	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1346	veh-mi
Peak 15-min total travel time, TT15	11.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/29/2003
Analysis Time Period PM DHV
Highway SR 73
From/To 40 to O'Neil Road
Jurisdiction
Analysis Year 2007 - Revised
Description Existing System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 17 %
Segment length 4.5 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 566 veh/h
Directional split 55 / 45 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.867
Two-way flow rate,(note-1) vp 780 pc/h
Highest directional split proportion (note-2) 429 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 2.2 mi/h
Average travel speed, ATS 32.9 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.922
Two-way flow rate,(note-1) vp 726 pc/h
Highest directional split proportion (note-2) 399
Base percent time-spent-following, BPTSF 47.2 %
Adj.for directional distribution and no-passing zones, fd/np 14.2
Percent time-spent-following, PTSF 61.4 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.24	
Peak 15-min vehicle-miles of travel, VMT15	708	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2547	veh-mi
Peak 15-min total travel time, TT15	21.5	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/24/2003
Analysis Time Period AM DHV
Highway O'Neil Road
From/To West of I-40
Jurisdiction
Analysis Year 2007 - Revised
Description Existing System w Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 135 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
PCE for trucks, ET 2.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.905
Two-way flow rate,(note-1) vp 233 pc/h
Highest directional split proportion (note-2) 140 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 0.0 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 42.5 mi/h

Adjustment for no-passing zones, fnp 2.1 mi/h
Average travel speed, ATS 38.6 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.77
PCE for trucks, ET 1.8
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.947
Two-way flow rate,(note-1) vp 206 pc/h
Highest directional split proportion (note-2) 124
Base percent time-spent-following, BPTSF 16.6 %
Adj.for directional distribution and no-passing zones, fd/np 17.2
Percent time-spent-following, PTSF 33.8 %

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.07	
Peak 15-min vehicle-miles of travel, VMT15	113	veh-mi
Peak-hour vehicle-miles of travel, VMT60	405	veh-mi
Peak 15-min total travel time, TT15	2.9	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	GGB
Agency/Co.	PBSJ
Date Performed	4/29/2003
Analysis Time Period	PM DHV
Highway	O'Neil Road
From/To	I-40 to SR 32
Jurisdiction	
Analysis Year	2007 - Revised
Description	Existing System w Prop. Devel.

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	7	%
Segment length	3.0	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V	435	veh/h
Directional split	60 / 40	%

Average Travel Speed

Grade adjustment factor, fG	0.93	
PCE for trucks, ET	1.9	
PCE for RVs, ER	1.1	
Heavy-vehicle adjustment factor,	0.941	
Two-way flow rate,(note-1) vp	552	pc/h
Highest directional split proportion (note-2)	331	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	2.8	mi/h
Average travel speed, ATS	35.4	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94
PCE for trucks, ET	1.5
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.966
Two-way flow rate,(note-1) vp	532 pc/h
Highest directional split proportion (note-2)	319
Base percent time-spent-following, BPTSF	37.4 %
Adj.for directional distribution and no-passing zones, fd/np	17.5
Percent time-spent-following, PTSF	54.9 %

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.17	
Peak 15-min vehicle-miles of travel, VMT15	363	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1305	veh-mi
Peak 15-min total travel time, TT15	10.2	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/24/2003
Analysis Time Period AM DHV
Highway O'Neil Road
From/To I-40 to SR 73
Jurisdiction
Analysis Year 2007 - Revised
Description Existing System w Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 135 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
PCE for trucks, ET 2.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.905
Two-way flow rate,(note-1) vp 233 pc/h
Highest directional split proportion (note-2) 140 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 0.0 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 42.5 mi/h

Adjustment for no-passing zones, fnp 2.1 mi/h
Average travel speed, ATS 38.6 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.77
PCE for trucks, ET 1.8
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.947
Two-way flow rate,(note-1) vp 206 pc/h
Highest directional split proportion (note-2) 124
Base percent time-spent-following, BPTSF 16.6 %
Adj.for directional distribution and no-passing zones, fd/np 17.2
Percent time-spent-following, PTSF 33.8 %

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.07	
Peak 15-min vehicle-miles of travel, VMT15	113	veh-mi
Peak-hour vehicle-miles of travel, VMT60	405	veh-mi
Peak 15-min total travel time, TT15	2.9	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/29/2003
Analysis Time Period PM DHV
Highway O'Neil Road
From/To I-40 to SR 73
Jurisdiction
Analysis Year 2007 - revised
Description Existing System w Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 435 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.941
Two-way flow rate,(note-1) vp 552 pc/h
Highest directional split proportion (note-2) 331 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 0.0 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 42.5 mi/h

Adjustment for no-passing zones, fnp 2.8 mi/h
Average travel speed, ATS 35.4 mi/h

Percent Time-Spent-Following

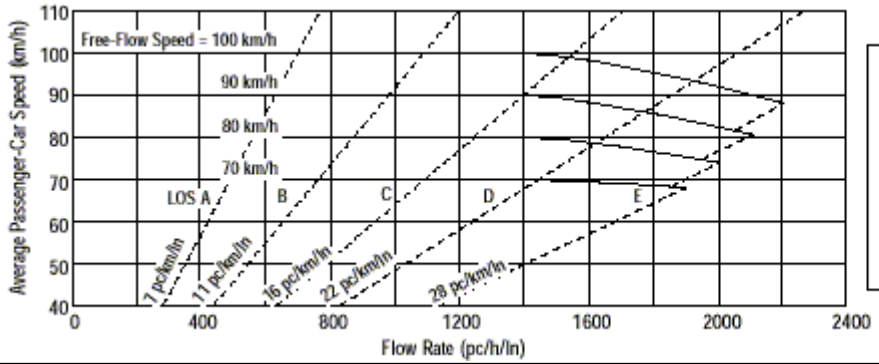
Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 532 pc/h
Highest directional split proportion (note-2) 319
Base percent time-spent-following, BPTSF 37.4 %
Adj.for directional distribution and no-passing zones, fd/np 17.5
Percent time-spent-following, PTSF 54.9 %

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.17	
Peak 15-min vehicle-miles of travel, VMT15	363	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1305	veh-mi
Peak 15-min total travel time, TT15	10.2	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	4/24/2003
Analysis Time Period	AM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2007 - revised

Project Description Exist. System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1020	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

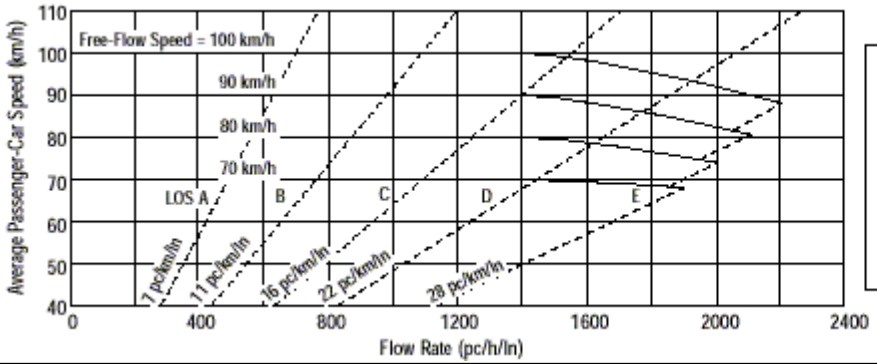
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	593	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	12.5	Max Service Flow Rate (pc/h/ln)	
LOS	B	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	4/24/2003
Analysis Time Period	AM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2007 - revised

Project Description Exist. System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1020	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

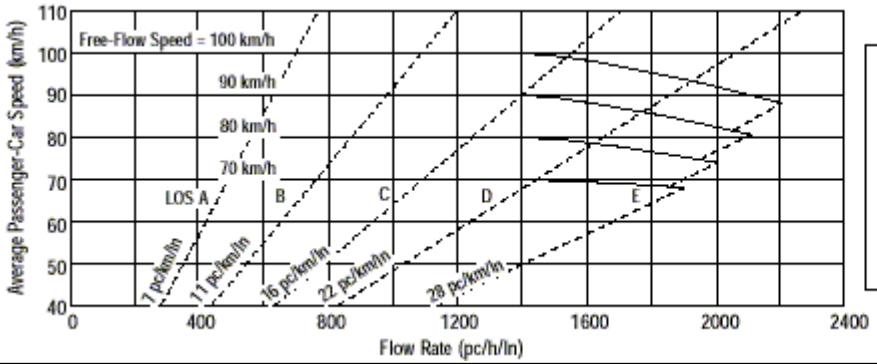
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	592	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	12.5	Max Service Flow Rate (pc/h/ln)	
LOS	B	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	4/29/2009
Analysis Time Period	PM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Exist. System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	2251	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

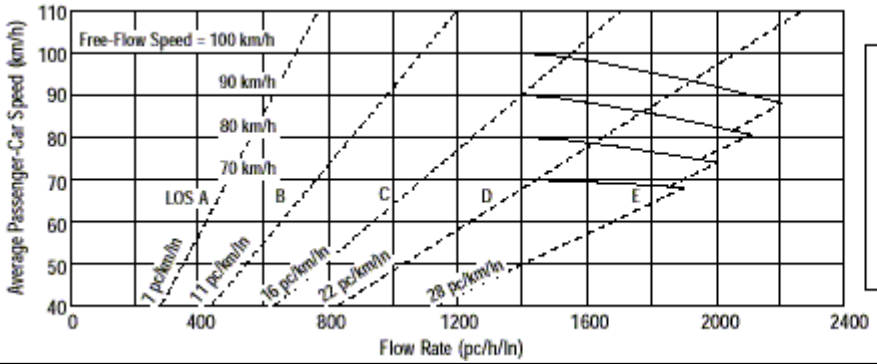
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	1265	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	26.6	Max Service Flow Rate (pc/h/ln)	
LOS	D	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	4/29/2009
Analysis Time Period	PM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Exist. System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	2251	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	1306	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	27.5	Max Service Flow Rate (pc/h/ln)	
LOS	D	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

2027 Existing System with Proposed Development

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2284	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	731	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	285	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2284	731	285	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	634	203	79	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2652	849	331	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2652 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2652	4800	No
v_{12}	2652	4400	No
$v_{FO} = v_F - v_R$	1803	4800	No
v_R	849	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 24.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.374	
Space mean speed in ramp influence area,	S_R = 60	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 59.5	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	3803	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1884	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	509	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3803	1884	509	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1056	523	141	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4416	2188	591	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4416 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4416	4800	No
v_{12}	4416	4400	Yes
$v_{FO} = v_F - v_R$	2228	4800	Yes
v_R	2188	2100	Yes

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 40.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.495	
Space mean speed in ramp influence area,	S_R = 56	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 56.1	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1553	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	285	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	731	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1553	285	731	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	431	79	203	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1803	331	849	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1803 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2134	4800	No
v_{R12}	2134	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 19.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.322

Space mean speed in ramp influence area, S_R = 61.0 mph

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

Space mean speed for all vehicles, S = 61.0 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1919	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	509	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1884	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1919	509	1884	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	533	141	523	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2228	591	2188	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2228 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2819	4800	No
v_{R12}	2819	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 25.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.355

Space mean speed in ramp influence area, S_R = 60.1 mph

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

Space mean speed for all vehicles, S = 60.1 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1679	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	412	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	827	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1679	412	827	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	466	114	230	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1977	485	974	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1977 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1977	4800	No
v_{12}	1977	4400	No
$v_{FO} = v_F - v_R$	1492	4800	No
v_R	485	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 18.1 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.342

Space mean speed in ramp influence area, S_R = 60 mph

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

Space mean speed for all vehicles, S = 60.4 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2899	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	558	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1899	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2899	558	1899	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	805	155	528	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3414	657	2237	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3414 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3414	4800	No
v_{12}	3414	4400	No
$v_{FO} = v_F - v_R$	2757	4800	No
v_R	657	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 30.5 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.357	
Space mean speed in ramp influence area,	S_R = 60	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.0	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1267	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	827	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	412	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1267	827	412	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	352	230	114	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1492	974	485	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1492 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2466	4800	No
v_{R12}	2466	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 22.1 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.335

Space mean speed in ramp influence area, S_R = 60.6 mph

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

Space mean speed for all vehicles, S = 60.6 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2341	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	1899	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	558	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2341	1899	558	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	650	528	155	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2757	2237	657	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2757 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4994	4800	Yes
v_{R12}	4994	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 41.2 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.865

Space mean speed in ramp influence area, S_R = 45.8 mph

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

Space mean speed for all vehicles, S = 45.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1838	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	127	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	217	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1838		127		217		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	511		35		60		v
Trucks and buses	17		17		17		%
Recreational vehicles	0		0		0		%
Terrain type:	Rolling		Rolling		Rolling		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2563	177	303	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2563 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2563	4800	No
v_{12}	2563	4400	No
$v_{FO} = v_F - v_R$	2386	4800	No
v_R	177	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 24.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.314	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.2	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2428	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	301	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	579	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2428	301	579	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	674	84	161	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3386	420	807	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3386 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3386	4800	No
v_{12}	3386	4400	No
$v_{FO} = v_F - v_R$	2966	4800	No
v_R	420	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 31.1 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.336	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.6	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1711	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	217	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	127	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1711	217	127	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	475	60	35	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2386	303	177	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2386 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2689	4800	No
v_{R12}	2689	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 24.4 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.351

Space mean speed in ramp influence area, S_R = 60.2 mph

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

Space mean speed for all vehicles, S = 60.2 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2127	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	579	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	301	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2127	579	301	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	591	161	84	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2966	807	420	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2966 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3773	4800	No
v_{R12}	3773	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 32.7 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.464

Space mean speed in ramp influence area, S_R = 57.0 mph

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

Space mean speed for all vehicles, S = 57.0 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1613	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	233	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	299	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1613	233	299	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	448	65	83	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2249	325	417	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2249 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2249	4800	No
v_{12}	2249	4400	No
$v_{FO} = v_F - v_R$	1924	4800	No
v_R	325	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 21.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.327

Space mean speed in ramp influence area, S_R = 61 mph

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

Space mean speed for all vehicles, S = 60.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	3277	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	587	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	209	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3277	587	209	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	910	163	58	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4570	819	291	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4570 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4570	4800	No
v_{12}	4570	4400	Yes
$v_{FO} = v_F - v_R$	3751	4800	No
v_R	819	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 41.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.372	
Space mean speed in ramp influence area,	S_R = 60	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 59.6	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1380	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	299	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	233	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1380	299	233	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	383	83	65	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1924	417	325	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1924 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2341	4800	No
v_{R12}	2341	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 21.7 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.335

Space mean speed in ramp influence area, S_R = 60.6 mph

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

Space mean speed for all vehicles, S = 60.6 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/24/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Existing System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2690	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	209	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	587	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2690	209	587	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	747	58	163	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3751	291	819	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3751 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4042	4800	No
v_{R12}	4042	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 35.0- pc/mi/ln

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

Speed Estimation

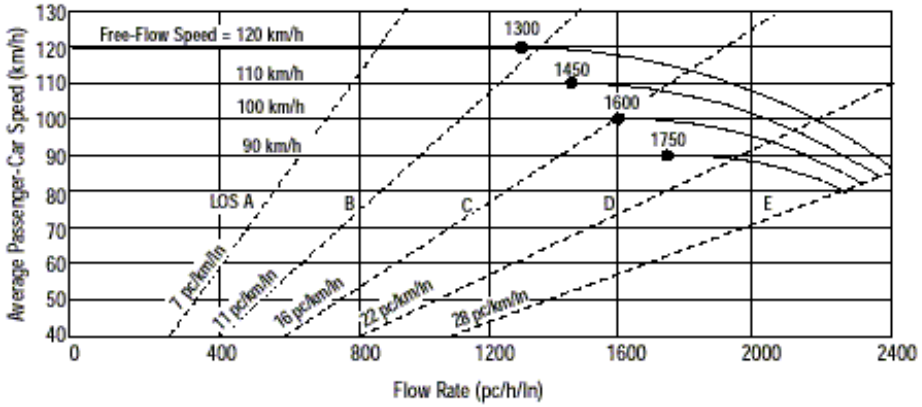
Intermediate speed variable, M_S = 0.516

Space mean speed in ramp influence area, S_R = 55.6 mph

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

Space mean speed for all vehicles, S = 55.6 mph

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/24/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	SR 32 to SR 73
Jurisdiction	
Analysis Year	2027

Project Description Existing System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1838 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1496	pc/h/ln
S	69.8	mi/h
D = v_p / S	21.4	pc/mi/ln
LOS	C	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

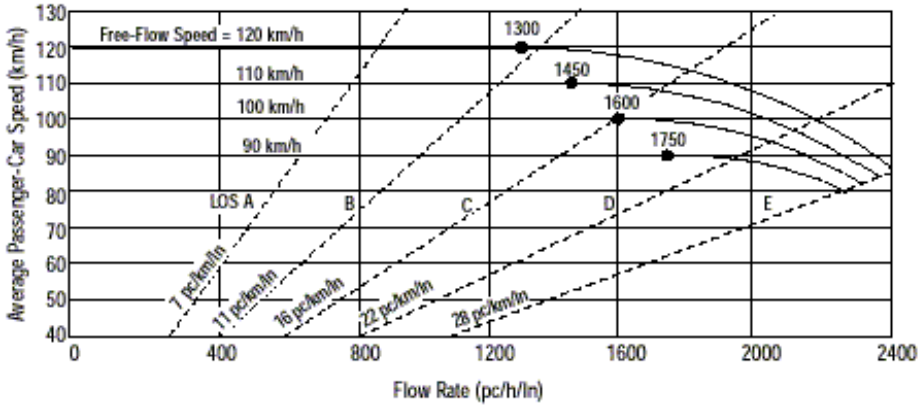
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/24/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	SR 32 to SR 73
Jurisdiction	
Analysis Year	2027

Project Description Existing System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	2428 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1976	pc/h/ln
S	65.3	mi/h
D = v_p / S	30.3	pc/mi/ln
LOS	D	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

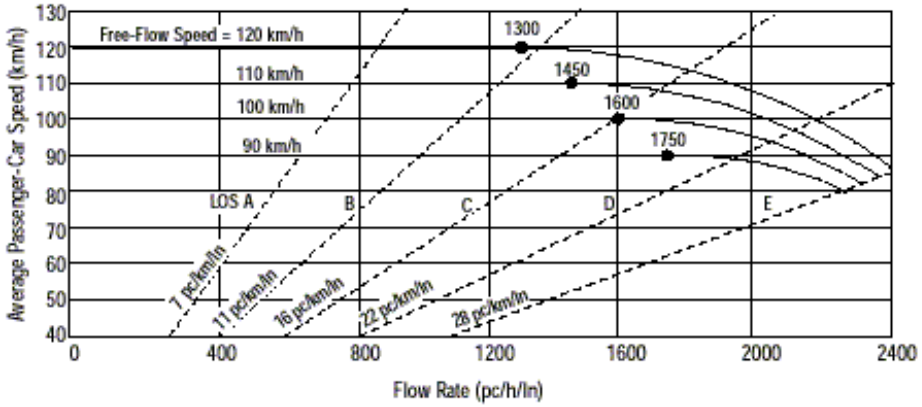
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/24/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	SR 73 to SR 32
Jurisdiction	
Analysis Year	2027

Project Description Existing System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1679 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1367	pc/h/ln
S	70.0	mi/h
D = v_p / S	19.5	pc/mi/ln
LOS	C	

Design (N)

Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

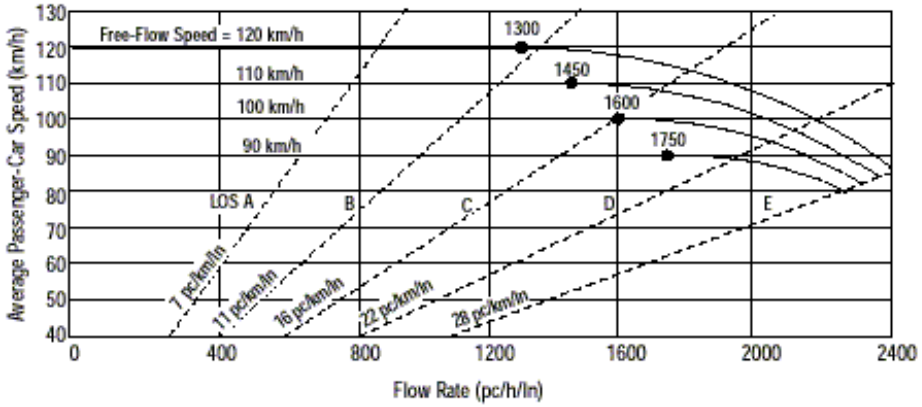
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/24/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	SR 73 to SR 32
Jurisdiction	
Analysis Year	2027

Project Description Existing System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	2899 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.25	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	2359	pc/h/ln
S	54.9	mi/h
D = v_p / S	43.0	pc/mi/ln
LOS	E	

Design (N)

Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*1772*	*84*	*201*	*1372*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*1968*	*93*	*223*	*1524*	*0*
Percent Heavy Vehicles	*0*	--	--	*4*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*207*	*0*	*524*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*230*	*0*	*582*
Percent Heavy Vehicles	*0*	*0*	*0*	*4*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*223*				*230*		*582*
C (m) (vph)		*284*				*16*		*345*
v/c		*0.79*				*14.38*		*1.69*
95% queue length		*6.10*				*29.66*		*35.73*
Control Delay		*51.9*						*348.4*
LOS		*F*				*F*		*F*
Approach Delay	--	--						
Approach LOS	--	--				*F*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*4237*	*166*	*343*	*2845*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*4707*	*184*	*381*	*3161*	*0*
Percent Heavy Vehicles	*0*	--	--	*4*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*279*	*0*	*1605*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*310*	*0*	*1783*
Percent Heavy Vehicles	*0*	*0*	*0*	*4*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*381*				*310*		*1783*
C (m) (vph)		*21*				*0*		*97*
v/c		*18.14*						*18.38*
95% queue length		*47.98*						*213.88*
Control Delay								
LOS		*F*				*F*		*F*
Approach Delay	--	--						
Approach LOS	--	--						

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description	*Existing System with Prop. Devel.*
East/West Street: *I-40 WB Ramps*	North/South Street: *SR 32*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*500*	*1479*	*0*	*0*	*1492*	*327*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*555*	*1643*	*0*	*0*	*1657*	*363*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*81*	*0*	*331*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*90*	*0*	*367*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*555*		*90*		*367*			
C (m) (vph)	*381*		*0*		*313*			
v/c	*1.46*				*1.17*			
95% queue length	*28.94*				*15.58*			
Control Delay	*246.6*				*142.4*			
LOS	*F*		*F*		*F*			
Approach Delay	--	--						
Approach LOS	--	--						

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*1534*	*2982*	*0*	*0*	*3041*	*365*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*1704*	*3313*	*0*	*0*	*3378*	*405*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*147*	*0*	*411*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*163*	*0*	*456*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*1704*		*163*		*456*			
C (m) (vph)	*78*		*0*		*85*			
v/c	*21.85*				*5.36*			
95% queue length	*206.35*				*49.81*			
Control Delay								
LOS	*F*		*F*		*F*			
Approach Delay	--	--						
Approach LOS	--	--						

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & SR 73*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *SR 32* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*682*	*141*	*0*	*0*	*95*	*236*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*757*	*156*	*0*	*0*	*105*	*262*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*263*	*0*	*570*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*292*	*0*	*633*
Percent Heavy Vehicles	*0*	*0*	*0*	*7*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (vph)	*757*					*292*		*633*
C (m) (vph)	*1456*					*42*		*936*
v/c	*0.52*					*6.95*		*0.68*
95% queue length	*3.14*					*34.43*		*5.48*
Control Delay	*10.1*							*16.5*
LOS	*B*					*F*		*C*
Approach Delay	--	--				*916.0*		
Approach LOS	--	--				*F*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & SR 73*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *SR 32* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*914*	*195*	*0*	*0*	*263*	*610*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*1015*	*216*	*0*	*0*	*292*	*677*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*648*	*0*	*986*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*720*	*0*	*1095*
Percent Heavy Vehicles	*0*	*0*	*0*	*7*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (vph)	*1015*					*720*		*1095*
C (m) (vph)	*1242*					*5*		*736*
v/c	*0.82*					*144.00*		*1.49*
95% queue length	*9.94*					*92.30*		*52.67*
Control Delay	*19.3*							*243.4*
LOS	*C*					*F*		*F*
Approach Delay	--	--						
Approach LOS	--	--				*F*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 EB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*234*	*170*	*47*	*281*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*260*	*188*	*52*	*312*	*0*
Percent Heavy Vehicles	*0*	--	--	*17*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*77*	*0*	*50*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*85*	*0*	*55*
Percent Heavy Vehicles	*0*	*0*	*0*	*17*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*				*L*		*R*
v (vph)		*52*				*85*		*55*
C (m) (vph)		*1037*				*331*		*717*
v/c		*0.05*				*0.26*		*0.08*
95% queue length		*0.16*				*1.00*		*0.25*
Control Delay		*8.7*				*19.6*		*10.4*
LOS		*A*				*C*		*B*
Approach Delay	--	--				*16.0*		
Approach LOS	--	--				*C*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *I-40 EB ramps* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*368*	*475*	*104*	*719*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*408*	*527*	*115*	*798*	*0*
Percent Heavy Vehicles	*0*	--	--	*17*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*147*	*0*	*154*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*163*	*0*	*171*
Percent Heavy Vehicles	*0*	*0*	*0*	*17*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*				*L*		*R*
v (vph)		*115*				*163*		*171*
C (m) (vph)		*675*				*77*		*378*
v/c		*0.17*				*2.12*		*0.45*
95% queue length		*0.61*				*14.86*		*2.28*
Control Delay		*11.4*				*631.2*		*22.2*
LOS		*B*				*F*		*C*
Approach Delay	--	--				*319.4*		
Approach LOS	--	--				*F*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 and I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 WB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*170*	*141*	*0*	*0*	*158*	*129*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*188*	*156*	*0*	*0*	*175*	*143*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*170*	*0*	*63*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*188*	*0*	*70*	*0*	*0*	*0*
Percent Heavy Vehicles	*7*	*0*	*17*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*		*L*		*R*			
v (vph)	*188*		*188*		*70*			
C (m) (vph)	*1214*		*303*		*852*			
v/c	*0.15*		*0.62*		*0.08*			
95% queue length	*0.55*		*3.87*		*0.27*			
Control Delay	*8.5*		*34.5*		*9.6*			
LOS	*A*		*D*		*A*			
Approach Delay	--	--	*27.7*					
Approach LOS	--	--	*D*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 and I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 WB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*102*	*413*	*0*	*0*	*335*	*107*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*113*	*458*	*0*	*0*	*372*	*118*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*488*	*0*	*99*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*542*	*0*	*110*	*0*	*0*	*0*
Percent Heavy Vehicles	*7*	*0*	*17*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*		*L*		*R*			
v (vph)	*113*		*542*		*110*			
C (m) (vph)	*1048*		*201*		*573*			
v/c	*0.11*		*2.70*		*0.19*			
95% queue length	*0.36*		*46.95*		*0.70*			
Control Delay	*8.8*		*813.8*		*12.8*			
LOS	*A*		*F*		*B*			
Approach Delay	--	--	*678.7*					
Approach LOS	--	--	*F*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*626*	*292*	*481*	*608*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*695*	*324*	*534*	*675*	*0*
Percent Heavy Vehicles	*0*	--	--	*3*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*1*	*1*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*225*	*0*	*370*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*250*	*0*	*411*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*	*L*		*R*			
v (vph)		*534*	*250*		*411*			
C (m) (vph)		*677*	*7*		*440*			
v/c		*0.79*	*35.71*		*0.93*			
95% queue length		*7.80*	*33.20*		*10.73*			
Control Delay		*27.2*			*58.8*			
LOS		*D*	*F*		*F*			
Approach Delay	--	--						
Approach LOS	--	--	*F*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*552*	*972*	*1599*	*628*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*613*	*1080*	*1776*	*697*	*0*
Percent Heavy Vehicles	*0*	--	--	*3*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*1*	*1*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*1006*	*0*	*1653*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*1117*	*0*	*1836*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*	*L*		*R*			
v (vph)		*1776*	*1117*		*1836*			
C (m) (vph)		*374*	*0*		*491*			
v/c		*4.75*			*3.74*			
95% queue length		*178.97*			*172.13*			
Control Delay								
LOS		*F*	*F*		*F*			
Approach Delay	--	--						
Approach LOS	--	--						

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*17*	*215*	*0*	*0*	*174*	*90*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*18*	*238*	*0*	*0*	*193*	*100*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*68*	*0*	*12*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*75*	*0*	*13*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*18*						*88*	
C (m) (vph)	*1263*						*538*	
v/c	*0.01*						*0.16*	
95% queue length	*0.04*						*0.58*	
Control Delay	*7.9*						*13.0*	
LOS	*A*						*B*	
Approach Delay	--	--					*13.0*	
Approach LOS	--	--					*B*	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/24/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Existing System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*45*	*174*	*0*	*0*	*215*	*284*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*50*	*193*	*0*	*0*	*238*	*315*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*296*	*0*	*49*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*328*	*0*	*54*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*50*						*382*	
C (m) (vph)	*1012*						*413*	
v/c	*0.05*						*0.92*	
95% queue length	*0.16*						*10.19*	
Control Delay	*8.7*						*59.4*	
LOS	*A*						*F*	
Approach Delay	--	--				*59.4*		
Approach LOS	--	--				*F*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/24/2002
Analysis Time Period AM DHV
Highway SR 32
From/To SR 73 to O'Neil Road
Jurisdiction
Analysis Year 2027
Description Existing System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1751 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 2034 pc/h
Highest directional split proportion (note-2) 1017 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 0.8 mi/h
Average travel speed, ATS 24.7 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1946 pc/h
Highest directional split proportion (note-2) 973
Base percent time-spent-following, BPTSF 81.9 %
Adj.for directional distribution and no-passing zones, fd/np 3.6
Percent time-spent-following, PTSF 85.5 %

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.64	
Peak 15-min vehicle-miles of travel, VMT15	1459	veh-mi
Peak-hour vehicle-miles of travel, VMT60	5253	veh-mi
Peak 15-min total travel time, TT15	59.1	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/24/2002
Analysis Time Period PM DHV
Highway SR 32
From/To SR 73 to O'Neil Road
Jurisdiction
Analysis Year 2027
Description Existing System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 3158 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 3668 pc/h
Highest directional split proportion (note-2) 1834 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp mi/h
Average travel speed, ATS mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 3509 pc/h
Highest directional split proportion (note-2) 1755
Base percent time-spent-following, BPTSF 95.4 %
Adj.for directional distribution and no-passing zones, fd/np -0.9
Percent time-spent-following, PTSF 94.5 %

Level of Service and Other Performance Measures

Level of service, LOS			
Volume to capacity ratio, v/c	1.15		
Peak 15-min vehicle-miles of travel, VMT15		2632	veh-mi
Peak-hour vehicle-miles of travel, VMT60		9474	veh-mi
Peak 15-min total travel time, TT15			veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/24/2002
Analysis Time Period AM DHV
Highway SR 32
From/To O'Neil Road to Morrell Springs
Jurisdiction
Analysis Year 2027
Description Existing System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 3 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 2085 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.985
Two-way flow rate,(note-1) vp 2375 pc/h
Highest directional split proportion (note-2) 1188 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 0.7 mi/h
Average travel speed, ATS 22.1 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 2317 pc/h
Highest directional split proportion (note-2) 1159
Base percent time-spent-following, BPTSF 87.0 %
Adj.for directional distribution and no-passing zones, fd/np 2.5
Percent time-spent-following, PTSF 89.5 %

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.74	
Peak 15-min vehicle-miles of travel, VMT15	1738	veh-mi
Peak-hour vehicle-miles of travel, VMT60	6255	veh-mi
Peak 15-min total travel time, TT15	78.8	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/24/2002
Analysis Time Period PM DHV
Highway SR 32
From/To O'Neil Road to Morrell Springs
Jurisdiction
Analysis Year 2027
Description Existing System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 3 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 4432 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.985
Two-way flow rate,(note-1) vp 5049 pc/h
Highest directional split proportion (note-2) 2525 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp mi/h
Average travel speed, ATS mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 4924 pc/h
Highest directional split proportion (note-2) 2462
Base percent time-spent-following, BPTSF 98.7 %
Adj.for directional distribution and no-passing zones, fd/np -9.8
Percent time-spent-following, PTSF 88.8 %

Level of Service and Other Performance Measures

Level of service, LOS			
Volume to capacity ratio, v/c	1.58		
Peak 15-min vehicle-miles of travel, VMT15		3693	veh-mi
Peak-hour vehicle-miles of travel, VMT60		13296	veh-mi
Peak 15-min total travel time, TT15			veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	GGB
Agency/Co.	PBSJ
Date Performed	10/24/2002
Analysis Time Period	AM DHV
Highway	SR 73
From/To	SR 32 to 40
Jurisdiction	
Analysis Year	2027
Description	Existing System with Prop. Devel.

Input Data

Highway class	Class 2				
Shoulder width	4.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	7	%
Segment length	2.4	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V	735	veh/h
Directional split	60 / 40	%

Average Travel Speed

Grade adjustment factor, fG	0.93
PCE for trucks, ET	1.9
PCE for RVs, ER	1.1
Heavy-vehicle adjustment factor,	0.941
Two-way flow rate,(note-1) vp	933 pc/h
Highest directional split proportion (note-2)	560 pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	1.3	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	41.2	mi/h
Adjustment for no-passing zones, fnp	1.9	mi/h
Average travel speed, ATS	32.0	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94
PCE for trucks, ET	1.5
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.966
Two-way flow rate,(note-1) vp	899 pc/h
Highest directional split proportion (note-2)	539
Base percent time-spent-following, BPTSF	54.6 %
Adj.for directional distribution and no-passing zones, fd/np	10.8
Percent time-spent-following, PTSF	65.4 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.29	
Peak 15-min vehicle-miles of travel, VMT15	490	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1764	veh-mi
Peak 15-min total travel time, TT15	15.3	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	GGB
Agency/Co.	PBSJ
Date Performed	10/24/2002
Analysis Time Period	PM DHV
Highway	SR 73
From/To	SR 32 to 40
Jurisdiction	
Analysis Year	2027
Description	Existing System with Prop. Devel.

Input Data

Highway class	Class 2				
Shoulder width	4.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	7	%
Segment length	2.4	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V	1716	veh/h
Directional split	50 / 50	%

Average Travel Speed

Grade adjustment factor, fG	0.99
PCE for trucks, ET	1.5
PCE for RVs, ER	1.1
Heavy-vehicle adjustment factor,	0.966
Two-way flow rate,(note-1) vp	1993 pc/h
Highest directional split proportion (note-2)	997 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h

Estimated Free-Flow Speed:

Base free-flow speed, BFFS	45.0 mi/h
Adj. for lane and shoulder width, fLS	1.3 mi/h
Adj. for access points, fA	2.5 mi/h
Free-flow speed, FFS	41.2 mi/h
Adjustment for no-passing zones, fnp	0.8 mi/h
Average travel speed, ATS	25.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00
PCE for trucks, ET	1.0
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	1.000
Two-way flow rate,(note-1) vp	1907 pc/h
Highest directional split proportion (note-2)	954
Base percent time-spent-following, BPTSF	81.3 %
Adj.for directional distribution and no-passing zones, fd/np	3.7
Percent time-spent-following, PTSF	85.0 %

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.62	
Peak 15-min vehicle-miles of travel, VMT15	1144	veh-mi
Peak-hour vehicle-miles of travel, VMT60	4118	veh-mi
Peak 15-min total travel time, TT15	45.8	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	GGB
Agency/Co.	PBSJ
Date Performed	10/24/2002
Analysis Time Period	AM DHV
Highway	SR 73
From/To	40 to O'Neil Road
Jurisdiction	
Analysis Year	2027
Description	Existing System with Prop. Devel.

Input Data

Highway class	Class 2		
Shoulder width	4.0 ft	Peak-hour factor, PHF	0.90
Lane width	12.0 ft	% Trucks and buses	17 %
Segment length	4.5 mi	% Recreational vehicles	0 %
Terrain type	Rolling	% No-passing zones	50 %
Grade: Length	mi	Access points/mi	10 /mi
Up/down	%		

Two-way hourly volume, V 491 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG	0.93
PCE for trucks, ET	1.9
PCE for RVs, ER	1.1
Heavy-vehicle adjustment factor,	0.867
Two-way flow rate,(note-1) vp	676 pc/h
Highest directional split proportion (note-2)	406 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h

Estimated Free-Flow Speed:

Base free-flow speed, BFFS	45.0 mi/h
Adj. for lane and shoulder width, fLS	1.3 mi/h
Adj. for access points, fA	2.5 mi/h
Free-flow speed, FFS	41.2 mi/h
Adjustment for no-passing zones, fnp	2.5 mi/h
Average travel speed, ATS	33.5 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94
PCE for trucks, ET	1.5
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.922
Two-way flow rate,(note-1) vp	630 pc/h
Highest directional split proportion (note-2)	378
Base percent time-spent-following, BPTSF	42.5 %
Adj.for directional distribution and no-passing zones, fd/np	16.2
Percent time-spent-following, PTSF	58.8 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.21	
Peak 15-min vehicle-miles of travel, VMT15	614	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2210	veh-mi
Peak 15-min total travel time, TT15	18.3	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/24/2002
Analysis Time Period PM DHV
Highway SR 73
From/To 40 to O'Neil Road
Jurisdiction
Analysis Year 2027
Description Existing System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 17 %
Segment length 4.5 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 954 veh/h
Directional split 55 / 45 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.922
Two-way flow rate,(note-1) vp 1162 pc/h
Highest directional split proportion (note-2) 639 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.5 mi/h
Average travel speed, ATS 30.7 mi/h

Percent Time-Spent-Following

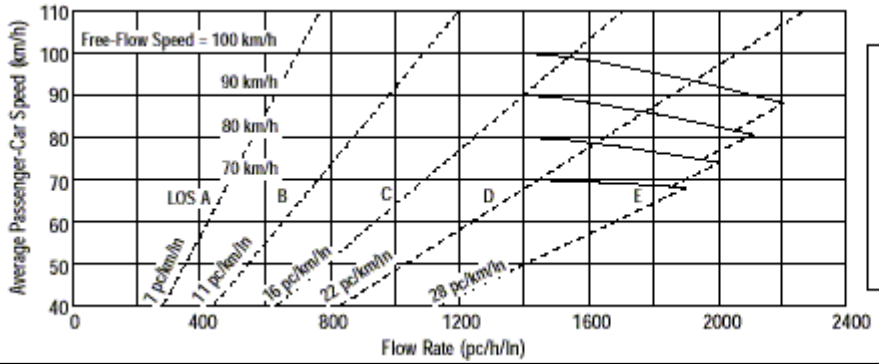
Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1060 pc/h
Highest directional split proportion (note-2) 583
Base percent time-spent-following, BPTSF 60.6 %
Adj.for directional distribution and no-passing zones, fd/np 9.7
Percent time-spent-following, PTSF 70.3 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.36	
Peak 15-min vehicle-miles of travel, VMT15	1193	veh-mi
Peak-hour vehicle-miles of travel, VMT60	4293	veh-mi
Peak 15-min total travel time, TT15	38.9	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/24/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2027

Project Description Exist. System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1896	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

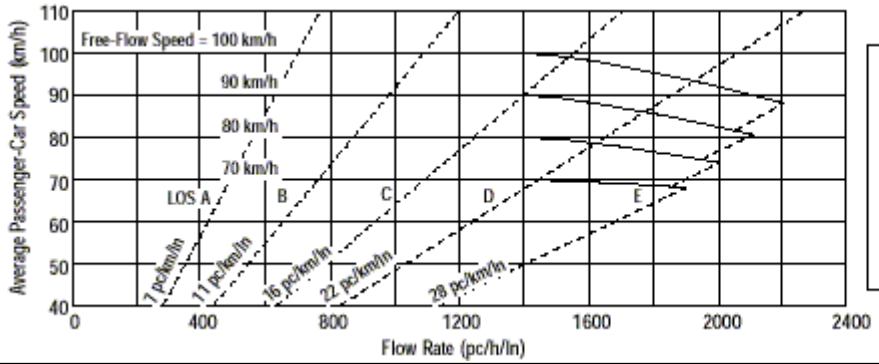
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	1077	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	22.7	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/24/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2027

Project Description Exist. System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1896	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

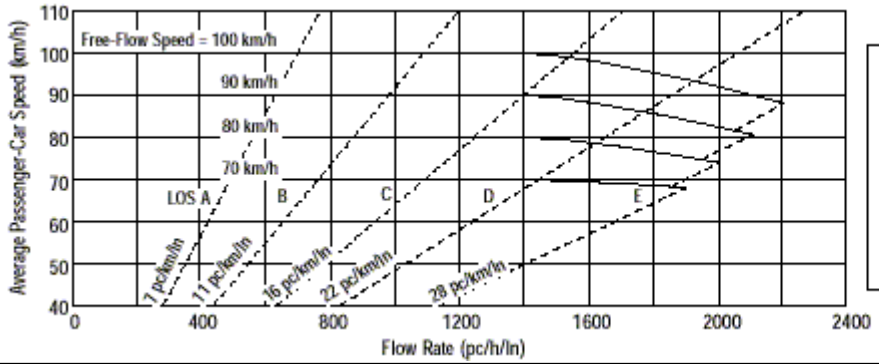
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	1100	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	23.2	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/24/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2027

Project Description Exist. System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	4450	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

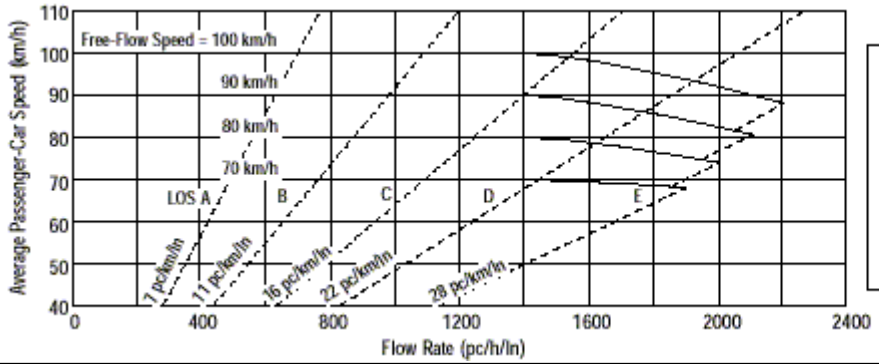
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	2556	Required Number of Lanes, N	
Speed, S (mi/h)		Flow Rate, v_p (pc/h)	
D (pc/mi/ln)		Max Service Flow Rate (pc/h/ln)	
LOS	F	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/24/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2027

Project Description Exist. System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	4450	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	2583	Required Number of Lanes, N	
Speed, S (mi/h)		Flow Rate, v_p (pc/h)	
D (pc/mi/ln)		Max Service Flow Rate (pc/h/ln)	
LOS	F	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period AM DHV
Highway O'Neil Road
From/To I-40 to SR 32
Jurisdiction
Analysis Year 2027
Description Existing System w Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 521 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.941
Two-way flow rate,(note-1) vp 662 pc/h
Highest directional split proportion (note-2) 397 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 0.0 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 42.5 mi/h

Adjustment for no-passing zones, fnp 2.5 mi/h
Average travel speed, ATS 34.8 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 637 pc/h
Highest directional split proportion (note-2) 382
Base percent time-spent-following, BPTSF 42.9 %
Adj.for directional distribution and no-passing zones, fd/np 16.1
Percent time-spent-following, PTSF 58.9 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.21	
Peak 15-min vehicle-miles of travel, VMT15	434	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1563	veh-mi
Peak 15-min total travel time, TT15	12.5	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period PM DHV
Highway O'Neil Road
From/To I-40 to SR 32
Jurisdiction
Analysis Year 2027
Description Existing System w Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1964 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 2281 pc/h
Highest directional split proportion (note-2) 1369 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 0.0 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 42.5 mi/h

Adjustment for no-passing zones, fnp 0.7 mi/h
Average travel speed, ATS 24.1 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 2182 pc/h
Highest directional split proportion (note-2) 1309
Base percent time-spent-following, BPTSF 85.3 %
Adj.for directional distribution and no-passing zones, fd/np 2.9
Percent time-spent-following, PTSF 88.2 %

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.71	
Peak 15-min vehicle-miles of travel, VMT15	1637	veh-mi
Peak-hour vehicle-miles of travel, VMT60	5892	veh-mi
Peak 15-min total travel time, TT15	68.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period AM DHV
Highway O'Neil Road
From/To I-40 to SR 73
Jurisdiction
Analysis Year 2027
Description Existing System w Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 521 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.941
Two-way flow rate,(note-1) vp 662 pc/h
Highest directional split proportion (note-2) 397 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 0.0 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 42.5 mi/h

Adjustment for no-passing zones, fnp 2.5 mi/h
Average travel speed, ATS 34.8 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 637 pc/h
Highest directional split proportion (note-2) 382
Base percent time-spent-following, BPTSF 42.9 %
Adj.for directional distribution and no-passing zones, fd/np 16.1
Percent time-spent-following, PTSF 58.9 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.21	
Peak 15-min vehicle-miles of travel, VMT15	434	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1563	veh-mi
Peak 15-min total travel time, TT15	12.5	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period PM DHV
Highway O'Neil Road
From/To I-40 to SR 73
Jurisdiction
Analysis Year 2027
Description Existing System w Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1964 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 2281 pc/h
Highest directional split proportion (note-2) 1369 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 0.0 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 42.5 mi/h

Adjustment for no-passing zones, fnp 0.7 mi/h
Average travel speed, ATS 24.1 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 2182 pc/h
Highest directional split proportion (note-2) 1309
Base percent time-spent-following, BPTSF 85.3 %
Adj.for directional distribution and no-passing zones, fd/np 2.9
Percent time-spent-following, PTSF 88.2 %

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.71	
Peak 15-min vehicle-miles of travel, VMT15	1637	veh-mi
Peak-hour vehicle-miles of travel, VMT60	5892	veh-mi
Peak 15-min total travel time, TT15	68.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

2007 Proposed System with Proposed Development

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1311	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	246	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	217	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1311		246		217		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	364		68		60		v
Trucks and buses	3		3		3		%
Recreational vehicles	0		0		0		%
Terrain type:	Rolling		Rolling		Rolling		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1522	286	252	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1522 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1522	4800	No
v_{12}	1522	4400	No
$v_{FO} = v_F - v_R$	1236	4800	No
v_R	286	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.1 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.324	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.9	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/30/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2002	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	474	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	454	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	2002		474		454		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	556		132		126		v
Trucks and buses	3		3		3		%
Recreational vehicles	0		0		0		%
Terrain type:	Rolling		Rolling		Rolling		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2325	550	527	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2325 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2325	4800	No
v_{12}	2325	4400	No
$v_{FO} = v_F - v_R$	1775	4800	No
v_R	550	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 22.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.347	
Space mean speed in ramp influence area,	S_R = 60	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.3	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1065	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	217	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	246	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1065	217	246	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	296	60	68	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1237	252	286	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1237 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1489	4800	No
v_{R12}	1489	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 14.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.307

Space mean speed in ramp influence area, S_R = 61.4 mph

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

Space mean speed for all vehicles, S = 61.4 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/30/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1528	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	454	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	474	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1528	454	474	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	424	126	132	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	1.5	
Recreational vehicle PCE, ER	2.0	2.0	1.2	

Heavy vehicle adjustment, fHV	0.957	0.957	0.985	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1774	527	535	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1774 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2301	4800	No
v_{R12}	2301	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 21.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.328

Space mean speed in ramp influence area, S_R = 60.8 mph

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

Space mean speed for all vehicles, S = 60.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1139	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	284	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	356	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1139	284	356	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	316	79	99	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1341	334	419	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1341 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1341	4800	No
v_{12}	1341	4400	No
$v_{FO} = v_F - v_R$	1007	4800	No
v_R	334	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 12.6 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.328	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.8	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/30/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2270	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	483	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	458	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2270	483	458	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	631	134	127	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2674	569	539	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2674 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2674	4800	No
v_{12}	2674	4400	No
$v_{FO} = v_F - v_R$	2105	4800	No
v_R	569	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 24.1 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.349

Space mean speed in ramp influence area, S_R = 60 mph

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

Space mean speed for all vehicles, S = 60.2 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	855	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	356	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	284	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	855	356	284	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	238	99	79	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1007	419	334	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1007 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1426	4800	No
v_{R12}	1426	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 14.2 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.306

Space mean speed in ramp influence area, S_R = 61.4 mph

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

Space mean speed for all vehicles, S = 61.4 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/30/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1787	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	458	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	483	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1787	458	483	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	496	127	134	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2105	539	569	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2105 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2644	4800	No
v_{R12}	2644	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 23.7 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.344

Space mean speed in ramp influence area, S_R = 60.4 mph

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

Space mean speed for all vehicles, S = 60.4 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1190	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	95	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	74	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1190	95	74	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	331	26	21	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1659	132	103	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1659 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1659	4800	No
v_{12}	1659	4400	No
$v_{FO} = v_F - v_R$	1527	4800	No
v_R	132	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 16.3 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.310

Space mean speed in ramp influence area, S_R = 61 mph

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

Space mean speed for all vehicles, S = 61.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/30/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1725	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	272	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	80	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1725		272		80		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	479		76		22		v
Trucks and buses	17		17		17		%
Recreational vehicles	0		0		0		%
Terrain type:	Rolling		Rolling		Rolling		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2405	379	112	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2405 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2405	4800	No
v_{12}	2405	4400	No
$v_{FO} = v_F - v_R$	2026	4800	No
v_R	379	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 22.7 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.332	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.7	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1095	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	74	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	95	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1095	74	95	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	304	21	26	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1527	103	132	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1527 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1630	4800	No
v_{R12}	1630	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 16.3 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.314

Space mean speed in ramp influence area, S_R = 61.2 mph

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

Space mean speed for all vehicles, S = 61.2 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/30/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1453	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	80	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	272	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1453	80	272	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	404	22	76	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2026	112	379	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2026 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2138	4800	No
v_{R12}	2138	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 20.2 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.327

Space mean speed in ramp influence area, S_R = 60.8 mph

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

Space mean speed for all vehicles, S = 60.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	961	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	63	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	211	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	961		63		211		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	267		18		59		v
Trucks and buses	17		17		17		%
Recreational vehicles	0		0		0		%
Terrain type:	Rolling		Rolling		Rolling		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1340	88	294	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1340 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1340	4800	No
v_{12}	1340	4400	No
$v_{FO} = v_F - v_R$	1252	4800	No
v_R	88	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 14.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.306

Space mean speed in ramp influence area, S_R = 61 mph

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

Space mean speed for all vehicles, S = 61.4 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/30/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1903	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	95	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	215	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1903	95	215	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	529	26	60	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2654	132	300	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2654 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2654	4800	No
v_{12}	2654	4400	No
$v_{FO} = v_F - v_R$	2522	4800	No
v_R	132	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 25.3 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.310	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.3	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	898	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	211	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	63	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	898	211	63	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	249	59	18	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1252	294	88	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1252 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1546	4800	No
v_{R12}	1546	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 15.5 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.312

Space mean speed in ramp influence area, S_R = 61.3 mph

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

Space mean speed for all vehicles, S = 61.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/30/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1808	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	215	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	95	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1808	215	95	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	502	60	26	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2521	300	132	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2521 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2821	4800	No
v_{R12}	2821	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 25.5 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.359

Space mean speed in ramp influence area, S_R = 59.9 mph

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

Space mean speed for all vehicles, S = 59.9 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1282	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	133	vph
Length of first accel/decel lane	450	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	41	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1282	133	41	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	356	37	11	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1489	154	48	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1489 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1489	4800	No
v_{12}	1489	4400	No
$v_{FO} = v_F - v_R$	1335	4800	No
v_R	154	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 13.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.312	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.3	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/30/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1982	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	465	vph
Length of first accel/decel lane	450	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	208	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1982	465	208	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	551	129	58	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2301	540	242	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2301 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2301	4800	No
v_{12}	2301	4400	No
$v_{FO} = v_F - v_R$	1761	4800	No
v_R	540	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 20.0- pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.347	
Space mean speed in ramp influence area,	S_R = 60	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.3	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1149	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	41	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	133	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1149	41	133	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	319	11	37	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1334	48	154	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1334 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1382	4800	No
v_{R12}	1382	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 13.1 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.292

Space mean speed in ramp influence area, S_R = 61.8 mph

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

Space mean speed for all vehicles, S = 61.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/30/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1517	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	208	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	465	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1517	208	465	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	421	58	129	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1761	242	540	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1761 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2003	4800	No
v_{R12}	2003	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 17.9 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.305

Space mean speed in ramp influence area, S_R = 61.5 mph

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

Space mean speed for all vehicles, S = 61.5 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1109	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	60	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	90	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2600	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1109		60		90		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	308		17		25		v
Trucks and buses	3		3		3		%
Recreational vehicles	0		0		0		%
Terrain type:	Rolling		Rolling		Rolling		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	2.5		2.5		2.5		
Recreational vehicle PCE, ER	2.0		2.0		2.0		

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1288	70	105	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1288 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1288	4800	No
v_{12}	1288	4400	No
$v_{FO} = v_F - v_R$	1218	4800	No
v_R	70	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 12.6 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.304	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.5	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/30/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2023	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	211	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	458	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2600	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2023	211	458	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	562	59	127	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2349	245	532	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2349 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2349	4800	No
v_{12}	2349	4400	No
$v_{FO} = v_F - v_R$	2104	4800	No
v_R	245	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 21.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.320

Space mean speed in ramp influence area, S_R = 61 mph

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

Space mean speed for all vehicles, S = 61.0 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/29/2003
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1049	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	600	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	60	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2600	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1049	90	60	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	291	25	17	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1218	105	70	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1218 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1323	4800	No
v_{R12}	1323	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 12.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.282

Space mean speed in ramp influence area, S_R = 62.1 mph

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

Space mean speed for all vehicles, S = 62.1 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	4/30/2003
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2007 - Revised
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1812	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	458	vph
Length of first accel/decel lane	600	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	211	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2600	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1812	458	211	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	503	127	59	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2104	532	245	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2104 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2636	4800	No
v_{R12}	2636	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 22.0 pc/mi/ln

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

Speed Estimation

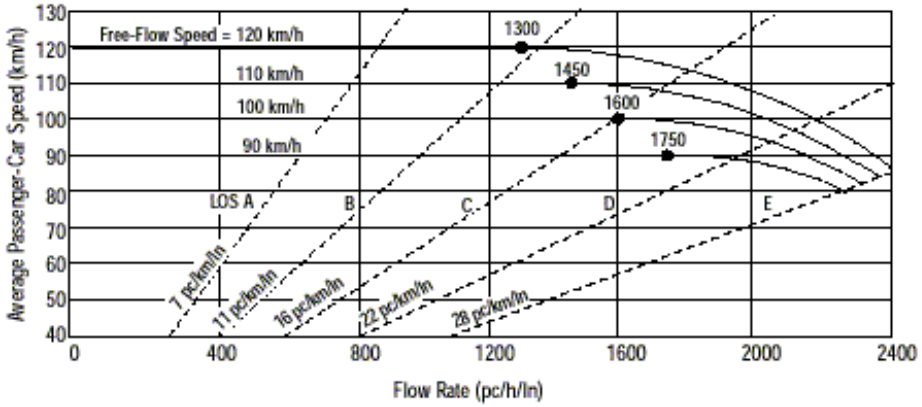
Intermediate speed variable, M_S = 0.321

Space mean speed in ramp influence area, S_R = 61.0 mph

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

Space mean speed for all vehicles, S = 61.0 mph

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	4/29/2003
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	SR 32 to O'Neil
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1282 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	6
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.697

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1022	pc/h/ln
S	70.0	mi/h
D = v_p / S	14.6	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

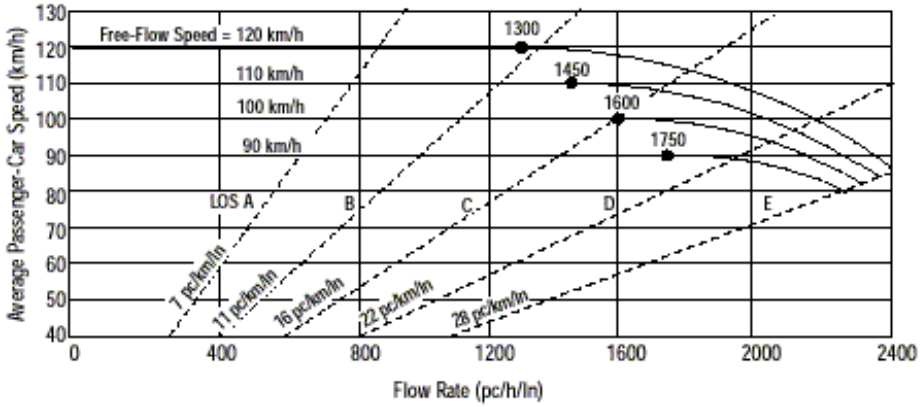
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	4/30/2003
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	SR 32 to O'Neil
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1982 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	6
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.697

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1580	pc/h/ln
S	69.5	mi/h
D = v_p / S	22.7	pc/mi/ln
LOS	C	

Design (N)

Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

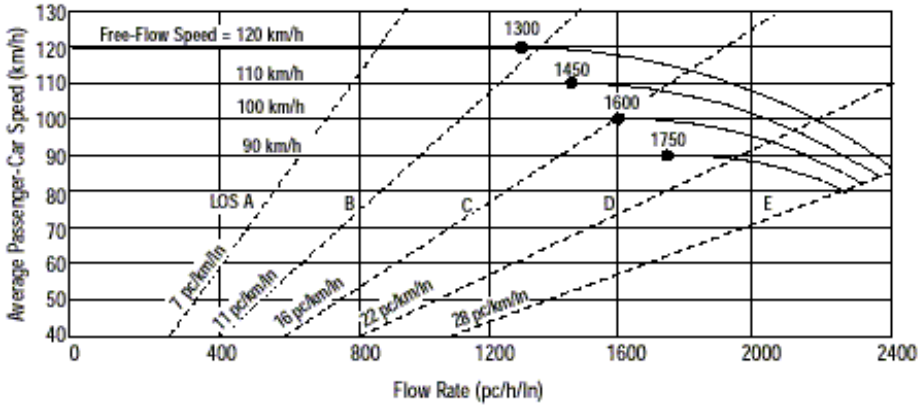
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	4/29/2003
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	SR 32 to O'Neil
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1139 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	6
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.697

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	908	pc/h/ln
S	70.0	mi/h
D = v_p / S	13.0	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

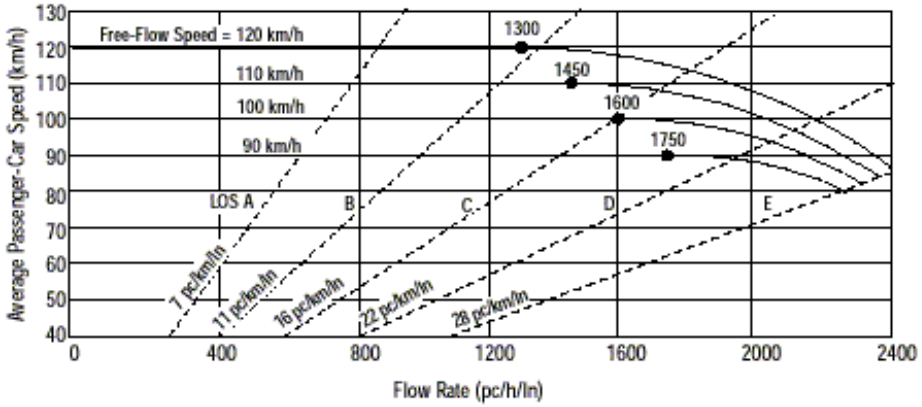
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	4/30/2003
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	SR 32 to O'Neil
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	2270 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	6
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.697

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1810	pc/h/ln
S	67.7	mi/h
D = v_p / S	26.7	pc/mi/ln
LOS	D	

Design (N)

Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

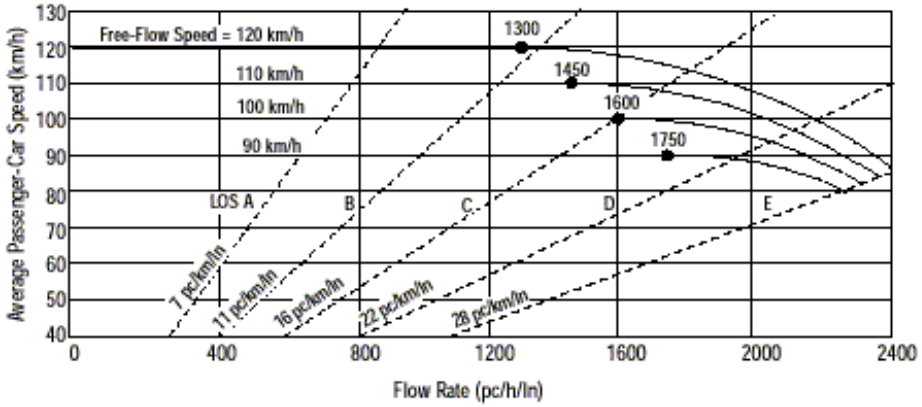
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	4/29/2003
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	O'Neil to SR 73
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1190 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	969	pc/h/ln
S	70.0	mi/h
D = v_p / S	13.8	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

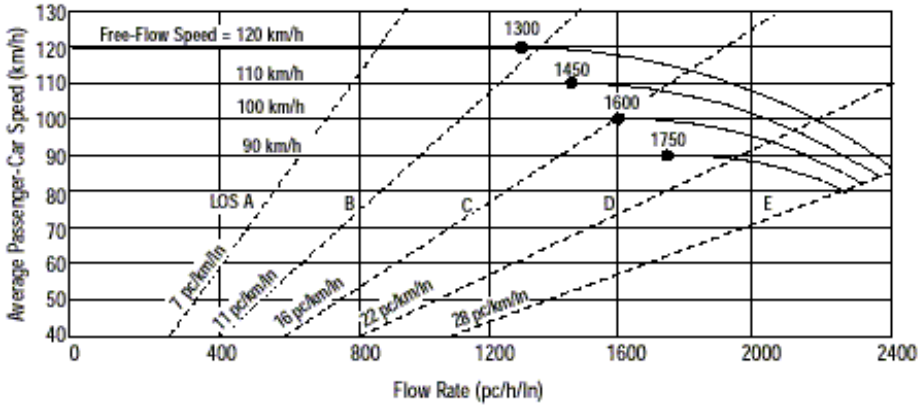
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	4/30/2003
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	O'Neil to SR 73
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1725 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1404	pc/h/ln
S	70.0	mi/h
D = v_p / S	20.1	pc/mi/ln
LOS	C	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

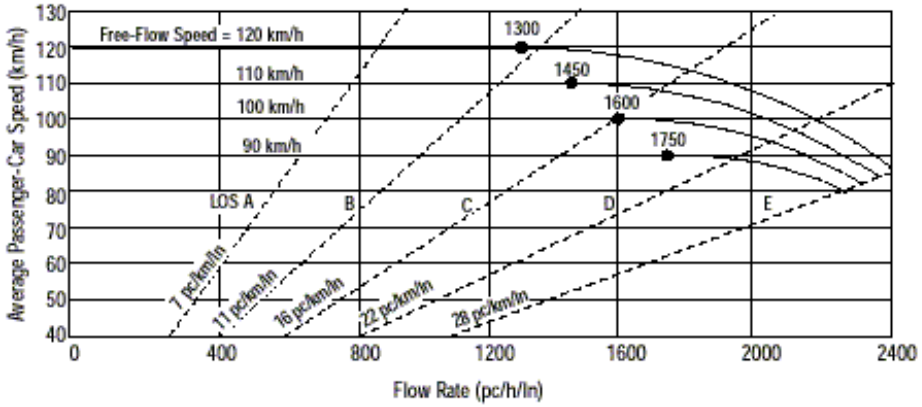
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	4/29/2003
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	O'Neil to SR 73
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1109 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	903	pc/h/ln
S	70.0	mi/h
D = v_p / S	12.9	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

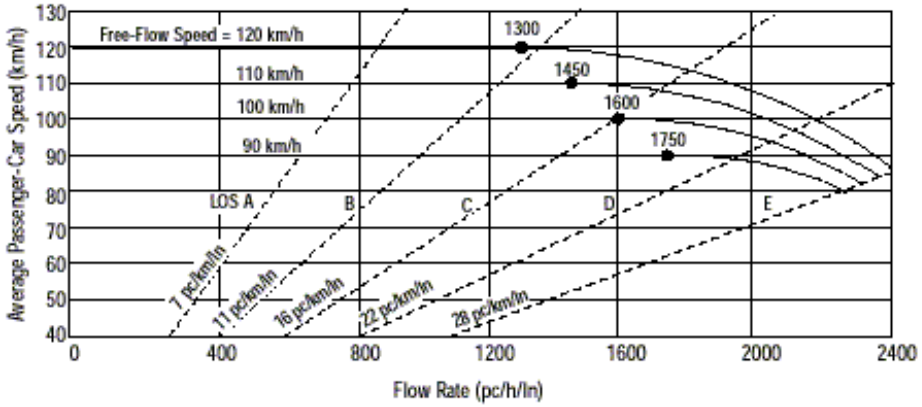
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	4/30/2003
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	O'Neil to SR 73
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	2023 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1646	pc/h/ln
S	69.2	mi/h
D = v_p / S	23.8	pc/mi/ln
LOS	C	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/29/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*880*	*52*	*165*	*770*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*977*	*57*	*183*	*855*	*0*
Percent Heavy Vehicles	*0*	--	--	*4*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*129*	*0*	*117*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*143*	*0*	*130*
Percent Heavy Vehicles	*0*	*0*	*0*	*4*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*183*				*143*		*130*
C (m) (vph)		*690*				*133*		*572*
v/c		*0.27*				*1.08*		*0.23*
95% queue length		*1.06*				*7.97*		*0.87*
Control Delay		*12.1*				*164.7*		*13.1*
LOS		*B*				*F*		*B*
Approach Delay	--	--				*92.5*		
Approach LOS	--	--				*F*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - revised*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*1617*	*104*	*350*	*1487*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*1796*	*115*	*388*	*1652*	*0*
Percent Heavy Vehicles	*0*	--	--	*4*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*175*	*0*	*299*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*194*	*0*	*332*
Percent Heavy Vehicles	*0*	*0*	*0*	*4*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*388*				*194*		*332*
C (m) (vph)		*332*				*0*		*313*
v/c		*1.17*						*1.06*
95% queue length		*16.06*						*12.41*
Control Delay		*138.3*						*105.5*
LOS		*F*				*F*		*F*
Approach Delay	--	--						
Approach LOS	--	--						

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/29/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description	*Proposed System with Prop. Devel.*
East/West Street: *I-40 WB Ramps*	North/South Street: *SR 32*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*152*	*857*	*0*	*0*	*885*	*204*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*168*	*952*	*0*	*0*	*983*	*226*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*50*	*0*	*234*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*55*	*0*	*260*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*168*		*55*		*260*			
C (m) (vph)	*692*		*128*		*530*			
v/c	*0.24*		*0.43*		*0.49*			
95% queue length	*0.95*		*1.88*		*2.68*			
Control Delay	*11.9*		*52.8*		*18.2*			
LOS	*B*		*F*		*C*			
Approach Delay	--	--	*24.2*					
Approach LOS	--	--	*C*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*230*	*1562*	*0*	*0*	*1745*	*228*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*255*	*1735*	*0*	*0*	*1938*	*253*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*92*	*0*	*391*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*102*	*0*	*434*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*255*		*102*		*434*			
C (m) (vph)	*295*		*7*		*292*			
v/c	*0.86*		*14.57*		*1.49*			
95% queue length	*7.59*		*14.51*		*24.42*			
Control Delay	*62.0*				*268.9*			
LOS	*F*		*F*		*F*			
Approach Delay	--	--						
Approach LOS	--	--	*F*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & SR 73*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/29/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *SR 32* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*369*	*112*	*0*	*0*	*75*	*74*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*410*	*124*	*0*	*0*	*83*	*82*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*109*	*0*	*313*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*121*	*0*	*347*
Percent Heavy Vehicles	*0*	*0*	*0*	*7*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (vph)	*410*					*121*		*347*
C (m) (vph)	*1483*					*184*		*963*
v/c	*0.28*					*0.66*		*0.36*
95% queue length	*1.14*					*3.86*		*1.65*
Control Delay	*8.4*					*55.8*		*10.8*
LOS	*A*					*F*		*B*
Approach Delay	--	--				*22.5*		
Approach LOS	--	--				*C*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & SR 73*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - revised*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *SR 32* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*317*	*206*	*0*	*0*	*248*	*136*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*352*	*228*	*0*	*0*	*275*	*151*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*151*	*0*	*351*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*167*	*0*	*390*
Percent Heavy Vehicles	*0*	*0*	*0*	*7*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (vph)	*352*					*167*		*390*
C (m) (vph)	*1260*					*143*		*752*
v/c	*0.28*					*1.17*		*0.52*
95% queue length	*1.15*					*9.55*		*3.03*
Control Delay	*9.0*					*189.0*		*14.8*
LOS	*A*					*F*		*B*
Approach Delay	--	--				*67.0*		
Approach LOS	--	--				*F*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 EB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*170*	*51*	*23*	*102*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*188*	*56*	*25*	*113*	*0*
Percent Heavy Vehicles	*0*	--	--	*17*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*48*	*0*	*47*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*53*	*0*	*52*
Percent Heavy Vehicles	*0*	*0*	*0*	*17*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*				*L*		*R*
v (vph)		*25*				*53*		*52*
C (m) (vph)		*1239*				*582*		*926*
v/c		*0.02*				*0.09*		*0.06*
95% queue length		*0.06*				*0.30*		*0.18*
Control Delay		*8.0*				*11.8*		*9.1*
LOS		*A*				*B*		*A*
Approach Delay	--	--				*10.5*		
Approach LOS	--	--				*B*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 EB ramps* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*314*	*43*	*37*	*204*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*348*	*47*	*41*	*226*	*0*
Percent Heavy Vehicles	*0*	--	--	*17*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*92*	*0*	*180*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*102*	*0*	*200*
Percent Heavy Vehicles	*0*	*0*	*0*	*17*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*				*L*		*R*
v (vph)		*41*				*102*		*200*
C (m) (vph)		*1087*				*379*		*801*
v/c		*0.04*				*0.27*		*0.25*
95% queue length		*0.12*				*1.07*		*0.99*
Control Delay		*8.4*				*18.0*		*11.0*
LOS		*A*				*C*		*B*
Approach Delay	--	--				*13.3*		
Approach LOS	--	--				*B*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 and I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 WB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*130*	*88*	*0*	*0*	*93*	*81*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*144*	*97*	*0*	*0*	*103*	*90*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*32*	*0*	*31*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*35*	*0*	*34*	*0*	*0*	*0*
Percent Heavy Vehicles	*7*	*0*	*17*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*		*L*		*R*			
v (vph)	*144*		*35*		*34*			
C (m) (vph)	*1351*		*446*		*920*			
v/c	*0.11*		*0.08*		*0.04*			
95% queue length	*0.36*		*0.25*		*0.12*			
Control Delay	*8.0*		*13.8*		*9.1*			
LOS	*A*		*B*		*A*			
Approach Delay	--	--	*11.4*					
Approach LOS	--	--	*B*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 and I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 WB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*148*	*258*	*0*	*0*	*181*	*67*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*164*	*286*	*0*	*0*	*201*	*74*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*60*	*0*	*35*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*66*	*0*	*38*	*0*	*0*	*0*
Percent Heavy Vehicles	*7*	*0*	*17*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*		*L*		*R*			
v (vph)	*164*		*66*		*38*			
C (m) (vph)	*1260*		*281*		*719*			
v/c	*0.13*		*0.23*		*0.05*			
95% queue length	*0.45*		*0.89*		*0.17*			
Control Delay	*8.3*		*21.7*		*10.3*			
LOS	*A*		*C*		*B*			
Approach Delay	--	--	*17.5*					
Approach LOS	--	--	*C*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*417*	*26*	*5*	*403*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*463*	*28*	*5*	*447*	*0*
Percent Heavy Vehicles	*0*	--	--	*3*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*1*	*1*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*19*	*0*	*1*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*21*	*0*	*1*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*	*L*		*R*			
v (vph)		*5*	*21*		*1*			
C (m) (vph)		*1067*	*298*		*597*			
v/c		*0.00*	*0.07*		*0.00*			
95% queue length		*0.01*	*0.23*		*0.01*			
Control Delay		*8.4*	*18.0*		*11.0*			
LOS		*A*	*C*		*B*			
Approach Delay	--	--	*17.7*					
Approach LOS	--	--	*C*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*367*	*86*	*1*	*417*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*407*	*95*	*1*	*463*	*0*
Percent Heavy Vehicles	*0*	--	--	*3*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*1*	*1*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*85*	*0*	*5*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*94*	*0*	*5*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*	*L*		*R*			
v (vph)		*1*	*94*		*5*			
C (m) (vph)		*1057*	*320*		*642*			
v/c		*0.00*	*0.29*		*0.01*			
95% queue length		*0.00*	*1.20*		*0.02*			
Control Delay		*8.4*	*20.9*		*10.7*			
LOS		*A*	*C*		*B*			
Approach Delay	--	--	*20.3*					
Approach LOS	--	--	*C*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*1*	*134*	*0*	*0*	*109*	*25*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*1*	*148*	*0*	*0*	*121*	*27*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*20*	*0*	*3*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*22*	*0*	*3*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*1*						*25*	
C (m) (vph)	*1427*						*724*	
v/c	*0.00*						*0.03*	
95% queue length	*0.00*						*0.11*	
Control Delay	*7.5*						*10.2*	
LOS	*A*						*B*	
Approach Delay	--	--				*10.2*		
Approach LOS	--	--				*B*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*PM DHV*		

Project Description	*Proposed System with Prop. Devel.*
East/West Street: *O'Neil*	North/South Street: *SR 73*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*3*	*109*	*0*	*0*	*134*	*86*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*3*	*121*	*0*	*0*	*148*	*95*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*83*	*0*	*1*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*92*	*0*	*1*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*3*						*93*	
C (m) (vph)	*1317*						*669*	
v/c	*0.00*						*0.14*	
95% queue length	*0.01*						*0.48*	
Control Delay	*7.7*						*11.2*	
LOS	*A*						*B*	
Approach Delay	--	--					*11.2*	
Approach LOS	--	--					*B*	

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*O'Neil & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*90*	*30*	*11*	*72*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*100*	*33*	*12*	*80*	*0*
Percent Heavy Vehicles	*0*	--	--	*3*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*1*	*1*	*1*	*1*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*32*	*0*	*101*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*35*	*0*	*112*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*12*				*35*		*112*
C (m) (vph)		*1486*				*759*		*977*
v/c		*0.01*				*0.05*		*0.11*
95% queue length		*0.02*				*0.14*		*0.39*
Control Delay		*7.4*				*10.0-*		*9.2*
LOS		*A*				*A*		*A*
Approach Delay	--	--				*9.4*		
Approach LOS	--	--				*A*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*O'Neil & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*466*	*173*	*35*	*257*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*517*	*192*	*38*	*285*	*0*
Percent Heavy Vehicles	*0*	--	--	*3*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*1*	*1*	*1*	*1*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*91*	*0*	*374*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*101*	*0*	*415*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*38*				*101*		*415*
C (m) (vph)		*1044*				*380*		*752*
v/c		*0.04*				*0.27*		*0.55*
95% queue length		*0.11*				*1.05*		*3.42*
Control Delay		*8.6*				*17.9*		*15.5*
LOS		*A*				*C*		*C*
Approach Delay	--	--				*16.0*		
Approach LOS	--	--				*C*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*O'Neil & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*AM DHV*		

Project Description	*Proposed System with Prop. Devel.*
East/West Street: *I-40 WB Ramps*	North/South Street: *SR 32*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*65*	*57*	*0*	*0*	*37*	*25*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*72*	*63*	*0*	*0*	*41*	*27*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*46*	*0*	*14*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*51*	*0*	*15*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*72*		*51*		*15*			
C (m) (vph)	*1562*		*691*		*999*			
v/c	*0.05*		*0.07*		*0.02*			
95% queue length	*0.14*		*0.24*		*0.05*			
Control Delay	*7.4*		*10.6*		*8.7*			
LOS	*A*		*B*		*A*			
Approach Delay	--	--	*10.2*					
Approach LOS	--	--	*B*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*O'Neil & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*4/30/2003*	Analysis Year	*2007 - Revised*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*380*	*177*	*0*	*0*	*122*	*78*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*422*	*196*	*0*	*0*	*135*	*86*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*170*	*0*	*41*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*188*	*0*	*45*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*422*		*188*		*45*			
C (m) (vph)	*1443*		*196*		*843*			
v/c	*0.29*		*0.96*		*0.05*			
95% queue length	*1.23*		*7.91*		*0.17*			
Control Delay	*8.5*		*103.7*		*9.5*			
LOS	*A*		*F*		*A*			
Approach Delay	--	--	*85.5*					
Approach LOS	--	--	*F*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/30/2003
Analysis Time Period AM DHV
Highway SR 32
From/To SR 73 to O'Neil Road
Jurisdiction
Analysis Year 2007 - Revised
Description Proposed System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 865 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.941
Two-way flow rate,(note-1) vp 1099 pc/h
Highest directional split proportion (note-2) 550 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.6 mi/h
Average travel speed, ATS 31.1 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 1058 pc/h
Highest directional split proportion (note-2) 529
Base percent time-spent-following, BPTSF 60.5 %
Adj.for directional distribution and no-passing zones, fd/np 10.1
Percent time-spent-following, PTSF 70.7 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.34	
Peak 15-min vehicle-miles of travel, VMT15	721	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2595	veh-mi
Peak 15-min total travel time, TT15	23.2	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/30/2003
Analysis Time Period PM DHV
Highway SR 32
From/To SR 73 to O'Neil Road
Jurisdiction
Analysis Year 2007 - Revised
Description Proposed System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 955 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 1109 pc/h
Highest directional split proportion (note-2) 555 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.6 mi/h
Average travel speed, ATS 31.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 1168 pc/h
Highest directional split proportion (note-2) 584
Base percent time-spent-following, BPTSF 64.2 %
Adj.for directional distribution and no-passing zones, fd/np 8.8
Percent time-spent-following, PTSF 73.0 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.35	
Peak 15-min vehicle-miles of travel, VMT15	796	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2865	veh-mi
Peak 15-min total travel time, TT15	25.7	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/30/2003
Analysis Time Period AM DHV
Highway SR 32
From/To O'Neil Road to Morrell Springs
Jurisdiction
Analysis Year 2007 - Revised
Description Proposed System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 3 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 826 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.974
Two-way flow rate,(note-1) vp 1014 pc/h
Highest directional split proportion (note-2) 507 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.8 mi/h
Average travel speed, ATS 31.6 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.985
Two-way flow rate,(note-1) vp 991 pc/h
Highest directional split proportion (note-2) 496
Base percent time-spent-following, BPTSF 58.2 %
Adj.for directional distribution and no-passing zones, fd/np 10.9
Percent time-spent-following, PTSF 69.1 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.32	
Peak 15-min vehicle-miles of travel, VMT15	688	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2478	veh-mi
Peak 15-min total travel time, TT15	21.8	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/30/2003
Analysis Time Period PM DHV
Highway SR 32
From/To O'Neil Road to Morrell Springs
Jurisdiction
Analysis Year 2007 - Revised
Description Proposed System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 3 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 790 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.974
Two-way flow rate,(note-1) vp 969 pc/h
Highest directional split proportion (note-2) 485 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.9 mi/h
Average travel speed, ATS 31.8 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.985
Two-way flow rate,(note-1) vp 948 pc/h
Highest directional split proportion (note-2) 474
Base percent time-spent-following, BPTSF 56.5 %
Adj.for directional distribution and no-passing zones, fd/np 11.4
Percent time-spent-following, PTSF 68.0 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.30	
Peak 15-min vehicle-miles of travel, VMT15	658	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2370	veh-mi
Peak 15-min total travel time, TT15	20.7	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	GGB
Agency/Co.	PBSJ
Date Performed	4/30/2003
Analysis Time Period	AM DHV
Highway	SR 73
From/To	SR 32 to 40
Jurisdiction	
Analysis Year	2007 - Revised
Description	Proposed System with Prop. Devel.

Input Data

Highway class	Class 2				
Shoulder width	4.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	7	%
Segment length	2.4	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V	370	veh/h
Directional split	60 / 40	%

Average Travel Speed

Grade adjustment factor, fG	0.93
PCE for trucks, ET	1.9
PCE for RVs, ER	1.1
Heavy-vehicle adjustment factor,	0.941
Two-way flow rate,(note-1) vp	470 pc/h
Highest directional split proportion (note-2)	282 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h

Estimated Free-Flow Speed:

Base free-flow speed, BFFS	45.0 mi/h
Adj. for lane and shoulder width, fLS	1.3 mi/h
Adj. for access points, fA	2.5 mi/h
Free-flow speed, FFS	41.2 mi/h
Adjustment for no-passing zones, fnp	3.0 mi/h
Average travel speed, ATS	34.6 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.77
PCE for trucks, ET	1.8
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.947
Two-way flow rate,(note-1) vp	564 pc/h
Highest directional split proportion (note-2)	338
Base percent time-spent-following, BPTSF	39.1 %
Adj.for directional distribution and no-passing zones, fd/np	17.3
Percent time-spent-following, PTSF	56.4 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.15	
Peak 15-min vehicle-miles of travel, VMT15	247	veh-mi
Peak-hour vehicle-miles of travel, VMT60	888	veh-mi
Peak 15-min total travel time, TT15	7.1	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/30/2003
Analysis Time Period PM DHV
Highway SR 73
From/To SR 32 to 40
Jurisdiction
Analysis Year 2007 - Revised
Description Proposed System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 2.4 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 741 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.941
Two-way flow rate,(note-1) vp 941 pc/h
Highest directional split proportion (note-2) 471 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.9 mi/h
Average travel speed, ATS 32.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 907 pc/h
Highest directional split proportion (note-2) 454
Base percent time-spent-following, BPTSF 54.9 %
Adj.for directional distribution and no-passing zones, fd/np 11.9
Percent time-spent-following, PTSF 66.9 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.29	
Peak 15-min vehicle-miles of travel, VMT15	494	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1778	veh-mi
Peak 15-min total travel time, TT15	15.4	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/30/2003
Analysis Time Period AM DHV
Highway SR 73
From/To 40 to O'Neil Road
Jurisdiction
Analysis Year 2007 - Revised
Description Prop System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 17 %
Segment length 4.5 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 293 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
PCE for trucks, ET 2.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.797
Two-way flow rate,(note-1) vp 575 pc/h
Highest directional split proportion (note-2) 345 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 2.8 mi/h
Average travel speed, ATS 34.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.77
PCE for trucks, ET 1.8
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.880
Two-way flow rate,(note-1) vp 480 pc/h
Highest directional split proportion (note-2) 288
Base percent time-spent-following, BPTSF 34.4 %
Adj.for directional distribution and no-passing zones, fd/np 17.9
Percent time-spent-following, PTSF 52.3 %

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.18	
Peak 15-min vehicle-miles of travel, VMT15	366	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1319	veh-mi
Peak 15-min total travel time, TT15	10.8	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	GGB
Agency/Co.	PBSJ
Date Performed	4/30/2003
Analysis Time Period	PM DHV
Highway	SR 73
From/To	40 to O'Neil Road
Jurisdiction	
Analysis Year	2007 - Revised
Description	Proposed System with Prop. Devel.

Input Data

Highway class	Class 2		
Shoulder width	4.0 ft	Peak-hour factor, PHF	0.90
Lane width	12.0 ft	% Trucks and buses	17 %
Segment length	4.5 mi	% Recreational vehicles	0 %
Terrain type	Rolling	% No-passing zones	50 %
Grade: Length	mi	Access points/mi	10 /mi
Up/down	%		

Two-way hourly volume, V 541 veh/h
Directional split 55 / 45 %

Average Travel Speed

Grade adjustment factor, fG	0.93
PCE for trucks, ET	1.9
PCE for RVs, ER	1.1
Heavy-vehicle adjustment factor,	0.867
Two-way flow rate,(note-1) vp	745 pc/h
Highest directional split proportion (note-2)	410 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h

Estimated Free-Flow Speed:

Base free-flow speed, BFFS	45.0 mi/h
Adj. for lane and shoulder width, fLS	1.3 mi/h
Adj. for access points, fA	2.5 mi/h
Free-flow speed, FFS	41.2 mi/h
Adjustment for no-passing zones, fnp	2.3 mi/h
Average travel speed, ATS	33.1 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94
PCE for trucks, ET	1.5
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.922
Two-way flow rate,(note-1) vp	694 pc/h
Highest directional split proportion (note-2)	382
Base percent time-spent-following, BPTSF	45.7 %
Adj.for directional distribution and no-passing zones, fd/np	15.0
Percent time-spent-following, PTSF	60.6 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.23	
Peak 15-min vehicle-miles of travel, VMT15	676	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2435	veh-mi
Peak 15-min total travel time, TT15	20.4	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	GGB
Agency/Co.	PBSJ
Date Performed	4/30/2003
Analysis Time Period	AM DHV
Highway	O'Neil Road
From/To	I-40 to SR 32
Jurisdiction	
Analysis Year	2007 - Revised
Description	Prop. System w Prop. Devel.

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	7	%
Segment length	3.0	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V	293	veh/h
Directional split	60 / 40	%

Average Travel Speed

Grade adjustment factor, fG	0.71
PCE for trucks, ET	2.5
PCE for RVs, ER	1.1
Heavy-vehicle adjustment factor,	0.905
Two-way flow rate,(note-1) vp	507 pc/h
Highest directional split proportion (note-2)	304 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h

Estimated Free-Flow Speed:

Base free-flow speed, BFFS	45.0 mi/h
Adj. for lane and shoulder width, fLS	0.0 mi/h
Adj. for access points, fA	2.5 mi/h
Free-flow speed, FFS	42.5 mi/h
Adjustment for no-passing zones, fnp	2.9 mi/h
Average travel speed, ATS	35.7 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.77
PCE for trucks, ET	1.8
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.947
Two-way flow rate,(note-1) vp	446 pc/h
Highest directional split proportion (note-2)	268
Base percent time-spent-following, BPTSF	32.4 %
Adj.for directional distribution and no-passing zones, fd/np	18.1
Percent time-spent-following, PTSF	50.6 %

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.16	
Peak 15-min vehicle-miles of travel, VMT15	244	veh-mi
Peak-hour vehicle-miles of travel, VMT60	879	veh-mi
Peak 15-min total travel time, TT15	6.8	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	GGB
Agency/Co.	PBSJ
Date Performed	4/30/2003
Analysis Time Period	PM DHV
Highway	O'Neil Road
From/To	I-40 to SR 32
Jurisdiction	
Analysis Year	2007 - Revised
Description	Prop. System w Prop. Devel.

Input Data

Highway class	Class 2		
Shoulder width	6.0 ft	Peak-hour factor, PHF	0.90
Lane width	12.0 ft	% Trucks and buses	7 %
Segment length	3.0 mi	% Recreational vehicles	0 %
Terrain type	Rolling	% No-passing zones	50 %
Grade: Length	mi	Access points/mi	10 /mi
Up/down	%		

Two-way hourly volume, V 1270 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG	0.99
PCE for trucks, ET	1.5
PCE for RVs, ER	1.1
Heavy-vehicle adjustment factor,	0.966
Two-way flow rate,(note-1) vp	1475 pc/h
Highest directional split proportion (note-2)	885 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h

Estimated Free-Flow Speed:

Base free-flow speed, BFFS	45.0 mi/h
Adj. for lane and shoulder width, fLS	0.0 mi/h
Adj. for access points, fA	2.5 mi/h
Free-flow speed, FFS	42.5 mi/h
Adjustment for no-passing zones, fnp	1.0 mi/h
Average travel speed, ATS	30.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00
PCE for trucks, ET	1.0
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	1.000
Two-way flow rate,(note-1) vp	1411 pc/h
Highest directional split proportion (note-2)	847
Base percent time-spent-following, BPTSF	71.1 %
Adj.for directional distribution and no-passing zones, fd/np	6.2
Percent time-spent-following, PTSF	77.3 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.46	
Peak 15-min vehicle-miles of travel, VMT15	1058	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3810	veh-mi
Peak 15-min total travel time, TT15	35.2	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 4/30/2003
Analysis Time Period AM DHV
Highway O'Neil Road
From/To I-40 to SR 73
Jurisdiction
Analysis Year 2007 - Revised
Description Prop. System w Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 133 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
PCE for trucks, ET 2.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.905
Two-way flow rate,(note-1) vp 230 pc/h
Highest directional split proportion (note-2) 138 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 0.0 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 42.5 mi/h

Adjustment for no-passing zones, fnp 2.1 mi/h
Average travel speed, ATS 38.6 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.77
PCE for trucks, ET 1.8
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.947
Two-way flow rate,(note-1) vp 203 pc/h
Highest directional split proportion (note-2) 122
Base percent time-spent-following, BPTSF 16.3 %
Adj.for directional distribution and no-passing zones, fd/np 17.2
Percent time-spent-following, PTSF 33.5 %

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.07	
Peak 15-min vehicle-miles of travel, VMT15	111	veh-mi
Peak-hour vehicle-miles of travel, VMT60	399	veh-mi
Peak 15-min total travel time, TT15	2.9	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	GGB
Agency/Co.	PBSJ
Date Performed	4/30/2003
Analysis Time Period	PM DHV
Highway	O'Neil Road
From/To	I-40 to SR 73
Jurisdiction	
Analysis Year	2007 - Revised
Description	Prop. System w Prop. Devel.

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	7	%
Segment length	3.0	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V	418	veh/h
Directional split	60 / 40	%

Average Travel Speed

Grade adjustment factor, fG	0.93	
PCE for trucks, ET	1.9	
PCE for RVs, ER	1.1	
Heavy-vehicle adjustment factor,	0.941	
Two-way flow rate,(note-1) vp	531	pc/h
Highest directional split proportion (note-2)	319	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	2.8	mi/h
Average travel speed, ATS	35.5	mi/h

Percent Time-Spent-Following

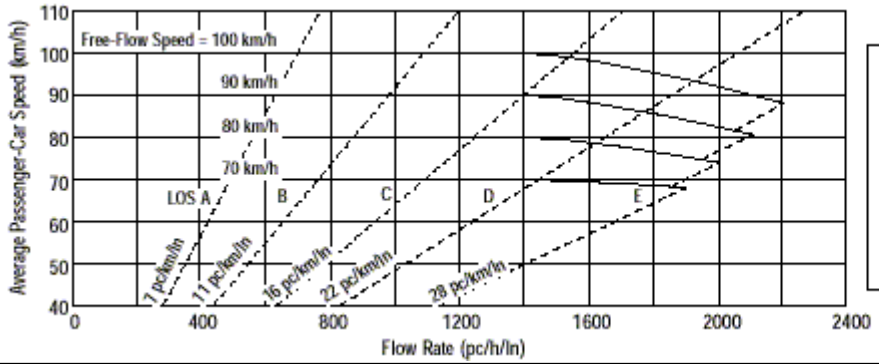
Grade adjustment factor, fG	0.94
PCE for trucks, ET	1.5
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.966
Two-way flow rate,(note-1) vp	511 pc/h
Highest directional split proportion (note-2)	307
Base percent time-spent-following, BPTSF	36.2 %
Adj.for directional distribution and no-passing zones, fd/np	17.7
Percent time-spent-following, PTSF	53.9 %

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.17	
Peak 15-min vehicle-miles of travel, VMT15	348	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1254	veh-mi
Peak 15-min total travel time, TT15	9.8	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	4/30/2003
Analysis Time Period	AM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	887	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

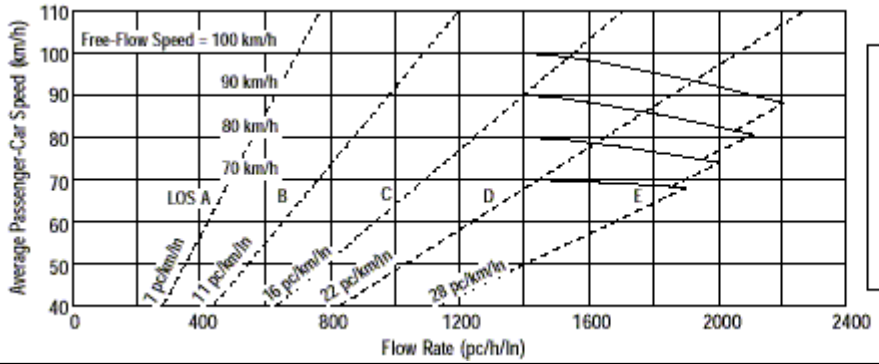
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	541	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	11.4	Max Service Flow Rate (pc/h/ln)	
LOS	B	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	4/30/2003
Analysis Time Period	AM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2007 - Revised

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	887	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

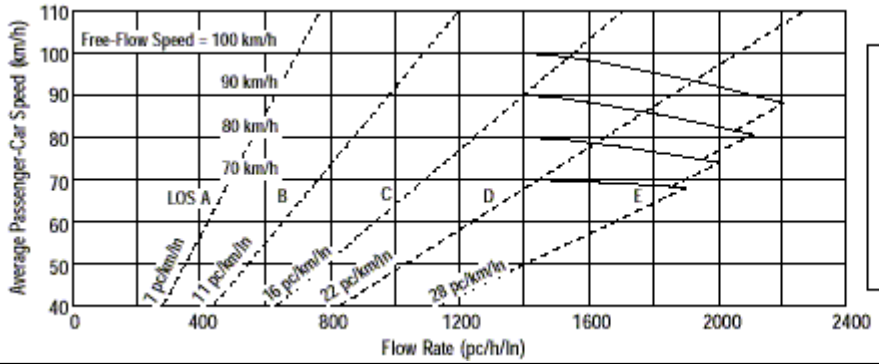
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	514	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	10.8	Max Service Flow Rate (pc/h/ln)	
LOS	A	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	4/30/2003
Analysis Time Period	PM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2007 - revised

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1786	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

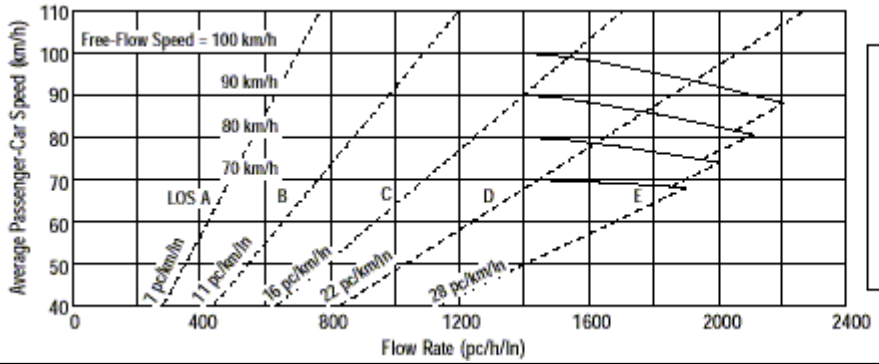
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	999	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	21.0	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	4/30/2003
Analysis Time Period	PM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2007 - revised

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1786	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	1036	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	21.8	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

2027 Proposed System with Proposed Development

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2284	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	394	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	425	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2284	394	425	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	634	109	118	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2652	457	493	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2652 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2652	4800	No
v_{12}	2652	4400	No
$v_{FO} = v_F - v_R$	2195	4800	No
v_R	457	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 24.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.339	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.5	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	3803	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	758	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	976	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3803	758	976	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1056	211	271	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4416	880	1133	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4416 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4416	4800	No
v_{12}	4416	4400	Yes
$v_{FO} = v_F - v_R$	3536	4800	No
v_R	880	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 40.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.377	
Space mean speed in ramp influence area,	S_R = 59	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 59.4	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1890	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	425	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	394	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1890	425	394	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	525	118	109	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2195	493	457	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2195 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2688	4800	No
v_{R12}	2688	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 24.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.347

Space mean speed in ramp influence area, S_R = 60.3 mph

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

Space mean speed for all vehicles, S = 60.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	3045	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	976	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	758	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2200	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3045	976	758	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	846	271	211	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3536	1133	880	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3536 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4669	4800	No
v_{R12}	4669	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 39.2 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.705

Space mean speed in ramp influence area, S_R = 50.3 mph

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

Space mean speed for all vehicles, S = 50.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2043	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	519	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	570	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2043	519	570	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	568	144	158	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2406	611	671	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2406 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2406	4800	No
v_{12}	2406	4400	No
$v_{FO} = v_F - v_R$	1795	4800	No
v_R	611	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 21.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.353

Space mean speed in ramp influence area, S_R = 60 mph

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

Space mean speed for all vehicles, S = 60.1 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	4548	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1042	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	734	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4548	1042	734	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1263	289	204	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	5357	1227	864	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 5357 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5357	4800	Yes
v_{12}	5357	4400	Yes
$v_{FO} = v_F - v_R$	4130	4800	No
v_R	1227	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 47.2 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.408	
Space mean speed in ramp influence area,	S_R = 59	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 58.6	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1524	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	570	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	519	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1524	570	519	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	423	158	144	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1795	671	611	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1795 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2466	4800	No
v_{R12}	2466	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 22.2 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.335

Space mean speed in ramp influence area, S_R = 60.6 mph

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

Space mean speed for all vehicles, S = 60.6 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 32
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	3506	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	734	vph
Length of first accel/decel lane	350	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1042	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2400	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3506	734	1042	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	974	204	289	v
Trucks and buses	4	4	4	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.943	0.943	0.943	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4129	864	1227	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 4129 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4993	4800	Yes
v_{R12}	4993	4600	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 41.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.864

Space mean speed in ramp influence area, S_R = 45.8 mph

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

Space mean speed for all vehicles, S = 45.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2003	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	193	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	118	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2003	193	118	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	556	54	33	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2793	269	165	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2793 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2793	4800	No
v_{12}	2793	4400	No
$v_{FO} = v_F - v_R$	2524	4800	No
v_R	269	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 26.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.322	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.0	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	3178	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	600	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	128	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3178	600	128	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	883	167	36	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4432	837	178	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4432 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4432	4800	No
v_{12}	4432	4400	Yes
$v_{FO} = v_F - v_R$	3595	4800	No
v_R	837	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 40.1 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.373	
Space mean speed in ramp influence area,	S_R = 60	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 59.5	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1810	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	118	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	193	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1810	118	193	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	503	33	54	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2524	165	269	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2524 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2689	4800	No
v_{R12}	2689	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 24.5 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.351

Space mean speed in ramp influence area, S_R = 60.2 mph

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

Space mean speed for all vehicles, S = 60.2 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2578	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	128	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	600	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2578	128	600	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	716	36	167	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3595	178	837	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3595 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3773	4800	No
v_{R12}	3773	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 32.9 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.464

Space mean speed in ramp influence area, S_R = 57.0 mph

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

Space mean speed for all vehicles, S = 57.0 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1613	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	102	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	384	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1613	102	384	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	448	28	107	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2249	142	535	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2249 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2249	4800	No
v_{12}	2249	4400	No
$v_{FO} = v_F - v_R$	2107	4800	No
v_R	142	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 21.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, D_S = 0.311

Space mean speed in ramp influence area, S_R = 61 mph

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

Space mean speed for all vehicles, S = 61.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	3277	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	152	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	497	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3277	152	497	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	910	42	138	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4570	212	693	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4570 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4570	4800	No
v_{12}	4570	4400	Yes
$v_{FO} = v_F - v_R$	4358	4800	No
v_R	212	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 41.8 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.317	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.1	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1511	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	384	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	102	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1511	384	102	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	420	107	28	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2107	535	142	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2107 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2642	4800	No
v_{R12}	2642	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 24.0 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.349

Space mean speed in ramp influence area, S_R = 60.2 mph

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

Space mean speed for all vehicles, S = 60.2 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	SR 73
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	3125	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	497	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	152	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3125	497	152	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	868	138	42	v
Trucks and buses	17	17	17	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.797	0.797	0.797	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4358	693	212	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 4358 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5051	4800	Yes
v_{R12}	5051	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 42.7 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.903

Space mean speed in ramp influence area, S_R = 44.7 mph

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

Space mean speed for all vehicles, S = 44.7 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2315	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	477	vph
Length of first accel/decel lane	450	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	165	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2315	477	165	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	643	133	46	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2688	554	192	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2688 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2688	4800	No
v_{12}	2688	4400	No
$v_{FO} = v_F - v_R$	2134	4800	No
v_R	554	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 23.3 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.348	
Space mean speed in ramp influence area,	S_R = 60	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.3	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	4021	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	1593	vph
Length of first accel/decel lane	450	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	750	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4021	1593	750	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1117	443	208	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4669	1850	871	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4669 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4669	4800	No
v_{12}	4669	4400	Yes
$v_{FO} = v_F - v_R$	2819	4800	No
v_R	1850	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 40.4 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.465	
Space mean speed in ramp influence area,	S_R = 57	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.0	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 EB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1838	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	165	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	477	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1838	165	477	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	511	46	133	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2134	192	554	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2134 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2326	4800	No
v_{R12}	2326	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 20.4 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.316

Space mean speed in ramp influence area, S_R = 61.2 mph

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

Space mean speed for all vehicles, S = 61.2 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 EB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2428	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	750	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	1593	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2500	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2428	750	1593	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	674	208	443	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2819	871	1850	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2819 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3690	4800	No
v_{R12}	3690	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 30.7 pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.432

Space mean speed in ramp influence area, S_R = 57.9 mph

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

Space mean speed for all vehicles, S = 57.9 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1895	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	216	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	364	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2600	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1895	216	364	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	526	60	101	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	2200	251	423	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2200 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2200	4800	No
v_{12}	2200	4400	No
$v_{FO} = v_F - v_R$	1949	4800	No
v_R	251	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 20.5 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.321	
Space mean speed in ramp influence area,	S_R = 61	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.0	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Diverge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	3622	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	723	vph
Length of first accel/decel lane	300	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	1649	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2600	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3622	723	1649	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	1006	201	458	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	4206	839	1915	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4206 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4206	4800	No
v_{12}	4206	4400	No
$v_{FO} = v_F - v_R$	3367	4800	No
v_R	839	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 37.7 pc/mi/ln

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

Speed Estimation

Intermediate speed variable,	D_S = 0.374	
Space mean speed in ramp influence area,	S_R = 60	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 59.5	mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	AM DHV
Freeway/dir or travel:	I-40 WB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	1679	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	364	vph
Length of first accel/decel lane	600	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	216	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2600	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1679	364	216	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	466	101	60	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	1950	423	251	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1950 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2373	4800	No
v_{R12}	2373	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 20.0+ pc/mi/ln

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

Speed Estimation

Intermediate speed variable, M_S = 0.309

Space mean speed in ramp influence area, S_R = 61.4 mph

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

Space mean speed for all vehicles, S = 61.4 mph

HCS2000: Ramps and Ramp Junctions Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-mail: http://www.pbsj.com

Merge Analysis

Analyst:	GGB
Agency/Co.:	PBSJ
Date performed:	10/25/2002
Analysis time period:	PM DHV
Freeway/dir or travel:	I-40 WB
Junction:	O'Neil
Jurisdiction:	
Analysis Year:	2027
Description:	Proposed System with Prop. Devel.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2899	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	1649	vph
Length of first accel/decel lane	600	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	723	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2600	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2899	1649	723	vph
Peak-hour factor, PHF	0.90	0.90	0.90	
Peak 15-min volume, v15	805	458	201	v
Trucks and buses	3	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	

Heavy vehicle adjustment, fHV	0.957	0.957	0.957	
Driver population factor, fP	1.00	1.00	1.00	
Flow rate, vp	3366	1915	839	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3366 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5281	4800	Yes
v_{R12}	5281	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 42.0 pc/mi/ln

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

Speed Estimation

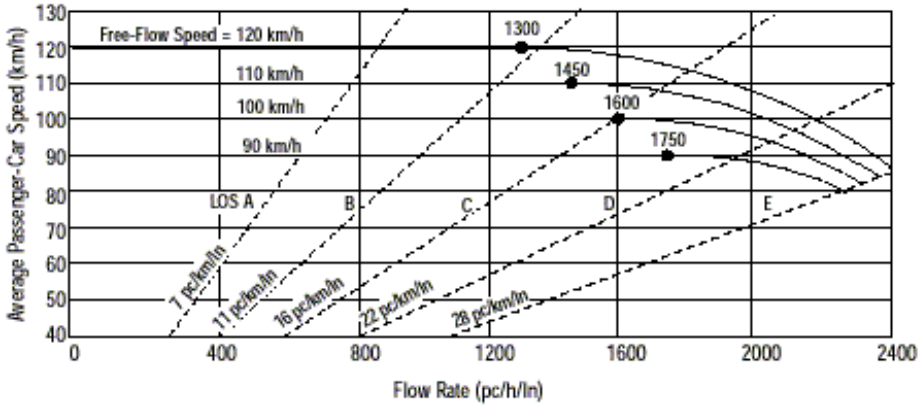
Intermediate speed variable, M_S = 1.034

Space mean speed in ramp influence area, S_R = 41.1 mph

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

Space mean speed for all vehicles, S = 41.1 mph

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/25/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	SR 32 to O'Neil
Jurisdiction	
Analysis Year	2027

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	2315 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	6
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.697

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1846	pc/h/ln
S	67.3	mi/h
D = v_p / S	27.4	pc/mi/ln
LOS	D	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

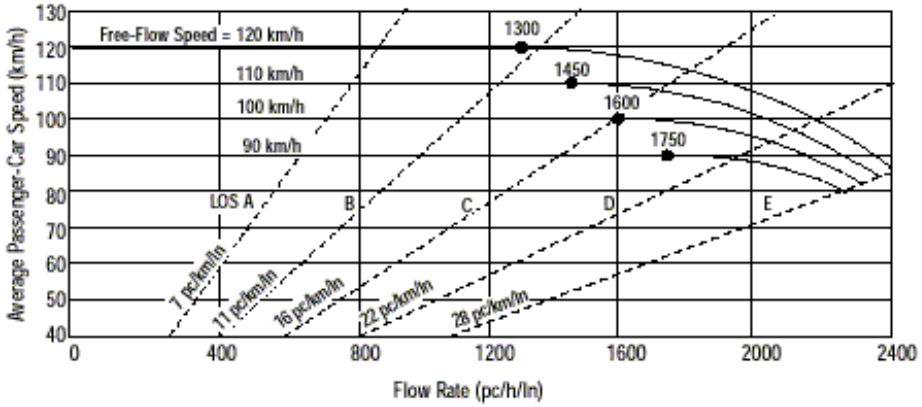
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/25/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	SR 32 to O'Neil
Jurisdiction	
Analysis Year	2027

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	4021 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	6
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.697

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	3206	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	F	

Design (N)

Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

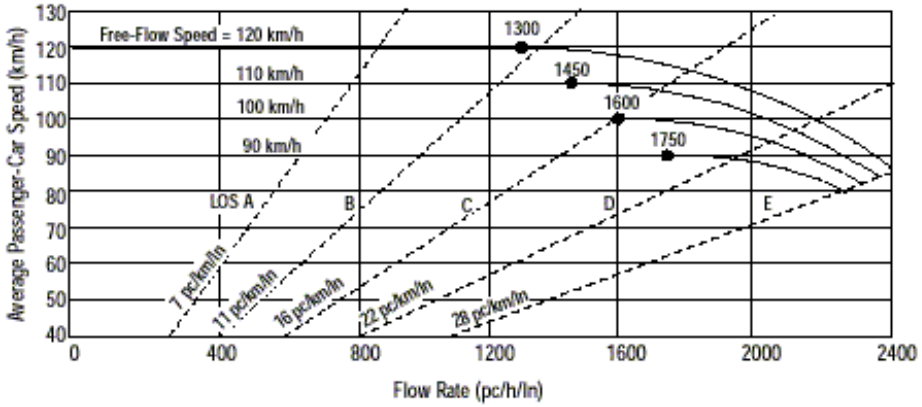
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/25/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	SR 32 to O'Neil
Jurisdiction	
Analysis Year	2027

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	2043 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	6
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.697

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1629	pc/h/ln
S	69.3	mi/h
D = v_p / S	23.5	pc/mi/ln
LOS	C	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

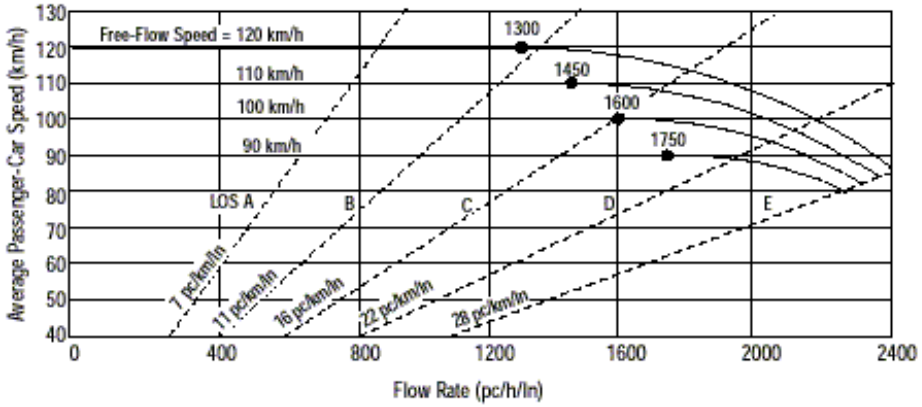
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/25/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	SR 32 to O'Neil
Jurisdiction	
Analysis Year	2027

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	4548 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	6
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.697

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures		
Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	3626	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	F	

Design (N)	
Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

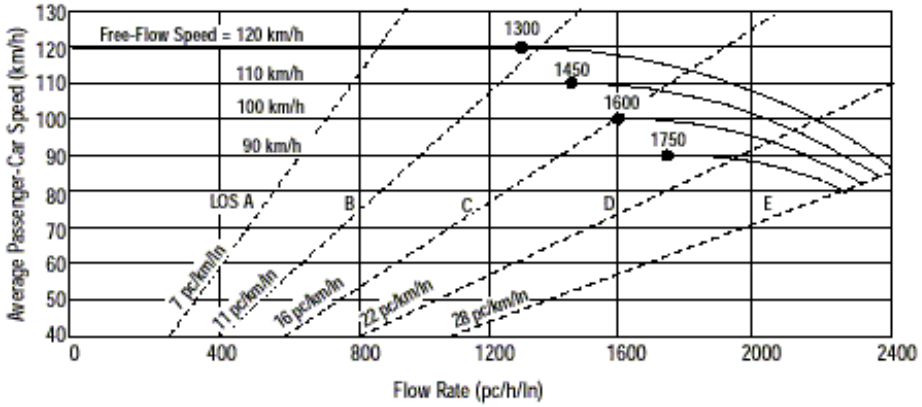
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/25/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	O'Neil to SR 73
Jurisdiction	
Analysis Year	2027

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	2003 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1630	pc/h/ln
S	69.3	mi/h
D = v_p / S	23.5	pc/mi/ln
LOS	C	

Design (N)

Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

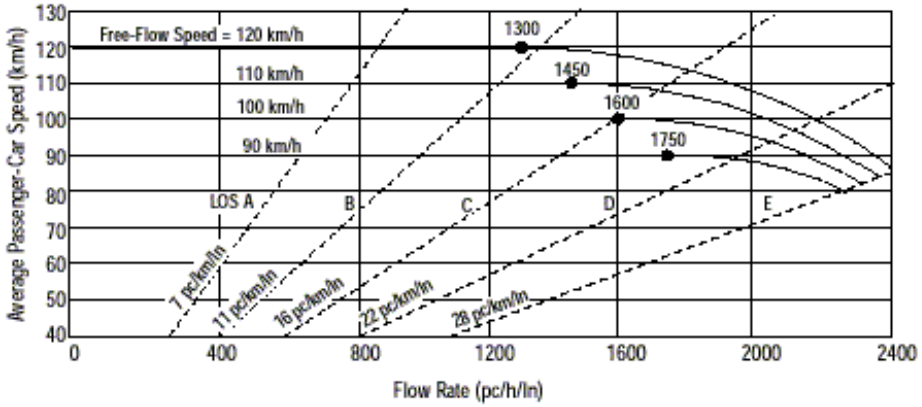
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/25/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 EB
From/To	O'Neil to SR 73
Jurisdiction	
Analysis Year	2027

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	3178 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	2587	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	F	

Design (N)

Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

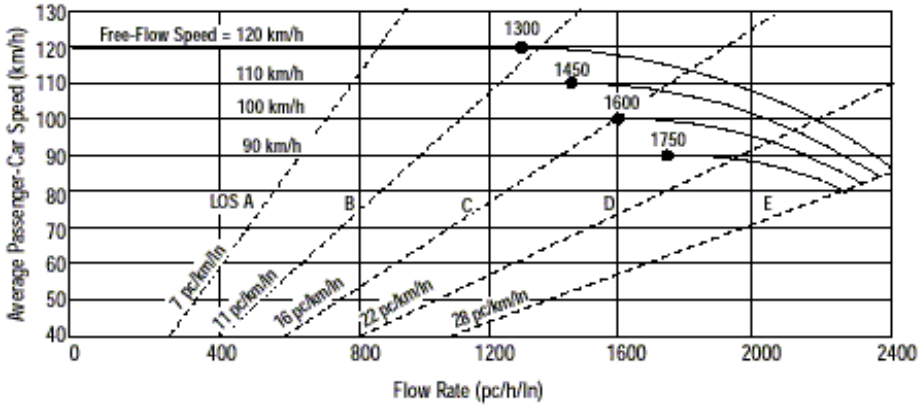
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/25/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	O'Neil to SR 73
Jurisdiction	
Analysis Year	2027

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1895 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures		
Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1542	pc/h/ln
S	69.7	mi/h
D = v_p / S	22.1	pc/mi/ln
LOS	C	

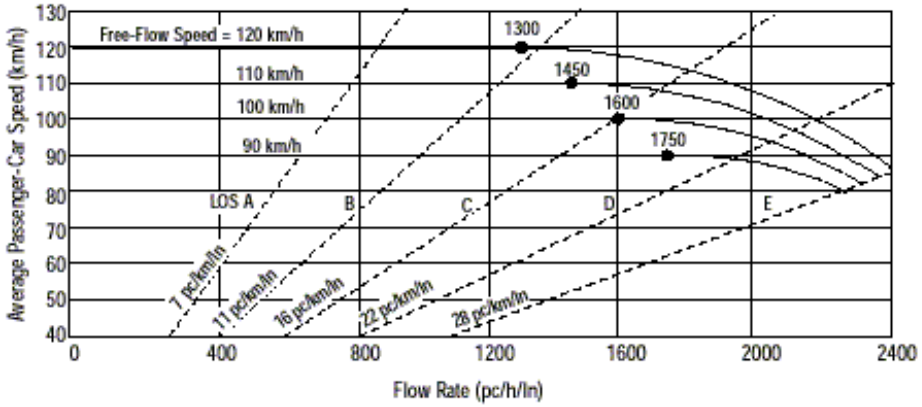
Design (N)	
Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary	
N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location	
E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D

General Information

Analyst	GGB
Agency or Company	PBSJ
Date Performed	10/25/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction of Travel	I-40 WB
From/To	O'Neil to SR 73
Jurisdiction	
Analysis Year	2027

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	3622 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	9
Peak-Hr Direction Prop, D		General Terrain:	Rolling
DDHV = AADT x K x D	veh/h	Grade Length	0.00mi
Driver type adjustment	1.00	Up/Down %	0.00

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.683

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	70.0	mi/h

Calc Speed Adj and FFS

f_{LW}	0.0	mi/h
f_{LC}	0.0	mi/h
f_{ID}	0.0	mi/h
f_N	0.0	mi/h
FFS	70.0	mi/h

LOS and Performance Measures		
Operational (LOS)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	2948	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	F	

Design (N)	
Design (N)	
Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*1408*	*84*	*341*	*1232*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*1564*	*93*	*378*	*1368*	*0*
Percent Heavy Vehicles	*0*	--	--	*4*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*207*	*0*	*187*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*230*	*0*	*207*
Percent Heavy Vehicles	*0*	*0*	*0*	*4*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*378*				*230*		*207*
C (m) (vph)		*409*				*5*		*389*
v/c		*0.92*				*46.00*		*0.53*
95% queue length		*10.13*				*30.91*		*3.01*
Control Delay		*59.6*						*24.3*
LOS		*F*				*F*		*C*
Approach Delay	--	--						
Approach LOS	--	--				*F*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*2588*	*166*	*810*	*2378*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*2875*	*184*	*900*	*2642*	*0*
Percent Heavy Vehicles	*0*	--	--	*4*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*279*	*0*	*479*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*310*	*0*	*532*
Percent Heavy Vehicles	*0*	*0*	*0*	*4*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*900*				*310*		*532*
C (m) (vph)		*123*				*0*		*146*
v/c		*7.32*						*3.64*
95% queue length		*100.48*						*52.08*
Control Delay								
LOS		*F*				*F*		*F*
Approach Delay	--	--						
Approach LOS	--	--						

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*243*	*1372*	*0*	*0*	*1492*	*327*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*270*	*1524*	*0*	*0*	*1657*	*363*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*81*	*0*	*438*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*90*	*0*	*486*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*270*		*90*		*486*			
C (m) (vph)	*381*		*19*		*343*			
v/c	*0.71*		*4.74*		*1.42*			
95% queue length	*5.28*		*11.75*		*25.13*			
Control Delay	*34.4*				*233.8*			
LOS	*D*		*F*		*F*			
Approach Delay	--	--	*523.7*					
Approach LOS	--	--	*F*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*369*	*2498*	*0*	*0*	*3041*	*365*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*410*	*2775*	*0*	*0*	*3378*	*405*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*2*	*0*	*0*	*2*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*147*	*0*	*895*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*163*	*0*	*994*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*410*		*163*		*994*			
C (m) (vph)	*78*		*0*		*130*			
v/c	*5.26*				*7.65*			
95% queue length	*44.92*				*111.35*			
Control Delay								
LOS	*F*		*F*		*F*			
Approach Delay	--	--						
Approach LOS	--	--						

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & SR 73*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *SR 32* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*596*	*227*	*0*	*0*	*161*	*118*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*662*	*252*	*0*	*0*	*178*	*131*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*174*	*0*	*504*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*193*	*0*	*560*
Percent Heavy Vehicles	*0*	*0*	*0*	*7*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (vph)	*662*					*193*		*560*
C (m) (vph)	*1368*					*47*		*852*
v/c	*0.48*					*4.11*		*0.66*
95% queue length	*2.73*					*21.60*		*5.05*
Control Delay	*10.1*							*16.9*
LOS	*B*					*F*		*C*
Approach Delay	--	--				*416.1*		
Approach LOS	--	--				*F*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & SR 73*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *SR 32* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*626*	*483*	*0*	*0*	*562*	*218*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*695*	*536*	*0*	*0*	*624*	*242*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*242*	*0*	*687*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*268*	*0*	*763*
Percent Heavy Vehicles	*0*	*0*	*0*	*7*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (vph)	*695*					*268*		*763*
C (m) (vph)	*933*					*7*		*476*
v/c	*0.74*					*38.29*		*1.60*
95% queue length	*7.08*					*35.46*		*42.59*
Control Delay	*19.2*							*302.7*
LOS	*C*					*F*		*F*
Approach Delay	--	--						
Approach LOS	--	--				*F*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 EB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*320*	*81*	*37*	*163*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*355*	*90*	*41*	*181*	*0*
Percent Heavy Vehicles	*0*	--	--	*17*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*77*	*0*	*116*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*85*	*0*	*128*
Percent Heavy Vehicles	*0*	*0*	*0*	*17*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*				*L*		*R*
v (vph)		*41*				*85*		*128*
C (m) (vph)		*1040*				*388*		*849*
v/c		*0.04*				*0.22*		*0.15*
95% queue length		*0.12*				*0.82*		*0.53*
Control Delay		*8.6*				*16.9*		*10.0-*
LOS		*A*				*C*		*A*
Approach Delay	--	--				*12.7*		
Approach LOS	--	--				*B*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 EB ramps* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*656*	*69*	*59*	*327*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*728*	*76*	*65*	*363*	*0*
Percent Heavy Vehicles	*0*	--	--	*17*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*147*	*0*	*453*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*163*	*0*	*503*
Percent Heavy Vehicles	*0*	*0*	*0*	*17*	*0*	*7*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*				*L*		*R*
v (vph)		*65*				*163*		*503*
C (m) (vph)		*758*				*160*		*671*
v/c		*0.09*				*1.02*		*0.75*
95% queue length		*0.28*				*8.01*		*6.79*
Control Delay		*10.2*				*133.4*		*24.6*
LOS		*B*				*F*		*C*
Approach Delay	--	--				*51.2*		
Approach LOS	--	--				*F*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 and I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 WB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*256*	*141*	*0*	*0*	*148*	*129*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*284*	*156*	*0*	*0*	*164*	*143*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*52*	*0*	*50*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*57*	*0*	*55*	*0*	*0*	*0*
Percent Heavy Vehicles	*7*	*0*	*17*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*		*L*		*R*			
v (vph)	*284*		*57*		*55*			
C (m) (vph)	*1226*		*214*		*852*			
v/c	*0.23*		*0.27*		*0.06*			
95% queue length	*0.90*		*1.03*		*0.21*			
Control Delay	*8.8*		*27.8*		*9.5*			
LOS	*A*		*D*		*A*			
Approach Delay	--	--	*18.8*					
Approach LOS	--	--	*C*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 and I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *SR 73* | North/South Street: *I-40 WB ramps*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*390*	*413*	*0*	*0*	*290*	*107*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*433*	*458*	*0*	*0*	*322*	*118*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*96*	*0*	*56*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*106*	*0*	*62*	*0*	*0*	*0*
Percent Heavy Vehicles	*7*	*0*	*17*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*		*L*		*R*			
v (vph)	*433*		*106*		*62*			
C (m) (vph)	*1094*		*59*		*573*			
v/c	*0.40*		*1.80*		*0.11*			
95% queue length	*1.92*		*9.89*		*0.36*			
Control Delay	*10.4*		*530.7*		*12.0*			
LOS	*B*		*F*		*B*			
Approach Delay	--	--	*339.3*					
Approach LOS	--	--	*F*					

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*625*	*89*	*4*	*608*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*694*	*98*	*4*	*675*	*0*
Percent Heavy Vehicles	*0*	--	--	*3*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*1*	*1*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*70*	*0*	*6*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*77*	*0*	*6*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*	*L*		*R*			
v (vph)		*4*	*77*		*6*			
C (m) (vph)		*824*	*158*		*441*			
v/c		*0.00*	*0.49*		*0.01*			
95% queue length		*0.01*	*2.32*		*0.04*			
Control Delay		*9.4*	*47.7*		*13.3*			
LOS		*A*	*E*		*B*			
Approach Delay	--	--	*45.2*					
Approach LOS	--	--	*E*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 32 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*552*	*292*	*6*	*629*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*613*	*324*	*6*	*698*	*0*
Percent Heavy Vehicles	*0*	--	--	*3*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*1*	*1*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*300*	*0*	*4*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*333*	*0*	*4*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*	*L*		*R*			
v (vph)		*6*	*333*		*4*			
C (m) (vph)		*727*	*170*		*491*			
v/c		*0.01*	*1.96*		*0.01*			
95% queue length		*0.02*	*25.31*		*0.02*			
Control Delay		*10.0-*	*497.3*		*12.4*			
LOS		*A*	*F*		*B*			
Approach Delay	--	--	*491.5*					
Approach LOS	--	--	*F*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*4*	*215*	*0*	*0*	*174*	*90*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*4*	*238*	*0*	*0*	*193*	*100*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*68*	*0*	*2*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*75*	*0*	*2*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*4*						*77*	
C (m) (vph)	*1263*						*539*	
v/c	*0.00*						*0.14*	
95% queue length	*0.01*						*0.50*	
Control Delay	*7.9*						*12.8*	
LOS	*A*						*B*	
Approach Delay	--	--					*12.8*	
Approach LOS	--	--					*B*	

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*SR 73 & O'Neil*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *O'Neil* | North/South Street: *SR 73*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*2*	*174*	*0*	*0*	*215*	*284*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*2*	*193*	*0*	*0*	*238*	*315*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*296*	*0*	*4*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*328*	*0*	*4*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*2*						*332*	
C (m) (vph)	*1012*						*468*	
v/c	*0.00*						*0.71*	
95% queue length	*0.01*						*5.53*	
Control Delay	*8.6*						*29.3*	
LOS	*A*						*D*	
Approach Delay	--	--					*29.3*	
Approach LOS	--	--					*D*	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*O'Neil & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*10/25/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*338*	*118*	*47*	*244*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*375*	*131*	*52*	*271*	*0*
Percent Heavy Vehicles	*0*	--	--	*3*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*1*	*1*	*1*	*1*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*135*	*0*	*342*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*150*	*0*	*380*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*52*				*150*		*380*
C (m) (vph)		*1178*				*436*		*765*
v/c		*0.04*				*0.34*		*0.50*
95% queue length		*0.14*				*1.51*		*2.80*
Control Delay		*8.2*				*17.5*		*14.3*
LOS		*A*				*C*		*B*
Approach Delay	--	--				*15.2*		
Approach LOS	--	--				*C*		

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*O'Neil & I-40 EB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 EB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*1482*	*538*	*212*	*811*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*1646*	*597*	*235*	*901*	*0*
Percent Heavy Vehicles	*0*	--	--	*3*	--	--
Median Type	*Raised curb*					
RT Channelized			*1*			*0*
Lanes	*0*	*1*	*1*	*1*	*1*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*451*	*0*	*1142*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*501*	*0*	*1268*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*1*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*				*L*		*R*
v (vph)		*235*				*501*		*1268*
C (m) (vph)		*390*				*343*		*335*
v/c		*0.60*				*1.46*		*3.79*
95% queue length		*3.80*				*26.77*		*120.57*
Control Delay		*27.3*				*252.0*		
LOS		*D*				*F*		*F*
Approach Delay	--	--				*991.3*		
Approach LOS	--	--				*F*		

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*O'Neil & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*AM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*261*	*212*	*0*	*0*	*136*	*103*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*290*	*235*	*0*	*0*	*151*	*114*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*155*	*0*	*61*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*172*	*0*	*67*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*290*		*172*		*67*			
C (m) (vph)	*1424*		*278*		*802*			
v/c	*0.20*		*0.62*		*0.08*			
95% queue length	*0.76*		*3.79*		*0.27*			
Control Delay	*8.2*		*36.9*		*9.9*			
LOS	*A*		*E*		*A*			
Approach Delay	--	--	*29.3*					
Approach LOS	--	--	*D*					

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*GGB*	Intersection	*O'Neil & I-40 WB ramps*
Agency/Co.	*PBSJ*	Jurisdiction	
Date Performed	*11/1/2002*	Analysis Year	*2027*
Analysis Time Period	*PM DHV*		

Project Description *Proposed System with Prop. Devel.*

East/West Street: *I-40 WB Ramps* | North/South Street: *SR 32*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*1182*	*751*	*0*	*0*	*505*	*467*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*1313*	*834*	*0*	*0*	*561*	*518*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Raised curb*					
RT Channelized			*0*			*1*
Lanes	*1*	*1*	*0*	*0*	*1*	*1*
Configuration	*L*	*T*			*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*581*	*0*	*205*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*645*	*0*	*227*	*0*	*0*	*0*
Percent Heavy Vehicles	*3*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*		*L*		*R*			
v (vph)	*1313*		*645*		*227*			
C (m) (vph)	*1005*		*0*		*367*			
v/c	*1.31*				*0.62*			
95% queue length	*48.63*				*3.97*			
Control Delay	*160.4*				*29.5*			
LOS	*F*		*F*		*D*			
Approach Delay	--	--						
Approach LOS	--	--						

>

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/25/2002
Analysis Time Period AM DHV
Highway SR 32
From/To SR 73 to O'Neil Road
Jurisdiction
Analysis Year 2027
Description Proposed System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1392 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 1617 pc/h
Highest directional split proportion (note-2) 809 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 0.9 mi/h
Average travel speed, ATS 27.7 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1547 pc/h
Highest directional split proportion (note-2) 774
Base percent time-spent-following, BPTSF 74.3 %
Adj.for directional distribution and no-passing zones, fd/np 5.4
Percent time-spent-following, PTSF 79.7 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.51	
Peak 15-min vehicle-miles of travel, VMT15	1160	veh-mi
Peak-hour vehicle-miles of travel, VMT60	4176	veh-mi
Peak 15-min total travel time, TT15	41.9	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/25/2002
Analysis Time Period PM DHV
Highway SR 32
From/To SR 73 to O'Neil Road
Jurisdiction
Analysis Year 2027
Description Proposed System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1773 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 2060 pc/h
Highest directional split proportion (note-2) 1030 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 0.8 mi/h
Average travel speed, ATS 24.5 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1970 pc/h
Highest directional split proportion (note-2) 985
Base percent time-spent-following, BPTSF 82.3 %
Adj.for directional distribution and no-passing zones, fd/np 3.4
Percent time-spent-following, PTSF 85.7 %

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.64	
Peak 15-min vehicle-miles of travel, VMT15	1478	veh-mi
Peak-hour vehicle-miles of travel, VMT60	5319	veh-mi
Peak 15-min total travel time, TT15	60.4	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/25/2002
Analysis Time Period AM DHV
Highway SR 32
From/To O'Neil Road to Morrell Springs
Jurisdiction
Analysis Year 2027
Description Proposed System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 3 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1243 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.985
Two-way flow rate,(note-1) vp 1416 pc/h
Highest directional split proportion (note-2) 708 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.0 mi/h
Average travel speed, ATS 29.2 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1381 pc/h
Highest directional split proportion (note-2) 691
Base percent time-spent-following, BPTSF 70.3 %
Adj.for directional distribution and no-passing zones, fd/np 6.3
Percent time-spent-following, PTSF 76.6 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.44	
Peak 15-min vehicle-miles of travel, VMT15	1036	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3729	veh-mi
Peak 15-min total travel time, TT15	35.5	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/25/2002
Analysis Time Period PM DHV
Highway SR 32
From/To O'Neil Road to Morrell Springs
Jurisdiction
Analysis Year 2027
Description Proposed System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 3 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1191 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.985
Two-way flow rate,(note-1) vp 1357 pc/h
Highest directional split proportion (note-2) 679 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.1 mi/h
Average travel speed, ATS 29.5 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1323 pc/h
Highest directional split proportion (note-2) 662
Base percent time-spent-following, BPTSF 68.7 %
Adj.for directional distribution and no-passing zones, fd/np 7.0
Percent time-spent-following, PTSF 75.8 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.42	
Peak 15-min vehicle-miles of travel, VMT15	993	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3573	veh-mi
Peak 15-min total travel time, TT15	33.6	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/25/2002
Analysis Time Period AM DHV
Highway SR 73
From/To SR 32 to 40
Jurisdiction
Analysis Year 2027
Description Proposed System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 2.4 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 680 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.941
Two-way flow rate,(note-1) vp 864 pc/h
Highest directional split proportion (note-2) 518 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 2.0 mi/h
Average travel speed, ATS 32.5 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 832 pc/h
Highest directional split proportion (note-2) 499
Base percent time-spent-following, BPTSF 51.9 %
Adj.for directional distribution and no-passing zones, fd/np 11.4
Percent time-spent-following, PTSF 63.2 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.27	
Peak 15-min vehicle-miles of travel, VMT15	453	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1632	veh-mi
Peak 15-min total travel time, TT15	14.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/25/2002
Analysis Time Period PM DHV
Highway SR 73
From/To SR 32 to 40
Jurisdiction
Analysis Year 2027
Description Proposed System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 2.4 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1505 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 1748 pc/h
Highest directional split proportion (note-2) 874 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 0.9 mi/h
Average travel speed, ATS 26.8 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1672 pc/h
Highest directional split proportion (note-2) 836
Base percent time-spent-following, BPTSF 77.0 %
Adj.for directional distribution and no-passing zones, fd/np 4.8
Percent time-spent-following, PTSF 81.8 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.55	
Peak 15-min vehicle-miles of travel, VMT15	1003	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3612	veh-mi
Peak 15-min total travel time, TT15	37.5	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/25/2002
Analysis Time Period AM DHV
Highway SR 73
From/To 40 to O'Neil Road
Jurisdiction
Analysis Year 2027
Description Prop System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 17 %
Segment length 4.5 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 468 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.867
Two-way flow rate,(note-1) vp 645 pc/h
Highest directional split proportion (note-2) 387 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 2.6 mi/h
Average travel speed, ATS 33.6 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.922
Two-way flow rate,(note-1) vp 600 pc/h
Highest directional split proportion (note-2) 360
Base percent time-spent-following, BPTSF 41.0 %
Adj.for directional distribution and no-passing zones, fd/np 17.0
Percent time-spent-following, PTSF 58.0 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.20	
Peak 15-min vehicle-miles of travel, VMT15	585	veh-mi
Peak-hour vehicle-miles of travel, VMT60	2106	veh-mi
Peak 15-min total travel time, TT15	17.4	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/25/2002
Analysis Time Period PM DHV
Highway SR 73
From/To 40 to O'Neil Road
Jurisdiction
Analysis Year 2027
Description Proposed System with Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 17 %
Segment length 4.5 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 866 veh/h
Directional split 55 / 45 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.867
Two-way flow rate,(note-1) vp 1193 pc/h
Highest directional split proportion (note-2) 656 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 1.3 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 41.2 mi/h

Adjustment for no-passing zones, fnp 1.4 mi/h
Average travel speed, ATS 30.5 mi/h

Percent Time-Spent-Following

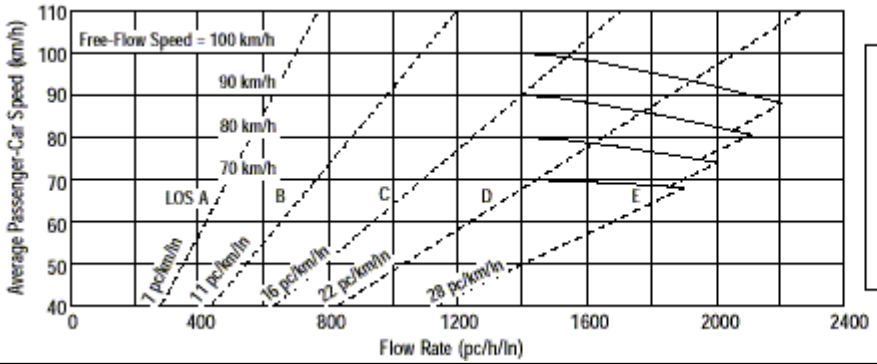
Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.922
Two-way flow rate,(note-1) vp 1111 pc/h
Highest directional split proportion (note-2) 611
Base percent time-spent-following, BPTSF 62.3 %
Adj.for directional distribution and no-passing zones, fd/np 9.2
Percent time-spent-following, PTSF 71.5 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.37	
Peak 15-min vehicle-miles of travel, VMT15	1083	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3897	veh-mi
Peak 15-min total travel time, TT15	35.5	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/25/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2027

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1419	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

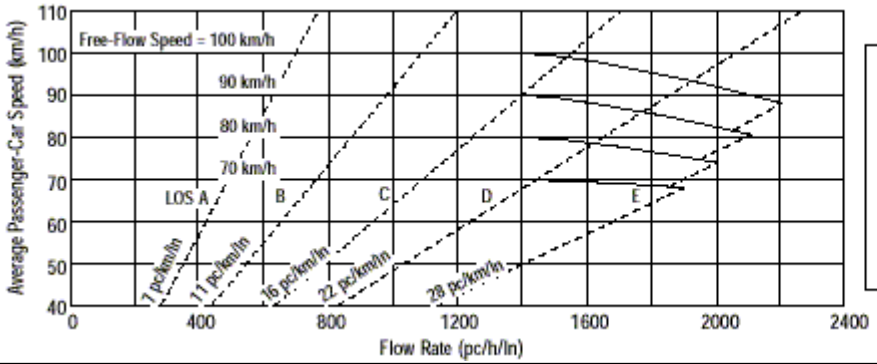
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	866	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	18.2	Max Service Flow Rate (pc/h/ln)	
LOS	C	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/25/2002
Analysis Time Period	AM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2027

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	1419	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

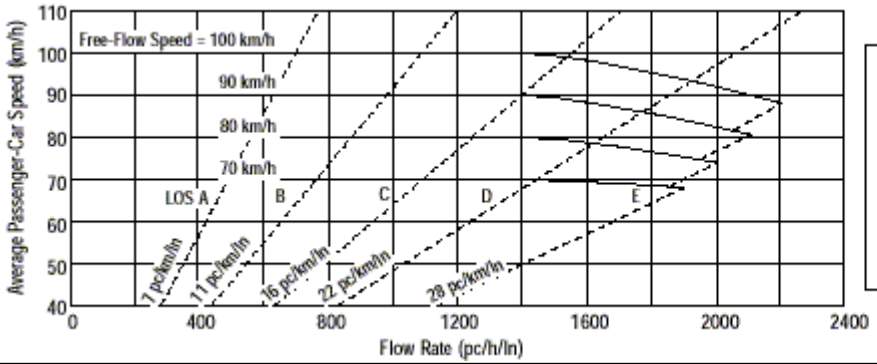
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	823	Required Number of Lanes, N	
Speed, S (mi/h)	47.5	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	17.3	Max Service Flow Rate (pc/h/ln)	
LOS	B	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 1)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/25/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2027

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	2857	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

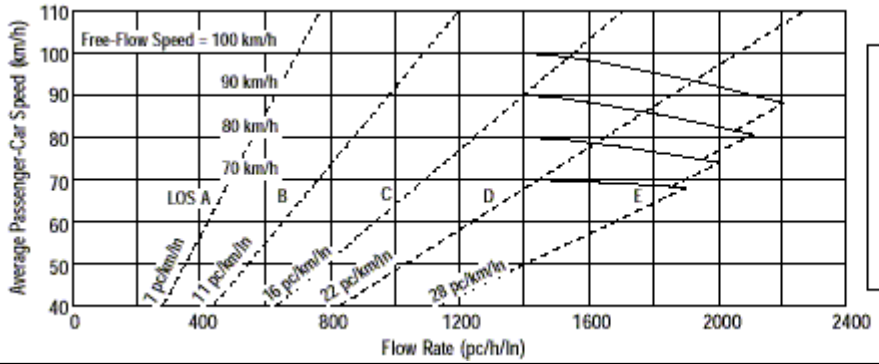
f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	1598	Required Number of Lanes, N	
Speed, S (mi/h)	46.7	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	34.2	Max Service Flow Rate (pc/h/ln)	
LOS	D	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

MULTILANE HIGHWAYS WORKSHEET(Direction 2)



Application	Input	Output
Oper. (LOS)	FFS, N, v_p	LOS, S, D
Des. (N)	FFS, LOS, v_p	N, S, D
Des. (v_p)	FFS, LOS, N	v_p, S, D
Plan. (LOS)	FFS, N, AADT	LOS, S, D
Plan. (N)	FFS, LOS, AADT	N, S, D
Plan. (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	GGB
Agency or Company	PBS&J
Date Performed	10/25/2002
Analysis Time Period	PM DHV

Site Information

Highway/Direction to Travel	SR 32
From/To	Morrell to 40
Jurisdiction	
Analysis Year	2027

Project Description Proposed System with Prop. Devel.

☑ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	2857	Peak-Hour Factor, PHF	0.90
AADT(veh/h)		%Trucks and Buses, P_T	3
Peak-Hour Prop of AADT (veh/d)		%RVs, P_R	0
Peak-Hour Direction Prop, D		General Terrain:	Rolling
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	2.0
E_T	2.5	f_{HV}	0.957

Speed Inputs

Lane Width, LW (ft)	12.0
Total Lateral Clearence, LC (ft)	12.0
Access Points, A (A/mi)	10
Median Type, M	Divided
FFS (measured)	

Calc Speed Adj and FFS

f_{LW} (mi/h)	0.0
f_{LC} (mi/h)	0.0
f_A (mi/h)	2.5
f_M (mi/h)	0.0

Base Free-Flow Speed, BFFS	50.0	FFS (mi/h)	47.5

Operations		Design	
Operational (LOS)		Design (N)	
Flow Rate, v_p (pc/h/ln)	1658	Required Number of Lanes, N	
Speed, S (mi/h)	46.4	Flow Rate, v_p (pc/h)	
D (pc/mi/ln)	35.7	Max Service Flow Rate (pc/h/ln)	
LOS	E	Design LOS	

HCS2000™ Copyright © 2000 University of Florida, All Rights Reserved Version 4.1b

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period AM DHV
Highway O'Neil Road
From/To I-40 to SR 32
Jurisdiction
Analysis Year 2027
Description Prop. System w Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1042 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 1210 pc/h
Highest directional split proportion (note-2) 726 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 0.0 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 42.5 mi/h

Adjustment for no-passing zones, fnp 1.4 mi/h
Average travel speed, ATS 31.7 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 1158 pc/h
Highest directional split proportion (note-2) 695
Base percent time-spent-following, BPTSF 63.9 %
Adj.for directional distribution and no-passing zones, fd/np 8.4
Percent time-spent-following, PTSF 72.3 %

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.38	
Peak 15-min vehicle-miles of travel, VMT15	868	veh-mi
Peak-hour vehicle-miles of travel, VMT60	3126	veh-mi
Peak 15-min total travel time, TT15	27.4	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period PM DHV
Highway O'Neil Road
From/To I-40 to SR 32
Jurisdiction
Analysis Year 2027
Description Prop. System w Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 3973 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 4615 pc/h
Highest directional split proportion (note-2) 2769 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 0.0 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 42.5 mi/h

Adjustment for no-passing zones, fnp mi/h
Average travel speed, ATS mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 4414 pc/h
Highest directional split proportion (note-2) 2648
Base percent time-spent-following, BPTSF 97.9 %
Adj.for directional distribution and no-passing zones, fd/np -13.7
Percent time-spent-following, PTSF 84.2 %

Level of Service and Other Performance Measures

Level of service, LOS			
Volume to capacity ratio, v/c	1.44		
Peak 15-min vehicle-miles of travel, VMT15		3311	veh-mi
Peak-hour vehicle-miles of travel, VMT60		11919	veh-mi
Peak 15-min total travel time, TT15			veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period PM DHV
Highway O'Neil Road
From/To I-40 to SR 73
Jurisdiction
Analysis Year 2027
Description Prop. System w Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 512 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.93
PCE for trucks, ET 1.9
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.941
Two-way flow rate,(note-1) vp 650 pc/h
Highest directional split proportion (note-2) 390 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 0.0 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 42.5 mi/h

Adjustment for no-passing zones, fnp 2.6 mi/h
Average travel speed, ATS 34.9 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 0.94
PCE for trucks, ET 1.5
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 0.966
Two-way flow rate,(note-1) vp 626 pc/h
Highest directional split proportion (note-2) 376
Base percent time-spent-following, BPTSF 42.3 %
Adj.for directional distribution and no-passing zones, fd/np 16.3
Percent time-spent-following, PTSF 58.7 %

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.20	
Peak 15-min vehicle-miles of travel, VMT15	427	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1536	veh-mi
Peak 15-min total travel time, TT15	12.2	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS2000: Two-Lane Highways Release 4.1b

PBS&J
Two International Plaza Drive
Suite 810
Nashville, TN 37217
Phone: 615-399-0298 Fax: 615-399-0361
E-Mail: http://www.pbsj.com

Two-Way Two-Lane Highway Segment Analysis

Analyst GGB
Agency/Co. PBSJ
Date Performed 10/21/2002
Analysis Time Period PM DHV
Highway O'Neil Road
From/To I-40 to SR 73
Jurisdiction
Analysis Year 2027
Description Prop. System w Prop. Devel.

Input Data

Highway class Class 2
Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
Lane width 12.0 ft % Trucks and buses 7 %
Segment length 3.0 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 50 %
Grade: Length mi Access points/mi 10 /mi
Up/down %

Two-way hourly volume, V 1928 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.99
PCE for trucks, ET 1.5
PCE for RVs, ER 1.1
Heavy-vehicle adjustment factor, 0.966
Two-way flow rate,(note-1) vp 2240 pc/h
Highest directional split proportion (note-2) 1344 pc/h

Free-Flow Speed from Field Measurement:
Field measured speed, SFM - mi/h
Observed volume, Vf - veh/h
Estimated Free-Flow Speed:
Base free-flow speed, BFFS 45.0 mi/h
Adj. for lane and shoulder width, fLS 0.0 mi/h
Adj. for access points, fA 2.5 mi/h

Free-flow speed, FFS 42.5 mi/h

Adjustment for no-passing zones, fnp 0.7 mi/h
Average travel speed, ATS 24.4 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
PCE for trucks, ET 1.0
PCE for RVs, ER 1.0
Heavy-vehicle adjustment factor, fHV 1.000
Two-way flow rate,(note-1) vp 2142 pc/h
Highest directional split proportion (note-2) 1285
Base percent time-spent-following, BPTSF 84.8 %
Adj.for directional distribution and no-passing zones, fd/np 3.1
Percent time-spent-following, PTSF 87.8 %

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.70	
Peak 15-min vehicle-miles of travel, VMT15	1607	veh-mi
Peak-hour vehicle-miles of travel, VMT60	5784	veh-mi
Peak 15-min total travel time, TT15	65.9	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

APPENDIX D
COST ESTIMATES

Route:	Interchange at Interstate 40 and O'Neil Road
Alternate	Interchange Only
Description:	Rural diamond interchange
From:	n/a
To:	n/a
County:	Cocke
Length (feet):	7,500
Date:	June 2, 2003

		Length (feet)		Width (feet)		(sq. ft. / acre)		Cost ($/acre)			
Clear & Grub	Mainline	7,500	x	60	/	43,560	x	$1,500	=	$15,496	
											$15,496
	Sideroads	5,500	x	72	/	43,560	x	$1,500	=	$13,636	
	Sideroads		x	30	/	43,560	x	$1,500	=	$0	
	Sideroads		x	30	/	43,560	x	$1,500	=	$0	
	Sideroads		x	30	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Total SR	5,500									**$13,636**
											$29,132

		Length (feet)		Percent		CY / LF		Cost ($/CY)			
Earthwork		7,500	x	75%	x	33.33	x	$4.00	=	$749,925	
		5,100	x	70%	x	12.59	x	$4.00	=	$179,785	
											$929,710

		Length (feet)				Cost ($/LF)			
Pavement Removal		3,000	x			$5.00	=		
									$15,000

Drainage

		Length (feet)		Avg Feet / CB		Cost ($/CB)			
Catchbasins	Mainline	7,500	/	800	x	$2,000	=	$18,750	
	Sideroads	5,500	/	400	x	$0	=	$0	
									$18,750

	Length (feet)		Percent		Cost ($/LF)			
Paved Ditches	7,500	x	35%	x	$15.00	=	$39,375	
								$39,375

		Length (feet)					
Box Culv./Br.	Mainline				Cost ($/LF)		
	0	0	x		$400.00	=	$0
	Sideroads						
	0	0	x		$400.00	=	$0
							$0

	Length (feet)		Percent		Cost ($/LF)		
Pipes	7,500	x	10.00%	x	$30.00	=	$22,500
	7,500	x		x	$35.00	=	$0
	7,500	x		x	$40.00	=	$0
	7,500	x		x	$45.00	=	$0
			10.00%				**$22,500**

	Pipes Total		Percent			
Other	$22,500	x	20.00%	=	$4,500	
						$4,500

	Drainage ST		Percent			
Erosion Control	$2,561,761	x	3.50%	=	$89,662	
						$89,662

$174,787

		Number		Length (feet)		Width (feet)		Cost ($/SF)			
Structures	O'Neil Road Bridge	1	x	300	x	80	x	$90	=	$2,160,000	
			x		x		x	$90	=	$0	
			x		x		x	$90	=	$0	
			x		x		x	$90	=	$0	
			x		x		x	$90	=	$0	
			x		x		x	$90	=	$0	
			x		x		x	$90	=	$0	
			x		x		x	$90	=	$0	
			x		x		x		=	$0	
			x		x		x		=	$0	
			x		x		x		=	$0	
			x		x		x		=	$0	
			x		x		x		=	$0	
			x		x		x		=	$0	
			x		x		x		=	$0	
		1		1							**$2,160,000**
											$2,160,000

		Number		Length (feet)		Width (feet)		Cost ($/SF)			
Railroad Crossing or Separation			x		x		x	$150	=	$0	
			x		x		x	$150	=	$0	
			x		x		x	$150	=	$0	
		Number						Cost ($/EA)			
			x					$100,000	=	$0	
			x					$100,000	=	$0	
			x		x		x	$100,000	=	$0	
											$0
											$0

			Length (feet)			Cost ($/LF)			
Paving		Mainline	8,025	x		$90	=	$722,250	
									$722,250
	Interchanges								
		Ramps		x		$75	=	$0	
		Ramps		x		$50	=	$0	
		Ramps		x		$50	=	$0	
		Ramps		x		$50	=	$0	
		Ramps		x		$50	=	$0	
		Ramps		x		$50	=	$0	
		Ramps		x		$50	=	$0	
		Sideroads		x		$175	=	$0	
		Sideroads		x		$50	=	$0	
		Sideroads		x		$50	=	$0	
		Sideroads		x		$50	=	$0	
		Sideroads		x		$50	=	$0	
		Sideroads		x		$50	=	$0	
	Sideroads								
	O'Neil Road	Sideroads	3500	x		$125	=	$437,500	
		Sideroads	1500	x		$60	=	$90,000	
		Sideroads		x			=	$0	
		Sideroads					=	$0	
		Sideroads					=	$0	
		Sideroads		x			=	$0	
		Sideroads		x			=	$0	
		Sideroads		x			=	$0	
		Sideroads		x			=	$0	
		Total R/SR	5,000						**$527,500**
			Length (Miles)			Cost ($/Mile)			
	Other		1.42	x		$15,000	=	$21,307	
									$21,307
									$1,249,750

Interchanges (Excluding Structures)

	Each		Cost ($/Int.)			
		x		=	$0	
		x		=	$0	
		x		=	$0	
		x		=	$0	
		x		=	$0	
		x		=	$0	
		x		=	$0	
Total R/SR	0					$0
						$0

Maintenance of Traffic

		Each		Cost ($/Int.)			
Interchanges		1	x	$75,000	=	$75,000	
			x		=	$0	
			x		=	$0	
			x		=	$0	
			x		=	$0	
			x		=	$0	
					=	$0	
Sideroads		1	x	$25,000	=	$25,000	
			x		=	$0	
			x		=	$0	
			x		=	$0	
			x		=	$0	
			x		=	$0	
			x		=	$0	
			x		=	$0	
Total R/SR		2					$100,000
							$100,000

Topsoil

	Length (feet)		No Sides		Width (feet)		Depth (feet)		
Ramps	7,500	x	4	x	30	x	0.55		
				/	CF / CY 27	x	Cost ($/CY) $3.50	=	
									$64,167

Seed

	Length (feet)		No Sides		Width (feet)		SF / SY		
Ramps	7,500	x	4	x	30	/	1,000		
						x	Cost ($/SY) $16.00	=	
									$14,400

Sod

	Length (feet)		(feet)		(sf/sy)		Cost ($/SY)		
Ramps	7,500	x	0	/	9	x	$5.00	=	
									$0

Signs

	Length (feet)					Cost ($/MI)		
Mainline	7,350	/	5280	x		$50,000.00	=	
								$69,602

Lighting

	Length (feet)		Cost ($/LF)		
Mainline	7,500	x	$0.00	=	
					$0

Signals

	Each		Cost ($/EA)		
		x	$100,000.00	=	
					$0

Fence

	Length (feet)		No Sides			Cost ($/LF)		
Mainline	7,500	x	1	x		$4.00	=	
								$30,000

Guardrail

	Length (feet)		Percent		Factor		Cost ($/LF)			
Mainline	7,500	x	25%	x	2	x	$10.00	=	$37,500	
End Treatments	9						2500		$22,500	
										$60,000

			Total		Cost ($/EA)		
Rip-Rap	Box Culv./Br.		0	x	$0.00	=	$0
			0	x	$0.00	=	$0
							$0
			Total		Percent		
Other	Sub-Total all Construdtion Items		4,896,548	x	8.50%	=	$416,207
							$416,207
			Total		Percent		
Mobilization	Sub-Total		5,312,755	x	4.50%	=	$244,074
							$244,074

Route:	Interchange at Interstate 40 and O'Neil Road
Alternate	O'Neil Road Improvements
Description:	Rural diamond interchange
From:	n/a
To:	n/a
County:	Cocke
Length (feet):	3,400
Date:	June 2, 2003

		Length (feet)		Width (feet)		(sq. ft. / acre)		Cost ($/acre)			
Clear & Grub	Mainline	3,400	x	80	/	43,560	x	$1,500	=	$9,366	
											$9,366
	Sideroads		x	72	/	43,560	x	$1,500	=	$0	
	Sideroads		x	30	/	43,560	x	$1,500	=	$0	
	Sideroads		x	30	/	43,560	x	$1,500	=	$0	
	Sideroads		x	30	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Sideroads		x	50	/	43,560	x	$1,500	=	$0	
	Total SR	0									**$0**
											$9,366

		Length (feet)		Percent		CY / LF		Cost ($/CY)			
Earthwork		3,400	x	60%	x	12.80	x	$4.00	=	$104,448	
		0	x	60%	x	12.80	x	$4.00	=	$0	
											$104,448

		Length (feet)				Cost ($/LF)			
Pavement Removal		3,000	x			$5.00	=		
									$15,000

Drainage

		Length (feet)		Avg Feet / CB		Cost ($/CB)			
Catchbasins	Mainline	3,400	/	800	x	$2,000	=	$8,500	
	Sideroads	0	/	400	x	$0	=	$0	
									$8,500

		Length (feet)		Percent		Cost ($/LF)			
Paved Ditches		3,400	x	13%	x	$15.00	=	$6,375	
									$6,375

		Length (feet)				Cost ($/LF)			
Box Culv./Br.	Mainline								
		0	x			$400.00	=	$0	
	Sideroads								
		0	x			$400.00	=	$0	
									$0

	Length (feet)		Percent		Cost ($/LF)			
Pipes	3,400	x	10.00%	x	$30.00	=	$10,200	
	3,400	x		x	$35.00	=	$0	
	3,400	x		x	$40.00	=	$0	
	3,400	x		x	$45.00	=	$0	
			10.00%					$10,200

	Pipes Total		Percent				
Other	$10,200	x	20.00%		=	$2,040	
							$2,040

	Drainage ST		Percent				
Erosion Control	$641,463	x	3.50%		=	$22,451	
							$22,451

$49,566

			Number		Length (feet)		Width (feet)		Cost ($/SF)			
Structures	O'Neil Road Bridge		0	x	0	x	0	x	$90	=	$0	
				x		x		x	$90	=	$0	
				x		x		x	$90	=	$0	
				x		x		x	$90	=	$0	
				x		x		x	$90	=	$0	
				x		x		x	$90	=	$0	
				x		x		x	$90	=	$0	
				x		x		x	$90	=	$0	
				x		x		x		=	$0	
				x		x		x		=	$0	
				x		x		x		=	$0	
				x		x		x		=	$0	
				x		x		x		=	$0	
				x		x		x		=	$0	
				x		x		x		=	$0	
		1	0									$0
												$0

		Number		Length (feet)		Width (feet)		Cost ($/SF)			
Railroad Crossing or Separation			x		x		x	$150	=	$0	
			x		x		x	$150	=	$0	
			x		x		x	$150	=	$0	
		Number						Cost ($/EA)			
			x					$100,000	=	$0	
			x					$100,000	=	$0	
			x		x		x	$100,000	=	$0	
											$0
											$0

			Length (feet)			Cost ($/LF)			
Paving		Mainline	3,400	x		$125	=	$425,000	
									$425,000
	Interchanges								
		Ramps		x		$75	=	$0	
		Ramps		x		$50	=	$0	
		Ramps		x		$50	=	$0	
		Ramps		x		$50	=	$0	
		Ramps		x		$50	=	$0	
		Ramps		x		$50	=	$0	
		Ramps		x		$50	=	$0	
		Sideroads		x		$175	=	$0	
		Sideroads		x		$50	=	$0	
		Sideroads		x		$50	=	$0	
		Sideroads		x		$50	=	$0	
		Sideroads		x		$50	=	$0	
		Sideroads		x		$50	=	$0	
	Sideroads								
	O'Neil Road	Sideroads		x		$125	=	$0	
		Sideroads		x		$60	=	$0	
		Sideroads		x			=	$0	
		Sideroads					=	$0	
		Sideroads					=	$0	
		Sideroads		x			=	$0	
		Sideroads		x			=	$0	
		Sideroads		x			=	$0	
		Sideroads		x			=	$0	
		Total R/SR	0						$0
			Length (Miles)			Cost ($/Mile)			
	Other		0.64	x		$15,000	=	$9,659	
									$9,659
									$425,000

Interchanges (Excluding Structures)

	Each		Cost ($/Int.)		
		x		=	$0
		x		=	$0
		x		=	$0
		x		=	$0
		x		=	$0
		x		=	$0
		x		=	$0
Total R/SR	0				$0
					$0

Maintenance of Traffic

		Each		Cost ($/Int.)		
Interchanges		0	x	$75,000	=	$0
			x		=	$0
			x		=	$0
			x		=	$0
			x		=	$0
					=	$0
					=	$0
Sideroads		1	x	$25,000	=	$25,000
			x		=	$0
			x		=	$0
			x		=	$0
			x		=	$0
			x		=	$0
			x		=	$0
			x		=	$0
Total R/SR		1				$25,000
						$25,000

Topsoil

	Length (feet)		No Sides		Width (feet)		Depth (feet)
Sideroads	3,400	x	2	x	65	x	0.51

	CF / CY		Cost ($/CY)	
/	27	x	$3.50	=

$29,221

Seed

	Length (feet)		No Sides		Width (feet)		SF / SY
Sideroads	3,400	x	2	x	85	/	1,000

	Cost ($/SY)	
x	$16.00	=

$9,248

Sod

	Length (feet)		(feet)		(sf/sy)		Cost ($/SY)	
Sideroads	3,400	x	0	/	9	x	$5.00	=

$0

Signs

	Length (feet)				Cost ($/MI)	
Mainline	3,400	/	5280	x	$7,500.00	=

$4,830

Lighting

	Length (feet)		Cost ($/LF)	
Mainline	3,400	x	$0.00	=

$0

Signals

	Each		Cost ($/EA)	
		x	$100,000.00	=

$0

Fence

	Length (feet)		No Sides		Cost ($/LF)	
Mainline	0	x	2	x	$4.00	=

$0

Guardrail

		Length (feet)		Percent		Factor		Cost ($/LF)		
	Mainline	3,400	x	13%	x	2	x	$11.00	=	$9,350
	End Treatments	4						2500		$10,000

$19,350

		Total		Cost ($/EA)			
Rip-Rap	Box Culv./Br.	0	x	$0.00	=	$0	
		0	x	$0.00	=	$0	
							$0

		Total		Percent			
Other	Sub-Total all Construdtion Items	691,029	x	8.50%	=	$58,737	
							$58,737

		Total		Percent			
Mobilization	Sub-Total	749,767	x	5.00%	=	$37,488	
							$37,488

APPENDIX E
CORRESPONDENCE

BETH E. LINZNER, P.A.
1001 West Cypress Creek Road – Suite 320
Fort Lauderdale, Florida 33309
Phone: (954)788-3400 Fax: (954)788-3500

January 24, 2001

Mr. Charles Lewis Moore, Executive
Cocke County Executive's Office
360 East Main Street
Suite 146
Newport, Tennessee 37821

Re: O'Neal Road Development

Dear Mr. Moore:

Your telefax of November 28, 2001 has been referred to me for a response on behalf of Whistle Stop, Inc. and Condor Investments of PBC, Inc. ("Condor") to the specific questions raised by Terry Bobrowski in his November 27, 2001 memorandum. Also enclosed is a revised letter of intent for your review.

Please note that in the event that Cocke County can secure access to O'Neal Road by completing construction of an interchange on I-40 by December 31, 2006, Whistle Stop, Inc. is prepared to develop a 103,000 square foot antique mall on a portion of the 180 acre site which Condor currently owns in Cocke County. To date, $800,000 has been spent to acquire the land. It is anticipated that site development will cost $500,000. Construction of the new buildings will cost approximately $5,000,000 and equipment and fixtures will cost an additional $500,000.

Provided that the interchange is completed by December 31, 2006 and that water and sewer have been brought to the site by that time, Condor and/or its affiliated entities are prepared to commence construction immediately. Construction of the project will take approximately fifteen (15) months. Based upon my client's experience with its Whistle Stop location in North Carolina, they estimate that approximately 30 new jobs will be created and that over three hundred (300) individuals will have an opportunity to make a living through booth rentals and the buying and selling of antiques.

If the first phase of the project is successful, the current site plan calls for a second phase of 60,000 of space to be devoted to the selling of antiques. The current plans also call for a recreational vehicle park and other facilities which would make the site a tourist destination.

When the initial phase of the project is fully leased, it is estimated that the project will generate 1,000 to 2,000 vehicle trips per day. Obviously, as additional development occurs the number of daily trips will increase.

I have been authorized by Condor to inform you that the 180 acres which it owns is free and clear of all debt and that the company owns real estate valued at in excess of $12,000,000, all of which is debt free. Condor is prepared to provide you with information to substantiate this statement.

If you require any additional information, please do not hesitate to contact me.

Sincerely,

Beth E. Linzner, Esq.

BETH E. LINZNER, P.A.
1001 West Cypress Creek Road - Suite 320
Fort Lauderdale, Florida 33309
Phone: (954)788-3400 Fax: (954)788-3500

February 14, 2002

Commissioner Bruce Saltsman
Department of Transportation
James K. Polk Bldg.
Seventh Floor
Nashville, TN 37423-0349

Re: O'Neal Road Development

Dear Commissioner Saltsman:

Pursuant to the request of James Vander Woude, attached is a copy of the letter of intent which was previously provided to Mr. Charles Lewis Moore of Cocke County. In addition to the enclosed material, Mr. Vander Woude has asked me to convey that both Bass Pro Shops and Cabelas, a Bass Pro Shops competitor, have expressed an interest in being located near the O'Neal Road interchange which would facilitate the development of the Whistle Stop Antiques Mall and related amenities. If you have any questions regarding the enclosed letter of intent, please do not hesitate to contact me.

Sincerely,

Beth E. Linzner, Esq.

/bel
enclosure

cc: James A. Vander Woude

JBS/Moore
1584 am

COCKE COUNTY EXECUTIVE
CHARLES LEWIS MOORE

Room #146 • Court House Annex • 360 East Main Street • Newport, Tennessee 37821
(423) 623-8791 • FAX (423) 623-8792

cc: Sen. Haun
Rep. Davis

February 15, 2002

STATE OF TENNESSEE
DEPT. OF TRANSPORTATION
RECEIVED
FEB 26 2002
CHIEF ENGINEER

Commissioner J. Bruce Saltsman, Sr.
State of Tennessee Department of Transportation
Suite 700, James K. Polk Building
Nashville, Tennessee 37243-0349

RE: O'Neil Road Development

Dear Commission Saltsman:

Pursuant to the conversation between you and Gordon Denton to construct an interchange at O'Neil Road in Cocke County between Exit 435 and Exit 440 on Interstate 40 to facilitate development.

Enclosed are letters from Ms. Beth E. Linzner, P.A. and map of Interstate 40 showing location of properties in proximity of O'Neil Road. Additional information will be provided in the future.

Please call if you have questions or need additional information.

Sincerely,

Charles Lewis Moore
County Executive

CLM:bc

cc: Senator Tommy Haun
Representative Ronnie Davis

Enclosures

STATE OF TENNESSEE
RECEIVED
FEB 20 2002
COMMISSIONER
DEPT. OF TRANSPORTATION

BETH E. LINZNER, P.A.
1001 West Cypress Creek Road - Suite 320
Fort Lauderdale, Florida 33309
Phone: (954)788-3400 Fax: (954)788-3500

February 21, 2002

Commissioner Bruce Saltsman
Department of Transportation
James K. Polk Bldg.
Seventh Floor
Nashville, TN 37423-0349

Re: O'Neal Road Development

Dear Commissioner Saltsman:

Pursuant to the request of James Vander Woude, attached is a copy of the letter of intent which was previously provided to Mr. Charles Lewis Moore of Cocke County. In addition to the enclosed material, Mr. Vander Woude has asked me to convey that both Bass Pro Shops and Cabelas, a Bass Pro Shops competitor, have expressed an interest in being located near the O'Neal Road interchange which would facilitate the development of the Whistle Stop Antiques Mall and related amenities. If you have any questions regarding the enclosed letter of intent, please do not hesitate to contact me.

Sincerely,

Beth E. Linzner, Esq.

/bel
enclosure

cc: James A. Vander Woude

LETTER OF INTENT

WHEREAS, Condor Investments of PBC, Inc., a Florida corporation, ("Condor") is the owner of the real property described on Exhibit "A" which is attached hereto and made a part hereof (the "Property");

WHEREAS, Condor and Whistle Stop Inc., a North Carolina corporation ("WSI") are affiliated entities. WSI intends to acquire from Condor approximately twenty (20) acres, a portion of the property described on Exhibit "A", for the purpose of constructing an antique mall of approximately 103,000 square feet ("Phase I") which would provide facilities on a rental basis to antique dealers for the retail sale of antiques and collectibles and other related retail uses;

WHEREAS, Cocke County, Tennessee (the "County") is desirous of Phase I being constructed on a portion of the Property and to provide economic relief in the form of jobs and other economic stimulus to its citizens;

WHEREAS, the County is desirous of providing water and sewer to the Property to facilitate the development of Phase I and other improvements and to assist Condor in arranging for the construction of an interchange from I-40 to O'Neal Road (the "Interchange"). Said interchange will provide access to the Property;

WHEREAS, provided that construction of the Interchange is completed and that sufficient water and sewer have been brought to the Property to accommodate the construction of Phase I no later than December 31, 2006, Condor and/or its affiliated entities would intend to commence construction of Phase I within three months of the completion of the Interchange and provision of adequate water and sewer with a target completion date of fifteen (15) months from the date of commencement of construction.

WHEREAS, Condor and/or WSI shall provide sufficient information to the County indicating its financial ability to complete Phase I;

WHEREAS, Condor and WSI will cooperate with the County by providing the County with sufficient information to apply for governmental financial assistance and grants; and

WHEREAS, Condor, WSI and the County shall enter into a formal agreement reciting the obligations of each of the parties hereto.

County of Cocke,
State of Tennessee

By:_____

Condor Investments of PBC, Inc., a Florida corporation

By:_____
James Vander Woude, Vice President

Whistle Stop, Inc., a North Carolina corporation

By:_____
James Vander Woude, President

Exhibit A – Legal Description

SITUATE in the EIGHTH (8th) Civil District of Cocke County, Tennessee, and BEING Tract Nos. Seventeen (17), Eighteen (18), Nineteen (19), Twenty (20), Twenty-One (21), Twenty-Two (22), Twenty-Three (23), Twenty-Four (24), Twenty-Five (25), Twenty-Six (26), Twenty-Seven (27), Twenty-Eight (28), Twenty-Nine (29), Thirty (30), Thirty-One (31), Thirty-Two (32), Thirty-Three (33), Thirty-Four (34), Thirty-Five (35), Thirty-Six (36), Thirty-Seven (37), Thirty-Eight (38), and Thirty-Nine (39) of the Jim Clift Farm and more particularly described as follows:

BEGINNING at a point in the center of O'Neil Road at the intersection of a 50 foot open right-of-way with O'Neil Road; thence leaving O'Neil Road and with the centerline of the open 50 foot right-of-way as same crosses the lands of Bullard, South 26 deg. 37 min. 00 sec. East 610.00 feet to a point; thence South 56 deg. 22 min. 00 sec. East 458.20 feet to a point; thence South 30 deg. 09 min. 00 sec. East 250.00 feet to a point; thence South 58 deg. 01 min. 00 sec. East 375.00 feet to a point in the center of the 50 foot right-of-way and corner to Bullard and being the TRUE POINT OF BEGINNING; thence continuing with the center of the 50 foot right-of-way and with the line of Bullard South 36 deg. 21 min. 00 sec. East 325.00 feet to an iron pin; thence South 53 deg. 02 min. 00 sec. East 165.00 feet to an iron pin; thence South 23 deg. 08 min. 00 sec. East 185.70 feet to an iron pin; thence South 62 deg. 06 min. 00 sec. East 197.78 feet to a point; thence leaving the center of the right-of-way South 62 deg. 06 min. 00 sec. East 127.22 feet to an iron pin; thence North 58 deg. 56 min. 00 sec. East 127.22 feet to a point; thence with the center of the 50 foot right-of-way North 58 deg. 56 min. 00 sec. East 477.97 feet to a point; thence leaving the center of the 50 foot right-of-way North 58 deg. 56 min. 00 sec. East 108.81 feet to an iron pin; thence South 38 deg. 59 min. 00 sec. East 108.81 feet to a point in the center of the 50 foot right-of-way; thence South 38 deg. 59 min. 00 sec. East 820.35 feet to a point; thence South 38 deg. 59 min. 00 sec. East 47.44 feet to an iron pin in the approximate margin of the 50 foot right-of-way; thence leaving the right-of-way and continuing with the line of Bullard South 28 deg. 21 min. 00 sec. East 662.00 feet to an iron pin on the bank of the Pigeon River; thence with the bank of the Pigeon River North 65 deg. 32 min. 27 sec. East 198.15 feet to a point; thence North 77 deg. 30 min. 25 sec. East 227.06 feet to a point; thence North 78 deg. 16 min. 17 sec. East 291.15 feet to a point; thence North 84 deg. 38 min. 20 sec. East 249.94 feet to a point; thence South 83 deg. 31 min. 57 sec. East 284.51 feet to an iron pin; thence leaving the bank of the Pigeon River and with the right-of-way of Interstate 40 North 14 deg. 56 min. 12 sec. East 125.84 feet to a concrete right-of-way monument; thence North 15 deg. 48 min. 56 sec. East 1249.36 feet to a concrete right-of-way monument; thence North 10 deg. 05 min. 00 sec. East 489.93 feet to a concrete right-of-way monument; thence North 27 deg. 52 min. 45 sec. East 67.81 feet to a point in the center of the 50 foot right-of-way; thence with the margin of a 75 foot right-of-way North 27 deg. 52 min. 45 sec. East 399.76 feet to a concrete right-of-way monument; thence North 72 deg. 30 min. 00 sec. West 169.65 feet to a concrete right-of-way monument and corner to Bush Brothers Co.; thence with the line of Bush Brothers Co. North 72 deg. 37 min. 55 sec. West 94.19 feet to a fence corner post; thence North 73 deg. 47 min. 21 sec. West 402.48 feet to a metal post at pond; thence North 73 deg. 48 min. 06 sec. West 386.09 feet to a metal post at pond; thence North 73 deg. 55 min. 22 sec. West 340.91 feet to a metal post; thence North 73 deg. 57 min. 49 sec. West 711.12 feet to an iron pin; thence North 73 deg. 57 min. 17 sec. West 375.44 feet to a metal post; thence North 74 deg. 22 min. 48 sec. West 374.09 feet to a metal post; thence North 74 deg. 22 min. 32 sec. West 462.07 feet to an iron pin in the line of Bush Brothers Co. and corner to Bullard; thence leaving the line of Bush Brothers Co. and with the line of Bullard South 16 deg. 11 min. 00 sec. West 953.50 feet to an iron pin; thence South 41 deg. 51 min. 00 sec. West 1003.00 feet to the point of beginning, containing 180.735 acres, more or less, according to survey of Joseph M. Bible, RLS No. 168, Bible Surveys, 115 North Mims Avenue, Newport, Tennessee 37821, dated May 14, 2001.

THERE IS ALSO CONVEYED a joint permanent non-exclusive 50 foot open right-of-way easement, for the purposes of ingress and egress, to be used in common with others, and being more particularly described as follows:

BEGINNING at a point in the center of O'Neil Road and at the intersection of a 50 foot open right-of-way with O'Neil Road; thence leaving O'Neil Road and with the centerline of the open 50 foot right-of-way as same crosses the lands of Bullard, South 26 deg. 37 min. 00 sec. East 610.00 feet to a point; thence South 56 deg. 22 min. 00 sec. East 458.20 feet to a point; thence South 30 deg. 09 min. 00 sec. East 250.00 feet to a point; thence South 58 deg. 01 min. 00 sec. East 375.00 feet to a point in the center of the 50 foot right-of-way and corner to Bullard and being the TRUE POINT OF BEGINNING; thence continuing with the center of the 50 foot right-of-way and with the line of Bullard South 36 deg. 21 min. 00 sec. East 325.00 feet to an iron pin; thence South 53 deg. 02 min. 00 sec. East 165.00 feet to an iron pin; thence South 23 deg. 08 min. 00 sec. East 185.70 feet to an iron pin; thence South 62 deg. 06 min. 00 sec. East 197.78 feet to a point; thence leaving the center of the right-of-way South 62 deg. 06 min. 00 sec. East 127.22 feet to an iron pin; thence North 58 deg. 56 min. 00 sec. East 127.22 feet to a point; thence with the center of the 50 foot right-of-way North 58 deg. 56 min. 00 sec. East 477.97 feet to a point; thence leaving the center of the 50 foot right-of-way North 58 deg. 56 min. 00 sec. East 108.81 feet to an iron pin; thence South 38 deg. 59 min. 00 sec. East 108.81 feet to a point in the center of the 50 foot right-of-way; thence South 38 deg. 59 min. 00 sec. East 820.35 feet to a point; thence South 38 deg. 59 min. 00 sec. East 47.44 feet to an iron pin in the approximate margin of the 50 foot right-of-way.

This conveyance is made subject to the terms and conditions of the Settlement Agreement dated October 13, 2000, executed by and between David K. Burchette and Steven F. Smith and Betty Ann Bewley and Bush Brothers Company, of record in said Register's Office in Record Book 1048, page 282.

THIS CONVEYANCE IS MADE SUBJECT TO that portion of the 50 foot open right-of-way which crosses the above described premises, the centerline of which is described as follows: BEGINNING at an iron pin a corner to Bullard and in the line of the above described tract, South 36 deg. 21 min. 00 sec. East 325.00 feet to an iron pin; thence South 53 deg. 02 min. 00 sec. East 165.00 feet to an iron pin; thence South 23 deg. 08 min. 00 sec. East 185.70 feet to an iron pin; thence South 62 deg. 06 min. 00 sec. East 197.78 feet to a point; thence with a curve to the left arc=231.58 feet, radius=225.01 feet to a point; thence North 58 deg. 56 min. 00 sec. East 477.97 feet to a point; thence with a curve to the right arc=179.06 feet, radius=124.99 feet to a point; thence South 38 deg. 59 min. 00 sec. East 820.35 feet to a point; thence with a curve to the left, leaving the line of Bullard and traversing through the above described tract, arc=75.86 feet, radius=49.89 feet to a point; thence North 53 deg. 54 min. 00 sec. East 182.56 feet to a point; thence North 88 deg. 48 min. 00 sec. East 200.00 feet to a point; thence North 72 deg. 19 min. 00 sec. East 400.00 feet to a point; thence North 44 deg. 54 min. 00 sec. East 689.00 feet to a point; thence North 26 deg. 05 min. 00 sec. East 216.42 feet to a point; thence with a curve to the left arc=123.12 feet, radius=200.03 feet to a point; thence North 09 deg. 11 min. 00 sec. West 103.52 feet to a point; thence with a curve to the right arc=133.98 feet, radius=119.64 feet to a point; thence North 54 deg. 59 min. 00 sec. East 294.00 feet to a point; thence with a curve to the right arc=139.64 feet, radius=200.02 feet to a point; thence South 85 deg. 01 min. 00 sec. East 252.34 feet to a point.

THIS CONVEYANCE IS MADE SUBJECT TO the rights of others in and to a 75 foot right-of-way crossing the eastern margin of the above described premises, the northeastern margin of which is described as follows: BEGINNING at a point in the center of the 50 foot open right-of-way said point being located South 27 deg. 52 min. 45 sec. West 67.81 feet from a concrete right-of-way monument; thence North 27 deg. 52 min. 45 sec. East 399.76 feet to a concrete right-of-way monument.

COPY

TOMMY HAUN
SENATOR
1ST SENATORIAL DISTRICT
COCKE, GREENE, HAMBLEN
AND UNICOI COUNTIES

1137 TUSCULUM BLVD.
GREENEVILLE, TENNESSEE 37745
PHONE: OFFICE (423) 639-4286
FAX (423) 639-3373

Senate Chamber
State of Tennessee

NASHVILLE

CHAIRMAN
TRANSPORTATION
MEMBER OF COMMITTEES:
STATE AND LOCAL GOVERNMENT
FISCAL REVIEW

NASHVILLE OFFICE
SUITE 307, WAR MEMORIAL BUILDING
NASHVILLE, TENNESSEE 37243-0201
(615)741-3851
FAX (615) 741-7200

March 15, 2002

The Honorable Bruce Saltsman
Commissioner
Department of Transportation
Suite 700, James K. Polk Building
Nashville, Tennessee 37243-0349

Dear Commissioner Saltsman:

We would like to request that the Tennessee Department of Transportation conduct an "Interchange Justification Study" in Cocke County at the O'Neil Road overpass on I-40 at the 438.9 mile marker.

We would appreciate it if you could let us know when this study could be done, with a copy of the report sent to us as soon as possible.

Sincerely,

Tommy Haun

Senator Tommy Haun

Ronnie Davis

Representative Ronnie Davis

TH/jy

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
SUITE 700, JAMES K. POLK BUILDING
NASHVILLE, TENNESSEE 37243-0349

J. BRUCE SALTSMAN, SR.
COMMISSIONER

DON SUNDQUIST
GOVERNOR

March 21, 2002

The Honorable Tommy Haun
State Senator
307 War Memorial Building
Nashville, TN 37243-0201

The Honorable Ronnie Davis
State Representative
215 War Memorial Building
Nashville, TN 37243-0111

Gentlemen:

I am in receipt of your letter of March 15, 2002 requesting TDOT to conduct an interchange justification study on I-40 in Cocke County at the O'Neil Road overpass.

Please be advised that I have directed our Planning Division to conduct the subject study utilizing TDOT funds. A study of this type normally requires approximately six months to complete and must be approved by the Federal Highway Administration

Please advise if I may be of additional assistance.

Sincerely,

J. Bruce Saltsman, Sr.
Commissioner

JBS:WLM:mg

Cc: Mr. Ralph Comer

NATIONAL BANK OF TENNESSEE
262 E. BROADWAY • NEWPORT, TENNESSEE 37821

June 6, 2002

Mr. James VanderWoude
1281 Georgia Road
Franklin, North Carolina 28734

I want to express our appreciation and excitement about your interest in Cocke County. The property that you have already purchased represents a real dedication to our county and the other property optioned or proposed is a tremendous commitment. The approximately 1000 acres will not only add to our real estate tax base but will have an economic impact of great proportion to our job market. The thousands of jobs that would be produced will help our unemployment, which consistently runs high, for local jobs and will enable many of our citizens to work close to where they live, unlike the situation is today. The economic impact will extend to the infrastructure of that area of our county. This large section and several miles around it have no sewer service, natural gas service, and has inadequate water service. The development that you represent will allow these services to people that may not have such service available to them in their lifetime.

The economic impact will extend to all of Cocke County, including the small and large operations in Newport and the other communities. The positive effect will extend into several counties as well and the multiple affect will help all of our community efforts. Your operation will allow Cocke County to improve the facilities for our officials, law enforcement, and roads. However, one of the major benefits to Cocke County will be to our educational system. Our financially strained school system is in much need of funding for teachers and facility improvements. The tax dollars generated, from both real estate taxes and sales taxes, will enable the school system to accomplish many of these needs.

We know that a new interstate interchange at mile marker 438.9 is a necessity for this project to succeed. National Bank of Tennessee and I, personally, will assist you in any way that we can to obtain the interchange. The economic impact for the state will, in my opinion, be tremendous. The tax dollars generated for the state will be well in excess of any money spent on this exit. Further development from the interchange will only add to the sales taxes collected as well as the hotel motel tax collected. This interchange will become one of the most active and sought after locations in East Tennessee.

Financial organizations will benefit as well from the increased volume of deposits and loans. We, at National Bank of Tennessee, extend our welcome to you and your associates and are ready to help you in anyway that we can do so. Again, thank you for your confidence and commitment to Cocke County.

Sincerely,

Keith A. Ketterman
President

KAK/md

Cocke County Property Assessor's Office

111 Court Avenue
Room 112
Newport, Tennessee 37821
Cocke

Phone (423) 623-7024

June 7, 2002

To Whom It May Concern:

Subject: I40 Exit Ramp
Mile Marker 438.9 Cocke County

This exit ramp would benefit Cocke County economically in so many ways. It would create a greater tax base for the county if this property could be accessed directly from the Interstate. Changing this land from farm, to commercial would increase the tax base ten fold. The subject property is excellent for recreational development. Developing this property in Cocke County; The Gateway To The Smokies, would create much needed jobs for the citizens of Cocke County, bringing in more sales tax for the county and the state.

The property is an excellent site for a RV Park by the river. The property would also be excellent for a proposed elaborate antique mall, and many more business ventures. The property is close to camping of all sorts (from back woods to more modern), rafting, hiking, horseback riding, fishing, and many more activities. All this can be done while maintaining the beautiful scenery from the Interstate.

The promotion of tourism to our beautiful county will increase revenue to our hotels, motels, and restaurants. Thus bringing in more tax dollars to the county and state. This venture has a great potential to create more jobs for the county than any previously proposed motion ever has.

We must look to the future, while preserving a rich heritage. The future is the children and young adults of our county. We need to give them the opportunity to stay where they were raised if they so choose, not to have to leave the county to find work. For this we appeal to you for the future of our children and young adults of this idyllic county and the great State of Tennessee. Please consider this worthy proposal.

Respectfully,

Delmar Williamson

Delmar Williamson
Assessor of Property

Meeting Notes

Project / Location: I-40, Cocke County, Proposed Interchange

Meeting Location: Cocke County Executive's Office

Date / Time: June10, 2002

Purpose Coordination with Local Officials

Attendees: Charles Lewis Moore, County Executive
Dean Williams, Economic Development Commission
Dan Lindsey, Newport Utilities
Gordon Denton, APAC TN
Charles Rathbone, Mason Realty
Jim Vander Woude, Condor Investments/Whistle Stop
Scott Vander Woude, Whistle Stop
Chris Vander Woude, Whistle Stop
Ken Stonebraker, Whistle Stop
Bill Wallace, PBS&J

Discussion / Comment:

A meeting was held on June 10, 2002 in Newport to coordinate the Interchange Justification Study process with local officials.

Mr. Moore stated that the project was the highest priority for Cocke County. He mentioned Cocke County's high unemployment rate and the need for economic development in the county. He also presented letters of support for the project from the National Bank of Newport and the County Tax Assessor's office. He also said other organizations and civic groups would be preparing letters of support.

Two International Plaza, Suite 810 • Nashville, TN 37217 • 615-399-0298 Fax 399-0263

Mr. Jim Vander Woude (developer) outlined their vision for development of the area around the proposed interchange. They have already acquired over 100 acres and have options on some 380 +/- additional acreage. Mr. Ken Stonebraker will put together additional information on development plans and submit them to PBS&J to assist in preparing traffic assignments. Mr. Dan Lindsey stated that Newport Utilities were committed to providing utilities to the site.

Bill Wallace reviewed the Interchange Justification Study process and requirements of FHWA for new interstate access points. He mentioned that an adequate connector road to link the proposed interchange with the local road system would be a requirement for interchange approval. The proposed connector would need to be planned along with the interchange study.

The schedule fro the study is to have a “draft” report for TDOT review by August, a submission to FHWA by October, and interchange approval by December.

NEWPORT/COCKE COUNTY
TENNESSEE
Chamber of Commerce
433-B Prospect Avenue • Newport, Tennessee 37821 • (423) 623-7201

To Whom It May Concern
Today is Thursday, June 13th, 2002

Good Day,

We share the excitement of Cocke County regarding the commercial development efforts of Mr. VanderWoude along Interstate 40. This Chamber of Commerce sees this as a positive step forward in developing image and pride for the County.

And we share the comments of Mr. Ketterman and Mr. Williamson in their letters regarding the potential for on going development projects such as this one. It will take a partnership of all of us to make a success out of this···the City of Newport, Cocke County, the State of Tennessee and all of the other entities which should be a part of it's construction, it's marketing and it's growth. We know that you will find that handshake within this community. Certainly within this Chamber of Commerce.

Please allow us to do whatever we can to make the effort as smooth as we can and please call upon this Chamber of Commerce for whatever assistance we may provide. We believe strongly in the potential commercial growth of this County and that, together, we may build a bright future for us all.

Cordially

Tom Rosberg
Executive Director

L.C.Gregg, President, Cocke County Bank
President, Camber of Commerce Board of Directors

Cocke County Board of Equalization
111 Court Avenue
Newport, Tennessee 37821

To Whom It May Concern:

Subject: I40 Exit Ramp
Mile Marker 438.9 Cocke County

We, the Board, would like to petition the State to locate an exit ramp in Cocke County at the Mile Marker 438.9 on Interstate 40. The exit ramp would profit this county in a lot of ways. If the subject property could be accessed from the Interstate, changing if from farm land to commercial, would bring in a greater tax base for our county. Cocke County being the gateway to the Smokies, would create so many new jobs for our people. Developing this property for recreational purposes would bring in more sales tax for the county and the state.

The property has river access and is close to a lot of recreational activities, such as rafting, camping, hiking, fishing, horseback riding and many more activities. This project would also create more revenue to our hotels, motels and restaurants.

Please take into consideration this proposal because we feel that it would benefit the citizens of our county and the Great State of Tennessee in so many ways.

Sincerely,

Cocke County Board of Equalization

Gray Sparks
Gray Sparks, Chairman

Beth Freeman
Beth Freeman, Secretary

George Ailshie
George Ailshie, Member

Charles E. Kickliter
Charles Kickliter, Member

James Valentine
James Valentine, Member

WHISTLE STOP MALL
1281 Georgia Road • Franklin, NC 28734
(828) 349-1600 • Fax (828) 369-0981

Date: 6/27/02
To: William C. Wallace
From: Chris VanderWoude
Subject: Right of Ways

William,

In an earlier meeting we've discussed the proposed interchange that you are now doing a study on. In discussing where the interchange would feed you mentioned the possibility of upgrading O'Neil Road to a four-lane road from the proposed interchange to 321. I'm writing this letter to let you know that we are willing to give the DOT the land necessary for the interchange and the increased right of way for O'Neil road where they are on land that we own. We currently own most of the land that will be required for the interchange. We are currently in discussions with the owners of the property that most O'Neil road passes through, but at this point we have not acquired the property. If we are able to purchase that land we will be willing to donate the necessary land for the increased size of the road. As I've discussed with others we feel that the increased size of O'Neil road will be beneficial in many ways. Most importantly it will able to serve as a great relief for traffic in the event that Interstate 40 becomes backed up or impassable due to a land slide or some other accident, as it has in the past. Please pass this on to the appropriate person(s).

Sincerely,

Chris VanderWoude

Meeting Notes

Project / Location: Proposed Interchange at O'Neil Road and I-40
Cocke County, TN

Meeting Location: TDOT 9th Floor Conference Room

Date / Time: July 18, 2002 at 10:00 AM

Purpose Coordination with TDOT

Attendees:
C. L. Tilley, TDOT Functional Design
Matt Ashby, TDOT Planning
Debbi Howard, TDOT Traffic Planning
Steve Allen, TDOT Traffic Planning
Leigh Ann Tribble, FHWA
Bill Wallace, PBS&J
Brian Reynolds, PBS&J

Discussion / Comment:

A meeting was held on July 18, 2002 to coordinate the Interchange Justification Study process with TDOT. The purpose of the meeting was to review the project location, information obtained from local officials, traffic generation and assignments, connector road requirements and the study schedule.

Bill Wallace began the meeting by providing background information regarding how this project originated. TDOT Commissioner Saltsman directed the Planning Division to conduct an Interchange Justification Study (IJS) utilizing TDOT funds at the O'Neil Road overpass along I-40 in Cocke County, TN. The IJS is conducted at the request of Cocke County Executive Charles Moore, State Senator Tommy Haun and State Representative Ronnie Davis.

Two International Plaza, Suite 810 • Nashville, TN 37217 • 615-399-0298 Fax 399-0263

An overview of the study area was given aided by aerial photographs and a USGS Quadrangle Map of Newport, TN. The study area was defined as the I-40 corridor between Exit 435 and Exit 440. The proposed interchange is located near the existing O'Neil Road. Apparently, a previous study has been completed for this area during the mid-70s, however the study is invalid due to the date. The intended land use for the study area as proposed by James Vanderwoude was reviewed. Approximately 1,000+ acres are available for potential development. A copy of the preliminary site plan was given to Steve Allen for use in trip generation and traffic projections.

According to a field review conducted by Bill Wallace, O'Neil Road is a narrow 14' to 16' gravel road. O'Neil Road would need to be realigned as a connector between the proposed I-40 interchange and U.S. Hwy 321. Leigh Ann Tribble stressed that the county/developer need to realign O'Neil Road to provide a connection between both U.S. Hwy 321 and S.R. 73. She believes approval of the proposed interchange is contingent upon this connection. Without the proposed development, there does not seem to be traffic demand for an interchange. Steve Allen will provide traffic counts for I-40 at Exit 435 and Exit 440.

The IJS should show the O'Neil Road connection between U.S. Hwy 321 and S.R. 73. Functional plans of the proposed O'Neil Road interchange will be included. The spacing between the proposed interchange and Exit 440 may require an auxiliary lane. Once the IJS is approved, an APR can be completed with functional plans for the connector Road. The APR should include at least two alternative alignments for the connector road and will address environmental concerns.

The schedule for the study is to have a "draft" report for TDOT to review by late August, a submission to FHWA by October, and interchange approval by December.

Meeting Notes

Project / Location: I-40/O'Neil Road IJS, Cocke County, Tennessee

Meeting Location: TDOT

Date / Time: March 12, 2003

Purpose Project Review Meeting with FHWA

Attendees:
Jerry Moorhead, TDOT
Steve Allen, TDOT
Bill Hart, TDOT
Matt Ashby, TDOT
Ron Baker, TDOT
Mark Doctor, FHWA
Gerald Bolden, PBS&J
Bill Wallace, PBS&J
Sarah Bowling, PBS&J

Discussion / Comment:

The meeting began with a brief overview of the project and the status of the draft IJS document review. Mark Doctor, FHWA, identified some issues that need to be reviewed and addressed. These issues include:

1. Degradation of the level-of-service on I-40
2. Lengths of acceleration/deceleration lanes for the ramps;
3. Location of control-of-access fence on the east side of the interchange;
4. The number of lanes on the structure over I-40; and
5. Responsibility for construction and time frame of the connector road between the interchange and SR 32.

Item 1 is a direct result of the added traffic volume to the network by the proposed development and the projected annual traffic growth. To address this issue, Steve Allen agreed to rework the projected traffic data and use a phased approach with a percentage of the proposed development completed by 2007 and the entire development completed by the 2027 design year. PBS&J will

coordinate with Steve Allen on the initial phase of the proposed development. When the traffic data is revised, PBS&J will analyze the network traffic operations, determine potential service life of failing facilities and revise the study accordingly. Also, during this process, items 2 – 4 will be reviewed and addressed by PBS&J.

Mark Doctor indicated that the proposed connector road (O'Neil Road) between I-40 and SR 32 would not be a condition for initial interchange approval. It will be constructed as required by future development, as will the tie in to SR 73. The connector road will be a local responsibility or joint TDOT/local responsibility.

When all of the issues have been addressed and the study has been revised per the discussions of this meeting, PBS&J will submit a revised draft copy to TDOT for review.