Appendix F – Existing and 2045 No-Build Conditions Traffic Operations Technical Memorandum

Technical Memo

Date:	Tuesday, May 7, 2019
Project:	Southern Meade County Corridor Study
To:	Study Advisory Team
From:	HDR
Subject:	Existing and Future No-Build Conditions Traffic Operations

Introduction

This memorandum presents results from a traffic operations analysis of the Southern Meade Corridor Study area for the following analysis periods:

- Existing Conditions (Year 2019)
- 2045 Planning Horizon No-Build Conditions (2045 No-Build Conditions)

The purpose of this memorandum is to identify traffic operational needs at primary intersections and along highway segments throughout the traffic analysis study area, which is bound by the following:

- Elk Creek Road (north boundary)
- 143rd Avenue (east)
- Meade County line (south)
- Erickson Ranch Road (west)

Elk Vale Road was not part of the original study area, but was included in the traffic forecasts because of its regional importance to connectivity along the eastern edge of the study area. Elk Vale Road provides a direct north/south connection to I-90 (Exit 61) and US16 Bypass.

In addition to intersection traffic operations analyses of existing and future-year conditions, a two-lane highway operations analysis and planning-level roadway capacity analysis were also conducted to evaluate peak hour and daily highway segment operations.

This analysis also serves as a baseline for the development and evaluation of proposed concepts for a new east/west corridor between Erickson Ranch Road and 143rd Avenue that will be carried into conceptual design.

Traffic Data

Traffic data used to develop the 2019 Existing Conditions and 2045 No-Build Conditions volume sets is summarized as follows:

Peak hour (morning and afternoon/evening) intersection turning movement counts:

- Collected by consultant team on Tuesday, February 19, 2019

24-hour roadway segment counts:

- Collected by consultant team on Tuesday, February 19, 2019

Traffic forecasts were based on output from the Rapid City Metropolitan Planning Organization (MPO) travel demand model. The following model versions were used:

- 2013 – base year
- 2040 – planning horizon

Heavy vehicle percentages and peak hour factors (PHF) used in the analysis were obtained from the peak hour intersection turning movement counts.

Traffic Volume Development

Daily segment volumes and AM and PM peak hour intersection volumes were developed for both the 2019 Existing Condition and 2045 Planning Horizon No-Build Conditions scenarios.

The 2019 Existing Conditions volume set was developed for the study area using the 2019 segment and peak hour counts, factored to a design season (August) to account for seasonal fluctuations. Intersection turning movement volumes were smoothed across the corridor.

Traffic forecasts for 2045 were prepared using the most current version of the Rapid City MPO travel demand model (year 2040). Methodology used in the development of segment and intersection peak hour forecasts was consistent with NCHRP 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design.

Analysis traffic volumes for the 2019 Existing Conditions and 2045 No-Build Conditions are summarized provided in **Figures 1 and 2**. The *Traffic Forecasts* technical memorandum presents more details regarding the development of existing conditions and future-year peak hour traffic volumes.

N

0 0.5 1
MILES

Empire Pl.
Ricard Rd.
Elk Creek Rd.
142nd Ave.
144th Ave.
139th Pl.
Elk Vale Rd.
Summerset
Piedmont
Meadow Retreat Dr.
Drolc Ln.
Forest Pl.
Peterson Rd.
Lofty Pines Rd.
143rd Ave.
N. Haines Ave.
Horseshoe Rd.
Erickson Ranch Rd.
Virgina Ln.
Bison Point Rd.
Norman Ave.
Peaceful Pines Rd.
Marvel Mountain Rd.
Dyess Ave.
224th St.
Deadwood Ave.
W. Nike Rd.
Interstate 90
Blackhawk
Rapid City

1,000
1,050
150
275
1,300
2,350
75

(5) (<5) (5)
5 5 <5
(5) <5 <5 (5)
(40) 35 50 (45)
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(60) (15) (5)

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(40) 10 15 (80)
(10) 30 5 (20)

(60)
225
25
(205)

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(<5) <5 5 (5)
(5) 5 <5 (10)

LEGEND
Study Area
County Line
Existing Roads
City Limits
Blackhawk
Piedmont
Rapid City
Summerset

TRAFFIC LEGEND
20 (40) AM (PM) Traffic Volumes
1,900 Daily Traffic Volumes
All volumes reflect a peak season (August).

PATH: Z:\PROJECTS\10151063 - MEADE CTY CORRIDOR STUDY\GIS\SHORT\TRAFFIC FIGURES BASE.MXD - USER: SSLOWEY - DATE: 4/22/2019

HDR

2019 EXISTING CONDITIONS TRAFFIC VOLUMES PEAK SEASON

SOUTHERN MEADE COUNTY CORRIDOR STUDY

DATE
5/6/2019

FIGURE
1

N

0 0.5 1
MILES

Empire Pl.
Ricard Rd.
Elk Creek Rd.
142nd Ave.
144th Ave.
139th Pl.
Elk Vale Rd.
Horseshoe Rd.
Summerset
Piedmont
Meadow Retreat Dr.
Drolc Ln.
Forest Pl.
Peterson Rd.
Lofty Pines Rd.
143rd Ave.
N. Haines Ave.
Erickson Ranch Rd.
Virgina Ln.
Bison Point Rd.
Dyess Ave.
224th St.
Norman Ave.
Peaceful Pines Rd.
Marvel Mountain Rd.
Interstate 90
Deadwood Ave.
W. Nike Rd.
Blackhawk
Rapid City

1,000
1,500
300
1,600
650
1,900
250
4,800

(10) (5) (10)
15 10 5
(10) 5 5 (10)
(90) 75 130 (110)
(55) 80 25 (20)
70 10 15
(50) (10) (30)

(5) (10) (5)
10 35 5
(10) 10 5 (5)
(30) 15 25 (20)
(45) 90 25 (10)
45 10 10
(100) (25) (20)

(5) (5) (5)
5 5 5
(5) 5 5 (5)
(45) 15 45 (25)
(5) 10 5 (5)
5 5 5
(5) (5) (5)

(10) (10) (5)
10 20 5
(10) 5 5 (5)
(25) 5 30 (10)
(20) 15 20 (5)
15 10 5
(15) (15) (20)

(35)
55
30
(50)

(35) (30)
75 165
(60) 25 55 (115)
(20) 40 20 (40)

(125)
430
60
(400)

(5) (5)
5 20
(5) 5 10 (10)
(10) 10 10 (20)

LEGEND
- Study Area
- County Line
- Existing Roads

City Limits
- Blackhawk
- Piedmont
- Rapid City
- Summerset

TRAFFIC LEGEND

20 (40) AM (PM) Traffic Volumes

1,900 Daily Traffic Volumes

All volumes reflect a peak season (August).

PATH: Z:\PROJECTS\10151063 - MEADE CTY CORRIDOR STUDY\GIS\SHORT\TRAFFIC FIGURES BASE.MXD - USER: SSLOWEY - DATE: 4/22/2019

HDR

2045 NO-BUILD CONDITIONS TRAFFIC VOLUMES PEAK SEASON

SOUTHERN MEADE COUNTY CORRIDOR STUDY

DATE
5/6/2019

FIGURE
2

Traffic Operations Analysis Methodology

Intersection peak hour level of service (LOS) was calculated using 6th Edition of the Highway Capacity Manual (HCM6) analysis methodology replicated in Highway Capacity Software version 7.6 (HCS7). HCM6 analysis methods measure average control delay in terms of seconds of delay per vehicle (sec/veh) at intersections and percent time-spent following (PTSF) on two-lane highways. LOS values can be applied to these measures in accordance with thresholds presented in **Table 1**.

Table 1: Level of Service Thresholds

LOS	Intersection Delay per Vehicle (sec/veh)		Two-Lane Highways PTSF
	Signalized Intersections	**Two-Way Stop-Control*, All-Way Stop-Control, and Roundabouts**	**Percent Time-Spent Following (PTSF) Class II Highway**
A	≤ 10	≤ 10	≤ 40
B	> 10 – 20	> 10 – 15	> 40 – 55
C	> 20 - 35	> 15 - 25	> 55 – 70
D	> 35 – 55	> 25 – 35	> 70 – 85
E	> 55 – 80	> 35 – 50	> 85
F	Demand exceeds capacity; > 80	Demand exceeds capacity; > 50	Demand exceeds capacity

Source: Transportation Research Board, HCM6.
* Two-way stop-control LOS reflects worst-case stop-controlled approach.

HCS7 modules used for this analysis include:

- Two-Way Stop-Controlled (TWSC) Intersections – HCS7 TWSC Module
- All-Way Stop-Controlled (AWSC) Intersections – HCS7 AWSC Module
- Two-Lane Highway Segments – HCS7 Two-Lane Module

Current HCM6 methodology does not directly analyze yield-control intersections. For this study, all yield-control approaches will be analyzed as stop-control.

Level of Service Goals for Study

The following minimum allowable LOS thresholds have been established for this study:

- Signalized intersections minimum allowable LOS – LOS B
- Two-way stop-controlled intersections LOS – LOS B (worst-case stop-controlled approach)
- Two-lane highways
    - Rural collector LOS – LOS C
    - Rural minor arterial LOS – LOS B

These LOS thresholds will be used to identify areas of operational needs along the corridor. In future Build Conditions operational analysis memoranda, these thresholds will be used to guide the development of potential improvements and subsequent evaluation of concepts.

This memorandum focuses on the traffic operations at the following existing study area intersections:

- Elk Creek Road & Erickson Ranch Road
- Elk Creek Road & Haines Avenue
- Elk Creek Road & 143rd Avenue
- Peaceful Pines Road/Deadwood Avenue & Erickson Ranch Road
- 224th Street & 143rd Avenue

Intersection Traffic Operations Analysis

The Existing Conditions traffic operations analysis reflects a scenario that analyzes the current network, using recently collected traffic counts (2019) and existing roadway conditions such as number of lanes, intersection traffic control, speed limits, signal timings, etc.

The 2019 Existing Conditions intersection operations are summarized in the **Table 2**. HCS7 analysis reports are provided in **Appendix A**.

Table 2: Study Area Intersections – Existing Conditions

Study Intersection	Intersection Control Type	AM Peak Period		PM Peak Period	
		Avg. Delay (sec/veh)	LOS	Avg. Delay (sec/veh)	LOS
Elk Creek Road & Erickson Ranch Road	TWSC* *N/S approaches*	10.2	B	9.6	B
Elk Creek Road & Haines Avenue	AWSC	7.2	A	7.6	A
Elk Creek Road & 143rd Avenue	TWSC* *S approach*	8.9	A	8.9	A
Peaceful Pines Road/ Deadwood Avenue & Erickson Ranch Road	TWSC* *N approach*	9.8	A	9.3	A
224th Street & 143rd Avenue	TWSC* *N approach*	8.6	A	8.7	A

* Two-way stop-control LOS reflects worst-case stop-controlled approach.

The purpose of the 2045 No-Build Conditions analysis is to identify future-year needs and help guide the subsequent development of potential improvements within the study area. Operational results are summarized in **Table 3** and the HCS7 analysis reports are provided in **Appendix B**.

Table 3: Study Area Intersections – 2045 No-Build Conditions

Study Intersection	Intersection Control Type	AM Peak Period		PM Peak Period	
		Avg. Delay (sec/veh)	LOS	Avg. Delay (sec/veh)	LOS
Elk Creek Road & Erickson Ranch Road	TWSC* *N/S approaches*	13.2	B	12.0	B
Elk Creek Road & Haines Avenue	AWSC	7.9	A	8.3	A
Elk Creek Road & 143rd Avenue	TWSC* *S approach*	9.5	A	9.5	A
Peaceful Pines Road/ Deadwood Avenue & Erickson Ranch Road	TWSC* *N approach*	11.1	A	9.7	A
224th Street & 143rd Avenue	TWSC* *N approach*	8.8	A	8.7	A

* Two-way stop-control LOS reflects worst-case stop-controlled approach.

Two-Lane Highway Traffic Operations Analysis

Two-lane highway segments were analyzed using Existing Conditions and 2045 No-Build Conditions traffic volumes for the following paved highway segments:

- Erickson Ranch Road
- Haines Avenue – north of Virginia Lane
- Haines Avenue – south of Virginia Lane
- Elk Creek Road

Similar to the intersection analyses, the existing conditions analysis reflects roadway geometrics and conditions that present in 2019. The 2045 No-Build Conditions assumes the same roadway conditions, but updates traffic volumes with the future-year forecasts. HCM6 methodology does not currently support analysis of gravel roadway segments, and thus existing gravel roadways were not analyzed as part of this review.

Two-lane highway operational analyses for the 2019 Existing Conditions and 2045 No-Build Conditions are summarized in **Tables 4 and 5**, respectively. It was found that all analyzed segments were resulted in a LOS C or better, which meet rural collector LOS goals for this study. Segments with the greatest percentage of time a vehicle spends following another vehicle are located towards the southern study area boundary and exhibit higher commuter volumes to/from Rapid City.

Table 4: Two-Lane Highway Segments – Existing Conditions

Study Two-Lane Highway Segment	Functional Classification	Peak Hour	Peak Direction of Travel	AM Peak Period		PM Peak Period	
				PTSF[1] (%)	LOS	PTSF[1] (%)	LOS
Erickson Ranch Rd *Elk Creek Rd – Westridge Rd*	Rural Collector	AM	SB	38.7	A		
		PM	NB			30.3	A
Erickson Ranch Rd *Westridge Rd – Peaceful Pines Rd*	Rural Collector	AM	SB	60.4	C		
		PM	NB			52.9	B
Haines Avenue *Elk Creek Rd – Virginia Ln*	Rural Collector	AM	SB	36.4	A		
		PM	NB			32.1	A
Haines Avenue *Virginia Ln – Pennington County*	Rural Collector	AM	SB	51.2	B		
		PM	NB			53.0	B
Elk Creek Road *Erickson Ranch Rd – Haines Ave*	Rural Collector	AM	EB	22.1	A		
		PM	WB			22.0	A

[1] PTSF reflects analysis in the peak direction

Table 5: Two-Lane Highway Segments – 2045 No-Build Conditions

Study Two-Lane Highway Segment	Functional Classification	Peak Hour	Peak Direction of Travel	AM Peak Period		PM Peak Period	
				PTSF[1] (%)	LOS	PTSF[1] (%)	LOS
Erickson Ranch Rd *Elk Creek Rd – Westridge Rd*	Rural Collector	AM	SB	45.0	B		
		PM	NB			38.9	A
Erickson Ranch Rd *Westridge Rd – Peaceful Pines Rd*	Rural Collector	AM	SB	65.1	C		
		PM	NB			58.4	C
Haines Avenue *Elk Creek Rd – Virginia Ln*	Rural Collector	AM	SB	47.1	B		
		PM	NB			42.6	B
Haines Avenue *Virginia Ln – Pennington County*	Rural Collector	AM	SB	65.0	C		
		PM	NB			64.5	C
Elk Creek Road *Erickson Ranch Rd – Haines Ave*	Rural Collector	AM	EB	31.5	A		
		PM	WB			28.8	A

[1] PTSF reflects analysis in the peak direction

Roadway Segment Capacity Assessment

Another method to estimate capacity-related needs is to compare daily segment volume forecasts, as presented in **Figure 2**, to LOS-based roadway segment capacity thresholds (as presented in the *South Dakota Department of Transportation Road Design Manual* Table 15-10). These thresholds, shown in **Table 6**, represent a planning-level guide to cross-sectional needs in terms of through lanes and potential turn lanes based on traffic volumes.

Table 6: Estimated Number of Lanes Based on Daily Traffic Volumes

Total Number of Lanes	Description	Total Design Year ADT [1]	
		Rural Level	Urban
2	1 lane in each direction	< 8,000	< 2,500
3	1 lane in each direction plus center turn lane	[2]	2,500 to 16,000
4	2 lanes in each direction	8,000 to 20,000 [3]	[3]
5	2 lanes in each direction plus center turn lane	[2]	16,000 to 30,000
6	3 lanes in each direction	> 20,000 [4]	> 30,000 [4]

Source: *South Dakota Department of Transportation Road Design Manual*, Table 15-10 (as of 4/26/19)

1 Construction/Reconstruction projects are designed based on a typical 20 year ADT projection beyond the anticipated year of project construction.

2 Continuous left turn lanes may be considered based on left turn volumes and/or when intersections and/or approaches are closely spaced together.

3 Undivided sections may be used if left turn movements are low and there is no crash history, otherwise consider installing a median or 5 lane section.

4 Medians should be used.

All roadways within the study exhibit a 2045 daily traffic volume forecast that is less than the 'Rural Level' threshold of 8,000 for a two-lane roadway. As Rapid City continues to grow northward and the area becomes more urbanized, particularly for the southern areas of Meade County, a 3-lane urban cross-section may be applicable. This would provide one lane in each direction plus a center turn lane.

Summary and Conclusions

Intersection traffic operations for the 2019 Existing Conditions and 2045 No-Build Conditions scenarios all measure delay within acceptable LOS thresholds (LOS B or better) for this study. Similarly, the two-lane highway analysis measures are all within the acceptable LOS thresholds for rural collector highways (LOS C or better).

A review of daily traffic forecasts and segment capacity, all existing two-lane roadways are expected to accommodate traffic volumes through the 2045 Planning Horizon if the study area stays predominantly rural. As the area becomes more urbanized, particularly areas along the Meade County border, a 3-lane cross-section may be appropriate at next time of reconstruction.

Appendix

A. Existing Conditions HCS7 Reports
B. 2045 No-Build Conditions HCS7 Reports

Appendix A – Existing Conditions HCS7 Reports

HCS7 Two-Way Stop-Control Report

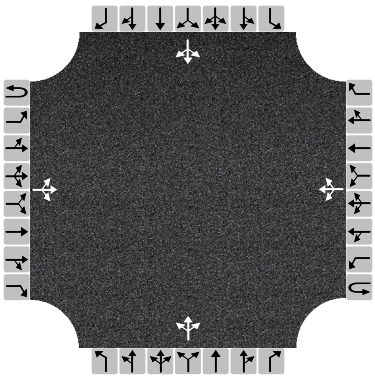
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2019
Time Analyzed	AM - Existing Conditions
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Elk Creek & 143rd Ave
Jurisdiction	Meade County
East/West Street	Elk Creek Road
North/South Street	143rd Avenue
Peak Hour Factor	0.45
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		0	5	5		0	10	0		1	0	0		0	0	0
Percent Heavy Vehicles (%)		20				20				20	20	20		20	20	20
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				0					2				0	
Capacity, c (veh/h)		1484				1484					924				0	
v/c Ratio		0.00				0.00					0.00					
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.0					
Control Delay (s/veh)		7.4				7.4					8.9				5.0	
Level of Service, LOS		A				A					A				A	
Approach Delay (s/veh)		0.0				0.0				8.9				5.0		
Approach LOS										A				A		

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HCS7 Two-Way Stop-Control Report

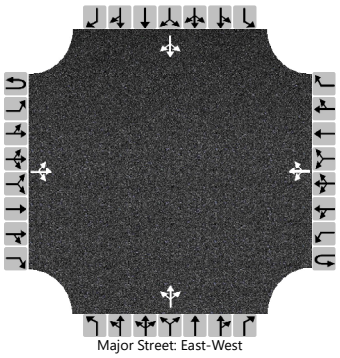
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2019
Time Analyzed	AM - Existing Conditions
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Elk Creek & Erickson Ra R
Jurisdiction	Meade County
East/West Street	Elk Creek Road
North/South Street	Erickson Ranch Road
Peak Hour Factor	0.71
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		0	35	30		20	50	0		30	5	5		0	5	5
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				28					56				14	
Capacity, c (veh/h)		1510				1485					743				791	
v/c Ratio		0.00				0.02					0.08				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.2				0.1	
Control Delay (s/veh)		7.4				7.5					10.2				9.6	
Level of Service (LOS)		A				A					B				A	
Approach Delay (s/veh)	0.0				2.2				10.2				9.6			
Approach LOS									B				A			

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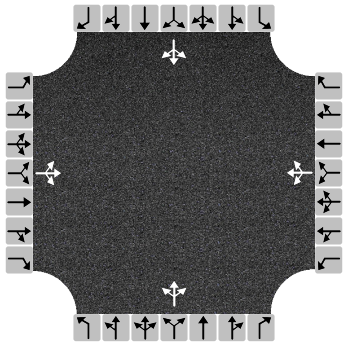
HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	HDR	Intersection	Elk Creek & Haines
Agency/Co.	HDR	Jurisdiction	Meade County
Date Performed	4/24/2019	East/West Street	Elk Creek Road
Analysis Year	2019	North/South Street	Haines Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.89
Time Analyzed	AM - Existing Conditions		
Project Description	Southern Meade County Corridor Study		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	5	5	55	10	10	0	30	5	5	0	15	10
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	73			22			45			28		
Percent Heavy Vehicles	6			6			6			6		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.065			0.020			0.040			0.025		
Final Departure Headway, hd (s)	3.70			4.33			4.30			4.00		
Final Degree of Utilization, x	0.075			0.027			0.054			0.031		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	1.70			2.33			2.30			2.00		

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	73			22			45			28		
Capacity	974			831			837			899		
95% Queue Length, Q_{95} (veh)	0.2			0.1			0.2			0.1		
Control Delay (s/veh)	7.0			7.5			7.5			7.1		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	7.0			7.5			7.5			7.1		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	7.2						A					

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HCS7 Two-Way Stop-Control Report

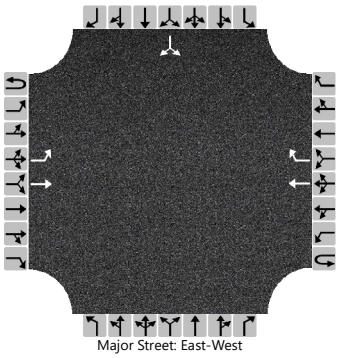
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2019
Time Analyzed	AM - Existing Conditions
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Peaceful P & Erickson RaR
Jurisdiction	Meade County
East/West Street	Peaceful Pines Road
North/South Street	Erickson Ranch Road
Peak Hour Factor	0.81
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		0	1	0
Configuration		L	T				T	R							LR	
Volume (veh/h)		10	30				5	15						130		50
Percent Heavy Vehicles (%)		3												3		3
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No									
Median Type | Storage							Undivided									

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.13												6.43		6.23
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		12													222	
Capacity, c (veh/h)		1584													964	
v/c Ratio		0.01													0.23	
95% Queue Length, Q_{95} (veh)		0.0													0.9	
Control Delay (s/veh)		7.3													9.8	
Level of Service (LOS)		A													A	
Approach Delay (s/veh)		1.8												9.8		
Approach LOS														A		

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HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/29/2019
Analysis Time Period	2019 - AM EC Southbound
Highway	Erickson Ranch Raod
From/To	Peaceful Pines to Elk Creek
Jurisdiction	Meade County
Analysis Year	2019
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.88	
Shoulder width	2.0	ft	% Trucks and buses	3	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	5.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	79	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd 180 veh/h
Opposing direction volume, Vo 25 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.5		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.985		0.974	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	208	pc/h	29	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	42	mi/h
Observed total demand,(note-3) V	20	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	-	mi/h
Adj. for lane and shoulder width,(note-3) fLS	-	mi/h
Adj. for access point density,(note-3) fA	-	mi/h
Free-flow speed, FFSd	42.2	mi/h
Adjustment for no-passing zones, fnp	2.2	mi/h
Average travel speed, ATSd	38.1	mi/h
Percent Free Flow Speed, PFFS	90.5	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.997		0.997	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	205	pc/h	28	pc/h
Base percent time-spent-following,(note-4) BPTSFd	22.0	%		
Adjustment for no-passing zones, fnp	43.3			
Percent time-spent-following, PTSFd	60.1	%		

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	271	veh-mi
Peak-hour vehicle-miles of travel, VMT60	954	veh-mi
Peak 15-min total travel time, TT15	7.1	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	5.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	38.1	mi/h
Percent time-spent-following, PTSFd (from above)	60.1	
Level of service, LOSd (from above)	C	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	204.5
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.91
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS7 Two-Way Stop-Control Report

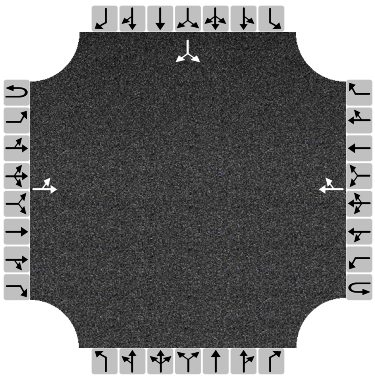
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2019
Time Analyzed	PM - Existing Conditions
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	224th St & 143rd Ave
Jurisdiction	Meade County
East/West Street	224th Street
North/South Street	143rd Avenue
Peak Hour Factor	0.69
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume, V (veh/h)		0	5				10	5						5		0
Percent Heavy Vehicles (%)		3												3		3
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0													7	
Capacity, c (veh/h)		1588													990	
v/c Ratio		0.00													0.01	
95% Queue Length, Q_{95} (veh)		0.0													0.0	
Control Delay (s/veh)		7.3													8.7	
Level of Service, LOS		A													A	
Approach Delay (s/veh)		0.0												8.7		
Approach LOS														A		

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HCS7 Two-Way Stop-Control Report

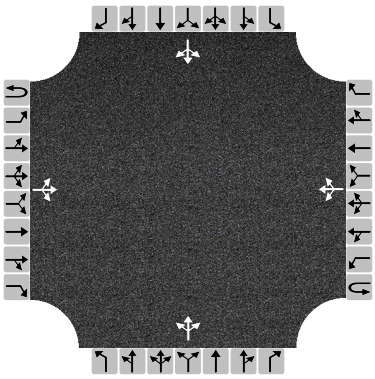
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2019
Time Analyzed	PM - Existing Conditions
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Elk Creek & 143rd Ave
Jurisdiction	Meade County
East/West Street	Elk Creek Road
North/South Street	143rd Avenue
Peak Hour Factor	0.50
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		0	10	0		0	10	0		1	0	0		0	0	0
Percent Heavy Vehicles (%)		20				20				20	20	20		20	20	20
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.30				4.30				7.30	6.70	6.40		7.30	6.70	6.40
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.38				2.38				3.68	4.18	3.48		3.68	4.18	3.48

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				0					2				0	
Capacity, c (veh/h)		1487				1487					921				0	
v/c Ratio		0.00				0.00					0.00					
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.0					
Control Delay (s/veh)		7.4				7.4					8.9				5.0	
Level of Service, LOS		A				A					A				A	
Approach Delay (s/veh)		0.0				0.0				8.9				5.0		
Approach LOS										A				A		

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HCS7 Two-Way Stop-Control Report

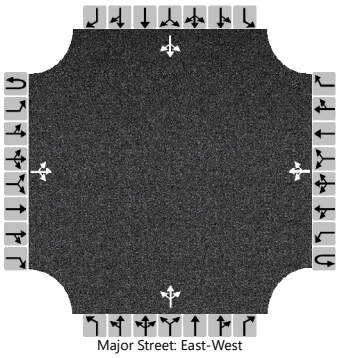
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2019
Time Analyzed	PM - Existing Conditions
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Elk Creek & Erickson Ra R
Jurisdiction	Meade County
East/West Street	Elk Creek Road
North/South Street	Erickson Ranch Road
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		5	40	20		15	45	5		20	5	15		5	0	5
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				19					51				13	
Capacity, c (veh/h)		1519				1504					825				848	
v/c Ratio		0.00				0.01					0.06				0.01	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.0	
Control Delay (s/veh)		7.4				7.4					9.6				9.3	
Level of Service (LOS)		A				A					A				A	
Approach Delay (s/veh)	0.6				1.8				9.6				9.3			
Approach LOS									A				A			

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HCS7 All-Way Stop Control Report

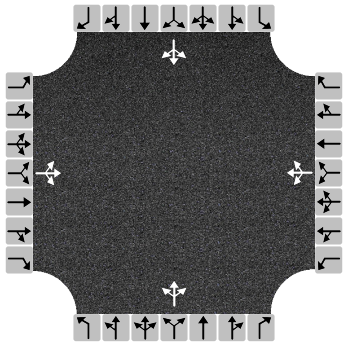
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2019
Analysis Time Period (hrs)	0.25
Time Analyzed	PM - Existing Conditions
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Elk Creek & Haines
Jurisdiction	Meade County
East/West Street	Elk Creek Road
North/South Street	Haines Avenue
Peak Hour Factor	0.73

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	5	15	30	0	5	0	60	15	5	0	5	5
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	68			7			110			14		
Percent Heavy Vehicles	6			6			6			6		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.061			0.006			0.097			0.012		
Final Departure Headway, hd (s)	3.95			4.35			4.29			3.98		
Final Degree of Utilization, x	0.075			0.008			0.131			0.015		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	1.95			2.35			2.29			1.98		

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	68			7			110			14		
Capacity	912			828			839			906		
95% Queue Length, Q_{95} (veh)	0.2			0.0			0.4			0.0		
Control Delay (s/veh)	7.3			7.4			7.9			7.0		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	7.3			7.4			7.9			7.0		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	7.6						A					

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HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/29/2019
Analysis Time Period	2019 - PM EC Northbound
Highway	Erickson Ranch Raod
From/To	Peaceful Pines to Elk Creek
Jurisdiction	Meade County
Analysis Year	2019
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.72	
Shoulder width	2.0	ft	% Trucks and buses	3	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	5.3	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	77	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd 120 veh/h
Opposing direction volume, Vo 50 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.6		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.982		0.974	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	170	pc/h	71	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	40	mi/h
Observed total demand,(note-3) V	20	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	-	mi/h
Adj. for lane and shoulder width,(note-3) fLS	-	mi/h
Adj. for access point density,(note-3) fA	-	mi/h
Free-flow speed, FFSd	40.2	mi/h
Adjustment for no-passing zones, fnp	2.1	mi/h
Average travel speed, ATSd	36.2	mi/h
Percent Free Flow Speed, PFFS	90.1	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.997		0.997	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	167	pc/h	70	pc/h
Base percent time-spent-following,(note-4) BPTSFd	18.4	%		
Adjustment for no-passing zones, fnp	48.1			
Percent time-spent-following, PTSFd	52.3	%		

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	221	veh-mi
Peak-hour vehicle-miles of travel, VMT60	636	veh-mi
Peak 15-min total travel time, TT15	6.1	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	5.3	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	36.2	mi/h
Percent time-spent-following, PTSFd (from above)	52.3	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	166.7
Effective width of outside lane, We	19.60
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.87
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS7 Two-Way Stop-Control Report

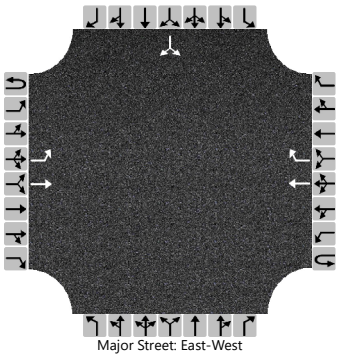
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2019
Time Analyzed	PM - Existing Conditions
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Peaceful P & Erickson RaR
Jurisdiction	Meade County
East/West Street	Peaceful Pines Road
North/South Street	Erickson Ranch Road
Peak Hour Factor	0.70
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		0	1	0
Configuration		L	T				T	R							LR	
Volume (veh/h)		40	10				20	80						25		25
Percent Heavy Vehicles (%)		3												3		3
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No									
Median Type | Storage							Undivided									

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.13												6.43		6.23
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		57													71	
Capacity, c (veh/h)		1435													905	
v/c Ratio		0.04													0.08	
95% Queue Length, Q_{95} (veh)		0.1													0.3	
Control Delay (s/veh)		7.6													9.3	
Level of Service (LOS)		A													A	
Approach Delay (s/veh)		6.1												9.3		
Approach LOS														A		

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HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2019 - AM EC Eastbound
Highway	Elk Creek Road
From/To	Erickson Ranch to Haines
Jurisdiction	Meade County
Analysis Year	2019
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.92	
Shoulder width	0.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	14	%
Up/down	-	%	Access point density	6	/mi

Analysis direction volume, Vd 65 veh/h
Opposing direction volume, Vo 50 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.9		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.949		0.949	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	74	pc/h	57	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access point density,(note-3) fA	1.5	mi/h
Free-flow speed, FFSd	54.3	mi/h
Adjustment for no-passing zones, fnp	2.4*	mi/h
Average travel speed, ATSd	50.9	mi/h
Percent Free Flow Speed, PFFS	93.7	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.994	0.994
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	71 pc/h	55 pc/h
Base percent time-spent-following,(note-4) BPTSFd	8.5 %	
Adjustment for no-passing zones, fnp	24.2	
Percent time-spent-following, PTSFd	22.1 %	

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	53	veh-mi
Peak-hour vehicle-miles of travel, VMT60	195	veh-mi
Peak 15-min total travel time, TT15	1.0	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	50.9	mi/h
Percent time-spent-following, PTSFd (from above)	22.1	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	70.7
Effective width of outside lane, We	20.10
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.21
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2019 - AM EC Southbound
Highway	Erickson Ranch Road
From/To	Westridge to Elk Creek
Jurisdiction	Meade County
Analysis Year	2019
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.71	
Shoulder width	0.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	60	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd 55 veh/h
Opposing direction volume, Vo 40 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.9		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.957		0.957	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	81	pc/h	59	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	53.8	mi/h
Adjustment for no-passing zones, fnp	2.1	mi/h
Average travel speed, ATSd	50.6	mi/h
Percent Free Flow Speed, PFFS	94.0	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.995	0.995
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	78 pc/h	57 pc/h
Base percent time-spent-following,(note-4) BPTSFd	9.3 %	
Adjustment for no-passing zones, fnp	50.8	
Percent time-spent-following, PTSFd	38.7 %	

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	54	veh-mi
Peak-hour vehicle-miles of travel, VMT60	154	veh-mi
Peak 15-min total travel time, TT15	1.1	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	50.6	mi/h
Percent time-spent-following, PTSFd (from above)	38.7	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	77.5
Effective width of outside lane, We	20.70
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.82
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2019 - AM EC Southbound
Highway	Erickson Ranch Road
From/To	Peaceful Pines to Westridge
Jurisdiction	Meade County
Analysis Year	2019
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.88	
Shoulder width	2.0	ft	% Trucks and buses	3	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.6	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	5	/mi

Analysis direction volume, Vd 180 veh/h
Opposing direction volume, Vo 25 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.5		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.985		0.974	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	208	pc/h	29	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	1.3	mi/h
Free-flow speed, FFSd	56.2	mi/h
Adjustment for no-passing zones, fnp	2.7	mi/h
Average travel speed, ATSd	51.6	mi/h
Percent Free Flow Speed, PFFS	91.8	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.997	0.997
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	205 pc/h	28 pc/h
Base percent time-spent-following,(note-4) BPTSFd	22.0 %	
Adjustment for no-passing zones, fnp	43.6	
Percent time-spent-following, PTSFd	60.4 %	

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	133	veh-mi
Peak-hour vehicle-miles of travel, VMT60	468	veh-mi
Peak 15-min total travel time, TT15	2.6	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.6	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	51.6	mi/h
Percent time-spent-following, PTSFd (from above)	60.4	
Level of service, LOSd (from above)	C	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	204.5
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.91
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2019 - AM EC Southbound
Highway	Haines Avenue
From/To	Virginia Ln to Elk Creek Rd
Jurisdiction	Meade County
Analysis Year	2019
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.90	
Shoulder width	0.0	ft	% Trucks and buses	4	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	4.4	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	40	%
Up/down	-	%	Access point density	2	/mi

Analysis direction volume, Vd 80 veh/h
Opposing direction volume, Vo 40 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.9		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.965		0.965	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	92	pc/h	46	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	55.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access point density,(note-3) fA	0.5	mi/h
Free-flow speed, FFSd	50.3	mi/h
Adjustment for no-passing zones, fnp	2.4*	mi/h
Average travel speed, ATSd	46.8	mi/h
Percent Free Flow Speed, PFFS	93.1	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.996		0.996	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	89	pc/h	45	pc/h
Base percent time-spent-following,(note-4) BPTSFd	10.5	%		
Adjustment for no-passing zones, fnp	39.0			
Percent time-spent-following, PTSFd	36.4	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	98	veh-mi
Peak-hour vehicle-miles of travel, VMT60	352	veh-mi
Peak 15-min total travel time, TT15	2.1	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	4.4	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.8	mi/h
Percent time-spent-following, PTSFd (from above)	36.4	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	88.9
Effective width of outside lane, We	19.20
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.90
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2019 - AM EC Southbound
Highway	Haines Avenue
From/To	Pennington Co to Virginia Ln
Jurisdiction	Meade County
Analysis Year	2019
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	2.0	ft	% Trucks and buses	4	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	27	%
Up/down	-	%	Access point density	5	/mi

Analysis direction volume, Vd 225 veh/h
Opposing direction volume, Vo 25 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.4		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.984		0.965	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	286	pc/h	32	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	1.3	mi/h
Free-flow speed, FFSd	56.2	mi/h
Adjustment for no-passing zones, fnp	2.4*	mi/h
Average travel speed, ATSd	51.3	mi/h
Percent Free Flow Speed, PFFS	91.3	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.996		0.996	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	282	pc/h	31	pc/h
Base percent time-spent-following,(note-4) BPTSFd	28.8	%		
Adjustment for no-passing zones, fnp	24.9			
Percent time-spent-following, PTSFd	51.2	%		

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	120	veh-mi
Peak-hour vehicle-miles of travel, VMT60	383	veh-mi
Peak 15-min total travel time, TT15	2.3	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	51.3	mi/h
Percent time-spent-following, PTSFd (from above)	51.2	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	281.3
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.34
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

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Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2019 - PM EC Northbound
Highway	Erickson Ranch Road
From/To	Westridge to Elk Creek
Jurisdiction	Meade County
Analysis Year	2019
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.79	
Shoulder width	0.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	56	%
Up/down	-	%	Access point density	6	/mi

Analysis direction volume, Vd 40 veh/h
Opposing direction volume, Vo 40 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.9		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.957		0.957	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	53	pc/h	53	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access point density,(note-3) fA	1.5	mi/h
Free-flow speed, FFSd	54.3	mi/h
Adjustment for no-passing zones, fnp	2.0	mi/h
Average travel speed, ATSd	51.5	mi/h
Percent Free Flow Speed, PFFS	94.9	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	51	pc/h	51	pc/h
Base percent time-spent-following,(note-4) BPTSFd	6.2	%		
Adjustment for no-passing zones, fnp	48.2			
Percent time-spent-following, PTSFd	30.3	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	35	veh-mi
Peak-hour vehicle-miles of travel, VMT60	112	veh-mi
Peak 15-min total travel time, TT15	0.7	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	51.5	mi/h
Percent time-spent-following, PTSFd (from above)	30.3	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	50.6
Effective width of outside lane, We	21.60
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.42
Bicycle LOS	C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2019 - PM EC Northbound
Highway	Erickson Ranch Road
From/To	Peaceful Pines to Westridge
Jurisdiction	Meade County
Analysis Year	2019
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.72	
Shoulder width	2.0	ft	% Trucks and buses	3	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.6	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd 120 veh/h
Opposing direction volume, Vo 50 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.6		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.982		0.974	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	170	pc/h	71	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	55.7	mi/h
Adjustment for no-passing zones, fnp	2.4*	mi/h
Average travel speed, ATSd	51.4	mi/h
Percent Free Flow Speed, PFFS	92.3	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.997		0.997	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	167	pc/h	70	pc/h
Base percent time-spent-following,(note-4) BPTSFd	18.4	%		
Adjustment for no-passing zones, fnp	48.9			
Percent time-spent-following, PTSFd	52.9	%		

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	108	veh-mi
Peak-hour vehicle-miles of travel, VMT60	312	veh-mi
Peak 15-min total travel time, TT15	2.1	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.6	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	51.4	mi/h
Percent time-spent-following, PTSFd (from above)	52.9	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	166.7
Effective width of outside lane, We	19.60
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	3.87
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2019 - PM EC Northbound
Highway	Haines Avenue
From/To	Virginia Ln to Elk Creek Rd
Jurisdiction	Meade County
Analysis Year	2019
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.93	
Shoulder width	0.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	4.4	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	28	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 80 veh/h
Opposing direction volume, Vo 40 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.9		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.957		0.957	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	90	pc/h	45	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	55.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access point density,(note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.8	mi/h
Adjustment for no-passing zones, fnp	2.4*	mi/h
Average travel speed, ATSd	46.4	mi/h
Percent Free Flow Speed, PFFS	93.1	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	86	pc/h	43	pc/h
Base percent time-spent-following,(note-4) BPTSFd	10.1	%		
Adjustment for no-passing zones, fnp	33.0			
Percent time-spent-following, PTSFd	32.1	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	95	veh-mi
Peak-hour vehicle-miles of travel, VMT60	352	veh-mi
Peak 15-min total travel time, TT15	2.0	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	4.4	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.4	mi/h
Percent time-spent-following, PTSFd (from above)	32.1	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	86.0
Effective width of outside lane, We	19.20
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.17
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2019 - PM EC Northbound
Highway	Haines Avenue
From/To	Pennington Co to Virginia Ln
Jurisdiction	Meade County
Analysis Year	2019
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.67	
Shoulder width	0.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	4.4	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	23	%
Up/down	-	%	Access point density	6	/mi

Analysis direction volume, Vd 205 veh/h
Opposing direction volume, Vo 60 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.4		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.973		0.941	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	314	pc/h	95	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access point density,(note-3) fA	1.5	mi/h
Free-flow speed, FFSd	54.3	mi/h
Adjustment for no-passing zones, fnp	2.4*	mi/h
Average travel speed, ATSd	48.7	mi/h
Percent Free Flow Speed, PFFS	89.7	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.993		0.993	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	308	pc/h	90	pc/h
Base percent time-spent-following,(note-4) BPTSFd	30.9	%		
Adjustment for no-passing zones, fnp	28.5			
Percent time-spent-following, PTSFd	53.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	337	veh-mi
Peak-hour vehicle-miles of travel, VMT60	902	veh-mi
Peak 15-min total travel time, TT15	6.9	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	4.4	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	48.7	mi/h
Percent time-spent-following, PTSFd (from above)	53.0	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	306.0
Effective width of outside lane, We	12.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.58
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2019 - PM EC Westbound
Highway	Elk Creek Road
From/To	Erickson Ranch to Haines
Jurisdiction	Meade County
Analysis Year	2019
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.78	
Shoulder width	2.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	7	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 75 veh/h
Opposing direction volume, Vo 50 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.9		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.941		0.941	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	102	pc/h	68	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	1.0	mi/h
Free-flow speed, FFSd	56.4	mi/h
Adjustment for no-passing zones, fnp	0.6	mi/h
Average travel speed, ATSd	54.5	mi/h
Percent Free Flow Speed, PFFS	96.7	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.993		0.993	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	97	pc/h	65	pc/h
Base percent time-spent-following,(note-4) BPTSFd	11.3	%		
Adjustment for no-passing zones, fnp	17.9			
Percent time-spent-following, PTSFd	22.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	72	veh-mi
Peak-hour vehicle-miles of travel, VMT60	225	veh-mi
Peak 15-min total travel time, TT15	1.3	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	54.5	mi/h
Percent time-spent-following, PTSFd (from above)	22.0	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	96.2
Effective width of outside lane, We	22.75
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.13
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Appendix B – 2045 No-Build Conditions HCS7 Reports

HCS7 Two-Way Stop-Control Report

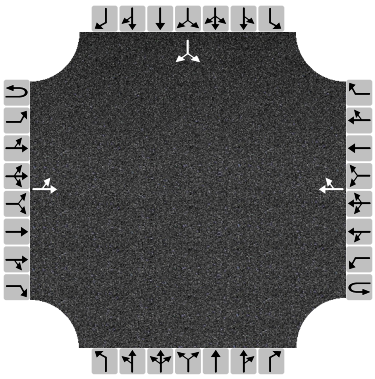
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2045
Time Analyzed	AM - 2045 No-Build Cond.
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	224th St & 143rd Ave
Jurisdiction	Meade County
East/West Street	224th Street
North/South Street	143rd Avenue
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume, V (veh/h)		5	10				10	10						20		5
Percent Heavy Vehicles (%)		3												3		3
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6													31	
Capacity, c (veh/h)		1584													981	
v/c Ratio		0.00													0.03	
95% Queue Length, Q_{95} (veh)		0.0													0.1	
Control Delay (s/veh)		7.3													8.8	
Level of Service, LOS		A													A	
Approach Delay (s/veh)		2.4												8.8		
Approach LOS														A		

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HCS7 Two-Way Stop-Control Report

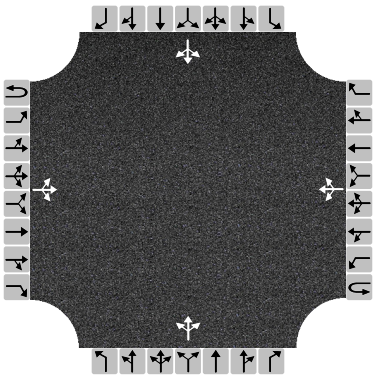
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2045
Time Analyzed	AM - 2045 No-Build Cond.
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Elk Creek & 143rd Ave
Jurisdiction	Meade County
East/West Street	Elk Creek Road
North/South Street	143rd Avenue
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		5	15	10		5	45	5		5	5	5		5	5	5
Percent Heavy Vehicles (%)		20				20				20	20	20		20	20	20
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				6					18				18	
Capacity, c (veh/h)		1434				1473					836				825	
v/c Ratio		0.00				0.00					0.02				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.1	
Control Delay (s/veh)		7.5				7.5					9.4				9.5	
Level of Service, LOS		A				A					A				A	
Approach Delay (s/veh)		1.2				0.7					9.4				9.5	
Approach LOS											A				A	

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HCS7 Two-Way Stop-Control Report

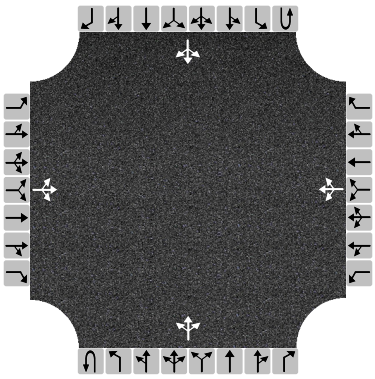
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2045
Time Analyzed	AM - 2045 No-Build Cond.
Intersection Orientation	North-South
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Elk Creek & Elk Vale
Jurisdiction	Meade County
East/West Street	Elk Creek Road
North/South Street	Elk Vale Road
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		5	10	10		15	30	5		15	5	5		5	15	10
Percent Heavy Vehicles (%)		14	14	14		14	14	14		14				14		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			30				63			19				6		
Capacity, c (veh/h)			859				804			1507				1532		
v/c Ratio			0.03				0.08			0.01				0.00		
95% Queue Length, Q_{95} (veh)			0.1				0.3			0.0				0.0		
Control Delay (s/veh)			9.3				9.9			7.4				7.4		
Level of Service, LOS			A				A			A				A		
Approach Delay (s/veh)		9.3				9.9				4.6				1.2		
Approach LOS		A				A										

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HCS7 Two-Way Stop-Control Report

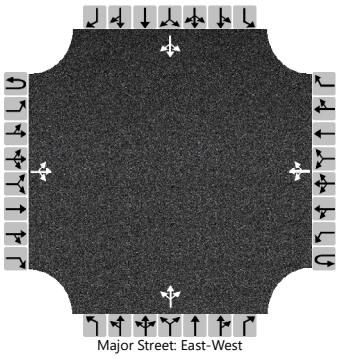
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2045
Time Analyzed	AM - 2045 No-Build Cond.
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Elk Creek & Erickson Ra R
Jurisdiction	Meade County
East/West Street	Elk Creek Road
North/South Street	Erickson Ranch Road
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		5	75	80		25	130	5		70	10	15		5	10	15
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				31					119				38	
Capacity, c (veh/h)		1390				1362					558				638	
v/c Ratio		0.00				0.02					0.21				0.06	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.8				0.2	
Control Delay (s/veh)		7.6				7.7					13.2				11.0	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.3				1.4				13.2				11.0			
Approach LOS									B				B			

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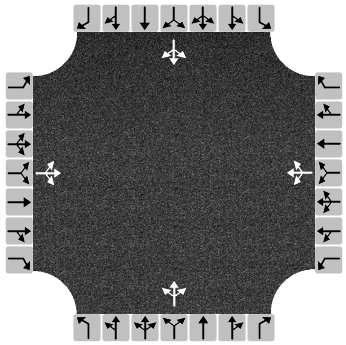
HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst	HDR	Intersection	Elk Creek & Haines
Agency/Co.	HDR	Jurisdiction	Meade County
Date Performed	4/24/2019	East/West Street	Elk Creek Road
Analysis Year	2045	North/South Street	Haines Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.80
Time Analyzed	AM - 2045 No-Build Cond.		
Project Description	Southern Meade County Corridor Study		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	10	15	90	25	25	5	45	10	10	5	35	10
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	144			69			81			63		
Percent Heavy Vehicles	6			6			6			6		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.128			0.061			0.072			0.056		
Final Departure Headway, hd (s)	3.97			4.53			4.59			4.47		
Final Degree of Utilization, x	0.159			0.086			0.104			0.078		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	1.97			2.53			2.59			2.47		

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	144			69			81			63		
Capacity	906			795			785			806		
95% Queue Length, Q_{95} (veh)	0.6			0.3			0.3			0.3		
Control Delay (s/veh)	7.7			8.0			8.1			7.8		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	7.7			8.0			8.1			7.8		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	7.9						A					

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HCS7 Two-Way Stop-Control Report

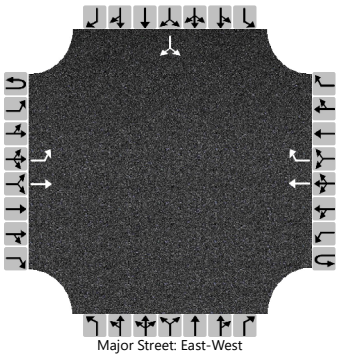
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2045
Time Analyzed	AM - 2045 No-Build Cond.
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Peaceful P & Erickson RaR
Jurisdiction	Meade County
East/West Street	Peaceful Pines Road
North/South Street	Erickson Ranch Road
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		0	1	0
Configuration		L	T				T	R							LR	
Volume (veh/h)		25	40				20	55						165		75
Percent Heavy Vehicles (%)		3												3		3
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No									
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.13												6.43		6.23
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		31													300	
Capacity, c (veh/h)		1495													892	
v/c Ratio		0.02													0.34	
95% Queue Length, Q_{95} (veh)		0.1													1.5	
Control Delay (s/veh)		7.5													11.1	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)		2.9												11.1		
Approach LOS														B		

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HCS7 Two-Way Stop-Control Report

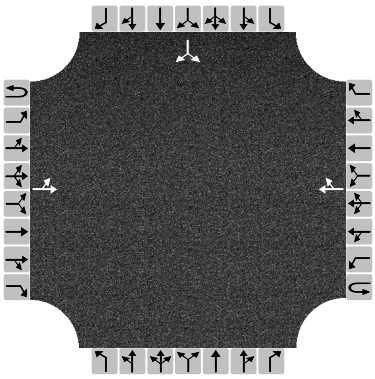
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2045
Time Analyzed	PM - 2045 No-Build Cond.
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	224th St & 143rd Ave
Jurisdiction	Meade County
East/West Street	224th Street
North/South Street	143rd Avenue
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume, V (veh/h)		5	10				20	10						5		5
Percent Heavy Vehicles (%)		3												3		3
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6													12	
Capacity, c (veh/h)		1567													992	
v/c Ratio		0.00													0.01	
95% Queue Length, Q_{95} (veh)		0.0													0.0	
Control Delay (s/veh)		7.3													8.7	
Level of Service, LOS		A													A	
Approach Delay (s/veh)		2.5												8.7		
Approach LOS														A		

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HCS7 Two-Way Stop-Control Report

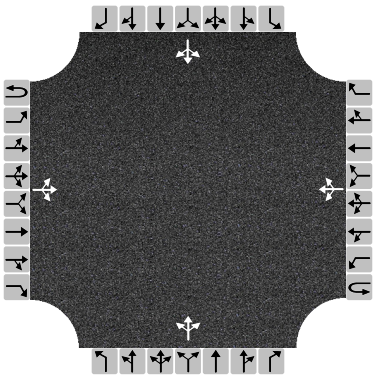
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2045
Time Analyzed	PM - 2045 No-Build Cond.
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Elk Creek & 143rd Ave
Jurisdiction	Meade County
East/West Street	Elk Creek Road
North/South Street	143rd Avenue
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		5	45	5		5	25	5		5	5	5		5	5	5
Percent Heavy Vehicles (%)		20				20				20	20	20		20	20	20
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				6					18				18	
Capacity, c (veh/h)		1465				1434					818				826	
v/c Ratio		0.00				0.00					0.02				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1				0.1	
Control Delay (s/veh)		7.5				7.5					9.5				9.5	
Level of Service, LOS		A				A					A				A	
Approach Delay (s/veh)		0.7				1.1				9.5				9.5		
Approach LOS										A				A		

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HCS7 Two-Way Stop-Control Report

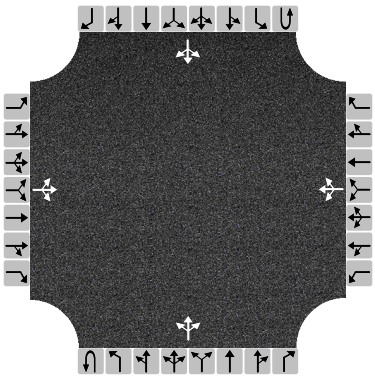
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2045
Time Analyzed	PM - 2045 No-Build Cond.
Intersection Orientation	North-South
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Elk Creek & Elk Vale
Jurisdiction	Meade County
East/West Street	Elk Creek Road
North/South Street	Elk Vale Road
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		10	25	20		5	20	5		5	10	15		5	5	10
Percent Heavy Vehicles (%)		14	14	14		14	14	14		14				14		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			68				37			6				6		
Capacity, c (veh/h)			881				831			1524				1507		
v/c Ratio			0.08				0.04			0.00				0.00		
95% Queue Length, Q_{95} (veh)			0.3				0.1			0.0				0.0		
Control Delay (s/veh)			9.4				9.5			7.4				7.4		
Level of Service, LOS			A				A			A				A		
Approach Delay (s/veh)		9.4				9.5				1.2				1.9		
Approach LOS		A				A										

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HCS7 Two-Way Stop-Control Report

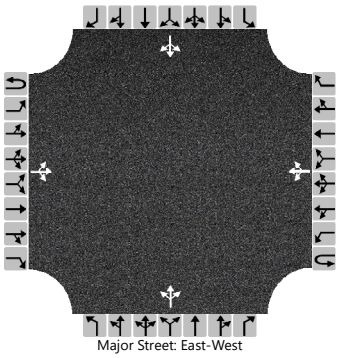
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2045
Time Analyzed	PM - 2045 No-Build Cond.
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Elk Creek & Erickson Ra R
Jurisdiction	Meade County
East/West Street	Elk Creek Road
North/South Street	Erickson Ranch Road
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		10	90	55		20	110	10		50	10	30		10	5	10
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		13				25					113				31	
Capacity, c (veh/h)		1412				1376					629				623	
v/c Ratio		0.01				0.02					0.18				0.05	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.6				0.2	
Control Delay (s/veh)		7.6				7.7					12.0				11.1	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.6				1.2				12.0				11.1			
Approach LOS									B				B			

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HCS7 All-Way Stop Control Report

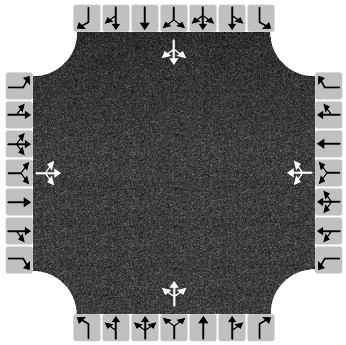
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2045
Analysis Time Period (hrs)	0.25
Time Analyzed	PM - 2045 No-Build Cond.
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Elk Creek & Haines
Jurisdiction	Meade County
East/West Street	Elk Creek Road
North/South Street	Haines Avenue
Peak Hour Factor	0.80

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	10	30	45	10	20	5	100	25	20	5	10	5
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	106			44			181			25		
Percent Heavy Vehicles	6			6			6			6		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.094			0.039			0.161			0.022		
Final Departure Headway, hd (s)	4.25			4.58			4.43			4.45		
Final Degree of Utilization, x	0.125			0.056			0.223			0.031		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	2.25			2.58			2.43			2.45		

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	106			44			181			25		
Capacity	848			786			812			809		
95% Queue Length, Q_{95} (veh)	0.4			0.2			0.9			0.1		
Control Delay (s/veh)	7.9			7.8			8.7			7.6		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	7.9			7.8			8.7			7.6		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	8.3						A					

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HCS7 Two-Way Stop-Control Report

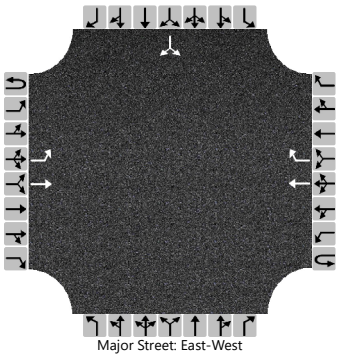
General Information

Analyst	HDR
Agency/Co.	HDR
Date Performed	4/24/2019
Analysis Year	2045
Time Analyzed	PM - 2045 No-Build Cond.
Intersection Orientation	East-West
Project Description	Southern Meade County Corridor Study

Site Information

Intersection	Peaceful P & Erickson RaR
Jurisdiction	Meade County
East/West Street	Peaceful Pines Road
North/South Street	Erickson Ranch Road
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		0	1	0
Configuration		L	T				T	R							LR	
Volume (veh/h)		60	20				40	115						30		35
Percent Heavy Vehicles (%)		3												3		3
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No									
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.13												6.43		6.23
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		75													81	
Capacity, c (veh/h)		1374													854	
v/c Ratio		0.05													0.10	
95% Queue Length, Q_{95} (veh)		0.2													0.3	
Control Delay (s/veh)		7.8													9.7	
Level of Service (LOS)		A													A	
Approach Delay (s/veh)		5.8												9.7		
Approach LOS														A		

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HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2045 - AM No-Build Eastbound
Highway	Elk Creek Road
From/To	Erickson Ranch to Haines
Jurisdiction	Meade County
Analysis Year	2045
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	0.0	ft	% Trucks and buses	6	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	14	%
Up/down	-	%	Access point density	6	/mi

Analysis direction volume, Vd 115 veh/h
Opposing direction volume, Vo 80 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.7		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.960		0.949	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	150	pc/h	105	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access point density,(note-3) fA	1.5	mi/h
Free-flow speed, FFSd	54.3	mi/h
Adjustment for no-passing zones, fnp	2.4*	mi/h
Average travel speed, ATSd	49.9	mi/h
Percent Free Flow Speed, PFFS	91.9	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.994		0.994	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	145	pc/h	101	pc/h
Base percent time-spent-following,(note-4) BPTSFd	16.3	%		
Adjustment for no-passing zones, fnp	25.8			
Percent time-spent-following, PTSFd	31.5	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	108	veh-mi
Peak-hour vehicle-miles of travel, VMT60	345	veh-mi
Peak 15-min total travel time, TT15	2.2	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	49.9	mi/h
Percent time-spent-following, PTSFd (from above)	31.5	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	143.8
Effective width of outside lane, We	17.10
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.13
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2045 - AM No-Build Southbound
Highway	Erickson Ranch Road
From/To	Westridge to Elk Creek
Jurisdiction	Meade County
Analysis Year	2045
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	0.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	60	%
Up/down	-	%	Access point density	8	/mi

Analysis direction volume, Vd 115 veh/h
Opposing direction volume, Vo 95 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.7		1.8	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.966		0.962	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	149	pc/h	123	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access point density,(note-3) fA	2.0	mi/h
Free-flow speed, FFSd	53.8	mi/h
Adjustment for no-passing zones, fnp	2.4	mi/h
Average travel speed, ATSd	49.3	mi/h
Percent Free Flow Speed, PFFS	91.6	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	144	pc/h	119	pc/h
Base percent time-spent-following,(note-4) BPTSFd	16.2	%		
Adjustment for no-passing zones, fnp	52.6			
Percent time-spent-following, PTSFd	45.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	101	veh-mi
Peak-hour vehicle-miles of travel, VMT60	322	veh-mi
Peak 15-min total travel time, TT15	2.1	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	49.3	mi/h
Percent time-spent-following, PTSFd (from above)	45.0	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	143.8
Effective width of outside lane, We	17.10
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.81
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2045 - AM No-Build Southbound
Highway	Erickson Ranch Road
From/To	Peaceful Pines to Westridge
Jurisdiction	Meade County
Analysis Year	2045
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	2.0	ft	% Trucks and buses	3	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.6	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	5	/mi

Analysis direction volume, Vd 240 veh/h
Opposing direction volume, Vo 80 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.4		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.988		0.974	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	304	pc/h	103	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	1.3	mi/h
Free-flow speed, FFSd	56.2	mi/h
Adjustment for no-passing zones, fnp	2.8	mi/h
Average travel speed, ATSd	50.2	mi/h
Percent Free Flow Speed, PFFS	89.4	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.997		0.997	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	301	pc/h	100	pc/h
Base percent time-spent-following,(note-4) BPTSFd	30.3	%		
Adjustment for no-passing zones, fnp	46.4			
Percent time-spent-following, PTSFd	65.1	%		

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	195	veh-mi
Peak-hour vehicle-miles of travel, VMT60	624	veh-mi
Peak 15-min total travel time, TT15	3.9	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.6	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	50.2	mi/h
Percent time-spent-following, PTSFd (from above)	65.1	
Level of service, LOSd (from above)	C	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	300.0
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.10
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2045 - AM No-Build Southbound
Highway	Haines Avenue
From/To	Virginia Ln to Elk Creek Rd
Jurisdiction	Meade County
Analysis Year	2045
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	0.0	ft	% Trucks and buses	4	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	4.4	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	40	%
Up/down	-	%	Access point density	2	/mi

Analysis direction volume, Vd 150 veh/h
Opposing direction volume, Vo 65 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.6		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.977		0.965	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	192	pc/h	84	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	55.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access point density,(note-3) fA	0.5	mi/h
Free-flow speed, FFSd	50.3	mi/h
Adjustment for no-passing zones, fnp	2.4*	mi/h
Average travel speed, ATSd	45.8	mi/h
Percent Free Flow Speed, PFFS	91.0	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.996		0.996	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	188	pc/h	82	pc/h
Base percent time-spent-following,(note-4) BPTSFd	20.4	%		
Adjustment for no-passing zones, fnp	38.3			
Percent time-spent-following, PTSFd	47.1	%		

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	206	veh-mi
Peak-hour vehicle-miles of travel, VMT60	660	veh-mi
Peak 15-min total travel time, TT15	4.5	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	4.4	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	45.8	mi/h
Percent time-spent-following, PTSFd (from above)	47.1	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	187.5
Effective width of outside lane, We	15.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.99
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2045 - AM No-Build Southbound
Highway	Haines Avenue
From/To	Pennington Co to Virginia Ln
Jurisdiction	Meade County
Analysis Year	2045
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	2.0	ft	% Trucks and buses	4	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	1.7	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	27	%
Up/down	-	%	Access point density	5	/mi

Analysis direction volume, Vd 430 veh/h
Opposing direction volume, Vo 60 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.2		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.992		0.965	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	542	pc/h	78	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	1.3	mi/h
Free-flow speed, FFSd	56.2	mi/h
Adjustment for no-passing zones, fnp	2.4*	mi/h
Average travel speed, ATSd	48.9	mi/h
Percent Free Flow Speed, PFFS	87.2	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.0		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	1.000		0.996	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	537	pc/h	75	pc/h
Base percent time-spent-following,(note-4) BPTSFd	47.0	%		
Adjustment for no-passing zones, fnp	20.5			
Percent time-spent-following, PTSFd	65.0	%		

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	228	veh-mi
Peak-hour vehicle-miles of travel, VMT60	731	veh-mi
Peak 15-min total travel time, TT15	4.7	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	1.7	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	48.9	mi/h
Percent time-spent-following, PTSFd (from above)	65.0	
Level of service, LOSd (from above)	C	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	537.5
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.67
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2045 - PM No-Build Northbound
Highway	Erickson Ranch Road
From/To	Westridge to Elk Creek
Jurisdiction	Meade County
Analysis Year	2045
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	0.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.8	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	56	%
Up/down	-	%	Access point density	6	/mi

Analysis direction volume, Vd 90 veh/h
Opposing direction volume, Vo 80 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.9		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.957		0.957	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	118	pc/h	104	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access point density,(note-3) fA	1.5	mi/h
Free-flow speed, FFSd	54.3	mi/h
Adjustment for no-passing zones, fnp	2.0	mi/h
Average travel speed, ATSd	50.6	mi/h
Percent Free Flow Speed, PFFS	93.1	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.1	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	0.995	0.995
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	113 pc/h	101 pc/h
Base percent time-spent-following,(note-4) BPTSFd	13.0 %	
Adjustment for no-passing zones, fnp	49.1	
Percent time-spent-following, PTSFd	38.9 %	

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	79	veh-mi
Peak-hour vehicle-miles of travel, VMT60	252	veh-mi
Peak 15-min total travel time, TT15	1.6	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.8	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	50.6	mi/h
Percent time-spent-following, PTSFd (from above)	38.9	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	112.5
Effective width of outside lane, We	18.60
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.42
Bicycle LOS	D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
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Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2045 - PM No-Build Northbound
Highway	Erickson Ranch Road
From/To	Peaceful Pines to Westridge
Jurisdiction	Meade County
Analysis Year	2045
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	2.0	ft	% Trucks and buses	3	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	2.6	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	100	%
Up/down	-	%	Access point density	7	/mi

Analysis direction volume, Vd 175 veh/h
Opposing direction volume, Vo 65 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.5		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.985		0.974	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	222	pc/h	83	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	1.8	mi/h
Free-flow speed, FFSd	55.7	mi/h
Adjustment for no-passing zones, fnp	2.4*	mi/h
Average travel speed, ATSd	50.9	mi/h
Percent Free Flow Speed, PFFS	91.4	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.997		0.997	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	219	pc/h	81	pc/h
Base percent time-spent-following,(note-4) BPTSFd	23.3	%		
Adjustment for no-passing zones, fnp	48.1			
Percent time-spent-following, PTSFd	58.4	%		

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	142	veh-mi
Peak-hour vehicle-miles of travel, VMT60	455	veh-mi
Peak 15-min total travel time, TT15	2.8	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	2.6	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	50.9	mi/h
Percent time-spent-following, PTSFd (from above)	58.4	
Level of service, LOSd (from above)	C	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	218.8
Effective width of outside lane, We	14.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	4.94
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2045 - PM No-Build Northbound
Highway	Haines Avenue
From/To	Virginia Ln to Elk Creek Rd
Jurisdiction	Meade County
Analysis Year	2045
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	0.0	ft	% Trucks and buses	5	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	4.4	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	28	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 145 veh/h
Opposing direction volume, Vo 65 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.6		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.971		0.957	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	187	pc/h	85	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	55.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access point density,(note-3) fA	1.0	mi/h
Free-flow speed, FFSd	49.8	mi/h
Adjustment for no-passing zones, fnp	2.4*	mi/h
Average travel speed, ATSd	45.3	mi/h
Percent Free Flow Speed, PFFS	90.9	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.995		0.995	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	182	pc/h	82	pc/h
Base percent time-spent-following,(note-4) BPTSFd	19.9	%		
Adjustment for no-passing zones, fnp	32.9			
Percent time-spent-following, PTSFd	42.6	%		

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	199	veh-mi
Peak-hour vehicle-miles of travel, VMT60	638	veh-mi
Peak 15-min total travel time, TT15	4.4	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	4.4	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	45.3	mi/h
Percent time-spent-following, PTSFd (from above)	42.6	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	181.3
Effective width of outside lane, We	15.30
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.22
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2045 - PM No-Build Northbound
Highway	Haines Avenue
From/To	Pennington Co to Virginia Ln
Jurisdiction	Meade County
Analysis Year	2045
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	0.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	4.4	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	23	%
Up/down	-	%	Access point density	6	/mi

Analysis direction volume, Vd 400 veh/h
Opposing direction volume, Vo 125 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.2		1.7	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.986		0.953	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	507	pc/h	164	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	4.2	mi/h
Adj. for access point density,(note-3) fA	1.5	mi/h
Free-flow speed, FFSd	54.3	mi/h
Adjustment for no-passing zones, fnp	2.4*	mi/h
Average travel speed, ATSd	46.7	mi/h
Percent Free Flow Speed, PFFS	86.0	%

Percent Time-Spent-Following

Direction	Analysis(d)	Opposing (o)
PCE for trucks, ET	1.0	1.1
PCE for RVs, ER	1.0	1.0
Heavy-vehicle adjustment factor, fHV	1.000	0.993
Grade adjustment factor,(note-1) fg	1.00	1.00
Directional flow rate,(note-2) vi	500 pc/h	157 pc/h
Base percent time-spent-following,(note-4) BPTSFd	44.7 %	
Adjustment for no-passing zones, fnp	26.0	
Percent time-spent-following, PTSFd	64.5 %	

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	550	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1760	veh-mi
Peak 15-min total travel time, TT15	11.8	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	4.4	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	46.7	mi/h
Percent time-spent-following, PTSFd (from above)	64.5	
Level of service, LOSd (from above)	C	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	500.0
Effective width of outside lane, We	12.00
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	6.83
Bicycle LOS	F

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

* These items have been entered or edited to override calculated value

HCS7: Two-Lane Highways Release 7.2

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	HDR
Agency/Co.	HDR
Date Performed	5/1/2019
Analysis Time Period	2045 - PM No-Build Westbound
Highway	Elk Creek Road
From/To	Erickson Ranch to Haines
Jurisdiction	Meade County
Analysis Year	2045
Description	Southern Meade County Corridor

Input Data

Highway class	Class 2		Peak hour factor, PHF	0.80	
Shoulder width	2.0	ft	% Trucks and buses	7	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	3.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	0	%
Grade: Length	-	mi	% No-passing zones	7	%
Up/down	-	%	Access point density	4	/mi

Analysis direction volume, Vd 125 veh/h
Opposing direction volume, Vo 85 veh/h

Average Travel Speed

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.7		1.9	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor,(note-5) fHV	0.953		0.941	
Grade adj. factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	164	pc/h	113	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed,(note-3) S FM	-	mi/h
Observed total demand,(note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed,(note-3) BFFS	60.0	mi/h
Adj. for lane and shoulder width,(note-3) fLS	2.6	mi/h
Adj. for access point density,(note-3) fA	1.0	mi/h
Free-flow speed, FFSd	56.4	mi/h
Adjustment for no-passing zones, fnp	0.7	mi/h
Average travel speed, ATSd	53.6	mi/h
Percent Free Flow Speed, PFFS	95.0	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.993		0.993	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	157	pc/h	107	pc/h
Base percent time-spent-following,(note-4) BPTSFd	17.4	%		
Adjustment for no-passing zones, fnp	19.2			
Percent time-spent-following, PTSFd	28.8	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	117	veh-mi
Peak-hour vehicle-miles of travel, VMT60	375	veh-mi
Peak 15-min total travel time, TT15	2.2	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	1700	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	3.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	53.6	mi/h
Percent time-spent-following, PTSFd (from above)	28.8	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	
Percent free flow speed including passing lane, PFFSpl	0.0	%

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	A	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	55
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	156.3
Effective width of outside lane, We	19.25
Effective speed factor, St	4.79
Bicycle LOS Score, BLOS	5.11
Bicycle LOS	E

Notes:
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4. For the analysis direction only.
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