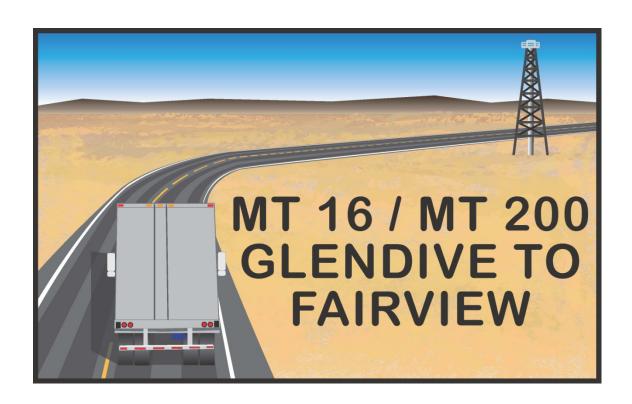


Appendix B

Existing and Projected Condition Report



EXISTING AND PROJECTED CONDITIONS REPORT

PREPARED FOR:



PREPARED BY:

104 East Broadway, Suite G-1 P.O. Box 1009 Helena, Montana 59624 (406) 442-0370

July 2012



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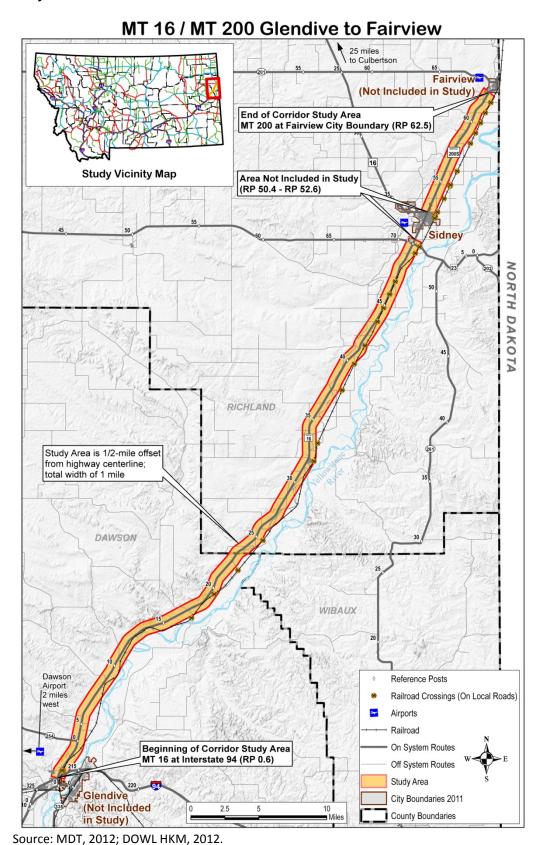
1.0 INTRODUCTION

The Montana Department of Transportation (MDT), in cooperation with Dawson and Richland Counties and the Federal Highway Administration (FHWA), initiated a corridor planning study between Glendive and Fairview on MT Highway 16 (MT 16) and MT Highway 200 (MT 200). The study assesses traffic and safety concerns caused by increasing truck volumes largely associated with growth in the oil industry in the Bakken region in northeastern Montana and northwestern North Dakota. This report presents information about existing and projected conditions within the study area to assist in identifying constraints and improvement opportunities in the corridor.

The study area begins on MT 16 at approximate Reference Post (RP) 0.6 just north of the I-94 Interchange in Glendive and extends northeasterly to the intersection of County Road 123 (RP 50.4) south of Sidney. The study resumes at Sidney's northern city limit boundary (RP 52.6) north of the MT 200 intersection with Holly Street, and extends northeast on MT 200 to the Fairview city limits (RP 62.5). The study excludes areas within the city limits of Glendive, Sidney, and Fairview and extends one-half mile on each side of the highway centerline throughout the corridor.

Figure 1-1 illustrates the study area.

Figure 1-1 Study Area





2.0 EXISTING CONDITIONS

2.1 Transportation System Conditions

The highway transportation system within the study corridor is discussed in terms of its physical features, geometric characteristics, crash history, access points, traffic volumes, and operational characteristics.

2.1.1 Physical Features and Characteristics

Physical features and characteristics of the corridor were identified through field observation and a review of published statistics, documentation, GIS data, and MDT record drawings (also called as-built drawings). A field review of the corridor was conducted on January 31, 2012 to assist in identifying existing conditions and constraints. Appendix 1 contains a summary memorandum and a photo log documenting conditions observed in the field.

Functional Classification and Roadway System

Functional classification is used to characterize public roads and highways in accordance with FHWA guidelines according to the type of service provided by the facility and the corresponding level of travel mobility and access to and from adjacent property. MT 16 from Glendive to Sidney (RP 0.6 to RP 50.4) is classified as a principal arterial on the Non-Interstate National Highway System (NINHS). The National Highway System (NHS) includes highways Congress has determined to have the greatest national importance to transportation, commerce, and defense. MT 200 from RP 52.6 to RP 53.7 is classified as a principal arterial and the portion from RP 53.7 to RP 62.5 is classified as a minor arterial. The entire segment between Sidney and Fairview (RP 52.6 to RP 62.5) is on the Primary Highway System, and is not part of the NHS.

Structures

The MDT Bridge Bureau identified 12 bridges and four major culvert crossings within the study area. Major culverts are treated similarly to bridges for inspection purposes. All 16 structures in the corridor are classified as not deficient and are not eligible for federal bridge funding. A summary of the MDT bridge assessments is presented in Table 2.1.

Appendix 2 includes MDT bridge inspection forms containing additional information for each structure. A structural analysis of each bridge was not conducted for this planning-level study. The need for a structural analysis should be determined during project development, if improvement options are forwarded from this study.

Table 2.1 MDT Bridge Assessment Summary

Feature Crossed	Location (RP)	Sufficiency Rating	Year Built	Skew (degrees)	Deck Width (ft)	Roadway Width (ft)	Main Span Type	Main Span Design	No. of Main Spans	Length of Maximum Span (ft)	Total Length (ft)
Deer Creek	4.3	89.7	1964	0	43.0	40.0	Prestressed Concrete	Tee Beam	2	112.0	112.0
Three Mile Creek	7.0	89.7	1964	0	N/A	40.0	Steel Culvert	N/A	1	N/A	27.0
Lower Seven Mile Creek	10.1	89.7	1967	0	42.0	40.0	Prestressed Concrete	Tee Beam	2	132.0	132.0
Morgan Creek	12.5	90.8	1967	0	42.0	3.9	Prestressed Concrete	Tee Beam	2	122.0	122.0
Thirteen Mile Creek	15.5	90.8	1969	0	42.7	40.0	Steel Continuous	Girder	10	332.0	332.0
Burns Creek	25.1	89.9	2010	8	42.7	39.4	Prestressed Concrete	Girder	3	195.6	195.6
Garden Coulee / Stockpass	31.3	89.9	1975	0	N/A	40.0	Steel Culvert	N/A	2	N/A	23.0
USBR Main Canal	32.1	87.8	1974	30	46.4	43.5	Prestressed Concrete	Girder	1	95.0	95.0
Dunlap Creek	32.4	87.8	1974	0	46.4	43.5	Prestressed Concrete	Girder	3	122.0	122.0
USBR Main Canal	32.7	85.8	1974	12	54.4	51.5	Prestressed Concrete	Girder	1	75.0	75.0
USBR Main Canal	37.5	86.6	1984	38	42.4	39.4	Prestressed Concrete	Girder	1	94.0	94.0
Crane Creek	41.3	55.3	1986	0	N/A	25.0	Steel Culvert	N/A	2	N/A	31.0
Fox Creek	46.7	83	1974	0	46.4	43.6	Prestressed Concrete	Girder	3	183.0	183.0
Lone Tree Creek	51.6	89.8	1974	0	95.0	83.0	Concrete Continuous	Slab	4	90.0	90.0
First Hay Creek	59.5	94.9	1986	40	42.1	39.3	Concrete Continuous	Slab	4	109.5	109.5
Second Hay Creek	60.0	97	1986	38	N/A	52.0	Steel Culvert	N/A	1	N/A	29.0

Source: MDT, 2012.



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Railroad Facilities

A BNSF Railway facility parallels MT 16 / MT 200 throughout the entire study area. There are no at-grade or grade-separated railroad crossings along MT 16 / MT 200 within the study area. The location of the railroad is depicted in Figure 1-1.

Bicycle and Pedestrian Facilities

There are no dedicated bicycle or pedestrian facilities adjacent to MT 16 / MT 200. Seven- to eight-foot shoulders are typical throughout the corridor, providing opportunity for non-motorized usage. No bicycle or pedestrian counts were collected for this study.

Drainage Conditions

MT 16 / MT 200 parallels the Yellowstone River through much of the study corridor and crosses several tributary streams and creeks. Highway run-off is directed to adjoining shoulders. Graded side slopes carry run-off to natural drainage conveyances through constructed ditches within the right-of-way or via natural drainage patterns formed by the topographic conditions of the adjacent lands.

Utilities

Table 2.2 lists major utility facilities observed or known to occur in the study area. Additional utilities are likely located within the corridor, including telephone, cable, and fiber optic lines. Irrigation canals and petroleum pipelines are also known to exist in the study area vicinity. A detailed utility investigation should be conducted during project development for any improvement options forwarded from this study.

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Table 2.2 Corridor Utilities

Location				
RP	Distance from Centerline	Side of Roadway	Utility Type	
1.9 to 3.8	80 to 100 feet	East	Overhead Electric Transmission Line; single wood pole structures	
4.1 to 5.6	80 to 90 feet	East	Overhead Electric Transmission Line; single wood pole structures	
4.1	100 feet	West	Large Overhead Electric Transmission Line; large steel structure	
4.5 to 4.8	120 feet	East	12-inch High Pressure Natural Gas Line	
5.9 to 12.4	80 to 100 feet	Left	Overhead Electric Transmission Line; single wood pole structures	
12.4 to 13.0	100 feet	East	Overhead Electric Transmission Line; single wood pole structures	
13.4	Centerline Crossing	NA	12-inch High Pressure Natural Gas Line	
13.6 to 13.8	110 feet	West	12-inch High Pressure Natural Gas Line	
14.5	Centerline Crossing	NA	High Pressure Natural Gas Line	
14.9	200 feet	East	Electric Substation	
17.0	150 feet	West	est Proposed Cell Tower	
18.3 to 18.6	80 to 100 feet	East	Two 12-inch High Pressure Natural Gas Lines	
18.6	Centerline Crossing	NA	Two 12-inch High Pressure Natural Gas Lines	
18.6 to 20.1	80 to 120 feet	West	Two 12-inch High Pressure Natural Gas Lines	
19.8 to 24.8	80 to 100 feet	West	Overhead Electric Transmission Line; single wood pole structures	
20.1	Centerline Crossing	NA	Two 12-inch High Pressure Natural Gas Lines	
20.1 to 20.4	90 to 120 feet	East	Two 12-inch High Pressure Natural Gas Lines	
22.0 to 22.1	80 to 100 feet	East	Two 12-inch High Pressure Natural Gas Lines	
22.1	Centerline Crossing	NA	Two 12-inch High Pressure Natural Gas Lines	
22.1 to 23.1	80 to 120 feet	West	Two High Pressure Natural Gas Lines	
40.3	Centerline Crossing	NA	Two High Pressure Natural Gas Lines	
40.3 to 40.4	80 to 100 feet	West	One 12-inch High Pressure Natural Gas Line	
44.5	Centerline Crossing	NA	One 12-inch High Pressure Natural Gas Line	
44.5 to 44.7	80 to 120 feet	East	One 12-inch High Pressure Natural Gas Line	

Source: MDT, 2012.

Right-of-Way and Land Ownership

Within the portion of the corridor from Glendive to Sidney (RP 0.6 to RP 50.4), MDT right-of-way typically extends 160 feet from MT 16 / MT 200, 80 feet on each side of centerline. In intermittent portions of the corridor, MDT right-of-way extends upwards of 400 feet on one

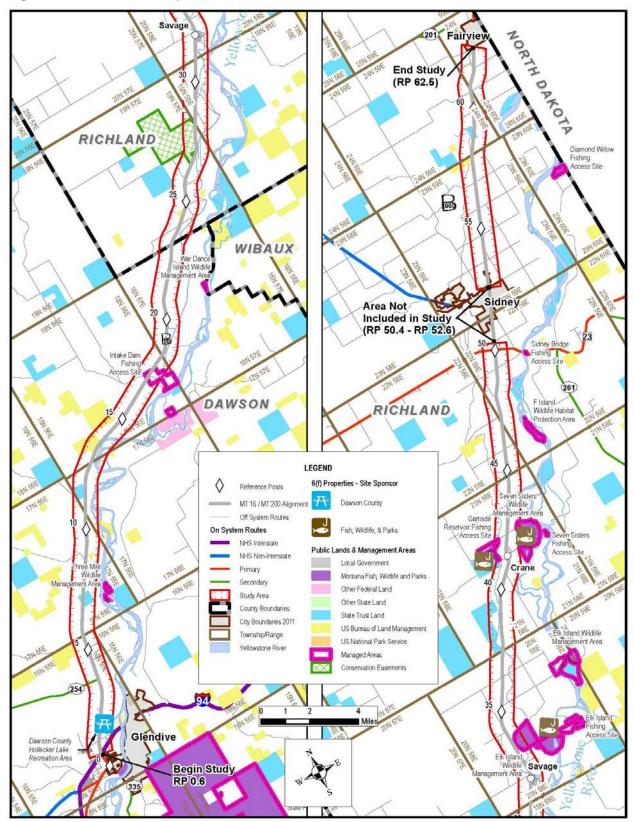


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side of the centerline where adjacent slopes are cut or filled to accommodate the roadway alignment. Right-of-way within the portion of the corridor from Sidney to Fairview (RP 52.6 to RP 62.5) is narrower, ranging from 100 to 140 feet wide (50 to 70 feet on each side of the roadway centerline). Appendix 3 provides additional right-of-way information.

Land within the study corridor is predominantly held in private ownership and used for agricultural and ranching purposes. The BNSF railway runs parallel to MT 16 / MT 200 and falls within or directly adjacent to the corridor study area. Public lands are dispersed throughout the corridor, including lands managed by the Bureau of Land Management (BLM) and the State of Montana. A number of land areas within the study corridor are managed for recreational or conservation purposes. Land ownership and management status is illustrated in Figure 2-1.

Figure 2-1 Land Ownership



Source: MDT, 2012; NRIS, 2012; DOWL HKM, 2012.

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Pavement Condition

Geotechnical reports provided by MDT indicate MT 16 / MT 200 is generally composed of a four-inch layer of asphalt over 1.5 feet of crushed base course. The subgrade soils (or material below the base course) throughout the corridor are considered poor soils for roadway design due to moisture sensitivity. The following conditions were noted in the corridor during a field review conducted on January 31, 2012.

- Rutting depressions parallel to the road centerline located within the travel lanes
- Transverse cracking pavement cracks perpendicular to the roadway centerline
- Longitudinal cracking pavement cracks parallel to the roadway centerline
- Shoulder failure sloughing of the roadway shoulder; typically a result of unstable roadway embankment

Pavement conditions observed in the field are categorized into three regions: (1) an area of recent reconstruction (RP 18.6 to RP 24.7), (2) Sidney to Fairview (RP 52.6 to RP 62.5), and (3) the remaining portion of the corridor study area (RP 0.6 to RP 18.6, and RP 24.7 to RP 50.4). Table 2.3 summarizes pavement conditions for each area of the corridor.

Table 2.3 Summary of Pavement Conditions

Location (RP)	General Conditions
0.6 - 18.6	 Minor rutting (1/4 inch deep or less) Transverse cracks (30 to 60 ft spacing) Intermittent longitudinal cracking Shoulder failure observed at approximately RP 14.3
18.6 - 24.7	Recently reconstructed; no signs of pavement deterioration
24.7 - 50.4	 Minor rutting (1/4 inch deep or less) Transverse cracks (30 to 60 ft spacing) Intermittent longitudinal cracking
52.6 - 62.5	 Minor rutting (1/4 inch deep or less) Sealed pavement cracks Transverse cracks (approximate 30 ft spacing) Continuous longitudinal cracking

Source: DOWL HKM, 2012.

2.1.2 Geometric Characteristics and Roadway Elements

Design Criteria and Guidelines

Within the study corridor, MT 16 from RP 0.6 to RP 50.4 and MT 200 from RP 52.6 to RP 53.7 are classified as Rural Principal Arterials. MT 200 from RP 53.7 to RP 62.5 is classified as a Rural



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Minor Arterial. Table 2.4 presents MDT geometric design criteria used to assess the study corridor.

The design speed used for analysis of the MT 16 / MT 200 study corridor is 60 to 70 miles per hour (mph) in combination with a level/rolling terrain type. Portions of the corridor, including RP 6.1 to RP 18.5 and RP 18.6 to RP 28.9, were designed to 60 mph criteria, although the roadway facility generally meets 70 mph design speed criteria in these locations. The posted speed limit within the corridor is primarily 70 mph for passenger vehicles and 60 mph for trucks, with short sections of reduced speed zones (45 to 55 mph) near the boundaries of Sidney and Fairview and through the community of Savage. The existing roadway alignment generally exhibits level terrain characteristics, although portions of the corridor exceed maximum grades for level terrain.

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Table 2.4 Design Criteria - Rural Minor and Rural Principal Arterials

Flamout			Cr	iteria	
Element			Rural Minor Arterial	Rural Principal Arterial	
Design	Design Speed	70 mph	60 mph	70 mph	
Controls	Level of Service (LOS	S) (Level Terrain)	В	В	
Roadway Elements	Travel Lane Width		12 ft	12 ft	
	Shoulder Width		Varies	Varies	
	Cross Slope	Travel Lane	2%	2%	
	Closs Slope	Shoulder	2%	2%	
		Inslope	6:1 (Width: 10 ft)	6:1 (Width: 10 ft)	
	Ditch	Width	10 ft Minimum	10 ft Minimum	
		Slope	20:1 towards back slope	20:1 towards back slope	
Earth Cut		0 to 5 ft	5:1	5:1	
Sections	Backslope; Cut Depth at Slope Stake	5 ft to 10 ft	4:1	4:1	
		10 ft to 15 ft	3:1	3:1	
		15 ft to 20 ft	2:1	2:1	
		> 20 ft	1.5:1	1.5:1	
		0 to 10 ft	6:1	6:1	
Earth Fill	Fill Height at Slope	10 ft to 20 ft	4:1	4:1	
Slopes	Stake	20 ft to 30 ft	3:1	3:1	
		> 30 ft	2:1	2:1	
	Stopping Sight Distan	ce	570 ft	730 ft	
	Passing Sight Distand		2135 ft	2480 ft	
	Minimum Horizontal ((e _{max} =8%)		1200 ft	1810 ft	
Alignment Elements	Vertical Curvature	Crest Vertical Curve	151	247	
	(K-Value)	Sag Vertical Curve	136	181	
	Maximum Grade	Level Terrain	3%	3%	
	waxiiiiuiii Graue	Rolling Terrain	4%	4%	
	Minimum Vertical Cle	arance	17 ft	17 ft	

Source: MDT Road Design Manual, Chapter 12, page 12(12), Figure 12-4, "Geometric Design Criteria for Rural Minor Arterials (National Highway System – Non Interstate) U.S. Customary," 2008; MDT Road Design Manual, Chapter 12, page 12(7), Figure 12-3, "Geometric Design Criteria for Rural Principal Arterials (National Highway System – Non Interstate) U.S. Customary," 2008.

Roadway Width

Within the study area, MT 16 / MT 200 is a two-lane undivided highway with two 12-foot travel lanes and varying shoulder widths. Seven- to eight-foot shoulders are typical throughout the corridor. Table 2.5 provides information on the roadway width and surface thickness throughout the corridor. According to the MDT NHS Route Segment Map, the suggested



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roadway width for MT 16 / MT 200 is 40 feet or greater, which would allow two 12-foot travel lanes and two eight-foot shoulders. However, the Route Segment Plan no longer defines a standard roadway width. The MDT Roadway Width Committee would determine the appropriate width during project development if improvement options are forwarded from the study.

Table 2.5 Highway Width and Surface Thickness

Pavement Thickness (inches)	Base Course Thickness (inches)	Surface Width (feet)	Lanes	Lane Width (feet)	Shoulder Width (feet)
4.8 – 11.0	8.4 – 22.0	28 - 46	2	12	7 - 8

Source: MDT, 2011 and 2012.

Horizontal Alignment

Horizontal alignment is a measure of the degree of turns and bends in the road, and includes consideration of horizontal curvature, superelevation, curve type, and stopping and passing sight distance. Based on current MDT criteria and a review of as-built plans, it appears that seven of the 57 horizontal curves within the corridor do not meet current MDT design standards for the design speed for curve radius and stopping sight distance. Appendix 4 presents horizontal alignment information for the corridor. It is MDT's practice to use a spiral curve when the curve radius is less than 3,820 ft. Because curve type is not listed in the MDT Road Design Manual as a design requirement, curve type is not considered in the Pass / Fail determination listed in Appendix 4. Superelevation was only assessed where sufficient as-built or record drawing data was available. Design elements listed in Appendix 4 are approximated, and determinations are based on the best available data provided by MDT.

Vertical Alignment

Vertical alignment is a measure of the elevation change on a roadway, and includes consideration of grade, vertical curve length, vertical curve type (sag curve or crest curve), and K value. K value is the horizontal distance needed to produce a one percent change in gradient and is directly correlated to the roadway design speed and stopping sight distance.

Review of as-built plans indicates eight of the 147 vertical curves within the study corridor fail to meet current MDT design standards for the design speed. Because minimum grade and curve length are not listed in the MDT Road Design Manual as design requirements, they are not considered in the vertical curve Pass / Fail determination. Appendix 4 presents vertical

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alignment information for the MT 16 / MT 200 corridor. Design elements listed in Appendix 4 are approximated, and determinations are based on the best available data provided by MDT.

Passing Zones

Passing zones are periodically provided within the corridor in locations with sufficient passing sight distance. Passing sight distance is defined as the minimum sight distance required to safely complete a passing maneuver. No sight distance issues were observed within striped passing zones or at intersections during a field review conducted in January 2012. Passing opportunities are limited by the frequency of oncoming vehicles (opposing flow rate), including large vehicles.

The MDT Traffic Engineering Manual states "at intersections of 2-lane, 2-way roadways, a no-passing zone should be marked in advance of the intersection or stop bar at a minimum distance of 500 ft (150 m) for rural facilities." MDT is currently considering an exception to this policy at intersections with low-volume minor approaches within the MT 16 / MT 200 corridor.

Table 2.6 lists the percent of each segment striped as no passing.

Table 2.6 Percent of Segment Striped as No Passing

Segment		Percent No Passing
Clandive to Cavego	MT 16 Northbound	23 Percent
Glendive to Savage	MT 16 Southbound	23 Percent
Savaga to Crana	MT 16 Northbound	31 Percent
Savage to Crane	MT 16 Southbound	19 Percent
Cropo to Sidnov	MT 16 Northbound	24 Percent
Crane to Sidney	MT 16 Southbound	22 Percent
Sidnov to Foirviow	MT 200 Eastbound	17 Percent
Sidney to Fairview	MT 200 Westbound	15 Percent

Source: DOWL HKM, 2012.

Clear Zones

The MDT Road Design Manual specifies an offset distance from the edge of the travel way (ETW) to be free of any obstructions. The ETW is delineated by the white pavement marking located on the right-hand side of the travel lane. This offset distance, known as the "clear zone," includes the roadway shoulder and is defined based on design speed, Average Annual Daily Traffic (AADT), horizontal curvature, the slope of cut / fill sections, and offsets from the



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ETW. A cut section occurs when a roadway facility is located below natural ground elevation and excavation of earthen materials is required. A fill section occurs when a roadway facility is located above natural ground elevation and addition of earthen materials is required.

Within cut sections, a roadside ditch is required by MDT for drainage. The dimensions of the ditch also provide a recovery area within the required clear zone for vehicles exiting the travel way. All cut slope sections within the MT 16 / MT 200 corridor meet current MDT design standards.

Criteria listed in Table 2.7 were used to analyze fill slopes and dimensions throughout the MT 16 / MT 200 corridor. The slopes and dimensions within the clear zone provide a recovery area for vehicles exiting the travel way. If the specified dimensions cannot be achieved, a roadway barrier (guardrail) should be provided.

Table 2.7 Fill Slope Clear Zone Distances

Design	Design	Fill Slope				
Speed	AADT	6:1 or Flatter	5:1	4:1	<3:1	
60 mnh	1500-6000	26'	32'	40'		
60 mph	>6000	30'	36'	44'	Barrier	
70 mm	1500-6000	30'	36'	42'	Warranted	
70 mph	>6000	32'	38'	46'		

MDT Road Design Manual, Chapter 14, page 14.2(2), "US Customary Units" 2008.

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Fill slope locations identified as possible safety concerns due to inadequate recovery area adjacent to the travel way are summarized in Table 2.8.

Table 2.8 Clear Zone Concerns for Fill Slope Locations

RP	Side of Road	Description		
1.1	East	 3:1 fill slope transitions to 2:1, 13 ft from ETW 		
1.8	West	 4:1 fill slope transitions to 2:1, 20 ft from ETW 		
2.4	East	 4:1 fill slope transitions to 2:1, 18 ft from ETW Box culvert opening located 30 ft from ETW 		
3.0	East	 5:1 fill slope transitions to 2:1, 18 ft from ETW 		
7.0	East & West	 4:1 fill slope to entrance/exit of double CMP culverts, 25 ft from ETW 		
8.5	East & West	 4:1 fill slope transitions to 2:1, 18 ft from ETW 		
11.8	East & West	 4:1 fill slope transitions to 2:1, 17 ft from ETW 		
12.7	West	 4:1 fill slope transitions to 2:1, 20 ft from ETW 		
14.2	West	 4:1 fill slope transitions to 1.5:1, 23 ft from ETW 		
14.4	West	 4:1 fill slope transitions to 2:1, 20 ft from ETW 		
16.3	West	 5:1 fill slope transitions to 3:1 and steeper, 17 ft from ETW 		
17.4	East	 4:1 fill slope transitions to 2:1, 20 ft from ETW prior to guardrail section 		
28.5	East	 Identified during corridor safety audit; additional information provided in Section 2.1.3 		
29.7	East & West	 5:1 fill slope transitions to 3:1, 28 ft from ETW 		

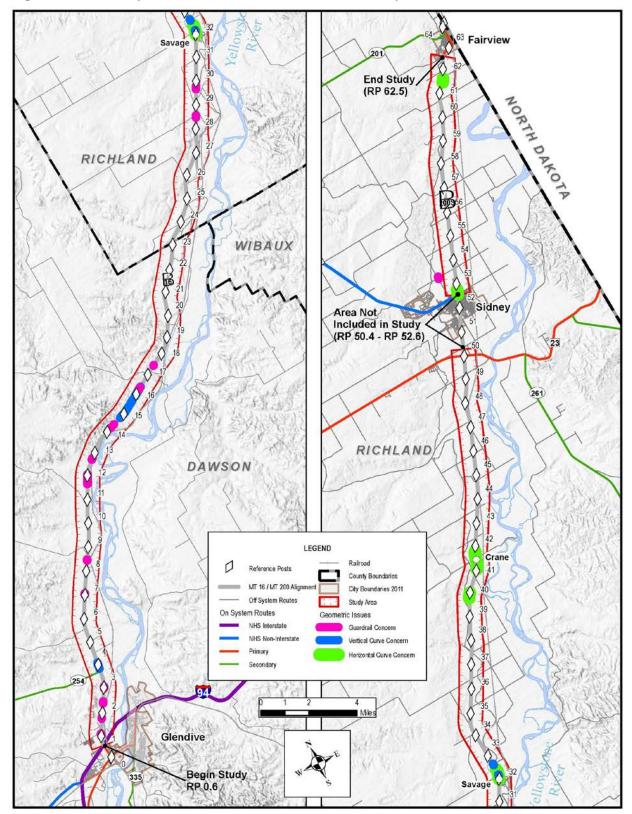
Source: DOWL HKM, 2012.

In addition to the 14 clear zone concerns identified in Table 2.8, an overhead sign post north of the MT 16 / MT 200 / Holly Street intersection (RP 52.6) is located within the clear zone. Relocation of the sign post outside the clear zone is recommended.

Summary of Geometric Concerns

Figure 2-2 presents the location of existing horizontal curve, vertical curve, and clear zone / guardrail concerns within the corridor. Additional guardrail concern locations may occur if traffic volumes reach projected values for the portion of the corridor from Glendive to Sidney.

Figure 2-2 Summary of Geometric Concerns within the Study Area



Source: MDT, 2012; DOWL HKM, 2012.



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2.1.3 Crash Analysis

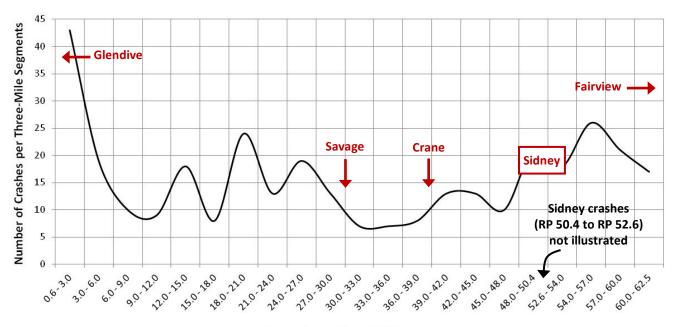
MDT conducted a corridor safety audit to assess safety conditions within the MT 16 / MT 200 corridor. As part of this process, MDT held an audit workshop on February 1 and 2, 2012. MDT representatives presented a summary of crash data information, followed by a field review of potential safety concerns. The corridor safety audit process identified the following concerns relevant to this corridor study:

- Commercial vehicle speed differential, which may lead to large vehicle queues and aggressive passing maneuvers
- Higher occurrence of crashes involving large vehicles
- Higher occurrence of unbelted crashes
- Higher occurrence of crashes involving vehicles with out-of-state registration
- Fatigued and impaired driver crashes
- · Ability of the existing transportation network to handle projected regional growth
- Increased driveway/intersection related crashes between Sidney and Fairview
- Moving sight distance concerns at the intersection of County Road 126 (RP 53.7)
- Minimal guidance to drivers and speed limit concerns approaching the intersection of MT 16 / MT 23 / MT 200 (RP 50.0). Concern was also expressed regarding the speed limit through this area.
- Head-on and single vehicle run-off-the-road (SVROR) crashes

The safety audit considered crash data for the portion of the MT 16 / MT 200 corridor from RP 0.0 to RP 64.2 for the five-year period from July 1, 2006 to June 30, 2011. A total of 337 crashes occurred within the MT 16 / MT 200 study corridor (RP 0.6 to RP 50.4 and RP 52.6 to RP 62.5). Crash locations within the study corridor are illustrated in Figure 2-3.

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Figure 2-3 Crash Locations in Study Corridor (2006 – 2011)



Approximate Three-Mile Segments

Source: MDT, 2012; DOWL HKM, 2012.

Rural Crash Rate, Severity Index, and Severity Rate for Study Corridor

MDT provided crash rate, severity index, and severity rate data for the MT 16 / MT 200 study corridor (RP 0.6 to RP 50.4 and RP 52.6 to RP 62.5) for the five-year period from January 1, 2007 to December 31, 2011.

Crash rate is a measure of the number of crashes in a roadway corridor per million vehicle miles (MVM) travelled. Since a higher number of crashes can generally be expected on roadway corridors with higher traffic volumes, this measurement offers an objective way to compare crash statistics for roadways with varying traffic volumes (which is also described as vehicle exposure). MDT calculates the crash rate as follows:

Crash Rate =
$$\frac{\text{(Total Number of Crashes)}}{\text{(Traffic Volume)(Analysis Time Period)(Segment Length)/(1,000,000 vehicles)}}$$

The severity index is a weighted measure of crashes occurring in a roadway corridor, with fatal crashes and crashes resulting in incapacitating injuries weighted more heavily (using a



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multiplier of 8) as compared to crashes resulting in less serious injuries (multiplier of 3) or property damage only (multiplier of 1). The severity index is calculated as follows:

Severity Index = 8(Fatal & Incapacitating Injury) + 3(Other Injury) + 1(Property Damage)Total Number of Crashes

Finally, the severity rate is a measure of the severity of crashes per million vehicle miles (MVM) travelled and is calculated as follows:

Severity Rate = (Crash Rate)(Severity Index)

The corridor crash rate, severity index, and severity rate were similar to or lower than statewide averages for similar facilities during this period, as presented in Table 2.9.

Table 2.9 Crash History Comparison (Statewide Average vs. MT 16 / MT 200 Corridor)

	Rural	NINHS	Rural Primary		
Criteria	Statewide Average (2007 – 2011)	MT 16 RP 0.6 – RP 50.4 (2007 – 2011)	Statewide Average (2007 – 2011)	MT 200 RP 52.6 – RP 62.5 (2007 – 2011)	
Crash Rate (All Vehicles)	1.01	1.16	1.12	1.26	
Severity Index (All Vehicles)	2.05	1.77	2.22	1.91	
Severity Rate (All Vehicles)	2.07	2.05	2.50	2.41	

Source: MDT, 2012.

Note: Crash statistics are calculated using Annual Average Daily Traffic Volumes (AADT) and reflect currently available data as of the date of this report.

Safety Audit Analysis – Rural Crashes

A total of 353 crashes were reported within areas designated as rural, defined as the portions of the corridor from RP 0.0 to RP 51.3, RP 52.6 to RP 62.5, and RP 63.9 to RP 64.2 (i.e., outside the city limits of Glendive, Sidney, and Fairview). Approximately 24% of rural crashes resulted in injuries, and three fatal crashes occurred. SVROR crashes accounted for over 35% of all crashes within the rural portions of the corridor. Table 2.10 lists rural injury and fatal crashes attributed to various collision types.

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Table 2.10 Collision Type (Rural Injury and Fatal Crashes Only, 2006 to 2011)

Collision Type (Injury and Fatal Crashes Only)	Rural Injury Crashes ⁽¹⁾	Rural Fatal Crashes ⁽¹⁾
Roll Over	27	1
Collision with Fixed Object	25	0
Head On	5	1
Right Angle	7	1
Left Turn Opposite Direction	3	0
Left Turn Same Direction	0	0
Sideswipe Opposite Direction	4	0
Sideswipe Same Direction	2	0
Pedestrian	0	0
Rear End	7	0
Loss of Control	1	0
Domestic Animal	1	0
Parked Vehicle	0	0
Wild Animal	2	0
Totals	84	3

Source: MDT, 2012.

Crash Trends

The corridor safety audit process identified crash trends over the following four stretches of highway:

- RP 0.0 to RP 4.0
 - Main collision types: fixed object and wild animal
 - Total of 58 crashes resulting in 7 injury crashes (1 incapacitating injury, 2 non-incapacitating injury and 4 possible injury) and 51 property damage only
- RP 12.0 to RP 28.0
 - Main collision types: fixed object, wild animal, and roll over
 - Total of 87 crashes resulting in a fatal crash, 24 injury crashes (6 incapacitating injury, 10 non-incapacitating injury and 8 possible injury) and 62 property damage only
- RP 49.0 to RP 51.3
 - o Main collision types: right angle, sideswipe, and wild animal
 - Total of 27 crashes resulting in a fatal crash, 6 injury crashes (1 incapacitating injury, 3 non-incapacitating injury and 2 possible injury) and 21 property damage only

⁽¹⁾ Data is provided for the period July 1, 2006 to June 30, 2011, reflecting currently available data as of the date of this report.

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- RP 53.0 to RP 63.0
 - o Main collision types: fixed object, rear end, right angle, roll over, and head on
 - Total of 73 crashes resulting in a fatal crash, 30 injury crashes (5 incapacitating injury, 16 non-incapacitating injury and 9 possible injury) and 42 property damage only

Light and Road Conditions

The highest percentage of crashes in the rural portion of the corridor occurred with dry road conditions (67%, or 238 of 353) and during daylight (48%, or 168 of 353).

Rural Crashes Involving Wild Animals

Wild animals were involved in 37% (130 out of 353) of reported rural crashes, although additional unreported crashes involving wild animals may have occurred during the 2006 to 2011 analysis period. Crashes involving wild animals were dispersed throughout the corridor, with higher numbers occurring near RP 0.0 (8 crashes), RP 1.0 (10 crashes), and RPs 14.0, 42.0, and 48.0 (6 crashes in each location). Seven deer and several bird carcasses were observed during a field survey on January 31, 2012. Figure 2-4 illustrates wild animal collisions in the rural portion of the corridor.

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Figure 2-4 Rural Crashes Involving Wild Animals (2006 – 2011)

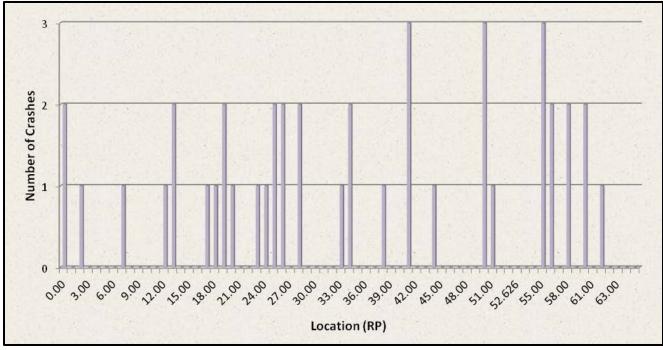
Source: MDT, 2012.

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Rural Crashes Involving Large Vehicles

Large vehicles include vans, buses, school buses, truck / truck-tractors, motor homes, ambulances, fire trucks, wreckers in transit, and working construction vehicles. Approximately 12% (42 of 353) of rural crashes involved large vehicles. Crashes involving large vehicles were relatively evenly spread throughout the corridor, as illustrated in Figure 2-5.

Figure 2-5 Rural Crashes Involving Large Vehicles (2006 – 2011)



Source: MDT, 2012.

2.1.4 Access Analysis

High resolution aerial imagery and Google Street View were used to review access points within the corridor. A total of 528 access points were identified, with 264 (50%) located on the west side of the roadway and 264 (50%) located on the east side of the roadway. Approximately 95% (500 out of 528) of all access points are unpaved. The most common types of access points are private driveways (231 out of 528 or 44%) and farm field accesses (164 out 528 or 31%). Table 2.11 presents access point data in the corridor.

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Table 2.11 Access Points within Study Corridor

	Private Driveways ⁽¹⁾			ommercial Access ⁽²⁾ Road		ccess ⁽³⁾	Farm Field Access ⁽⁴⁾	Total
	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	
West Side of Roadway	119	3	6	2	40	7	87	264
East Side of Roadway	108	1	13	3	50	12	77	264
Combined Total	227	4	19	5	90	19	164	528
Percent Total	43%	1%	3%	1%	17%	4%	31%	100%

Source: DOWL HKM, 2012.

Access point density is calculated by dividing the total number of unsignalized intersections and driveways on both sides of the roadway segment by the length of the segment in miles. Access point locations throughout the corridor are provided in Appendix 5. Access point densities are listed in Table 2.12.

Table 2.12 Access Density per Segment

Segment			Total Access	Total Length	Access Point Density	Reduction in FFS (1)	
Number	Name	Start RP	End RP	Points	(Miles)	(Access Points Per Mile)	(mph)
1	Glendive to Savage	0.0	31.5	156	30.9	5.0	0.0 to 2.5
2	Savage to Crane	31.5	41.5	107	10.0	10.7	
3	Crane to Sidney	41.5	50.4	110	8.9	12.4	2.5 to 5.0
4	Sidney to Fairview	52.6	62.5	155	9.9	15.7	

Source: DOWL HKM, 2012, HCM 2010, Exhibit 15-8 Adjustment Factor for Access-Point Density.

2.1.5 Traffic Volumes

Annual Average Daily Traffic (AADT) Volumes

Annual Average Daily Traffic (AADT) is the total of all motorized vehicles traveling in both directions on a highway on an average day. Traffic count data within the MT 16 / MT 200 corridor was collected using short-term counters. MDT collects a minimum of 36 hours of traffic count data during each short-term count setting. Short-term counts can be collected

⁽¹⁾ The Private Driveways category includes access points originating from a private residence.

The Commercial Access category includes access points originating from a commercial business.

⁽³⁾ The Road Access category includes access points originating from county roads, city streets, and rural roads.

⁽⁴⁾ The Farm Field Access category includes access points originating from a farm field.

⁽¹⁾ Free-flow speed (miles/hour).

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only when weather permits (usually April through September), unlike permanent counters which collect traffic data year-round. Short-term counts reflect a "snapshot" of traffic conditions during a particular 36-hour period and must be seasonally adjusted to provide a better representation of traffic conditions on an average day of the year.

MDT calculated weighted AADT traffic volumes along MT 16 between Glendive and Sidney (RP 0.6 to RP 50.4) and along MT 200 from Sidney to Fairview (RP 52.6 to RP 62.5). A single AADT traffic volume was calculated for each of these portions of the corridor by weighting volumes from multiple count locations by the length in miles of each roadway count segment. For the years 1990 to 2011, traffic data was collected in nine locations between Glendive and Sidney and five locations between Sidney and Fairview. Traffic volumes were collected for this corridor study in March 2012 in three locations between Glendive and Sidney and one location between Sidney and Fairview. Figure 2-6 illustrates weighted AADT volumes for the portions of the corridor between Glendive and Sidney and Sidney to Fairview from 1990 to 2012. Additional information is provided in Appendix 6.

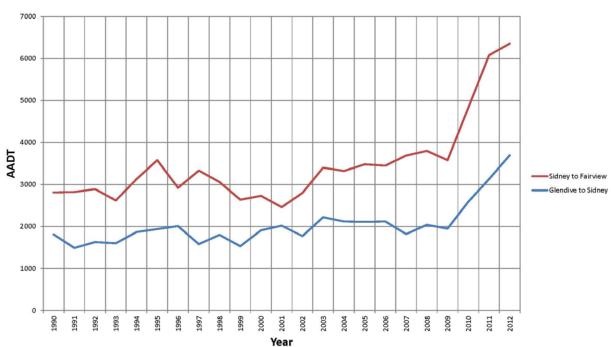


Figure 2-6 Weighted AADT Volumes (1990 – 2012)

Source: MDT, 2012.

Note: Traffic volumes were not collected in 2010 for the portion of the corridor from Sidney to Fairview. The 2010 Sidney to Fairview volume represents an average between 2009 and 2011 data.



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Figure 2-6 demonstrates the recent increase in traffic volumes in the study corridor. Observed traffic volumes increased for the portion of the corridor from Glendive to Sidney during the period 2009 to 2010 and 2010 to 2011 by 33 percent and 21 percent, respectively. Observed traffic volumes increased by 70 percent for the portion of the corridor between Sidney and Fairview during the period 2009 to 2011.

For the portion of the corridor from Glendive to Sidney, large trucks comprised 16 percent of the total traffic volume in 2011, representing an 82 percent increase from 2010. For the portion of the corridor from Sidney to Fairview, large trucks comprised 17 percent of the total traffic volume in 2011, representing a 245 percent increase from 2010.

Peak Hour Traffic Volumes

Counts for this analysis were collected by MDT in March 2012. Data from the March 2012 field count collection effort was used to identify the highest peak hour of the day (defined as the four consecutive 15-minute periods with the highest volumes during the count period). A seasonal adjustment factor was applied to the respective month and day of the counts to calculate annual average hourly traffic volumes. MDT calculates statewide seasonal adjustment factors based on the functional classification of a roadway and the month and day of the week associated with traffic volume data collected by permanent counter locations throughout the state. There are no permanent counter locations within the study corridor. Seasonal adjustments specific to the MT 16 and MT 200 corridor were not identified for this study.

2.1.6 Operational Characteristics

Methodology

Traffic conditions on transportation facilities are commonly defined using the Level of Service (LOS) concept. The Highway Capacity Manual (HCM) 2010 defines LOS based on a variety of factors to provide a qualitative assessment of the driver's experience. Within the study corridor, MT 16 and MT 200 fall under the HCM classification of a Class I two-lane highway. Class I two-lane highways are major intercity routes, primary connectors of major traffic generators, daily commuter routes, or major links in state or national highway networks where motorists expect to travel at relatively high speeds. These facilities serve mostly long-distance trips or provide connections between facilities that serve long-distance trips. The HCM defines LOS for Class I two-lane highway on the basis of the percent time-spent-following (PTSF) concept. PTSF represents the freedom to maneuver and the comfort and convenience of



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travel. It reflects the average percentage of time that vehicles must travel in platoons behind slower vehicles due to an inability to pass. The two major factors affecting PTSF include passing capacity and passing demand. The concept of passing capacity for a two-lane highway reflects that the ability to pass is limited by the opposing flow rate and by the distribution of gaps in the opposing flow. The concept of passing demand reflects that the demand for passing maneuvers increases as more drivers are caught in a platoon behind a slow-moving vehicle (i.e., as PTSF increases in a given direction). Both passing capacity and passing demand are related to flow rates. When flow in each direction increases, passing demand increases and passing capacity decreases.

For a Class I two-lane highway, six (6) LOS categories ranging from A to F are used to describe traffic operations, with LOS A representing the best conditions and LOS F representing the worst. LOS F exists whenever demand flow in one or both directions exceeds the capacity of the segment, operating conditions are unstable, and heavy congestion exists. Table 2.13 presents LOS criteria for Class I two-lane highway segments.

Table 2.13 LOS Criteria for Class I Two-lane Highways

Level of Service	Class I Two-lane Highways PTSF ⁽¹⁾ (%)
Α	≤35.0
В	>35.0 to 50.0
С	>50.0 to 65.0
D	>65.0 to 80.0
E	>80
F	Demand Exceeds Capacity

Source: HCM 2010, Exhibit 15-3 Automobile LOS for Two-lane Highways.

Highway Capacity Software (HCS) Version 2010 was used to analyze LOS for a Class I two-lane highway in the corridor.

The percentage of heavy vehicles in the traffic stream was considered as part of the HCS analysis. Heavy vehicles are defined as vehicles that have more than four tires touching the pavement. Trucks, buses, and recreational vehicles (RVs) are examples of heavy vehicles. Trucks cover a wide range of vehicles, from lightly loaded vans and panel trucks to the most heavily loaded haulers.

⁽¹⁾ Percent time-spent-following.



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An amendment to the contract (change order) for the 30 km NE of Glendive – NE project includes passing lanes from approximate RP 20.0 to RP 22.0, which will decrease PTSF and improve LOS over the length of the passing lanes and for some distance downstream before PTSF returns to its former level. These passing lanes are included in the HCS analysis conducted for this study.

Table 2.14 presents the downstream roadway length affected by passing lanes on highways with varying traffic volumes. Passing lanes constructed on highways with lower traffic volumes result in longer downstream affected lengths. This is due primarily to fewer vehicles downstream of the passing lane resulting in fewer following situations. Due to the downstream effect on PTSF, LOS for a two-lane highway may be improved by the addition of a passing lane.

Table 2.14 Downstream Length of Roadway Affected by Passing Lanes

Directional Demand Flow Rate ⁽¹⁾ (passenger cars per hour)	Downstream Length of Affected Roadway (miles)		
≤200	13.0		
300	11.6		
400	8.1		
500	7.3		
600	6.5		
700	5.7		
800	5.0		
900	4.3		
≥1,000	3.6		

Source: HCM 2010, Exhibit 15-23 Downstream Length of Roadway Affected by Passing Lanes on Directional Segments in Level and Rolling Terrain.

Note: Interpolation to the nearest 0.1 is recommended.

Analysis Results

Table 2.15 presents the results of the operational analysis for existing (2012) conditions. LOS values represent estimated operational conditions within each specified corridor segment. Appendix 7 contains HCS operational analysis worksheets.

⁽¹⁾ The traffic volume flow rate of a highway in one direction.



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Table 2.15 Class I Two-lane Highway Operational Analysis Results (2012)

Location		2012 2-Lane with Passing Lanes ⁽¹⁾		
			PTSF ⁽²⁾ (%)	LOS
		MT 16 Northbound RP 0.6 to RP 20.0	39.6	В
	Glendive to Savage	MT 16 Southbound RP 0.6 to RP 12.4	39.5	В
Segment		MT 16 Northbound RP 20.0 to RP 31.5	26.5	Α
		MT 16 Southbound RP 12.4 to RP 22.0	25.2	Α
		MT 16 Southbound RP 22.0 to RP 31.5	40.1	В
	Savage to Crane	MT 16 Northbound RP 31.5 to RP 41.5	37.9	В
		MT 16 Southbound RP 31.5 to RP 41.5	42.5	В
	Crane to Sidney	MT 16 Northbound RP 41.5 to RP 50.4	38.0	В
		MT 16 Southbound RP 41.5 to RP 50.4	50.2	С
	Sidney to Fairview	MT 200 Eastbound RP 52.6 to RP 62.5	51.1	С
ပိ		MT 200 Westbound RP 52.6 to RP 62.5	49.3	В

Source: DOWL HKM, 2012.

Note: Shaded gray rows indicate analyzed sections with passing lanes and their associated downstream effect.

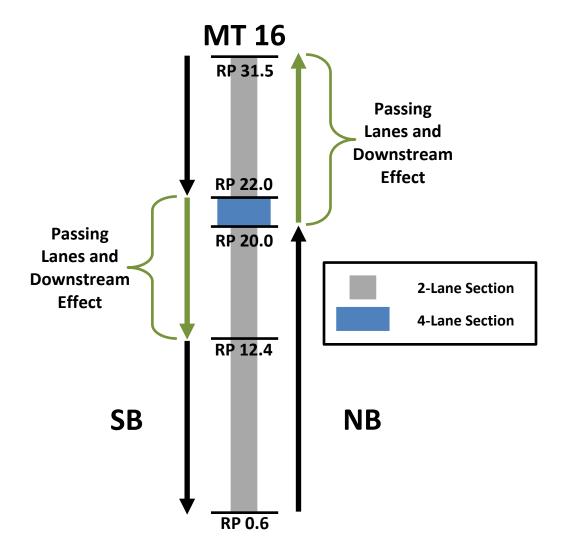
In the northbound direction, two LOS values are reported between Glendive (RP 0.6) and Savage (RP 31.5). The first LOS value represents the single northbound travel lane from RP 0.6 to RP 20.0, and the second LOS value represents two travel lanes including the passing lane and downstream effect from RP 20.0 to Savage (RP 31.5). Reduced posted speed limits in the town of Savage truncate the downstream effect of the northbound passing lane. In the southbound direction, three LOS values are reported between Glendive (RP 0.6) and Savage (RP 31.5). The first LOS values represents the single southbound travel lane from Glendive (RP 0.6) to RP 12.4, the second value represents two southbound travel lanes including the passing lane and downstream effect from RP 12.4 to RP 22.0, and the third value represents the single southbound travel lane from RP 22.0 to Savage (RP 31.5). Figure 2-7 illustrates these conditions.

⁽¹⁾ Passing lanes are being constructed as part of the 30 km NE of Glendive – NE project from RP 20.0 to RP 22.0 in the northbound and southbound directions. Project completion is anticipated in August 2012.

⁽²⁾ Percent time-spent-following.



Figure 2-7 Passing Lanes and Downstream Effect



The MDT Traffic Engineering Manual defines desirable operations for principal and minor arterial facilities in level terrain as LOS B. The MT 16 / MT 200 corridor currently operates at LOS B or better throughout the corridor, with the exception of the MT 16 southbound Crane to Sidney segment (RP 41.5 to RP 50.4) and the MT 200 eastbound Sidney to Fairview (RP 52.6 to RP 62.5), which are currently operating at LOS C.

2.2 Demographic and Economic Conditions

The study corridor includes portions of Dawson and Richland counties on the eastern border of Montana. The region has trended towards negative population growth in the last three decades. However, recent economic activity has reversed this trend, bringing more workers

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and traffic to the region. Historic and recent trends in population and economic activity are discussed in the following sections.

2.2.1 Population and Housing Characteristics

Table 2.16 summarizes data from the 2010 Census. Richland and Dawson counties are similar by most measures. Richland County is slightly more populated than Dawson County due in part to the larger population of Sidney compared to Glendive.

The Native American population of both counties is approximately three percent, compared to approximately six percent for the state. This percentage is similar to other counties in Montana without Reservation lands. The nearest Indian Reservations are the Fort Peck Reservation to the north and the Northern Cheyenne Reservation to the south. In terms of ethnicity, the Hispanic population is two to three percent, which is comparable to the state percentage.

Vacancy rates for the counties ranged from 8 to 11% at the time of the 2010 Census. A housing unit is considered vacant by the U.S. Census if no one is living in it at the time of the interview, unless its occupants are only temporarily absent. In addition, a vacant unit may be one which is entirely occupied by persons who have a usual residence elsewhere.

Field reports suggest an influx of workers has put increasing pressure on the housing markets in the region since the 2010 Census counts and vacancy rates may be lower now than previously reported. Recent permit applications for temporary housing units (e.g., RV parks or "man camps") indicate continued scarcity of permanent housing units.

Table 2.16 2010 Census Data

Category		Montana	Richland County	Dawson County
	County / State	989,415	9,746	8,966
Population Largest City in County Sidney (Richland County) Glendive (Dawson County)		NA	5,191	4,935
Dana	White	89%	97%	97%
Race	American Indian	6%	3%	3%
Ethnicity	Hispanic or Latino	3%	3%	2%
	Total housing units	482,825	4,550	4,233
Housing	Owner-occupied	58%	64%	63%
Housing	Renter-occupied	27%	28%	26%
	Vacant	15%	8%	11%

Source: U.S. Census Bureau, 2010.

Figure 2-8 illustrates historic and projected populations for Montana, Dawson County, and Richland County from 2000 to 2035. Montana experienced moderate positive growth from 2000 to 2010 and is expected to grow at a similar pace into the future, increasing to about 150 percent of the state's 2000 population by the year 2030.

From 2000 to 2004, Richland and Dawson Counties experienced a combined population decline of over 1,000 people. The population increased slightly from 2004 to 2010. The solid red line indicates study area population projections based on historical trends from the last decade. More recently, analysts have revised population projections based on the current oil development boom. The blue dashed line indicates an expected sharp increase in population in the near-term. As energy exploration and development activity eventually decline, population and job growth are expected to flatten. The length, rate, and long-term impacts of this population influx are unknown.

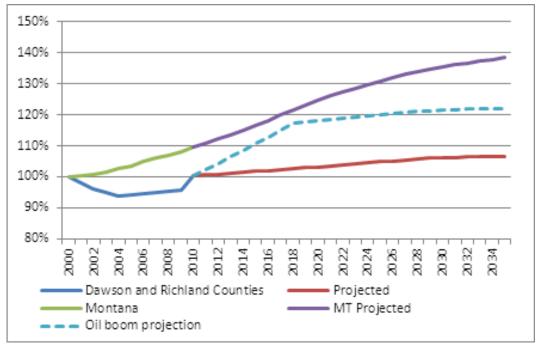


Figure 2-8 Historic and Projected Population

Source: NPS Data Services, 2012; Montana Census and Economic Information Center (CEIC), 2012.

2.2.2 Economy

The energy industry comprised the largest share of the regional economic base of Richland County according to data provided for the 2008 to 2010 period from the University of Montana Bureau of Business and Economic Research (BBER). Agriculture, manufacturing, and



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transportation sectors also play large roles in the regional economy. The economic base is rounded out by government activities, health care, and other industries including tourism.

Recent unemployment figures from state and federal labor departments suggest favorable employment conditions in the study area. As of November 2011, unemployment in Richland and Dawson Counties was approximately 3%, less than half the statewide rate of 6.6% and nearly two-thirds lower than the national rate of 8.6%. Unemployment data is presented in Table 2.17.

Table 2.17 November 2011 Unemployment Figures (not seasonally adjusted)

Location	Labor Force	Employed Unemploye		Rate	
Montana	498,322	465,573	32,749	6.6%	
Richland County	6,201	6,042	159	2.6%	
Dawson County	4,357	4,222	135	3.1%	

Source: MDT, 2012.

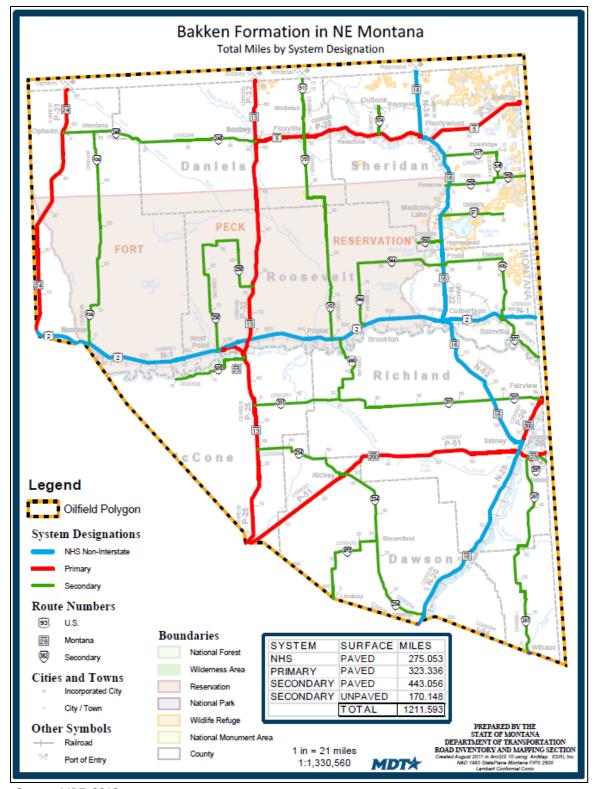
Energy Industry

The study area is located within the area of influence of Bakken formation, which is currently experiencing a boom in oil development. That boom has generated growth in freight and other traffic in recent months, making eastern Montana and northwestern North Dakota among the fastest growing economic areas in the United States. Within the study area, the MT 16 / MT 200 corridor is a major service route connecting Interstate 90 to the Bakken region.

Figure 2-9 illustrates the Bakken formation within Montana, along with political boundaries and state-managed roads. The Bakken formation extends well into North Dakota and Saskatchewan. Much of the recent increase in traffic volumes within the study area may be the product of commerce across these boundaries. Apart from drilling activities, economic activity may be generated by transport to and from drilling sites, rail facilities, and transmission stations and performing value-added work such as engineering, processing, marketing, and other labor.

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Figure 2-9 Bakken Formation in Montana



Source: MDT, 2012.

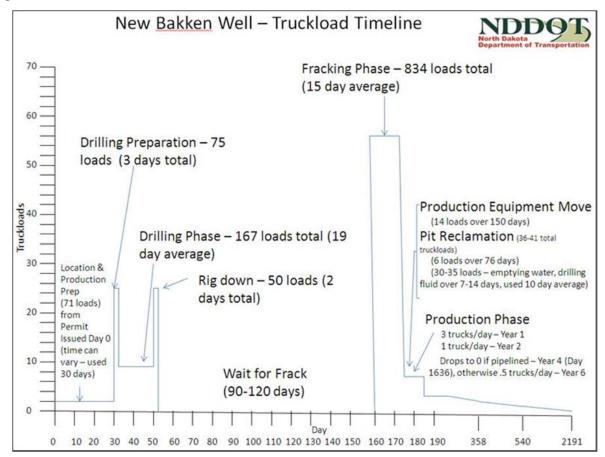


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While oil well development and production have contributed to the local economy for many years, technological advances have resulted in substantial increases in the amount of recoverable oil. Historically, oil wells consisted of a single, vertically drilled shaft. Newer oil extraction techniques involve directional / horizontal drilling within the oil bearing deposit from a single vertical shaft. Hydraulic fracturing technology is used to crack the oil bearing material along the horizontally drilled shafts. A mixture of water and sand is injected under high pressure, "fracturing" the rock to release captured oil and increasing the amount of recoverable oil from each well. Use of this technology began in the Bakken fields in mid 2000s and is now the predominant form of oil well development throughout the region.

The North Dakota Department of Transportation (NDDOT) developed a Bakken Well Truckload Timeline demonstrating the number of truckloads believed to be associated with hydraulic fracturing technology. This timeline is illustrated in Figure 2-10. NDDOT estimates nearly 2,400 truckloads in the first year of development and production for a single well, with almost 36% of those truckloads occurring during a 15-day "fracking" phase.

Figure 2-10 NDDOT Bakken Well Truckload Timeline





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In 1995, the US Geological Survey (USGS) estimated 151 million barrels of recoverable oil in the Bakken region. A revised estimate released by USGS in April 2008 increased the estimate of recoverable oil from 3.0 to 4.3 billion barrels. Current estimates continue to fluctuate, with some oil company estimates reaching 20 billion barrels of recoverable oil. The average life expectancy of an oil well in the Bakken formation can extend up to 20 years, although production is highest in the first year. Analysts estimate oil exploration and development in the Bakken formation may continue for ten to twenty years.

Agriculture

Agricultural activities are also a major component of the local economy. The 2010 Montana State Rail Plan identifies four shuttle loading facilities in northeastern Montana, one of which is located in Glendive. A 110-car grain elevator loading facility is currently being constructed in Culbertson, Montana. Historically, Montana producers relied on smaller, local elevators providing rail service in 52- or 26-car units. The new shuttle loading facilities are designed to load 110 rail cars, double to quadruple previous industry standards.

With fewer and more centralized grain loading facilities, the distance from farm to elevator has generally increased. Haul trucks are often larger, heavier, and travel longer distances to reach grain loading facilities, with potential impacts on pavement condition and roadway maintenance costs.

2.2.3 Other Planning Documents

Planning documents prepared by MDT, Dawson County, and Richland County relevant to the MT 16 / MT 200 corridor planning effort are listed below. Review of existing plans provides an understanding of conditions within the corridor and encourages consistency with local planning efforts.

<u>Culbertson Corridor Planning Study (ongoing)</u> – Culbertson, MT is located approximately 35 miles north / northwest of Sidney via MT 16. The Culbertson area has experienced similar growth in traffic along US 2 and MT 16 as is being experienced along the MT 16 / MT 200 corridor. The Culbertson Corridor Planning Study is primarily focused on truck traffic on US 2 and MT 16 which intersect in Culbertson.

<u>Sidney Truck Route Study (2009)</u> – MDT completed a study to assess the need for a bypass route that would allow truck traffic on the MT 16 / MT 200 corridor to avoid Central Avenue in downtown Sidney. The study identified an eastern truck route as having the greatest potential



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for diverting truck traffic from Central Avenue. The recommended improvement intersects the MT 200 corridor north of Sidney within the limits of the MT 16 / MT 200 corridor planning study area.

Growth Policy for Richland County, Sidney and Fairview (2007) — The Richland County Growth Policy is intended to provide long-range planning for the county and the communities of Sidney and Fairview. The plan identifies agriculture as the predominant land use within the county, with approximately 90% of the county's land mass in privately held farms and ranches. The plan acknowledges the impact of Bakken oil development, noting approximately 200 wells were developed between 2000 and plan adoption in 2007. Surface impacts of energy production include drill sites, transportation system impacts, and land conversion for industrial purposes to stockpile and house equipment and supplies.

There is no zoning in Richland County outside the Sidney and Fairview city limits. Richland County, Sidney, and Fairview have established joint City-County planning areas with the intent of extending zoning up to one mile beyond city limits. Draft Future Land Use Maps (FLUM) have been prepared for the joint Sidney and Fairview City-County planning areas and are being reviewed through the public hearing process prior to being adopted as elements of the Growth Policy.

The draft Sidney FLUM shows highway business and commercial zoning southwest of Sidney along the MT 16 corridor. Industrial uses extend to the east and residential uses extend to the west of proposed highway business / commercial zoning areas. Zoning proposed northeast of Sidney along MT 200 includes a mix of residential and commercial uses. The draft Fairview FLUM indicates a majority of commercial zoning within the city limits, with residential zoning extending southwest of town along the MT 200 corridor. Implementation of proposed zoning could increase development along the MT 16 / MT 200 corridor.

<u>Dawson County / Glendive Growth Policy (2006)</u> – The Dawson County / Glendive Growth Policy is intended to serve as a planning guide for local officials and citizens throughout the planning period from its adoption in 2006 through 2025. It is a long-range statement of local public policy providing guidance for accommodating development within the county.

The plan highlights a need to preserve agricultural land as a primary resource within the county, with future commercial, industrial, and residential development proposed in the area surrounding Glendive. Agriculture is identified as the predominant use along the MT 16



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corridor. The plan identifies strip commercial and industrial development along MT 16 extending approximately one mile north / northeast of I-94. Moving north, land use designations transition to rural residential development along MT 16 for approximately one mile, and then predominantly agricultural use to the county line. Land use designations within the first two miles of the study area (RP 0.6 to 2.6) may facilitate future commercial, industrial, and residential development within the corridor.

2.3 Environmental and Physical Setting

MDT prepared an Environmental Scan Report for the MT 16 / MT 200 Corridor Planning Study to identify environmental resource constraints and opportunities within the study corridor. Information was gathered from previously-published documents, agency websites, and GIS databases. Key information from the Environmental Scan Report is summarized in the following sections.

2.3.1 Physical Environment

Soil Resources and Prime Farmland

Some areas within the corridor are classified as prime and important farmlands. If improvement options are forwarded from this study, a U.S. Department of Agriculture Natural Resource Conservation Service Farmland Conversion Impact Rating Form for Linear Projects (form CPA-106) will need to be completed to document any impacts to farmlands.

Geologic Features and Hazards

The MT 16 / MT 200 alignment generally follows a highland terrace of the Yellowstone River, occasionally traversing lowland floodplain areas. Alluvium typically consists of unconsolidated deposits of gravel, sand, silt, and clay.

Surface Water

The study corridor is located in the Lower Yellowstone Watershed. The Yellowstone River from its confluence with the Powder River (near Terry, MT) to the North Dakota border is listed in the 2012 Integrated 303(d / 305(b) Water Quality Report for Montana by the Montana Department of Environmental Quality (DEQ). The 2012 DEQ report classifies the portion of the Yellowstone River within the study area as Category 5 and Category 4C. Category 5 water bodies are waters where one or more applicable beneficial use has been assessed as being impaired or threatened, and a Total Maximum Daily Loads (TMDL) is required to address the factors causing the impairment or threat. Category 4C water bodies are waters where TMDLs are not required as no pollutant-related use impairment is identified. TMDLs have not yet been



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written for water bodies in this watershed. When TMDLs are prepared and implementation plans are in place, any construction practices will have to comply with the requirements set forth in the plan.

Groundwater and Sourcewater Points

Numerous groundwater and sourcewater access points are located within the study corridor. Dawson County and Richland County have not developed Local Water Quality Districts (LWQD). If improvement options are forwarded from this study, water quality protection measures may need to be addressed during project development.

Irrigation

Irrigated farmland exists in Dawson County and Richland County adjacent to the study corridor. If improvement options are forwarded from this study, operators of irrigation facilities will need to be contacted for flow requirements during project development to minimize impacts to farming operations. Irrigation facilities will need to be assessed to determine if they are considered Waters of the U.S. and subject to jurisdiction by the U.S. Army Corps of Engineers (USACE).

Wetlands

The study area encompasses portions of the Yellowstone River and associated tributaries and wetland areas. If improvement options are forwarded from this study, wetland delineations and jurisdictional determinations will need to be conducted during project development according to standard USACE procedures.

Floodplains

Designated flood zones occur within the study corridor. If improvement options are forwarded from this study, coordination with the County Floodplain Administrator will need to be conducted during the project development process to minimize floodplain impacts and obtain any necessary floodplain permits.

Hazardous Materials

There are a number of underground storage tank (UST) sites, leaking underground storage tank (LUST) sites, and remediation response sites within the study corridor. If improvement options are forwarded from this study, handling and disposing of any contaminated materials encountered during construction activities will be conducted in accordance with applicable state, federal, and local laws and rules.

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Air Quality

The study corridor is not located in or adjacent to a non-attainment area and is exempt from a Mobile Source Air Toxics Analysis under the conformity exemption for planning studies.

Noise

Noise receptors may be located within the study area. If improvement options are forwarded from this study, noise studies may need to be conducted for Type I projects during project development.

Visual Resources

The study corridor contains an array of environmental resources which contribute to the rural landscape. There are no properties or view corridors within the study area listed on the Department of Interior's National Landscape Monument System.

2.3.2 Biological Resources

Fish and Wildlife

Threatened and Endangered Wildlife Species

Six (6) endangered, threatened, proposed, or candidate animal species are expected to occur in Dawson and Richland Counties. These species are listed in Table 2.18.

If improvement options are forwarded from this study, an evaluation of potential impacts to all endangered, threatened, proposed, or candidate species will need to be completed during the project development process.

Table 2.18 Threatened and Endangered Wildlife Species in Richland and Dawson Counties

Category Scientific Name		Common Name	Federal Status	
Fish	Scaphirhynchus albus	Pallid Sturgeon	Listed Endangered	
	Charadrius melodus	Piping Plover	Listed Threatened, Critical Habitat	
	Sterna antillarum athalassos	Interior Least Tern	Listed Endangered	
Bird	Grus Americana	Whooping Crane	Listed Endangered	
	Centrocercus urophasianus	Greater Sage Grouse	Candidate	
	Anthrus spragueii	Sprague's Pipit	Candidate	

Source: USFWS, 2011.



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Wildlife and Fish Species of Concern

Thirty-nine (39) animal species of concern are expected to exist in Dawson and Richland Counties. If improvement options are forwarded from this study, on-site surveys will need to be completed during the project development process.

Vegetation

Native vegetation in the study area generally consists of wetland and riparian areas along the Yellowstone River and sagebrush / grasslands in the upland areas. The remaining vegetation consists of cultivated crop land.

Threatened and Endangered Plant Species

No endangered, threatened, proposed, or candidate plant species are listed for Dawson or Richland Counties, and none are currently expected to occur in the study area.

Plant Species of Concern

A single plant species of concern is anticipated to occur in Dawson County. If improvement options are forwarded from this study, on-site surveys will need to be completed during the project development process.

Noxious Weeds

There are 32 noxious weeds in Montana, as designated by the Montana Statewide Noxious Weed List (effective April 15, 2008). If a project is forwarded from the improvement option(s), a noxious weed survey will need to be conducted during the project development process.

2.3.3 Social and Cultural Resources

Cultural and Archaeological Resources

Resources identified within the study corridor include historic irrigation canals, bridges, residences, mining operations and trash deposits, and archaeological sites. If improvement options are forwarded from this study, on-site surveys would need to be completed during the project development process.

Section 6(f) Resources

Five Section 6(f) resources are located within the study corridor and are listed in Table 2.19.

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Table 2.19 Section 6(f) Resources within the Project Area

Name	Type of Resource	Location	
Dawson County Hollecker Lake	Recreational Lake Area	On MT 16, approximately 0.2 Miles North of the MT 16 / I-94 Junction	
Gartside Reservoir	Fishing Access	Approximately 0.5 miles west of Crane, MT	
Seven Sisters Island	Fishing Access	Approximately 0.5 miles east of Crane, MT	
Intake Dam Fishing Access Site	Fishing Access	On MT 16, approximately 17.0 Miles North of Glendive	
Elk Island Wildlife Management Area / Fishing Access Site	Wildlife Management Area / Fishing Access Site	On MT 16, approximately 1.5 Miles North of Savage, MT	

Source: MDT, 2012.

Section 4(f) Resources

Known historic sites within the corridor include the Northern Pacific Railway (now BNSF Railway), portions of the Bureau of Reclamation's Lower Yellowstone Irrigation Project, and potentially several steel pony truss bridges in the vicinity of Savage that were built in the second decade of the twentieth century and are associated with the irrigation project. The old wagon road between Fort Keogh (outside Miles City) and Fort Buford in North Dakota is also likely located within the corridor as are sections of the Red Trail auto trail from the late 1910s and 1920s. Resources listed in the Section 6(f) discussion are also considered Section 4(f) resources. If federally funded improvement options are forwarded from this study, on-site surveys will need to be completed during the project development process to identify additional Section 4(f) resources in the corridor. Known and potential Section 4(f) resources are listed in Table 2.20.

Table 2.20 Known and Potential Section 4(f) Resources within the Study Area

Name	Type of Resource	Location	
Northern Pacific Railway (BNSF)	Historic Railway	Throughout Corridor	
Lower Yellowstone Irrigation Project	Historic Canal		
Fort Keogh to Fort Buford Wagon Trail	Historic Roadway	Various Locations Throughout Corridor	
Red Trail auto trail from the late 1910s and 1920s	Historic Roadway	700 000000	

Source: MDT, 2012. Section 6(f) resources from Table 2.19 are not duplicated.

Environmental Justice

Minority and low-income persons may live within the study corridor. If a federally funded project is forwarded from the study, environmental justice issues will need to be further evaluated during the project development process.

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3.0 PROJECTED CONDITIONS

Projected highway transportation system conditions within the study corridor are discussed in terms of anticipated future growth rates, traffic volumes, and operational characteristics.

3.1 Growth Rates

Community members stated during a safety audit meeting facilitated by MDT in February 2012 that traffic volumes along MT 16 / MT 200 corridor have increased substantially since 2008. Compound annual growth rates for the two portions of the corridor (MT 16 from RP 0.6 to RP 50.4, and MT 200 from RP 52.6 to RP 62.5) were calculated based on weighted AADT volumes over the period 1990 to 2008 and again for the period 2008 to 2012. The compound annual growth rate calculated for the period 1990 to 2008 is assumed to be reflective of historical background growth, while the compound annual growth rate calculated for the period 2008 to 2012 is assumed to be reflective of increases in traffic associated with recent economic activity in the region.

The general calculation for identifying a compound annual growth rate is presented below, followed by calculations using data for the two portions of the corridor for the years 1990 to 2008 and 2008 to 2012. A minimum period of five years is generally used to identify trends in traffic volumes to minimize potential volatility from an unusual traffic volume observed in a single year.

Compound Annual Growth Rate Calculation Formula

 $\hbox{[(Ending Volume/Starting Volume)$^{(1/(Ending \, Year-Starting \, Year)}]-1 = Compound \, Annual \, Growth \, Rate}$

Glendive to Sidney (RP 0.6 to RP 50.4)

Historical Background Growth Calculation (1990 to 2008)
$$[(2,040/1,810)^{(1/(2008-1990)}] - 1 \approx \textbf{0.7\%}$$
Recent Growth Calculation (2008 to 2012)
$$[(3,697/2,040)^{(1/(2012-2008)}] - 1 \approx \textbf{16.0\%}$$

Sidney to Fairview (RP 52.6 to RP 62.5)

Historical Background Growth Calculation (1990 to 2008)
$$[(3,800/2,810)^{(1/(2008-1990)}] - 1 \approx \textbf{1.7\%}$$
Recent Growth Calculation (2008 to 2012)
$$[(6,357/3,800)^{(1/(2012-2008)}] - 1 \approx \textbf{13.7\%}$$



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Historical background growth is an increase in traffic volumes over time attributed to population growth and general economic expansion within a study corridor. The traffic volume growth rates of 0.7% (Glendive to Sidney) and 1.7% (Sidney to Fairview) were calculated using a compound annual growth rate for the period 1990 to 2008, and are assumed to be reflective of historical background growth.

Discussions with community members during the MDT safety audit meeting in February 2012 suggested increasing traffic volumes since 2008 are likely due to recent economic activity associated with oil development in the region. The traffic volume growth rates of 16.0% (Glendive to Sidney) and 13.7% (Sidney to Fairview) were calculated using a compound annual growth rate for the period 2008 to 2012, and are assumed to be reflective of the current period of rapid economic expansion.

Growth rates observed during the recent 2008 to 2012 period are not expected to sustain throughout the study horizon year of 2035. The exact period of rapid economic expansion in the region is not known. Traffic volumes may continue to grow at higher growth rates observed in recent years for an additional period of time before returning to historic background growth rates. A range of three to five years of continued rapid economic expansion was assumed for this study. Traffic volume levels attained during this initial period of rapid economic expansion are expected to remain through the study horizon year of 2035. Following the initial period of rapid growth in traffic volumes associated with mobilization to the area, traffic volumes could be expected to equalize towards growth rates consistent with historical annual growth rates for the remainder of the planning horizon. Traffic volumes may begin to decline past the study horizon year of 2035 as development activity slows in the region.

3.2 Projected Traffic Volumes

Projected traffic volumes were calculated for MT 16 and MT 200 assuming a period of continued rapid growth ranging from three to five years, followed by a return to a consistent historic background growth. The formula for calculating projected traffic volumes is shown below.

Projected Traffic Volume Calculation Formula

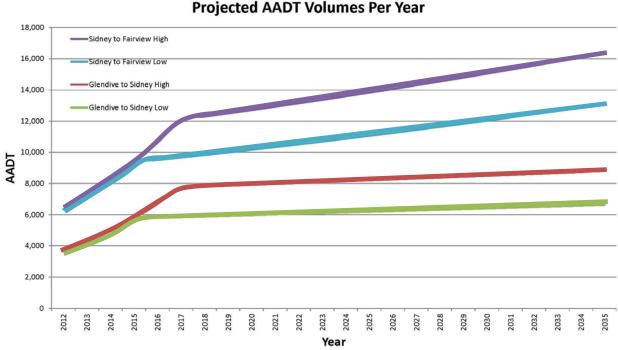
(Current Volume)*(1+[Growth Rate in Decimal Form]) Number of Years = Future Year Volume

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Projected 2035 AADT volumes range from approximately 6,600 to 8,800 vehicles per day in the Glendive to Sidney portion of the corridor, and approximately 13,100 to 16,400 vehicles per day in the Sidney to Fairview portion of the corridor. Projections represent planning-level estimates and do not reflect annual traffic volume fluctuations likely to occur throughout the planning horizon.

Projected AADT volumes are illustrated in Figure 3-1. Additional information is presented in Appendix 6.

Figure 3-1 Projected AADT



Source: DOWL HKM, 2012.

Low estimate indicates three years of rapid traffic volume growth, followed by twenty years of historical background growth.

High estimate indicates five years of rapid traffic volume growth, followed by eighteen years of historical background growth.

3.3 Projected Operational Characteristics

Analysis Results

Table 3.1 presents the results of the operational analysis for anticipated 2035 conditions.



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Table 3.1 Projected Operational Analysis Results (2035)

Location		2035 2-Lane with Passing Lanes ⁽¹⁾				
		Low Estimate ⁽²⁾		High Estimate ⁽³⁾		
		PTSF ⁽⁴⁾ (%)	LOS	PTSF ⁽⁴⁾ (%)	LOS	
		MT 16 Northbound RP 0.6 to RP 20.0	54.6	С	60.3	С
	Glendive to Savage	MT 16 Southbound RP 0.6 to RP 12.4	54.9	С	61.7	С
nent		MT 16 Northbound RP 20.0 to RP 31.5	39.3	В	47.3	В
		MT 16 Southbound RP 12.4 to RP 22.0	37.7	В	45.7	В
egn		MT 16 Southbound RP 22.0 to RP 31.5	55.3	С	60.1	С
		MT 16 Northbound RP 31.5 to RP 41.5	51.3	C	59.2	С
Corridor	Crane	MT 16 Southbound RP 31.5 to RP 41.5	57.3	C	64.7	С
or	Crane to	MT 16 Northbound RP 41.5 to RP 50.4	52.2	C	59.5	С
J	Sidney	MT 16 Southbound RP 41.5 to RP 50.4	64.7	С	72.8	D
	Sidney to	MT 200 Eastbound RP 52.6 to RP 62.5	71.3	D	77.4	D
	Fairview	MT 200 Westbound RP 52.6 to RP 62.5	69.2	D	75.9	D

Source: DOWL HKM, 2012.

Note: Shaded gray rows indicate analyzed sections with passing lanes and their associated downstream effect.

The HCM defines LOS for Class I two-lane highway on the basis of the percent time-spent-following (PTSF) concept. PTSF represents the freedom to maneuver and the comfort and convenience of travel. It reflects the average percentage of time that vehicles must travel in platoons behind slower vehicles due to an inability to pass. The two major factors affecting PTSF include passing capacity and passing demand. The concept of passing capacity for a two-lane highway reflects that the ability to pass is limited by the opposing flow rate and by the distribution of gaps in the opposing flow. The concept of passing demand reflects that the demand for passing maneuvers increases as more drivers are caught in a platoon behind a slow-moving vehicle (i.e., as PTSF increases in a given direction). Both passing capacity and passing demand are related to flow rates. When flow in each direction increases, passing demand increases and passing capacity decreases.

⁽¹⁾ Passing lanes are being constructed as part of the 30 km NE of Glendive – NE project from RP 20.0 to RP 22.0 in the northbound and southbound directions. Project completion is anticipated in August 2012.

⁽²⁾ Low estimate indicates three years of rapid traffic volume growth, followed by twenty years of historical background growth.

⁽³⁾ High estimate indicates five years of rapid traffic volume growth, followed by eighteen years of historical background growth.

⁽⁴⁾ Percent time-spent-following



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The MDT Traffic Engineering Manual defines desirable operations for principal and minor arterial facilities in level terrain as LOS B. The MT 16 / MT 200 corridor is projected to operate at LOS C or worse throughout the majority of the corridor, with the exception of the MT 16 segments from RP 20.0 to Savage in the northbound direction and RP 12.4 to RP 22.0 in the southbound direction, which are projected to operate at LOS B.

4.0 RECENT AND PROPOSED PROJECTS

Recent and planned MDT projects in the study area vicinity are described below.

<u>MT 200 / CR 129 Intersection Signing</u> involved installation of signing at the intersection of MT 200 and CR 129 from approximately RP 56.9 to approximately RP 57.2. The project was completed in 2012.

<u>30 km NE of Glendive – NE</u> involves reconstruction of MT 16 from approximately RP 18.6 to approximately RP 28.9. Centerline rumble strips will be installed throughout the reconstructed segment. An amendment to this project includes northbound and southbound passing lanes on MT 16 from approximately RP 20.0 to RP 22.0. The project began in April 2011 and completion is estimated in August 2012.

<u>Sidney – Southwest</u> is a major rehabilitation project from approximately RP 49.8 to RP 52.6 consisting of a mill, overlay, and seal and cover. This project included lane configuration modifications within Sidney from four lanes to three lanes and signal installation at the 7th Street / Central Ave. and Holly Street / Central Ave. intersections. An amendment to this project involved installing protected left-turn phases in the NB and SB directions at the Holly Street / Central Avenue intersection, in the NB direction at the 2nd Street N / Central Avenue intersection, and in the SB direction at the 14th Street / Central Avenue intersection. The project was let in February 2011.

<u>Slide Repair – NE of Glendive / MT11-1</u> is a slide repair project from approximately RP 13.0 to approximately RP 13.5. The project began in March 2012 and includes removing the slide area extending to the roadway shoulder.

<u>Fairview Intersection Improvements</u> is an intersection improvement project extending from approximately RP 63.1 to approximately RP 63.8. The project includes installation of a traffic signal on MT 200 at 6th Street, construction of a pedestrian crossing and installation of a high intensity rapid flashing beacon at Western Avenue, and geometric improvements and



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installation of all-way STOP control at the MT 200 / Secondary 201 intersection to better accommodate truck turning movements. The project began in May 2012.

<u>SF 119 – Glendive Rumble Strips</u> is a safety project to install shoulder and centerline rumble strips on MT 16 from approximately RP 1.5 to approximately RP 49.9. The anticipated project start date is fall 2012.



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5.0 SUMMARY OF ISSUES AND CONCERNS

Table 5.1 summarizes issues and concerns related to transportation system and environmental conditions in the corridor.

Table 5.1 Summary of Issues and Concerns

Condition		Issue / Concern			
	Physical Features	 <u>Utilities</u> High pressure natural gas pipelines cross the corridor in seven (7) locations. <u>Pavement Condition</u> There is evidence of minor rutting, transverse cracking, longitudinal cracking and shoulder failure within study area. 			
Conditions	Geometric Conditions	Horizontal Alignment Seven (7) locations do not meet current MDT standards. Vertical Alignment Thirteen (13) locations do not meet current MDT standards. Clear Zones Fifteen (15) locations do not meet current MDT standards.			
Transportation System Conditions	Safety	 Commercial vehicle speed differential, which may lead to large vehicle queues and aggressive passing maneuvers Higher occurrence of crashes involving large vehicles Higher occurrences of unbelted crashes Higher occurrences of crashes involving vehicles with out-of-state registration Fatigued and impaired driver crashes Increased driveway/intersection related crashes between Sidney and Fairview Moving sight distance concerns at the intersection of County Road 126 Minimal guidance to drivers approaching the intersection of MT 16/MT 23/MT 200. Concern was also expressed regarding the speed limit through this area. Head-on and single vehicle run-off-the-road (SVROR) crashes 			
	Operational Conditions	 Portions of MT 16 and MT 200 currently operate at an undesirable LOS C. The MT 16 / MT 200 corridor is projected to operate at LOS C or worse by 2035 throughout the majority of the corridor. 			



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Condition

Issue / Concern

Prime Farmland

Prime and important farmlands are located within the study area

Surface Water Impairment

Within the study corridor, the Yellowstone River is listed in DEQ's Integrated 303(d) / 305(b)
 Water Quality Report

Wetlands

 The study area includes portions of the Yellowstone River, its tributaries, and associated wetlands

Hazardous Materials

USTs, LUSTs and remediation response sites located within study area

Floodplains

Environmental Conditions

The corridor crosses mapped floodplains

Fish and Wildlife

 Six (6) endangered, threatened, proposed or candidate animal species and 39 species of concern are expected to occur in Dawson and Richland Counties.

Vegetation

One plant species of concern is expected to occur in Dawson and Richland Counties

Cultural and Archaeological Resources

Resources within the study corridor include historic irrigation canals, bridges, residences, mining operations and trash deposits, and archaeological sites.

Section 4(f) / Section 6(f) Resources

Several Section 4(f) and Section 6(f) resources are located within the corridor



Appendix 1

Field Review Memorandum and Photo Log



Physical Address: 104 East Broadway Suite G-1 Helena, Montana 59601 Mailing Address: P.O. Box 1009 Helena, Montana 59624

Phone: (406) 442 - 0370

Fax: (406) 442 - 0377

To: Carol Strizich

MDT Project Manager

From: Sarah Nicolai

DOWL HKM Project Manager

Date: February 15, 2012

Subject: Summary of Field Review Conducted on January 31, 2012

MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

DOWL HKM conducted a field review of the study corridor on January 31, 2012. This summary lists existing transportation conditions, constraints, and issues observed in the field during the review, and should not be considered a comprehensive account. Existing transportation conditions, constraints, and issues are listed progressing from south/west to north/east from Segment 1 to Segment 4 under each category. Reference Post (RP) locations are approximated. No testing or detailed inspections were conducted.

DOWL HKM visually inspected the following existing transportation conditions, constraints, and issues.

Segment 1: Glendive to Savage (RP 0.6 ± to RP 31.5 ±)

Tire Skid Marks

RP 8.7. Photo 18.

Turn Lanes

- Two-way left-turn lanes at RP 0.7. Photo 1.
- Northbound left-turn lane at intersection of Highland Park Road and MT 16 at RP 1.2. Photo 4.
- Northbound right-turn lane at RP 3.1. Photo 10.
- Southbound left-turn lane at RP 3.1. Photo 11.
- Northbound left-turn lane at intersection of MT 16 and County Road 254 at RP 3.7. Photo 12.
- Northbound right-turn lane at RP 17.1. Photo 34.
- Beginning of center left-turn lane at RP 31.5. Photo 50.

Intersections

- Intersection of MT 16 and County Road 550. County Road 550 is unpaved at RP 5.6. Photo 14.
- Intersection of MT 16 and County Road 544. County Road 544 is unpaved at RP 8.7. Photo 19.

Signage

- 45 miles per hour (mph) posted speed limit at RP 0.7. Photo 2.
- 70 mph posted speed limit and 65 mph night posted speed limit at RP 1.3. Photo 5.
- Watch for ice on bridge sign at RP 14.7. Photo 31.
- Slippery when wet sign at RP 24.6. Photo 42.

Pavement Conditions

- Transverse pavement cracking within the travel way measured approximately 0.25 inches in width, approximately every 60 feet. No measurable pavement rutting was observed within the travel way at RP 0.8.
- Transverse pavement cracking within the travel way measured approximately 0.25 inches in width, approximately every 60 feet. Transverse pavement cracking within the shoulder was observed approximately every 16 feet. No measurable pavement rutting was observed within the travel way at RP 3.4.
- Transverse pavement cracking within the travel way measured approximately 0.25 inches in width, approximately every 85 feet. Transverse pavement cracking within the shoulder was observed approximately every 15 feet. No measurable pavement rutting was observed within the travel way at RP 5.4. Photo 13.
- Transverse pavement cracking within the travel way measured approximately 0.125 inches in width. Transverse pavement cracking within the shoulder measured approximately 0.75 inches in width. Pavement rutting within the travel way measured approximately 0.5 centimeters in depth at RP 8.3. Photo 16.
- Transverse pavement cracking within the travel way measured approximately 0.5 inches in width, approximately every 45 feet. Transverse pavement cracking within the shoulder was observed approximately every 15 feet. A pavement depression was observed within the shoulder. No measurable pavement rutting was observed within the travel way at RP 14.1. Photo 29.
- Transverse pavement cracking within the travel way measured approximately 0.5 inches in width. Longitudinal and pavement cracking was observed, as well as a large pothole within the travel way. Pavement rutting within the travel way measured approximately 0.5 inches in depth at RP 19.3. Photos 35 and 36.
- Transverse pavement cracking within the travel way was observed. Narrow shoulder widths and spot resurfacing was observed at RP 19.6. Photo 37.
- Roadway reconstruction with re-graded side slopes at RP 19.7. Photo 38.
- Reconstructed pavement at RP 20.4. Photos 39 and 40.
- Transverse pavement cracking within the travel way measured approximately 0.5 inches in width, approximately every 35 feet. Longitudinal pavement cracking was observed within the travel way. No measureable pavement rutting was observed within the travel way at RP 29.0. Photo 46.

• Transverse pavement cracking within the travel way measured approximately 0.5 inches in width, approximately every 45 feet. Longitudinal pavement cracking was observed within the travel way. No measurable pavement rutting was observed within the travel way at RP 29.5. Photo 48.

Wetlands Characteristics

Areas exhibiting wetland characteristics were observed in the following locations:

- West of MT 16 at RP 1.7. Photo 7.
- East of MT 16 at RP 8.4. Photo 17.
- East of MT 16 at RP 29.2. Photo 47.

Bridges / Culverts

- 96-inch double arch culverts under MT 16 at RP 7.0. Photo 15.
- Lower Seven Mile Creek at RP 10.1. Photos 20 and 21.
- Morgan Creek at RP 12.5. Photos 25 and 26.
- Thirteen Mile Creek at RP 15.5. Photo 32.

Side Slopes

- East side slope transitions from 3:1 to 2:1 approximately 13 feet from northbound travel lane at RP 1.1. Photo 3.
- West side slope transitions from 4:1 to 2:1 approximately 20 feet from southbound travel lane at RP 1.8. Photo 7.
- East side slope transitions from 4:1 to 2:1 approximately 18 feet from northbound travel lane at RP 2.4. Photo 8.
- East side slope transitions from 5:1 to 2:1 approximately 18 feet from northbound travel lane at RP 3.0. Photo 9.
- East side slope was measured at 4:1 out approximately 25 feet from northbound travel lane at RP 7.0
- West side slope was measured at 4:1 out approximately 21 feet from southbound travel lane at RP 7.0.
- East side slope transitions from 4:1 to 2:1 approximately 18 feet from northbound travel lane at RP 8.5.
- West side slope transitions from 4:1 to 2:1 approximately 16 feet from southbound travel lane at RP 8.5.
- West side slope transitions from 4:1 to 2:1 approximately 17 feet from southbound travel lane at RP 11.8. Photo 23.
- East side slope transitions from 4:1 to 2:1 approximately 17 feet from northbound travel lane at RP 11.8. Photo 24.
- East side slope transitions from 4:1 to 2:1 approximately 20 feet from northbound travel lane at RP 12.7. Photo 27.
- West side slope transitions from 4:1 to 1.5:1 23 feet from southbound travel lane RP 14.2.
- West side slope transitions from 4:1 to 2:1 approximately 20 feet from southound travel lane at RP 14.2. Photo 30.

Side Slopes, continued

- West side slope transitions from 5:1 to 3:1 approximately 17 feet from southbound travel lane at RP 16.3. Photo 33.
- East side slope transitions from 4:1 to 2:1 approximately 20 feet from northbound travel lane at RP 17.4.
- Reconstructed pavement section ends at RP 24.7. Photo 43.
- Unvegetated side slopes at RP 27.5. Photo 45.
- East side slope transitions from 5:1 to 3:1 approximately 28 feet from northbound travel lane at RP 29.7.
- West side slope transitions from 5:1 to 3:1 approximately 28 feet from southbound travel lane at RP 29.7.

Recreational Features

Intake fishing access at RP 17.1. Photo 35.

Wildlife Issues

- Deer carcass observed at RP 1.0.
- Wildlife crossing sign at RP 1.4. Photo 6.
- Box culvert/wildlife undercrossing at RP 2.4. Photo 8.
- Wildlife crossing sign at RP 10.9. Photo 22.
- Owl carcass observed at RP 12.9.
- Deer carcass observed at RP 14.4.
- Bird carcasses observed at RP 17.4.
- Wildlife crossing sign at RP 20.9.
- Deer carcass observed at RP 21.7.
- Wildlife crossing sign at RP 30.9.

Other Features

- Damaged guardrail at RP 13.6. Photo 28.
- Paved vehicle pullout at RP 26.4. Photo 44.
- Paved vehicle pullout at RP 30.4. Photo 49.

Segment 2: Savage to Crane (RP 31.5 ± to RP 41.5 ±)

Tire Skid Marks

- RP 40.4. Photo 56.
- Entrance to Crane at RP 41.4. Photo 57.

Turn Lanes

• End of turning left-turn lane at RP 32.3. Photo 51.

Pavement Conditions

- Transverse pavement cracking within the travel way measured approximately 0.5 inches in width, approximately every 35 feet. No measurable pavement rutting was observed within the travel way at RP 32.5.
- Longitudinal pavement cracking was observed within the travel way. No measurable pavement rutting was observed within the travel way at RP 33.7.
- Transverse pavement cracking within the travel way measured approximately 0.25 inches in width, approximately every 50 feet. No measurable pavement rutting was observed within the travel way at RP 36.4.

Wetlands Characteristics

Areas exhibiting wetland characteristics were observed east and west of MT 16 at RP 37.7.
 Photo 54.

Bridges

- Dunlap Creek at RP 32.6. Photo 52.
- Irrigation Canal at RP 37.5. Photo 53.

Wildlife Issues

- Deer carcass observed at RP 32.5.
- Deer carcass observed at RP 33.6.
- Deer carcass observed at RP 39.7.
- Bird carcass observed at RP 39.7.
- Wildlife crossing sign at RP 40.9.

Other Features

Slow moving tractor was observed at RP 38.4. Photo 55.

Segment 3: Crane to Sidney (41.5 ± to RP 50.4 ±)

Intersections

Intersection of MT 16 / MT 200 and MT 200 / MT 23 at RP 50.0. Photo 63.

Pavement Conditions

- Transverse pavement cracking within the travel way measured approximately 0.25 inches in width. The transverse pavement cracking did not span the full width of the travel way. No measurable pavement rutting was observed within the travel way at RP 42.0.
- Transverse pavement cracking within the travel way measured approximately 0.25 inches in width, approximately every 80 feet. Longitudinal pavement cracking was observed within the travel way. No measurable pavement rutting was observed within the travel way at RP 45.9.
- Transverse pavement cracking within the travel way measured approximately 0.5 inches in width. No measurable pavement rutting was observed within the travel way at RP 48.8.

Wetlands Characteristics

Areas exhibiting wetland characteristics were observed east and west of MT 16 at RP 47.8.
 Photos 61 and 62.

Bridges

• Fox Creek at RP 46.7. Photo 59.

Wildlife Issues

Deer carcass observed at RP 48.4.

Other Features

- Railway paralleling MT 16 at RP 45.0. Photo 58.
- Damaged guardrail at RP 46.7. Photo 60.

Segment 4: Sidney to Fairview from Approximate (RP 52.6 \pm to 62.5 \pm)

Turn Lanes

• Return to two-lane configuration and northbound right-turn lane at RP 53.6. Photo 64.

Intersections

Intersection of MT 200 and County Road 126 at RP 53.6. Photo 65.

Pavement Conditions

- Transverse sealed pavement cracking within the travel way measured approximately 0.25 inches in width, approximately every 30 feet. Longitudinal pavement cracking was observed within the travel way. Chip seal pavement pealing was observed on the travel way white line. No measurable pavement rutting was observed within the travel way at RP 54.0. Photo 66.
- Transverse and longitudinal pavement crack sealing was observed within the travel way at RP 56.0. Photo 67.
- Transverse pavement cracking within the travel way measured approximately 0.5 inches in width, approximately every 30 feet. Longitudinal sealed pavement cracking was observed within the travel way. Chip seal pavement pealing was observed on the travel way white line. No measurable pavement rutting was observed within the travel way at RP 58.4. Photo 69.

Bridges

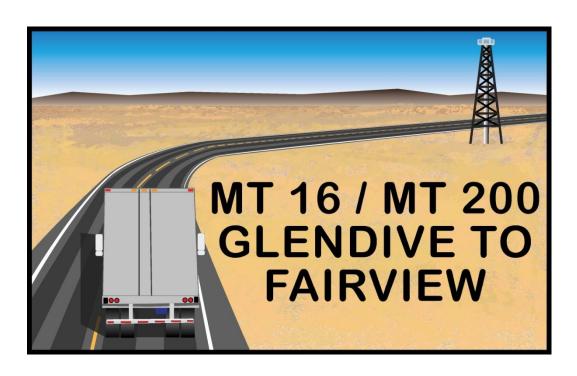
- First Hay Creek at RP 59.5. Photos 70 and 71.
- Second Hay Creek at RP 60.1. Photo 72.

Recreational Features

Old Fort Gilbert at RP 57.7. Photo 68.

Wildlife Issues

- Wildlife crossing sign at RP 50.9.
- Wildlife crossing sign at RP 60.9.



MT 16 / MT 200 GLENDIVE TO FAIRVIEW CORRIDOR PLANNING STUDY PHOTO LOG

PREPARED FOR:



PREPARED BY:



104 East Broadway, Suite G-1 P.O. Box 1009 Helena, Montana 59624 (406) 442-0370

February 2012

The photos contained within this photo log illustrate existing transportation conditions along Montana 16 and Montana 200, as well as potential constraints and issues observed in the field during a field review conducted on January 31, 2012. Photos are numbered in chronological order progressing south/west to north/east. Reference Post (RP) locations are approximated. This photo log does not provide a comprehensive account of all existing transportation conditions, constraints, and issues within the corridor. No testing or detailed inspections were conducted.

Segment 1: Glendive to Savage from Approximate (RP 0.6 ± to RP 31.5 ±)



Photo 1. Looking north on MT 16 at a two-way left-turn lane north of Glendive. RP 0.7.



Photo 2. Looking north on MT 16 at 45 mile per hour (mph) sign north of Glendive. RP 0.7.



Photo 3. Looking north on MT 16. East side slope transitions from 3:1 to 2:1 approximately 13 feet from northbound travel lane. RP 1.1.



Photo 4. Looking northwest at intersection of Highland Park Road and MT 16 northbound left-turn lane. RP 1.2.



Photo 5. Looking north on MT 16 at the beginning of a 70 mph zone. RP 1.3.



Photo 6. Looking north on MT 16 at deer crossing sign. RP 1.4.



Photo 7. Looking north on the west side slope of MT 16. West side slope transitions from 4:1 to 2:1 approximately 20 feet from southbound travel lane. Areas exhibiting wetland characteristics observed west of MT 16. RP 1.7.

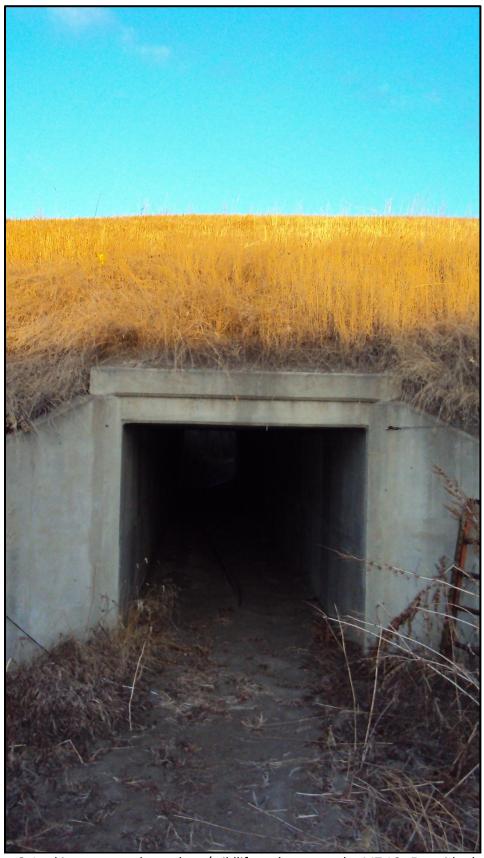


Photo 8. Looking west at a box culvert/wildlife underpass under MT 16. East side slope transitions from 4:1 to 2:1 approximately 18 feet from northbound travel lane. RP 2.4.



Photo 9. Looking north on MT 16 at trucks entering 45 mph advisory sign. East side slope transitions from 5:1 to 2:1 approximately 18 feet from northbound travel lane. RP 2.8.

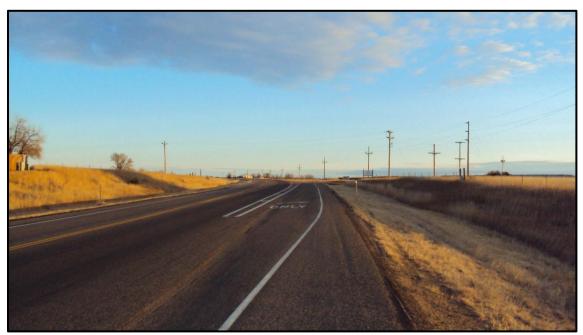


Photo 10. Looking north on MT 16 at northbound right-turn lane. RP 3.1.



Photo 11. Looking south on MT 16 southbound left-turn lane. RP 3.1.



Photo 12. Looking north on MT 16 at intersection of MT 16 and County Road 254 northbound left-turn lane. RP 3.7.

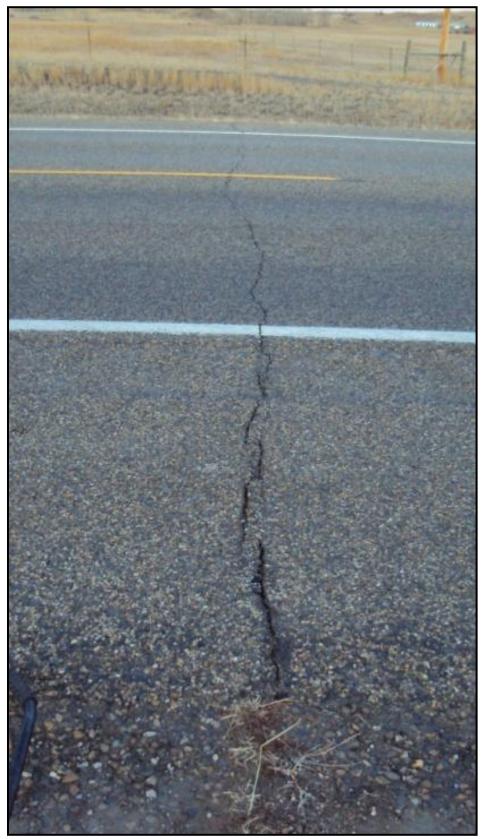


Photo 13. Looking across MT 16 at transverse pavement cracking. Pavement cracking within the travel way measured approximately 0.25 inches in width, approximately every 85 feet. RP 5.4.



Photo 14. Looking west at the intersection of MT 16 and County Road 550. County Road 550 is unpaved. RP 5.6.



Photo 15. Looking east at 96-inch double arch culverts under MT 16. West side slope was measured at 4:1 to approximately 21 feet from northbound travel lane. RP 7.0.

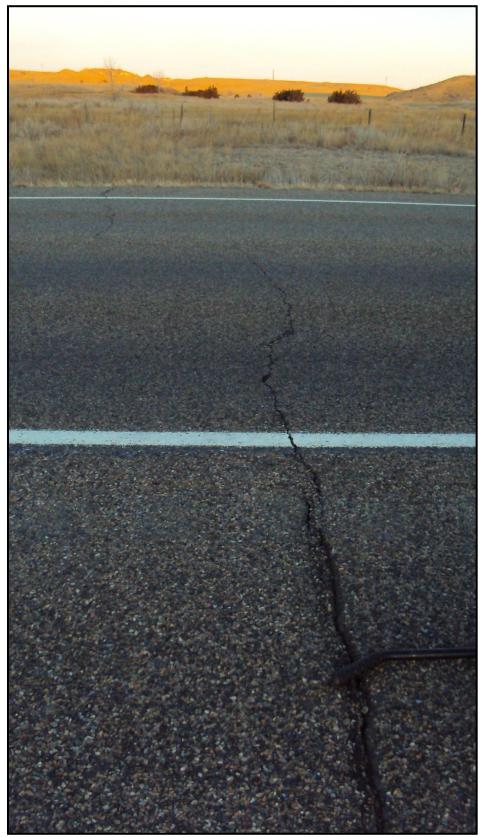


Photo 16. Looking across MT 16 at transverse pavement cracking. Pavement cracking within the travel way measured approximately 0.125 inches, approximately every 50 feet. Pavement rutting measured at approximately 0.5 centimeters. RP 8.3.



Photo 17. Looking at areas exhibiting wetland characteristics observed east of MT 16. East side slope transitions from 4:1 to 2:1 approximately 18 feet from northbound travel lane. RP 8.4.



Photo 18. Looking south on MT 16 at tire skid marks. RP 8.7.



Photo 19. Looking west at intersection of MT 16 and County Road 544. County Road 544 is unpaved. RP 8.7.



Photo 20. Looking south on MT 16 at Lower Seven Mile Creek. East side slope transitions from 4:1 to 2:1 approximately 15 feet from the northbound travel lane. RP 10.1.



Photo 21. Looking north on MT 16 at Lower Seven Mile Creek bridge undercrossing. RP 10.1.



Photo 22. Looking north on MT 16 at deer crossing sign. RP 10.9.



Photo 23. Looking south on MT 16. West side slope transitions from 4:1 to 2:1 approximately 17 feet from southbound travel lane. RP 12.0.



Photo 24. Looking north on MT 16. East side slope transitions from 4:1 to 2:1 approximately 17 feet from northbound travel lane. RP 12.0.



Photo 25. Looking north on MT 16 at Morgan Creek. RP 12.5.



Photo 26. Looking north on MT 16 at Morgan Creek bridge undercrossing. RP 12.5.



Photo 27. Looking north on MT 16. East side slope transitions from 4:1 to 2:1 approximately 20 feet from northbound travel lane. RP 12.7.



Photo 28. Looking north on MT 16 at damaged guardrail. East side slope transitions from 4:1 to 5:1 approximately 23 feet from northbound travel lane. RP 13.6.

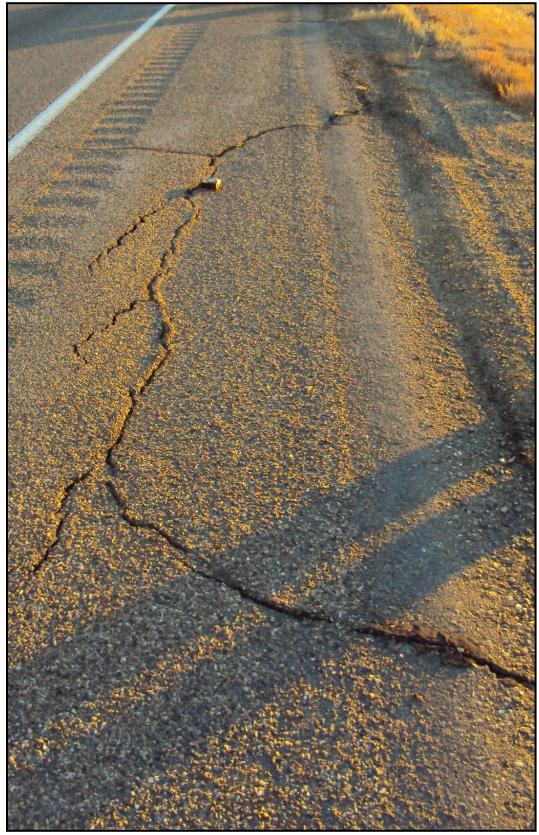


Photo 29. Looking across MT 16 at transverse pavement cracking. Pavement cracking within the travel way measured approximately 0.5 inches in width, approximately every 45 feet. RP 14.1.

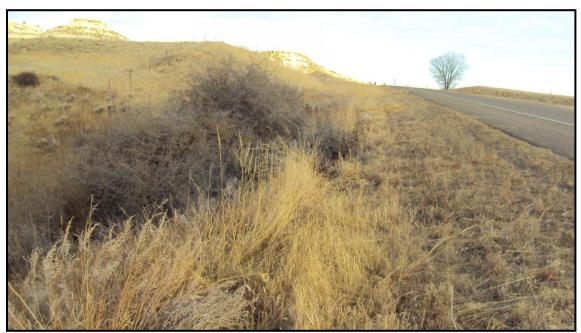


Photo 30. Looking south on MT 16. West side slope transitions from 4:1 to 2:1 approximately 20 feet from northbound travel lane. RP 14.4.



Photo 31. Looking south on MT 16 at watch for ice on bridge sign. RP 14.7.



Photo 32. Looking north on MT 16 at Thirteen Mile Creek. RP 15.5.



Photo 33. Looking north on MT 16. West side slope transitions from 5:1 to 3:1 approximately 17 feet from southbound travel lane. RP 16.4.



Photo 34. Looking north on MT 16 at northbound right-turn lane at Intake fishing access. RP 17.1.



Photo 35. Looking south on MT 16 at longitudinal pavement cracking and pothole. RP 19.3.

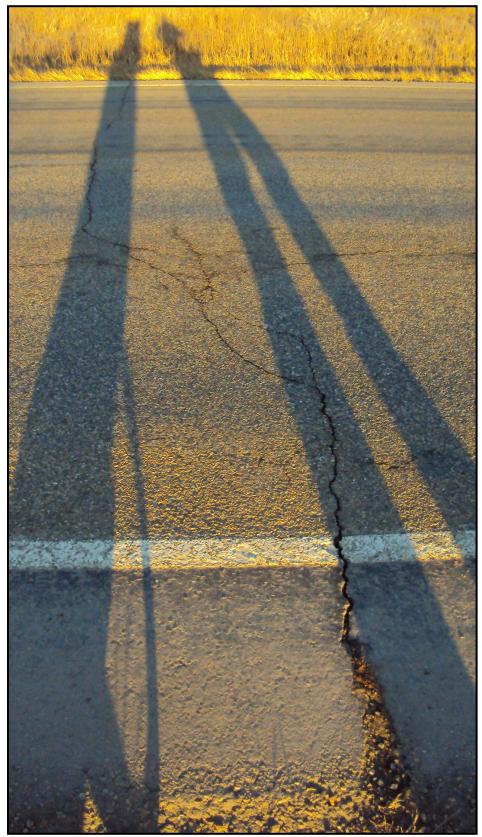


Photo 36. Looking across MT 16 at transverse pavement cracking. Pavement cracking within the travel way measured approximately 0.5 inches in width, approximately every 30 feet. Pavement rutting measured approximately 0.5 inches in depth. RP 19.3.



Photo 37. Looking south on MT 16 at narrow shoulder widths, longitudinal pavement cracking, and spot resurfacing. RP 19.6.



Photo 38. Looking north on MT 16 at roadway reconstruction and re-graded side slopes. RP 19.7.



Photo 39. Looking south at reconstructed portion of MT 16. RP 20.4.



Photo 40. Looking south at reconstructed portion of MT 16. RP 20.4.



Photo 41. Looking north on MT 16. East side slope transitions from 5:1 to 3:1 approximately 28 feet from northbound travel lane. RP 22.5.



Photo 42. Looking south on MT 16 at slippery when wet sign. RP 24.6.



Photo 43. Looking north on MT 16 at end of reconstructed section. RP 24.7.



Photo 44. Looking south on MT 16 at a paved vehicle pullout. RP 26.4.



Photo 45. Looking north on MT 16 at unvegetated side slope. RP 27.5.



Photo 46. Looking across MT 16 at continuous transverse pavement cracking. Pavement cracking within the travel way measured approximately 0.5 inches in width, approximately every 35 feet. RP 29.0.



Photo 47. Looking east of MT 16 at areas exhibiting wetland characteristics. RP 29.2.

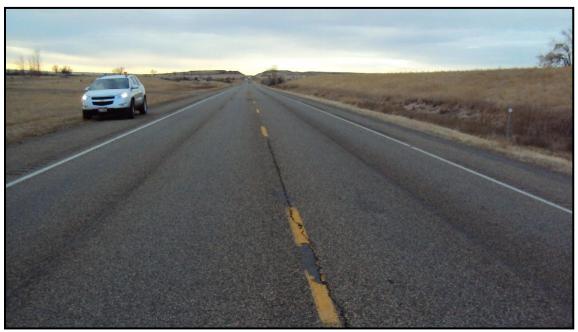


Photo 48. Looking north on MT 16 at continuous longitudinal pavement cracking. Pavement cracking within the travel way measured approximately 0.5 inches in width. RP 29.5.



Photo 49. Looking south on MT 16 at a paved vehicle pullout. RP 30.4.



Photo 50. Looking north on MT 16 at beginning of two-way left-turn lane and reduced posted speed limit (55 mph for all vehicles) through Savage, MT. RP 31.5.

Segment 2: Savage to Crane from Approximate (RP 31.5 ± to RP 41.5 ±)



Photo 51. Looking north on MT 16 at end of two-way left-turn lane and restored posted speed limits (60 mph for trucks, 70 mph for vehicles). RP 32.3.



Photo 52. Looking south on MT 16 at Dunlap Creek. RP 32.6.



Photo 53. Looking south on MT 16 at Irrigation Canal. RP 37.5.



Photo 54. Looking east of MT 16 at areas exhibiting wetland characteristics. RP 37.7.



Photo 55. Looking south on MT 16 at slow moving tractor. RP 38.4.



Photo 56. Looking north on MT 16 at tire skid marks. RP 40.4.



Photo 57. Looking north on MT 16 at entrance to Crane, MT. Speed limits are not reduced through Crane, MT. RP 41.4.

Segment 3: Crane to Sidney from Approximate (RP 41.5 ± to RP 50.4 ±)



Photo 58. Looking north at railway paralleling MT 16. RP 45.0.



Photo 59. Looking north on MT 16 at Fox Creek. RP 46.7.



Photo 60. Looking south on MT 16 at damaged guardrail. RP 46.7.



Photo 61. Looking northwest of MT 16 at areas exhibiting wetland characteristics observed approximately 32 feet from southbound travel lane. RP 47.8.



Photo 62. Looking northeast of MT 16 at areas exhibiting wetland characteristics observed approximately 32 feet from northbound travel lane. RP 47.8.



Photo 63. Looking north on MT 16 at intersection of MT 16 / MT 200 and MT 200 / MT 23. RP 50.0.

Segment 4: Sidney to Fairview from Approximate RP 52.6 to 62.5



Photo 64. Looking north on MT 200 (north of Sidney) at return of two-lane section. RP 53.6.



Photo 65. Looking at paved intersection of MT 200 and County Road 126. RP 53.6.



Photo 66. Looking at transverse sealed pavement cracking 0.25 inches in width, approximately every 30 feet. Chip seal pealing was observed on the travel way white line. No measurable pavement rutting was observed within the travel way. RP 54.0.



Photo 67. Looking north on MT 200 at transverse and longitudinal pavement crack sealing. RP 56.0.



Photo 68. Old Fort Gilbert sign. RP 57.7.



Photo 69. Looking across MT 16 at continuous longitudinal and transverse pavement crack sealing. Pavement cracking within the travel way measured approximately 1.5 inches in width, approximately every 30 feet. RP 58.4.



Photo 70. Looking north on MT 200 at First Hay Creek. RP 59.5.



Photo 71. Looking north on MT 200 at First Hay Creek Bridge undercrossing. RP 59.5.



Photo 72. Looking south on MT 200 at Second Hay Creek. Distance from the northbound travel lane to concrete wall is approximately 40 feet. RP 60.1

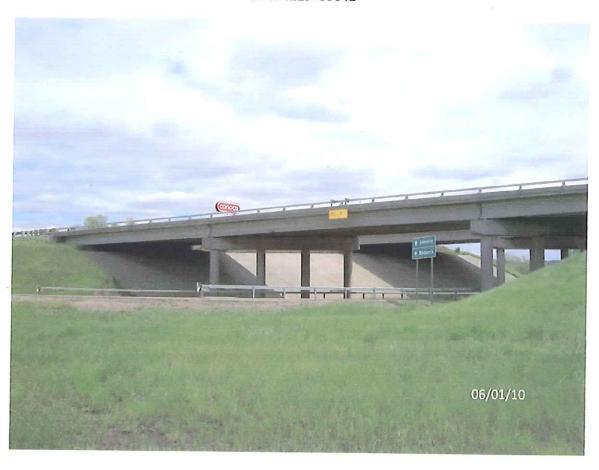


Appendix 2

Bridge Inspection Reports and Photographs



100094213+03641



100094213+03642



P000200004+03011



P000200007+00501



P00020010+00721



P00020012+05321



P00020015+04781



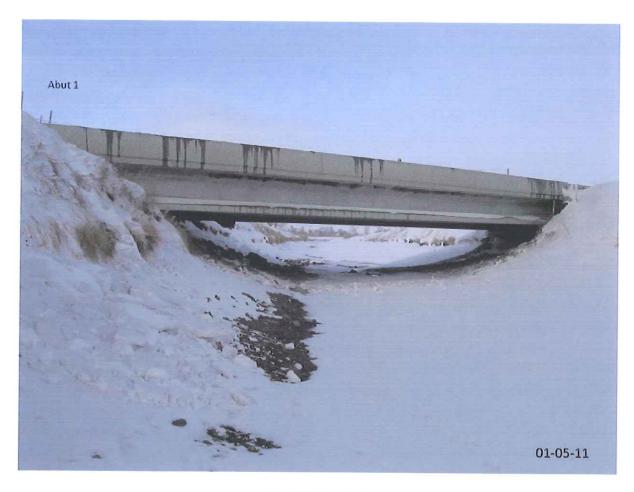
P00020025+00631



P00020031+02501

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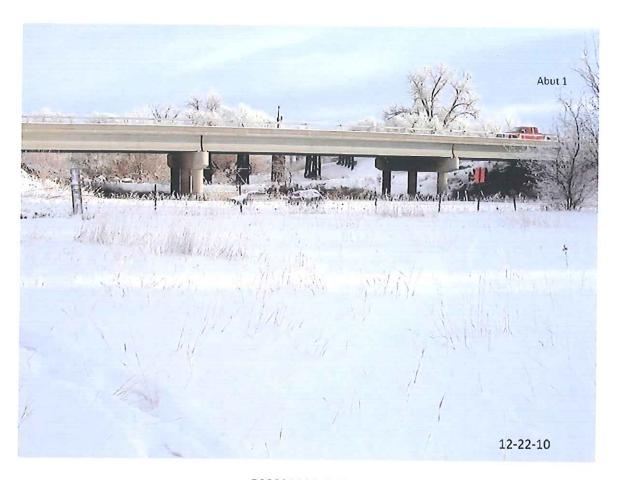
P00020031+01071, P00020032+03991, P00020032+06521



P00020037+05151



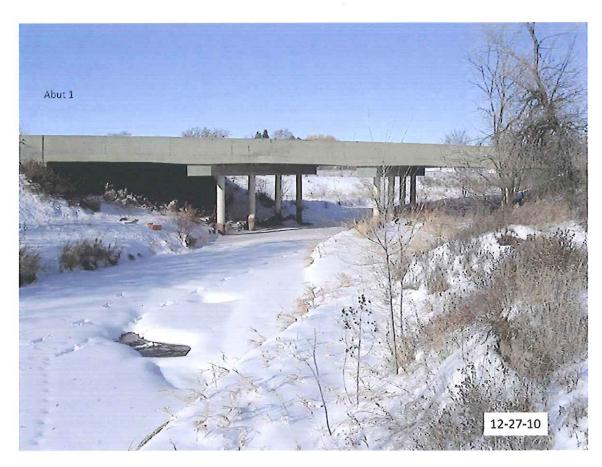
P00020041+03501



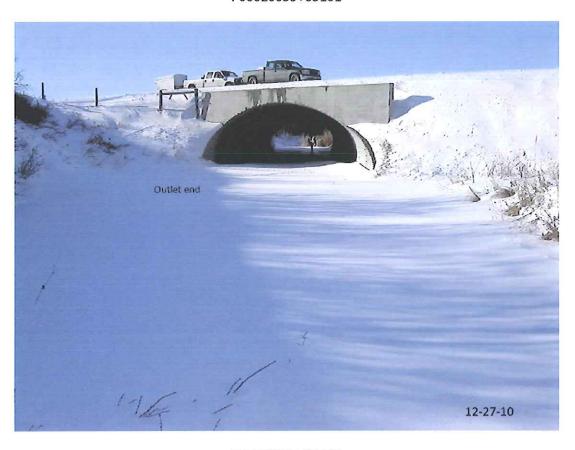
P00020046+06831



P00020051+06421



P00020059+05101



P00020060+00061

Form: bms001d

Printing Date: Tuesday, January 10 2012

P00020004+03011

Location: 3M N GLENDIVE Structure Name: none

General Location Data

District Code, Number, Location: 04

Dist 4

GLENDIVE

Division Code, Location:43

MILES CITY

County Code, Location: 021

DAWSON

City Code, Location: 00000

RURAL AREA

Kind fo Hwy Code, Description: 3

3 State Hwy

Signed Route Number: 00016

State Highway Agency

Str Owner Code, Description: 1

State Highway Agency

Maintained by Code, Description:1

Intersecting Feature: DEER CREEK

Kilometer Post, Mile Post:

6.92 km 4.30

Structure on the State Highway System:

Latitude: 47°09'45"

Construction Data

Structure on the National Highway System:

Longitude: 104°42'10"

Str Meet or Exceed NBIS Bridge Length: X

Construction Drawing Number: 6520

Construction Year: 1964

Construction Project Number: F 245(16)

Construction Station Number: 222+90.00

Current ADT: 1,880

Traffic Data

ADT Count Year: 2009

2 % Percent Trucks:

Reconstruction Year: 1974

Structure Loading, Rating and Posting Data

Loading Data:

Design Loading :		5 MS 18 (HS 20)
Inventory Load, Design :	32.6 mton	A LFD Assigned
Operating Load, Design :	38.1 mton	A LFD Assigned
Posting :		5 At/Above Legal Loads

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3:		-	
Truck 2 Type 3-S3:			
Truck 3 Type 3-3:	70		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

34.14 m

Deck Area:

448.00 m sq

Deck Roadway Width:

12.19 m

Approach Roadway Width:

12.19 m

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

99.99 m

Reference Feature for Vertical Clearance:

N Feature not hwy or RR

Vertical Clearance Under the Structure:

0.00 m

Reference Feature for Lateral Underclearance:

N Feature not hwy or RR

Minimum Lateral Under Clearance Right: Minimum Lateral Under Clearance Left: 0.00 m 0.00 m

Span Data

Main Span

Deck

Number Spans: 2

Material Type Code, Description: 5 Prestressed concrete

Span Design Code, Description: 4 Tee Beam

Approach Span

Number of Spans: 0

Material Type Code, Description:

Span Design Code, Description:

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Membrain Type: 0 None

Deck Surfacing Type: 0 None (no additional concrete thickness or wearing s

Deck Protection Type: 0 None

(52) Out-to-Out Width:

13.11 m

(50A) Curb Width:

(50B) Curb Width:

0.00 m

0.00 m

Skew Angle:

Over / Under Direction	Inventory	South, We	est or Bi-direction	al Travel	North or East Travel		
Name	Route	Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	12.19 m	N/A		
							1

Candidate ID

INITIAL ASSESSMENT FORM FOR STRUCTURE:

Page 2 of 5 Form: bms001d Printing Date: Tuesday, January 10 2012

P00020004+03011

Continue

Inspection Due Date: 20 January 2012 Inspection Data (91) Inspection Fequency (months): 24 Sufficiency Rating: 89.7 Health Index: 100 Structure Status : Not Deficient **NBI Inspection Data** 20 January 2010 Troy Hafele - 2056 (90) Date of Last Inspection: Last Inspected By (90) Inspection Date Inspected By (58) Deck Rating: 7 (68) Deck Geometry : 6 (36C) Approach Rail Rating (62) Culvert Rating : N (59) Superstructure Rating: 8 (36A) Bridge Rail Rating (61) Channel Rating : 8 (67) Structure Rating: 7 (60) Substructure Rating: 7 (71) Waterway Adequacy 3 (36B) Transition Rating (69) Under Clearance: N (36D) End Rail Rating (72) App Rdwy Align: 8 (113) Scour Critical: 5 (41) Posting Status: 0 m sq Unrepaired Spalls: 0.00 in Deck Surfacing Depth: **Inspection Hours** Crew Hours for inspection: Snooper Required : N Helper Hours: Snooper Hours for inspection -1 Special Crew Hours Flagger Hours -1 Special Equipment Hours -1 Inspection Work Candidates Effected Scope of Covered

Structure

Unit

Work

Action

Condition

States

Status

Date

Requested

Priority

Page 3 of 5 Form: bms001d Printing Date : Tuesday, January 10 2012

P00020004+03011 Continue

Element Inspection Data

* Span: Main-0 - -1 * * * * * * * * * Element Description Smart Flag Scale Factor Env Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 12 - Bare Concrete Deck 2 1 448 sq.m. X 100 % % % Previous Inspection Notes: 01/20/2010 - 2008 Sandblasted and sealed deck. 01/14/2008 - None. (34.14 X 13.11 = 447.575) 01/24/2005 - None 12/26/2000 - Chip seal cover raveling off on driving lane. 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 109 - P/S Conc Open Girder 204 m. 100 % Previous Inspection Notes: 01/20/2010 - 6 T beams. 01/14/2008 - None 01/24/2005 - None 12/26/2000 - None 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 205 - R/Conc Column 3 ea. 100 Previous Inspection Notes: 01/20/2010 - None 01/14/2008 - None 01/24/2005 - None 12/26/2000 - None 10/02/1996 - None 01/01/1993 - None Inspection Notes:

Printing Date: Tuesday, January 10 2012

P00020004+03011 Continue

******* Span : Main-0 - -1 (cont.) * * * * * * * *

Smart Flag Scale Factor E	nv Quar	tity Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment								1 or order o
1	2	32 m.		100	0	0	0	
				%	%	%	%	
Previous Inspection Notes :		111	- Jan-					
1/20/2010 - None								UZS
01/14/2008 - None								(010)32
01/24/2005 - None								(02/#10
12/26/2000 - None								(0)11410
10/02/1996 - None								WEPC
01/01/1993 - None								INER
Inspection Notes:								
Element 234 - R/Conc Cap								
1	1	13 m.		100	0	0	0	
				%	%	%	%	
Previous Inspection Notes :					- L		1	
1/20/2010 - None								UZEZ
1/14/2008 - None								0101572
1/24/2005 - None								(674#(6
2/26/2000 - None								(0)1(1)8
0/02/1996 - None								WHEC
1/01/1993 - None								REFA
Inspection Notes:								
lement 313 - Fixed Bearing								
		10 1	100	100	٥			
1	1	12 ea.		100	0	0		
				%	%	%	%	
revious Inspection Notes :								
1/20/2010 - Quantity does not in	clude bearings	buried in back	walls 0 6 6 0) = 12.				JAKEN.
1/14/2008 - None								(0)(0)(8)/2
1/24/2005 - None								CZIPIC
2/26/2000 - Dirt on rt outside bea	aring device at	abut, 3.						(0)2413
0/02/1996 - None								Whitese
1/01/1993 - None								REFI
nspection Notes:								



P00020004+03011 Continue

****** * Span : Main-0 - -1 (cont.) * * * * * * * *

Element Desc Smart Flag Element 334 -	(101101)					ain-01 (COI				-
		Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
		0.000	- Submity	Orino	mop Lacil	i ot otat i	1 of Olat 2	1 Ct Stat 3	FCI Stat 4	PCI Stat 5
	1	2	68	m.		95			0 (
						%		Action to Contract the Contract of the Contrac		
Previous Inspe	ection Notes :					70		1	70	1
01/20/2010 - 1			rust on nosts			T AND A PROPERTY OF				2467,5
01/14/2008 - N										102/5/2
01/24/2005 - N		X 2 00.20								OOBZ
12/26/2000 - N										OLHN
10/02/1996 - N	None									WHEC.
01/01/1993 - N	None									INEE!
Inspection No	otes:									
General Ir	spection I	Notes								
01/20/2010 - N										UZEZ
01/14/2008 - N	lew end rail se	ection 2007								0101672
01/24/2005 - N	lone									CZHC
12/26/2000 - N	lone									OLHN
OPS\$A0241 ir Structure P000 Date 10/2/96 - Previous comr	nspection com 020004+0301 nents > Suffic	ments - 1 - iency Ratin	ation Accepted g Calculation A d by ops\$u900	ccepte	d by ops\$u59	963 at 3/10/97 1	1:34:36			WFPC
01/01/1993 - S Sufficiency Ra	Sufficiency Rat ting Calculation	ting Calcula on Accepted	ation Accepted d by ops\$u9004	by ops\$ 1 at 2/19	5u5963 at 3/1 9/97 14:59:0	0/97 11:34:36 1				REFI
01/01/1991 - U	pdated with ta	ape 1992								1/18192
02/01/1989 - U	pdated with ta	ape 1991								plean
01/01/1987 - U	pdated with ta	ape 1988								1818161
01/01/1985 - U	pdated with ta	ape 1986								NB146)
01/01/1983 - U	pdated with ta	ape 1984								181846
	lodated with ta	ape 1983								RIBBS
12/01/1980 - U										

Form: bms001d Printing Date: Tuesday, January 10 2012

P00020007+00501

Location: 7M NE GLENDIVE Structure Name: none

General Location Data

District Code, Number, Location: 04

Dist 4

GLENDIVE

Division Code, Location: 43

MILES CITY

County Code, Location: 021

DAWSON

City Code, Location: 00000

RURAL AREA

Kind fo Hwy Code, Description: 3

3 State Hwy

Signed Route Number: 00016

Str Owner Code, Description: 1

State Highway Agency

Maintained by Code, Description:1

State Highway Agency 7.04

Intersecting Feature: THREE MILE CREEK

Latitude: 47°11'56"

Kilometer Post, Mile Post:

11.33 km

Structure on the State Highway System: X

Construction Project Number:

Construction Data

Structure on the National Highway System:

Longitude: 104°40'57"

Construction Station Number: 0+00.00

Str Meet or Exceed NBIS Bridge Length: X

Construction Drawing Number: none

Construction Year: 1964

Current ADT: 1,880

Traffic Data

ADT Count Year: 2009

2 % Percent Trucks:

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

Design Loading:		0 Unknown
Inventory Load, Design:	32.6 mton	B ASD Assigned
Operating Load, Design:	32.6 mton	B ASD Assigned
Posting :		5 At/Above Legal Loads

Rating Data:	Operating	Inventory	Posting
Truck 1 Type 3:			
Truck 2 Type 3-S3:			
Truck 3 Type 3-3:	40		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

8.23 m

Deck Area:

0.00 m sq

Deck Roadway Width:

12.19 m

Approach Roadway Width:

12.19 m

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

99.99 m

Reference Feature for Vertical Clearance:

N Feature not hwy or RR 0.00 m

Vertical Clearance Under the Structure: Reference Feature for Lateral Underclearance:

N Feature not hwy or RR

Minimum Lateral Under Clearance Right:

0.00 m

Minimum Lateral Under Clearance Left:

0.00 m

Span Data

Main Span

Number Spans: 2

Material Type Code, Description: 3 Steel

Span Design Code, Description: 19 Culvert (includes frame culverts)

Deck

Deck Structure Type: N Not applicable

Deck Surfacing Type: N Not Applicable (applies only to strutures with no dec

Deck Protection Type: N Not applicable (applies only to structures with no de

Deck Membrain Type: N Not applicable (applies only to structures with no de

Approach Span

Number of Spans: 0

Material Type Code, Description:

Span Design Code, Description:

(52) Out-to-Out Width:

(50A) Curb Width:

0.00 m

0.00 m

(50B) Curb Width: 0.00 m

Skew Angle:

Over / Under Direction	Inventory	South, We	est or Bi-direction	al Travel	North or East Travel		
Name	Route	Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	12.19 m	N/A		



Form: bms001d Printing Date: Tuesday, January 10 2012

P00020007+00501 Continue

Inspection Data Sufficiency Rating: 89.7 Health Index: 100 Structure Status: Not Deficient		Due Date : 12 dion Fequency (
NBI Inspection Data							
(90) Date of Last Inspection : 12 January 20	011		La	ast Inspected By	Troy Hafele -	2056	
(90) Inspection Date :				Inspected By			
(58) Deck Rating : N	(68) Deck Geo	metry : 6	(36C) Ap	proach Rail Rati	ng :N	(62) Culvert	Rating : 7
(59) Superstructure Rating : N	(67) Structure F	Rating: 7	(36A)	Bridge Rail Ratir	g : N	(61) Channe	Rating: 7
(60) Substructure Rating : N	5 3		(36B)) Transition Ratir	g : N	(71) Waterway Ad	dequacy :8
(72) App Rdwy Align : 8	(69) Under Clear (41) Posting S	(Ass. C.)	(36)	D) End Rail Ratir	g : N	(113) Scour	Critical: 8
Unrepaired Spa	alls: 0 m	sq	f	D	eck Surfacing I	Depth: 0.0	0 in
Inspection Hours	Lancia de la constante de la c		⊣			•	
Crew Hours for inspection : 1			er Required	<u> </u>		-	
Helper Hours : -1 Special Crew Hours : -1	51	nooper Hours fo				1	
		FIE	agger Hours	-1]	
Special Equipment Hours :1							
Inspection Work Candidates	Status	Driority	Effected	Scope		A - 0' -	Covered
Candidate ID Date Requested	Status	Priority	Structure Unit	Wor	K	Action	Condition States
Element Inspection Data Element Description Smart Flag Scale Factor Env Qu Element 240 - Steel Culvert galvanized DBL	antity Units I	nsp Each Pc	t Stat 1	* * * * * * * * * * * * Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
1 2	50 m.	X / IL ZIII K X 02	100	٨	The first source		
	30 III.		%	0 %	9/	0	
Provious Inspection Notes :	En	TO ACT	70	70		%	%
Previous Inspection Notes :		has congrete a	nd outlet end	(1	protection Th	1	NVXCX
01/12/2011 - outlet ends have 1' of manure/se	ediment. Inlet end	nas concrete at	id odlict chid	nas riprap siope	protoction. 11		
01/12/2011 - oullet ends have 1' of manure/se 01/05/2009 - None	ediment, Inlet end	nas concrete ai	id odlict cho	i nas riprap siope	protoction, 11		PH:
	ediment. Inlet end	nas concrete ai	ia odnot cria	і паѕ пргар ѕюрє	protoction, 11		
01/05/2009 - None 01/17/2007 - None 01/24/2005 - None	ediment. Inlet end	nas concrete a	id dulier end	i nas riprap siope	protection, 11		IZHP
01/05/2009 - None 01/17/2007 - None 01/24/2005 - None 12/30/2002 - Same comments as last insp.	ediment, inlet end	nas concrete al	io odnor cho	i nas riprap siope	procedent. 11		IMP XZBK
01/05/2009 - None 01/17/2007 - None 01/24/2005 - None	ediment. Inlet end	nas concrete al	lo dallet end	i nas riprap siope	protoction: 11		IZIP XZBK CZRE
01/05/2009 - None 01/17/2007 - None 01/24/2005 - None 12/30/2002 - Same comments as last insp. 12/26/2000 - Same comments as last insp. 12/04/1998 - 1 foot of silt at the bottoms of pig		nas concrete al	lo dallet erla	i nas riprap siope	protocolon: 11		IZIP XZBK CZHE WJCZ
01/05/2009 - None 01/17/2007 - None 01/24/2005 - None 12/30/2002 - Same comments as last insp. 12/26/2000 - Same comments as last insp. 12/04/1998 - 1 foot of silt at the bottoms of pig 10/02/1996 - None		nas concete al	io odlici cho	i nas riprap siope	protoction.		IZIP XZBK CZHE WJCZ OLHZ
01/05/2009 - None 01/17/2007 - None 01/24/2005 - None 12/30/2002 - Same comments as last insp. 12/26/2000 - Same comments as last insp. 12/04/1998 - 1 foot of silt at the bottoms of pig		nas concete al	io odlici cho	i nas riprap siope	protocolors. 11		IZIP XZBK CZHE WJCZ GLHZ GAGS

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P00020007+00501 Continue

General Inspection Notes	
01/12/2011 - None	NZ0Z
01/05/2009 - None	Mis
01/17/2007 - None	XZ8K
01/24/2005 - None	¢2HE
12/30/2002 - None	Walcz
12/26/2000 - None	OH-PZ
12/04/1998 - None	©\4(c)\$
10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$a0241 at 8/15/97 14:18:24 OPS\$A0241 inspection comments - Structure P00020007+00501 - Date 10/2/96 -	тусу
Previous comments > Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:36 Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:01	
10/01/1994 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:36 Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:01	REFI
01/01/1993 - Updated with tape 1994	NS94
01/01/1991 - Updated with tape 1992	N892
02/01/1989 - Updated with tape 1991	N891
01/01/1987 - Updated with tape 1988	NB88
01/01/1985 - Updated with tape 1986	NERG
01/01/1983 - Updated with tape 1984	NB84
5	

Page 1 of 5 Form: bms001d

Printing Date: Tuesday, January 10 2012

P00020010+00721

Location: 6M SW INTAKE Structure Name: none

General Location Data

District Code, Number, Location: 04

Str Owner Code, Description: 1

Dist 4

GLENDIVE

State Highway Agency

Division Code, Location: 43

MILES CITY

County Code, Location: 021

DAWSON

City Code, Location: 00000

RURAL AREA

Kind fo Hwy Code, Description: 3

3 State Hwy

Signed Route Number: 00016

Kilometer Post, Mile Post:

State Highway Agency

Intersecting Feature: LOWER 7 MILE CREEK

Maintained by Code, Description:1

10.07

Structure on the State Highway System: X

Latitude: 47°14'08"

Construction Data

Structure on the National Highway System: X Str Meet or Exceed NBIS Bridge Length: X Longitude: 104°38'51"

Construction Station Number: 527+92.00

Construction Drawing Number: 8050 Construction Year: 1967

Construction Project Number: F 245(19)

16.21 km

Traffic Data Current ADT: 1,880

ADT Count Year: 2009

Percent Trucks:

2 %

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

Design Loading:		5 MS 18 (HS 20)
Inventory Load, Design:	32.6 mton	A LFD Assigned
Operating Load, Design:	34.4 mton	A LFD Assigned
Posting:		5 At/Above Legal Loads

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3:	36		
Truck 2 Type 3-S3:	49		7
Truck 3 Type 3-3:	57		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

40.23 m

Deck Area:

515.00 m sq

Deck Roadway Width:

12.19 m

Approach Roadway Width:

12.19 m

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

99.99 m

Reference Feature for Vertical Clearance:

N Feature not hwy or RR

Vertical Clearance Under the Structure:

0.00 m N Feature not hwy or RR

Reference Feature for Lateral Underclearance: Minimum Lateral Under Clearance Right:

0.00 m

Minimum Lateral Under Clearance Left:

0.00 m

Span Data

Main Span

Number Spans: 2

Material Type Code, Description: 5 Prestressed concrete

Span Design Code, Description: 4 Tee Beam

Approach Span

Number of Spans: 0 Material Type Code, Description:

(52) Out-to-Out Width:

Span Design Code, Description:

Deck

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Surfacing Type: 0 None (no additional concrete thickness or wearing ş

Deck Protection Type: 0 None

Deck Membrain Type: 0 None

(50A) Curb Width: 0.00 m

12.80 m

(50B) Curb Width:

0.00 m

Skew Angle: °

Over / Under Direction			est or Bi-direction	al Travel	North or East Travel		
Name	Route	Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	12.19 m	N/A	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
		(N - 10 - 1			130.1		

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Printing Date: Tuesday, January 10 2012

P00020010+00721 Continue

Inspection E	Data	Inspectio	n Due Date : 20	January 20	12			
Sufficiency Rating : 4 Health Index : 100		(91) Inspe	ction Fequency	(months) : 24	ı			
Structure Status :Not	Deficient							
NBI Inspection Da								
(90) Date of Last Ins	pection : 20 January 2	2010		L	ast Inspected By	Troy Hafele	- 2056	
(90) Inspection	on Date :				Inspected By			
(58) Deck	Rating : 7	(68) Deck Ge	eometry : 6	(36C) A	pproach Rail Ratin	9 1	(62) Culver	t Rating : N
(59) Superstructure	Rating: 8	(67) Structure	Rating: 7	(36A)	Bridge Rail Rating	9:0	(61) Channe	Rating: 8
(60) Substructure	Rating : 7	(69) Under Clea	arance : N	(36E	3) Transition Rating	9:1	(71) Waterway A	dequacy 8
(72) App Rdw	y Align : 8	(41) Posting		(36	D) End Rail Rating	9:1	(113) Scou	r Critical : 5
	Unrepaired Sp	oalls: 0 n	n sq	Ħ	De	ck Surfacing	Depth: 0.0	00 in
Inspection Hours						-		
Crew Hours for inspec	ction : 1.5		Snoo	per Required	: N			
Helper H			Snooper Hours t	or inspection	-1		7	
Special Crew H	ours: -1		F	lagger Hours	-1		7	
Special Equipment H	ours: -1						_	
Inspection Wor	k Candidates	VALUE OF THE PARTY		Effected	Scope	of		Covered
Candidate ID	Date Requested	Status	Priority	Structure Unit	Work	(Action	Condition States

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P00020010+00721

Continue

Element Inspection Data

* * * Span : Main-0 - -1 * * * * * * * * * Element Description Smart Flag Scale Factor Env Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 12 - Bare Concrete Deck sq.m. 2 515 Х 100 % % % Previous Inspection Notes: 01/20/2010 - Deck was sandblasted and sealed in 2008. Some exposed aggregate. 01/14/2008 - None. (40.23 X 12.80 = 514.944) 01/24/2005 - None 12/26/2000 - Chip and seal cover starting to ravel off on driving lanes. 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 109 - P/S Conc Open Girder 1 1 241 100 m. % Previous Inspection Notes: 01/20/2010 - 6 T beams. 01/14/2008 - None 01/24/2005 - None 12/26/2000 - None 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 205 - R/Conc Column 2 ea. 100 % Previous Inspection Notes: 01/20/2010 - None 01/14/2008 - None 01/24/2005 - None 12/26/2000 - None 10/02/1996 - None 01/01/1993 - None Inspection Notes:

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P00020010+00721 Continue

****** Span : Main-0 - -1 (cont.) *******

	cription									
	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215	- R/Conc Abutn	nent								
	1	2	31	m.		100	0	0	0	
1					114 11	%	%	%	%	Value III.
Previous Ins	pection Notes :									
01/20/2010 -	None									(4)7(1/2
01/14/2008 -	None									(0)1837
01/24/2005 -	None									(CTH)
12/26/2000 -	None									OILH
10/02/1996 -	None									INJAW.
01/01/1993 -	None									INSH
Inspection N	lotes:									
	¥									
Element 234	- R/Conc Cap							2		
	1	1	12	m.		100	0	0	0	ST 2 18 18
						%	%	%	%	3. 10 3.43
Previous Inst	ection Notes :			- 1	1273		~			
)1/20/2010 -										
01/14/2008 -										UZLZ
1/24/2005 -										OB2
2/26/2000 -										(C))##(0)
0/02/1996 -										Mayv
1/01/1993 -	None									R(EG)
Inspection N										MEN
		7								
Element 313	- Fixed Bearing									
	1	1	12	ea.		100	0	0	No. of the last	Political Control
100						%	%	%	%	
revious Insp	ection Notes :			-						
1/20/2010 -	Quantity does no	ot include	bearings buried	l in bacl	kwall 0 6 6 0	= 12.				10):/(1/2
1/14/2008 -	None									OHEZ
1/24/2005 -	None									CH#(c
2/26/2000 -	Dirt on both out	side beari	ngs at abut 1.							OURI
0/02/1996 -	None									MINAA
1/01/1993 -	None									R/HH
laanaatian N	otes:			or or distance						
Inspection N										

Page 5 of 5 Form: bms001d Printing Date : Tuesday, January 10 2012

P00020010+00721 Continue

* * * * * * * * * * Span : Main-0 - -1 (cont.) * * * * * * * * *

| Element Description Smart Flag Scale Factor Env Quantity Units Insp Each Pct Stat 1 I Element 334 - Metal Rail Coated 1 2 80 m. 95 % Previous Inspection Notes : | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
|--|------------|------------|------------|-------------|
| Element 334 - Metal Rail Coated 1 2 80 m. 95 | | | | i ot otat o |
| % | 5 | 0 | | |
| % | ****** | | 0 | |
| | % | % | | |
| | | ,, | | |
| 01/20/2010 - Thrie beam with freckled rust on the posts. | | | | - triz |
| 01/14/2008 - None. (40.23 X 2 = 80.46) | | | | CHSZ |
| 01/24/2005 - None | | | | CTHG |
| 12/26/2000 - None | | | | ONIHL |
| 10/02/1996 - None | | | | MUVV |
| 01/01/1993 - None | | | | INES |
| Inspection Notes: | | | | |
| | | | | |
| General Inspection Notes | | | | |
| 01/20/2010 - None | | | | UZLZ |
| 01/14/2008 - New end sections 2007. | | | | (0)EZ |
| 01/24/2005 - Same as previously reported. | | | | CHIE |
| 12/26/2000 - Bridge at bottom of vertical. Berm starting to wash at right side abut.3. | | | | (0)141 |
| 10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$a0241 at 8/15/97 14:19:33 OPS\$A0241 inspection comments - Structure P00020010+00721 - Date 10/2/96 - Previous comments > Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34 Sufficiency Rating Calculation Accepted by ops\$u5902 | 4:37 | | | MJVV |
| 01/01/1993 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:37 Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:02 | | | | REFL |
| 01/01/1991 - Updated with tape 1992 | | | | N(\$49)2 |
| 02/01/1989 - Updated with tape 1991 | | | | NESST |
| 01/01/1987 - Updated with tape 1988 | | | | MERRO |
| 01/01/1985 - Updated with tape 1986 | | | | MERRIS |
| 01/01/1983 - Updated with tape 1984 | | | | (MEDA) |
| 12/01/1980 - Updated with tape 1983 | | | | N(8)8(3) |
| 12/01/1978 - Updated with tape 1980 | | | | (81EB(0) |
| | | | | |
| | 3 | | | |
| | | | | |
| | | | | |
| | | 303 | | |
| | | | | |
| | | | | |
| | | | | |

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P00020012+05321

Location: 4M SW INTAKE Structure Name: none

General Location Data

District Code, Number, Location: 04

GLENDIVE

Division Code, Location: 43

MILES CITY

County Code, Location: 021

DAWSON

City Code, Location: 00000

Kilometer Post, Mile Post:

RURAL AREA

Kind fo Hwy Code, Description:

3 State Hwy

Signed Route Number: 00016

Str Owner Code, Description: 1

State Highway Agency

Maintained by Code, Description:1

State Highway Agency

Intersecting Feature: MORGAN CREEK

Structure on the State Highway System: X

Latitude: 47°15'54"

20.17 km

12.53

Structure on the National Highway System: X

Longitude: 104°37'08"

Construction Project Number: F 245(19)

Str Meet or Exceed NBIS Bridge Length: X

Construction Station Number: 657+59.00

Construction Drawing Number: 8056

Construction Data

Construction Year: 1967

Traffic Data

Current ADT: 1,650

ADT Count Year: 2009

Percent Trucks:

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading: | | 5 MS 18 (HS 20) |
|-------------------------|-----------|------------------------|
| Inventory Load, Design: | 32.6 mton | A LFD Assigned |
| Operating Load, Design: | 34.4 mton | A LFD Assigned |
| Posting : | | 5 At/Above Legal Loads |

| Rating Data : | Operating | Inventory | Posting |
|--------------------|-----------|-----------|---------|
| Truck 1 Type 3: | 36 | | |
| Truck 2 Type 3-S3: | 51 | | |
| Truck 3 Type 3-3: | 60 | | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

37.19 m

Deck Area:

476.00 m sq

Deck Roadway Width:

12.19 m

Approach Roadway Width:

12.19 m

Median Code, Description: 0 No median

N Feature not hwy or RR 0.00 m

Reference Feature for Vertical Clearance: Vertical Clearance Under the Structure:

Vertical Clearance Over the Structure:

Structure Vertical and Horizontal Clearance Data:

N Feature not hwy or RR

99.99 m

Reference Feature for Lateral Underclearance:

0.00 m

Minimum Lateral Under Clearance Right: Minimum Lateral Under Clearance Left:

0.00 m

Span Data

Main Span

Number Spans: 2

Material Type Code, Description: 5 Prestressed concrete

Span Design Code, Description: 4 Tee Beam

Approach Span

Number of Spans: 0 Material Type Code, Description:

Span Design Code, Description:

Deck

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Surfacing Type: 0 None (no additional concrete thickness or wearing s

Deck Protection Type: 0 None Deck Membrain Type: 0 None (52) Out-to-Out Width:

12.80 m

(50A) Curb Width:

(50B) Curb Width:

0.00 m

0.00 m

Skew Angle: °

| Over / Under Direction | TANG PANGGANAS, INCIDENTANTAN PANGGANAS AND | | est or Bi-direction | al Travel | North or East Travel | | | |
|------------------------|---|-----------|---------------------|------------|----------------------|---|------------|--|
| Name | Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizontal | |
| Route On Structure | P00020 | Both | 99.99 m | 12.19 m | N/A | ======================================= | | |

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Printing Date: Tuesday, January 10 2012

P00020012+05321 Continue

| Inspection D | ata | Inspection | Due Date : 20 | anuary 2012 | | | | |
|---|----------------------|-----------------|-------------------|-------------------|-------------------|--------------|-----------------|---------------------|
| Sufficiency Rating: 9 Health Index: 100 | 90.8 | (91) Inspe | ction Fequency (r | nonths) : 24 | | | | |
| Structure Status :Not | Deficient | | | | | | | |
| NBI Inspection Da | ata | | | | | | | |
| (90) Date of Last Ins | pection : 20 January | 2010 | | Las | t Inspected By | Troy Hafele | - 2056 | |
| (90) Inspection | on Date : | | | | Inspected By | : | | |
| (58) Deck | Rating: 7 | (68) Deck Ge | ometry: 6 | (36C) App | roach Rail Ratin | ng :1 | (62) Culver | t Rating : N |
| (59) Superstructure | Rating : 8 | (67) Structure | Rating: 7 | (36A) B | ridge Rail Rating | g: 0 | (61) Channe | Rating: 8 |
| (60) Substructure | Rating : 7 | (69) Under Clea | arance : N | (36B) 1 | ransition Rating | g : 1 | (71) Waterway A | dequacy 8 |
| (72) App Rdwy | y Align : 6 | (41) Posting | | (36D) | End Rail Rating | g : 1 | (113) Scou | r Critical : 5 |
| | Unrepaired Sp | oalls: 0 m | sq | Ī | De | ck Surfacing | Depth: 0.0 | 00 in |
| Inspection Hours | | 8 | | | | | | |
| Crew Hours for inspec | tion: 1.5 | | Snoop | er Required : | N | | | |
| Helper He | | | Snooper Hours fo | r inspection : | -1 | | 7 | |
| Special Crew Ho | ours: -1 | | Fla | gger Hours : | -1 | | 1 | |
| Special Equipment Ho | ours: -1 | | | L | | | _ | |
| Inspection World | k Candidates | 04-4 | Data de | Effected | Scope | | | Covered |
| Candidate ID | Date
Requested | Status | Priority | Structure
Unit | Worl | K | Action | Condition
States |

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P00020012+05321 Continue

Element Inspection Data

* * * * * * * * * * Span : Main-0 - -1 * * * * * * * * * Element Description Smart Flag Scale Factor Env Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 12 - Bare Concrete Deck 1 2 476 sq.m. X 100 % % % Previous Inspection Notes : 01/20/2010 - 2008 Sandblasted and sealed deck. Inspection Notes: Element 109 - P/S Conc Open Girder 1 222 1 100 m. % Previous Inspection Notes: 01/20/2010 - 6 T beams. 01/14/2008 - None 01/24/2005 - None 12/26/2000 - None 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 205 - R/Conc Column 1 2 100 ea. % Previous Inspection Notes: 01/20/2010 - None 01/14/2008 - None 01/24/2005 - None 12/26/2000 - None 10/02/1996 - None 01/01/1993 - None Inspection Notes:



P00020012+05321 Continue

******* Span : Main-0 --1 (cont.) *******

| | Scale Factor | Env | | | | | | | | |
|----------------|-------------------|-------------|-----------------|-----------------|--------------|-------------|-------------|-----------------|-------------------|---------------|
| | | CHV I | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| | - R/Conc Abutn | | accounty. | 011110 | mor Edding | . or orar r | 1 of Oldi 2 | 1 or orar o | 1 01 0101 4 | 1 of olar 5 |
| | 1 | 2 | 31 | m. | | 100 | 0 | (|) | |
| | | | | | | % | % | | | |
| Previous Insn | ection Notes : | | | | -1489 | | ,, | | 1 | Ì |
| 01/20/2010 - I | | | | | | | | | | Durat-la |
| 01/14/2008 - 1 | | | | | | | | | | UCH |
| 01/24/2005 - 1 | | | | | | | | | | 08432 |
| 12/26/2000 - 1 | | | | | | | | | | (CIS)#I |
| 10/02/1996 - 1 | | | | | | | | | | GLEIC
LOUA |
| 01/01/1993 - 1 | | | | | | | | | | REH |
| | | | | | | | | | Children and | NHI |
| Inspection N | otes: | | | | | | | | | |
| lement 234 | - R/Conc Cap | | | | | • | | | | |
| | 1 | 1 | 12 | m. | | 100 | 0 | (| (| |
| | MATERIAL SECTION | | | | | % | % | | - Annual Language | |
| Previous Insp | ection Notes : | | | | | · · | ,, | | 1^ | |
| 1/20/2010 - 1 | | | | 70.0 / U.S. 100 | | | | NAMES IN COLUMN | | Elekoloda |
|)1/14/2008 - I | | | | | | | | | | Udh |
| 1/24/2005 - 1 | | | | | | | | | | (0)(1) |
| 2/26/2000 - 1 | | | | | | | | | | OLHO |
| 10/02/1996 - I | | | | | | | | | | HON |
| 01/01/1993 - 1 | | | | | | | | | | RESI |
| Inspection No | | | | • | | | | | | Merch |
| | | | | | | | | | | |
| lement 313 - | - Fixed Bearing | | | 1 | | | | | | |
| | 1 | 1 | 12 | ea. | | 100 | 0 | 0 | te li tais | |
| | | | | | | % | % | % | % | |
| revious Insp | ection Notes : | | | | | | | | | - |
| 1/20/2010 - 0 | Quantity does r | not include | bearings burie | d in bac | kwalls 0 6 6 | 0 = 12. | | | | Hickie |
| 1/14/2008 - 1 | | | | | | | | | | OSBZ |
| 1/24/2005 - 3 | Same as previo | usly repor | ted. | | | | | | | CISHI |
| 2/26/2000 - [| Dirt is on both o | outside bea | ring devices at | both at | outments. | | | | | (0)11(0 |
| 0/02/1996 - 1 | None | | | | | | | | | U(O,I)A |
| 1/01/1993 - 1 | None | | | | | | | | | (2) (日年) |
| Inspection No | otes: | | | | | | | | | |
| | | | | | | | | | | |



P00020012+05321

Continue

* * * * * * * * * * Span : Main-0 - -1 (cont.) * * * * * * * *

| Element Description Smart Flag Scale Factor Env Element 334 - Metal Rail Coated 1 2 | 0 | | | | | | |
|---|---------------------------------------|--|----------------------|------------|------------|------------|--------------|
| Element 334 - Metal Rail Coated | Quantity | Units Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| 1 2 | | | | | <u> </u> | | 0.00.0000000 |
| | 74 | m. | 95 | 5 | (| 0 | |
| | | | % | % | % | % | |
| Previous Inspection Notes : | | | | | 53 | | |
| 01/20/2010 - Thrie beam posts have s | ome freckled rus | | | | | | (J)(G)F(s |
| 01/14/2008 - None. (37.19 X 2 = 74.3 | | 9.00 | | | | | OSISZ |
| 01/24/2005 - Same as previously repo | Children and the second | | | | | | CSIAII |
| 12/26/2000 - Concrete spalling at It ou | | t 3 near wingwall. | | | | | OLHIO |
| 10/02/1996 - None | | | | | | | UoJA |
| 01/01/1993 - None | | | | | | | REF |
| Inspection Notes: | | | | | | | |
| | | | - | | | | |
| General Inspection Notes | | | | | | | |
| 01/20/2010 - None | 2.0 | | | | | | UGFD |
| 01/14/2008 - New end sections 2007. | | | | | | | 0887 |
| 01/24/2005 - Same as previously reported. | | | | | | | GISHIII |
| 12/26/2000 - The approach sectoin ha | is numerous crac | king in asphault. B | ridge is in slight | vertical. | | | (D) H1 (O) |
| 10/02/1996 - Sufficiency Rating Calcul
OPS\$A0241 inspection comments -
Structure P00020012+05321 -
Date 10/2/96 -
Previous comments > Sufficiency Rati
Sufficiency Rating Calculation Accepte | ng Calculation Ad | ccepted by ops\$u5 | 963 at 3/10/97 1 | 1:34:37 | | | Mode |
| 01/01/1993 - Sufficiency Rating Calcul
Sufficiency Rating Calculation Accepte | lation Accepted b
ed by ops\$u9004 | y ops\$u5963 at 3/
at 2/19/97 14:59:0 | 10/97 11:34:37
)3 | | | | REFI |
| 01/01/1991 - Updated with tape 1992 | | | | | | | NE92 |
| 02/01/1989 - Updated with tape 1991 | | | | | | | N(8391) |
| 01/01/1987 - Updated with tape 1988 | | | | | | | NERG |
| 01/01/1985 - Updated with tape 1986 | | | | | | | NBRG |
| 01/01/1983 - Updated with tape 1984 | | | | | | | 181816 |
| mon rood opadiod min tapo root | | | | | | | |
| 12/01/1980 - Updated with tape 1983 | | | | | | | N(BH) |

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Printing Date: Tuesday, January 10 2012

P00020015+04781

Location: 15M NE GLENDIVE Structure Name: 1M SW Intake

General Location Data

District Code, Number, Location: 04 Dist 4

GLENDIVE

Division Code, Location: 43

MILES CITY

County Code, Location: 021

DAWSON

City Code, Location: 00000 Signed Route Number: 00016 **RURAL AREA**

Kind fo Hwy Code, Description: 3

3 State Hwy

State Highway Agency

Str Owner Code, Description: 1

Intersecting Feature: THIRTEEN MILE CREEK

Maintained by Code, Description:1

Latitude: 47°16'60"

State Highway Agency

Kilometer Post, Mile Post:

24.90 km 15.47

Structure on the State Highway System: X

Str Meet or Exceed NBIS Bridge Length: X

Structure on the National Highway System: X

Longitude: 104°33'48"

Construction Data

Construction Project Number: F 245(20) Construction Station Number: 813+32.00

Construction Drawing Number: 8749

Construction Year: 1969

Reconstruction Year:

Traffic Data

Current ADT: 1,650

ADT Count Year: 2009

Percent Trucks:

3 %

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading: | | 5 MS 18 (HS 20) |
|--------------------------|-----------|------------------------|
| Inventory Load, Design: | 32.6 mton | B ASD Assigned |
| Operating Load, Design : | 44.4 mton | B ASD Assigned |
| Posting : | | 5 At/Above Legal Loads |

| Rating Data : | Operating | Inventory | Posting |
|--------------------|-----------|-----------|---------|
| Truck 1 Type 3: | 50 | | |
| Truck 2 Type 3-S3: | 70 | | |
| Truck 3 Type 3-3: | 89 | | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

101.19 m

Deck Area:

1,316.00 m sq

Deck Roadway Width:

12.19 m

Approach Roadway Width:

12.19 m

Median Code, Description: 0 No median

Span Data Main Span

Number Spans: 10

Material Type Code, Description: 4 Steel continuous

Span Design Code, Description: 2 Stringer/Multi-beam or Girder

Deck

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Surfacing Type: 1 Monolithic concrete (concurrently placed with struct

Deck Protection Type: 0 None

Deck Membrain Type: 0 None

Approach Span

Number of Spans: 0

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

Reference Feature for Vertical Clearance:

Reference Feature for Lateral Underclearance :

Vertical Clearance Under the Structure :

Minimum Lateral Under Clearance Right: Minimum Lateral Under Clearance Left:

Material Type Code, Description:

Span Design Code, Description:

(52) Out-to-Out Width:

13.01 m

99.99 m

0.00 m

0.00 m

0.00 m

N Feature not hwy or RR

N Feature not hwy or RR

(50A) Curb Width:

(50B) Curb Width:

0.00 m

0.00 m

Skew Angle: °

| Inventory | Journ, we | est or Bi-directions | ai i ravei | North or East Travel | | |
|-----------|-----------------|----------------------|--------------------|-------------------------------|---|--|
| Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizontal |
| P00020 | Both | 99.99 m | 12.19 m | N/A | | |
| | Route
P00020 | Direction | Direction Vertical | Direction Vertical Horizontal | Direction Vertical Horizontal Direction | Direction Vertical Horizontal Direction Vertical |

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Printing Date: Tuesday, January 10 2012

P00020015+04781 Continue

| Inspection E | ata | Inspect | ion Due Date : | 12 January 201 | 3 | | | |
|---------------------------|------------------------|--|-----------------|-------------------|---|-----------------------------|---------------------|--|
| Sufficiency Rating : 94 | 90.8 | (91) Insp | pection Fequenc | y (months) : 24 | | | | |
| Structure Status :Not | Deficient | | | | | | | |
| NBI Inspection D | ata | | | | | | | |
| (90) Date of Last Ins | pection : 12 January 2 | 2011 | | La | ast Inspected By | ele - 2056 | | |
| (90) Inspection | on Date : | | | | Inspected By : | | | |
| (58) Deck | Rating: 6 | (68) Deck Geometry : 6 | | | proach Rail Rating | (62) Culver | t Rating : N | |
| (59) Superstructure | Rating: 7 | (67) Structure Rating : 7 | | | Bridge Rail Rating : 1 | (61) Channe | I Rating : 7 | |
| (60) Substructure | Rating: 7 | (60) Under C | learance : NI | (36B |) Transition Rating : 1 | 1 (71) Waterway Adequacy :6 | | |
| (72) App Rdw | y Align : 8 | (69) Under Clearance: N (41) Posting Status: A | | | (36D) End Rail Rating : 1 (113) Scour Critica | | | |
| Inspection Hours | Unrepaired Sp | palls: 0 | m sq | | Deck Surfac | ing Depth : 7.5 | 50 in | |
| Crew Hours for inspec | | | Sno | oper Required | : N | | | |
| Helper H | | | Snooper Hours | s for inspection | -1 | | | |
| Special Crew H | | | | Flagger Hours :1 | | | | |
| Special Equipment H | | | | | | | | |
| Inspection Wor | k Candidates | | 1 | Effected | Scope of | | Covered | |
| Candidate ID | Date
Requested | Status | Priority | Structure
Unit | Work | Action | Condition
States | |
| D41-FY2007-000025 | 23 January 2007 | Approved | Low | All Spans | Bridge | Spot Paint (flex) | | |
| tepair rust area on pile. | | | | | | | | |
| pot painting. Approve | d. DRC | | | | | | | |

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P00020015+04781

Element Inspection Data

* Span : Main-0 - -1 * * * * * * * * * Element Description Smart Flag Scale Factor Env Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 12 - Bare Concrete Deck 2 1316 sq.m. Х 0 100 % % % % Previous Inspection Notes: 01/12/2011 - Span 1 has random map cracking. Spalls have been epoxy patched(Span 10 photo). TH 01/05/2009 - None 01/17/2007 - Chain drag detected areas of delamination around spalls. Span 10: 6m x 7m area of spalling with exposed rebar. (101.19 X 13.01 = 1316.482) 01/24/2005 - Same as previously reported. Also there are spalled areas in the North end of the structure with some exposed rebar. See Photo There are numerous other smaller spalled areas thru out the deck. 12/30/2002 - Same as last insp. 12/26/2000 - None 12/04/1998 - Transverse cracking on deck over bent #3. Spalled fillet It bay at bent #8. 10/02/1996 - None 10/01/1994 - None 08/09/1973 - None Inspection Notes: Element 107 - Paint Stl Opn Girder 5 - 10 1/2w x 29 3/4h inch I beams per span 1 506 m. 100 % % Previous Inspection Notes: 01/12/2011 - None 01/05/2009 - None 01/17/2007 - None 01/24/2005 - None 12/30/2002 - None 12/26/2000 - None 12/04/1998 - None 10/02/1996 - None 10/01/1994 - None 08/09/1973 - None Inspection Notes:



P00020015+04781 Continue

******* Span : Main-0 - -1 (cont.) * * * * * * * *

| | Scale Factor | Env | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
|---|--|--|--|---------------------------------|-----------------|------------------|-------------------|--|-------------------|--|
| Element 181 | - Pnt Vrt X-Fran | | Guanity | Office | mop Lacil | , or orar i | i ot otat z | i di Siai S | ru siai 4 | PCI Stat 5 |
| 7,000 C | 1 | 1 | 231 | m. | | 100 | 0 | 0, | 0 | |
| | | | | | | % | % | % | % | |
| Previous Inst | pection Notes : | | | | | | | | | |
| 01/12/2011 - | | | | | | | | and the same of th | | 140.75 |
| 01/05/2009 - | | | | | | | | | | NITE |
| | Obtain quantity | this eleme | int | | | | | | | 1KG) |
| 01/24/2005 - | | uno cionic | AIC. | | | | | | | XUB
CZ# |
| 12/30/2002 - | | | | | | | | | | WPC |
| 12/26/2000 - | | | | | | | | | | (6)5) |
| Inspection N | | | | | | | | | | Vien |
| | | | | | | | | | | |
| Element 202 | - Paint Stl Colur | nn | | | | | | | | |
| | 1 | 3 | 45 | ea. | | 85 | 5 | 5 | 5 | |
| | | | | HES. | 100 | % | % | % | % | |
| revious Insp | pection Notes : | | | | | | | | | |
| 1/12/2011 - | Bottoms of mos | t H piling h | ave some peel | ing pair | nt with surfac | e rust, numerous | other misc spot | s also have surfa | ice rust. Some of | 1814s |
| nese areas h | nave scaling rust | . See elen | nent 220 for eve | nosed for | ootings(photo | Rent 10\ TH | outer miles open | o dico mare come | ico rusi. Como o | |
| A INTIMANA | Manage | | Herit 220 for exp | oood i | 3 VI | bent 10). III | | | | |
| | | | | | | | | | | |
| 01/17/2007 - | Area with expos | ed steel h | ave section loss | | | | right TH 1-13-10) |). | | XUB |
| 01/17/2007 -
01/24/2005 - | Area with expos
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01/24/2005 -
12/30/2002 -
12/26/2000 - | Area with expos
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ondition.
ling and lig | ave section lossed. | s and pi | itting. photo(I | Bent 4 2nd from | right TH 1-13-10) |). | | XUB
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01/24/2005 -
12/30/2002 -
12/26/2000 -
12/04/1998 - | Area with expos
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| 01/17/2007 -
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Printing Date: Tuesday, January 10 2012

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Continue

Span: Main-0 - -1 (cont.) * * * * * * * * *

Element Description Smart Flag Scale Factor Env Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 220 - R/C Sub Pile Cap/Ftg 2 22 ea. 90 10 % % Previous Inspection Notes: 01/12/2011 - Bent 10(photo). Bent 6 1st and 2nd from left, Bent 7-10 all have 5 footings each exposed. Bents 2-5 can see the tops of some footings, none included in quantity. Changed quantity from 20 to 22. TH 01/05/2009 - None 01/17/2007 - None 01/24/2005 - Same as previously reported. 12/30/2002 - Same as last insp. 12/26/2000 - The second from It has vertical cracking. Spall in footing 2nd from rt at bent 10 also. 12/04/1998 - Spall in footing 2nd from rt at bent #10. 10/02/1996 - None 10/01/1994 - None 08/09/1973 - None Inspection Notes: Element 234 - R/Conc Cap Bents 2 - 10 1 108 95 m. % % % % Previous Inspection Notes: 01/12/2011 - Bents 4(photo) and 8(2009 photo) caps are water stained. TH 01/05/2009 - None 01/17/2007 - None 01/24/2005 - Same as previously reported. 12/30/2002 - Caps have not changed. 12/26/2000 - Same as last insp. 12/04/1998 - Vertical cracking in caps at bents 7,8 and 9. 10/02/1996 - None 10/01/1994 - None 08/09/1973 - None Inspection Notes:

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P00020015+04781 Continue

****** * Span : Main-0 - -1 (cont.) * * * * * * * *

| riement Des | | | | | | | 54.9 | | | |
|---|---|------------------|---------------------|------------------|----------------|---|------------------------|------------------------------|------------|--|
| | Scription | En. | Ougatitu | l le‼s | laca Faat | Det Ct-1.4 | Del Ciri O | D-10: 10 | D. C | B. C |
| 253 | Scale Factor - Assm Jt w/o S | Env
Seal Bent | Quantity
4 and 8 | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| .icinicin 000 | 1 | 2 | | d m | | 100 | | | | |
| | | 2 | 2€ | m. | | | 0 | | | |
| ENGRAL I | | | | | | % | % | % | % | |
| | pection Notes : | | | | | | | | | |
| | Bent 4(photo). | TH | | | | | | | | Miles |
| 01/05/2009 - | | | | | | | | | | IKGZ |
| | | Ith even ac | cross deck .057 | mm. Bei | nt 8 joint .01 | 2mm wider at L | Γ fog line, .045m | nm RT and .057n | nm LT. | XUEN |
| 01/24/2005 - | | | | | | | | | | CZHK |
| 12/30/2002 - | | | | | | | | | | WIFICZ |
| 12/26/2000 - | | | | | | | | | | Olak |
| 12/04/1998 - | | | | | | | | | | GAHA |
| 10/02/1996 - | | | | | | | | | | LIRUK |
| 10/01/1994 - | | | | | | | | | | REFI |
| 08/09/1973 - | None | | | | | | | | | [5](3)(9) |
| Inspection N | Notes: | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | 0 7-5-0 | . O-E | | | |
| Element 311 | - Moveable Rea | ering Rent | 4 Span 3=5 S | nan 4=5 | and Rent 8 | | | | | |
| Element 311 | - Moveable Bea | | | - | and Bent 8 | 50, 551 | | | | A 1 - 1 - 1 - 1 - 1 |
| Element 311 | - Moveable Bea | aring Bent | 4 Span 3=5, S | - | and Bent 8 | 100 | 0 | and the second second second | | THE SECTION |
| | 1 | | | - | and Bent 8 | 50, 551 | | and the second second second | | |
| Previous Insp | 1 pection Notes : | | | - | and Bent 8 | 100 | 0 | and the second second second | | |
| Previous Insp
01/12/2011 - | pection Notes : | | | - | and Bent 8 | 100 | 0 | and the second second second | | MBZ |
| Previous Insp | pection Notes : | | | - | and Bent 8 | 100 | 0 | and the second second second | | |
| Previous Insp
01/12/2011 - | pection Notes :
None
None | | | - | and Bent 8 | 100 | 0 | and the second second second | | 4MB/Z |
| Previous Insp
01/12/2011 -
01/05/2009 - | pection Notes :
None
None | | | - | and Bent 8 | 100 | 0 | and the second second second | | 48TBZ |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N | pection Notes :
None
None
Notes: | 1 | 20 | ea. | | 100° | % | and the second second second | | MBZ |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N | pection Notes : None None Notes: - Fixed Bearing | 1
Bent 2=5 | , Bent 3=5, Be | ea.
nt 5=5, E | | 100
%
nt 7=5, Bent 9= | 0
%
5, Bent 10=5 | % | % | MBZ |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N | pection Notes :
None
None
Notes: | 1 | 20 | ea.
nt 5=5, E | | 100
%
nt 7=5, Bent 9= | 5, Bent 10=5 | % | % | INTBZ
IKBZ |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N | pection Notes : None None Notes: - Fixed Bearing | 1
Bent 2=5 | , Bent 3=5, Be | ea.
nt 5=5, E | | 100
%
nt 7=5, Bent 9= | 0
%
5, Bent 10=5 | % | % | INTBZ
IKBZ |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N
Element 313 | 1 Pection Notes: None None Notes: - Fixed Bearing 1 Dection Notes: | Bent 2=5 | , Bent 3=5, Ben 35 | ea. | Bent 6=5, Be | 100
%
nt 7=5, Bent 9=
100
% | 5, Bent 10=5 | % | % | NTBZ
IKBZ |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N
Element 313
Previous Insp | 1 Pection Notes: None None Notes: - Fixed Bearing 1 Dection Notes: Bearings at Abi | Bent 2=5 | , Bent 3=5, Ben 35 | ea. | Bent 6=5, Be | 100
%
nt 7=5, Bent 9=
100
% | 5, Bent 10=5 | % | % | INTEX |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N
Element 313
Previous Insp
01/12/2011 -
01/05/2009 - | pection Notes : None None Notes: - Fixed Bearing 1 Dection Notes : Bearings at About None | Bent 2=5 | , Bent 3=5, Ben 35 | ea. | Bent 6=5, Be | 100
%
nt 7=5, Bent 9=
100
% | 5, Bent 10=5 | % | % | IKBZ
IKBZ
IKBZ |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N
Element 313
Previous Insp
01/12/2011 -
01/05/2009 -
01/17/2007 - | 1 Pection Notes: None None Notes: - Fixed Bearing 1 Dection Notes: Bearings at About None None | Bent 2=5 | , Bent 3=5, Ben 35 | ea. | Bent 6=5, Be | 100
%
nt 7=5, Bent 9=
100
% | 5, Bent 10=5 | % | % | XUBN
IKBZ
IKBZ |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N
Element 313
Previous Insp
01/12/2011 -
01/05/2009 -
01/17/2007 - | 1 Pection Notes: None None Notes: - Fixed Bearing 1 Dection Notes: Bearings at About None None None | Bent 2=5 | , Bent 3=5, Ben 35 | ea. | Bent 6=5, Be | 100
%
nt 7=5, Bent 9=
100
% | 5, Bent 10=5 | % | % | NTBZ
IKBZ
NTBZ
NTBZ
IKBZ
XUSM
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| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N
Element 313
Previous Insp
01/12/2011 -
01/05/2009 -
01/17/2007 -
01/24/2005 -
12/30/2002 - | 1 pection Notes: None None Notes: - Fixed Bearing 1 pection Notes: Bearings at Abi None None None None | Bent 2=5 | , Bent 3=5, Ben 35 | ea. | Bent 6=5, Be | 100
%
nt 7=5, Bent 9=
100
% | 5, Bent 10=5 | % | % | NTBZ
IKBZ
IKBZ
XUBM
CZHK
WPCZ |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N
Element 313
Previous Insp
01/12/2011 -
01/05/2009 -
01/17/2007 -
01/24/2005 -
12/20/2002 -
12/26/2000 - | pection Notes : None None Notes: - Fixed Bearing 1 Dection Notes : Bearings at About None None None None None None None | Bent 2=5 | , Bent 3=5, Ben 35 | ea. | Bent 6=5, Be | 100
%
nt 7=5, Bent 9=
100
% | 5, Bent 10=5 | % | % | NTBZ
IKBZ
IKBZ
XUBW
CZHK
WPCZ
OLIA |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N
Element 313
Previous Insp
01/12/2011 -
01/05/2009 -
01/17/2007 -
01/24/2005 -
12/30/2002 -
12/26/2000 -
12/26/2000 - | 1 Pection Notes: None None Notes: - Fixed Bearing 1 Dection Notes: Bearings at Abounce None None None None None None None Non | Bent 2=5 | , Bent 3=5, Ben 35 | ea. | Bent 6=5, Be | 100
%
nt 7=5, Bent 9=
100
% | 5, Bent 10=5 | % | % | NTBZ
IKBZ
IKBZ
XUBN
CZHK
WPCZ
OLIA
GAHA |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N
Element 313
Previous Insp
01/12/2011 -
01/05/2009 -
01/17/2007 -
01/24/2005 -
12/30/2002 -
12/26/2000 -
12/04/1998 -
10/02/1996 - | 1 pection Notes: None None Notes: - Fixed Bearing 1 pection Notes: Bearings at About None None None None None None None None | Bent 2=5 | , Bent 3=5, Ben 35 | ea. | Bent 6=5, Be | 100
%
nt 7=5, Bent 9=
100
% | 5, Bent 10=5 | % | % | NTBZ
IKBZ
NTBZ
IKBZ
XUBN
CZHK
WPCZ
OLIA
GAHA
URUK |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N
Element 313
Previous Insp
01/12/2011 -
01/05/2009 -
01/17/2007 -
01/24/2005 -
12/30/2002 -
12/26/2000 -
12/04/1998 -
10/02/1996 -
10/01/1994 - | pection Notes: None None Notes: - Fixed Bearing 1 Dection Notes: Bearings at Abu None None None None None None None None | Bent 2=5 | , Bent 3=5, Ben 35 | ea. | Bent 6=5, Be | 100
%
nt 7=5, Bent 9=
100
% | 5, Bent 10=5 | % | % | NTBZ
IKBZ
IKBZ
IKBZ
XUBN
CZHK
WPCZ
OLIA
GAHA
URUK
REFI |
| Previous Insp
01/12/2011 -
01/05/2009 -
Inspection N
Element 313
Previous Insp
01/12/2011 -
01/05/2009 -
01/17/2007 -
01/24/2005 -
12/30/2002 -
12/26/2000 -
12/04/1998 -
10/02/1996 - | pection Notes: None None Notes: - Fixed Bearing 1 Dection Notes: Bearings at Abounce None None None None None None None Non | Bent 2=5 | , Bent 3=5, Ben 35 | ea. | Bent 6=5, Be | 100
%
nt 7=5, Bent 9=
100
% | 5, Bent 10=5 | % | % | NTBZ
IKBZ
NTBZ
IKBZ
XUBN
CZHK
WPCZ |

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****** * * * Span : Main-0 - -1 (cont.) * * * * * * * *

| Element 334 - Me | etal Rail Coa | | ed 5 inch box b | | | | | | | Pct Stat 5 |
|--------------------|--|--------------|-------------------|--------|--------------|-------------------|------------------|----------------------|-------------------|------------------------------|
| | 1 | _ | | eam an | d I beam pos | sts with 16w x 12 | h concrete curb | | | Section Leaders de la region |
| P1. 25 P1 | A STATE OF THE PARTY OF THE PAR | 2 | 202 | m. | | 75 | 20 | 5 | 0 | |
| | | | | | | % | % | % | % | (|
| revious Inspecti | ion Notes : | | | | | | | | | |
| 1/12/2011 - rail l | has some pr | imer show | ving and scrape | marks | with surface | rust. Posts have | some freckled ru | ust. Rail is 3" from | n face of curb. T | H MGZ |
| 1/05/2009 - Non | | | | | | | | | | likitajiz |
| 1/17/2007 - Non | ne. (101.19) | X 2 = 202 | .38) | | | | | | | XUBAN |
| 1/24/2005 - San | ne as previo | usly repor | ted. | | | | | | | CZHK |
| 2/30/2002 - San | ne as last ins | sp. | | | | | | | | WPCZ |
| 2/26/2000 - San | ne as last ins | sp. | | | | | | | | OlijA |
| 2/04/1998 - Pair | nt comming o | off with lig | ht rust occurring | g. | | | | | | (C)AHHA(|
| 0/02/1996 - Non | e | | | | | | | | | URUK |
| 0/01/1994 - Non | ie | | | | | | | | | REF |
| 8/09/1973 - Non | ie | | | | | | | | | E(1818) |
| Inspection Notes | 3: | | | | | | | | | |
| ncape. | 000 | | | | | | | | | |

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P00020015+04781 Continue

| General Inspection Notes 01/12/2011 - 13' underclearance to water and 14' to bottom of channel. New ET 2000 guardrail end sections were installed in 2007. TH 01/05/2009 - None 01/17/2007 - None 01/24/2005 - None 12/30/2002 - None 12/30/2002 - None 12/26/2000 - None 12/04/1998 - Bridge is at bottom of vertical curve. 10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 11/17/97 13:05:37 OPS\$U5963 inspection comments - Structure P00020015+04781 - Date 10/2/96 - | NTBZ
IKBZ
XUBN
CZHK
WPCZ
OLIA
GAHA
URUK |
|--|--|
| 01/05/2009 - None 01/17/2007 - None 01/14/2005 - None 12/30/2002 - None 12/30/2002 - None 12/26/2000 - None 12/04/1998 - Bridge is at bottom of vertical curve. 10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 11/17/97 13:05:37 OPS\$U5963 inspection comments - Structure P00020015+04781 - Date 10/2/96 - | IKBZ
XUBN
GZHK
WPCZ
OLIA
GAHA |
| 01/24/2005 - None
12/30/2002 - None
12/26/2000 - None
12/04/1998 - Bridge is at bottom of vertical curve.
10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 11/17/97 13:05:37
OPS\$U5963 inspection comments -
Structure P00020015+04781 -
Date 10/2/96 - | XUBN
GZHK
WPCZ
OLIA
GAHA |
| 12/30/2002 - None
12/26/2000 - None
12/04/1998 - Bridge is at bottom of vertical curve.
10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 11/17/97 13:05:37
OPS\$U5963 inspection comments -
Structure P00020015+04781 -
Date 10/2/96 - | CZHK
WPCZ
OLIA
GAHA |
| 12/26/2000 - None
12/04/1998 - Bridge is at bottom of vertical curve.
10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 11/17/97 13:05:37
OPS\$U5963 inspection comments -
Structure P00020015+04781 -
Date 10/2/96 - | WPCZ
OLIA
GAHA |
| 12/04/1998 - Bridge is at bottom of vertical curve.
10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 11/17/97 13:05:37
OPS\$U5963 inspection comments -
Structure P00020015+04781 -
Date 10/2/96 - | OUA
CAHA |
| 10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 11/17/97 13:05:37
OPS\$U5963 inspection comments -
Structure P00020015+04781 -
Date 10/2/96 - | GAHA |
| OPS\$U5963 inspection comments -
Structure P00020015+04781 -
Date 10/2/96 - | |
| Previous comments > Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:37 | |
| Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:04 10/01/1994 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:37 Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:04 | REFI |
| 01/01/1993 - Updated with tape 1994 | MESSA |
| 01/01/1991 - Updated with tape 1992 | NB9)2 |
| 10/01/1988 - Updated with tape 1991 | MEGN |
| 01/01/1987 - Updated with tape 1988 | MBBB |
| 01/01/1985 - Updated with tape 1986 | NEBS |
| 01/01/1983 - Updated with tape 1984 | NB84 |
| 12/01/1980 - Updated with tape 1983 | Mette |
| 12/01/1978 - Updated with tape 1980 | NEWO |
| 08/09/1973 - Sufficiency Rating Calculation Accepted by ops\$a0241 at 8/15/97 14:24:54 OPS\$A0241 inspection comments - Structure P00020015+04781 - Date 8/9/73 - Previous comments > Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:37 Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:37 | EJBJD |

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P00020025+00631

Location: 6M SW SAVAGE Structure Name: none

General Location Data

District Code, Number, Location: 04

Dist 4

GLENDIVE

Division Code, Location:43

MILES CITY

County Code, Location: 083

RICHLAND

City Code, Location: 00000

Kilometer Post, Mile Post:

RURAL AREA

Kind fo Hwy Code, Description: 3

3 State Hwy

Signed Route Number: 00016

State Highway Agency

Str Owner Code, Description: 1

State Highway Agency

Maintained by Code, Description:1

25.06

Intersecting Feature: BURNS CREEK

Latitude: 47°22'24"

40.33 km

Structure on the State Highway System: X

Construction Data

Construction Project Number: MT-NH 20-2(24)25

Structure on the National Highway System: X Str Meet or Exceed NBIS Bridge Length: X

Longitude: 104°25'33"

Construction Station Number: 108+27.00

Traffic Data

ADT Count Year: 2009

Percent Trucks:

3 %

Construction Drawing Number: 20707 Construction Year: 2010

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

Current ADT: 1,830

| Design Loading: | | A HL93 |
|--------------------------|-----------|-------------------------|
| Inventory Load, Design : | 56.0 mton | 3 LRFR Load & Res. Fact |
| Operating Load, Design : | 80.2 mton | 3 LRFR Load & Res. Fact |
| Posting : | | 5 At/Above Legal Loads |

| Rating Data: | Operating | Inventory | Posting |
|--------------------|-----------|-----------|---------|
| Truck 1 Type 3: | 82.95 | 58.01 | |
| Truck 2 Type 3-S3: | 113.76 | 79.98 | |
| Truck 3 Type 3-3: | 135.72 | 94.91 | 1 |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

59.61 m

Deck Area:

775.00 m sq

Deck Roadway Width:

12.00 m

Approach Roadway Width:

12.00 m

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

99.99 m

Reference Feature for Vertical Clearance:

N Feature not hwy or RR

Vertical Clearance Under the Structure:

0.00 m

Reference Feature for Lateral Underclearance: Minimum Lateral Under Clearance Right: N Feature not hwy or RR 0.00 m

Minimum Lateral Under Clearance Left:

0.00 m

Span Data

Main Span

Number Spans: 3

Material Type Code, Description: 5 Prestressed concrete

Span Design Code, Description: 2 Stringer/Multi-beam or Girder

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Surfacing Type: 1 Monolithic concrete (concurrently placed with struct

Deck Protection Type: 1 Epoxy Coated Reinforcing

Deck Membrain Type: 0 None

Approach Span

Number of Spans: 0

Material Type Code, Description:

Span Design Code, Description:

(52) Out-to-Out Width:

13.00 m

(50A) Curb Width:

(50B) Curb Width:

0.00 m

0.00 m

Skew Angle: 8°

| Inventory | South, We | est or Bi-direction | al Travel | North or East Travel | | |
|-----------|-----------|---------------------|--------------------------|-------------------------------------|---|--|
| Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizontal |
| P00020 | Both | 99.99 m | 12.00 m | N/A | | |
| | Route | Route Direction | Route Direction Vertical | Route Direction Vertical Horizontal | Route Direction Vertical Horizontal Direction | Route Direction Vertical Horizontal Direction Vertical |

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Printing Date: Tuesday, January 10 2012

P00020025+00631 Continue

| Inspection D | Data | Inspection Due Date : 12 January 2013 | | | | | | | | |
|--|------------------------|---------------------------------------|-----------------|-------------------|--|-----------------|---------------------|--|--|--|
| Sufficiency Rating : 1
Health Index : 100 | | (91) Inspe | ection Fequency | (months) : 24 | | | | | | |
| Structure Status :Not | Deficient | | | | | | | | | |
| NBI Inspection Da | ata | | | | | | | | | |
| (90) Date of Last Ins | pection : 24 August 20 | 011 | | La | st Inspected By | e - 2056 | | | | |
| (90) Inspection | on Date : | | | | Inspected By : | | | | | |
| (58) Deck | Rating: 7 | (68) Deck G | eometry: 6 | (36C) Ap | proach Rail Rating 1 | (62) Culve | rt Rating : N | | | |
| (59) Superstructure | Rating : 8 | (67) Structure | Rating: 7 | (36A) I | Bridge Rail Rating : 1 | (61) Channe | el Rating : 7 | | | |
| (60) Substructure | Rating : 7 | (69) Under Cle | arance : N | (36B) | Transition Rating : 1 | (71) Waterway A | dequacy 6 | | | |
| (72) App Rdw | y Align : 8 | | Status : A | (360 | (36D) End Rail Rating : 1 (113) Scour Critical : | | | | | |
| | Unrepaired Sp | alls: 0 r | n sq | | Deck Surfacing Depth : 0.00 in | | | | | |
| Inspection Hours | | | | | | - ALLEGANA | | | | |
| Crew Hours for inspec | ction: 2 | | Snoo | per Required : | N | | | | | |
| Helper H | ours: -1 | | Snooper Hours | for inspection : | -1 | | | | | |
| Special Crew H | ours: _1 | | F | lagger Hours : | -1 | | | | | |
| Special Equipment H | ours: -1 | | | | | | | | | |
| Inspection World | k Candidates | | | Effected | Scope of | | Covered | | | |
| Candidate ID | Date
Requested | Status | Priority | Structure
Unit | Work | Action | Condition
States | | | |



P00020025+00631

Element Inspection Data

| | | | * * * * * * | **** | * Span : M | lain-0 - Spans 1 | -3****** | * * * | | |
|-------------------------------|------------------|------------|----------------------------------|----------|---------------|----------------------------------|-------------------|---------------------|--------------------|------------------|
| Element De | | | T 0 "" 1 | | T | | | | | |
| (72) | Scale Factor | Env | Quantity | | Insp Each | Pct Stat 1
n, plan paving not | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| Liement 20 | 1 | 2 | | sq.m. | | 1, plan paving not | | ď | 0 | N = = W = Wfrest |
| | | | 113 | sq.m. | 1 ^ | % | 0' | 0 | 0 | (|
| Daniena la | | 1 | | | THE RE | 90 | % | % | % | % |
| 08/24/2011 -
1 longitudina | I crack (photo). | Decks ride | diagonal crack.
e is wavy. TH | Crackir | ng over Bent | ls 2 and 3, upto 1 | 1.25mm in width. | Abut 4 has seve | ral diagonal crack | |
| Inspection I | waiting to pour | деск. ТН | | | | | | | | KZMZ |
| | | | | | | | | | | |
| Element 109 | - P/S Conc Ope | en Girder | , 5 Type A I bea | ams per | r span (plan | = 292 5m) | | | | |
| | 1 | 2 | 293 | | | 100 | 0 | 0) | 0 | - 10 P. C. |
| | | | | | | % | % | % | % | % |
| Previous Ins | pection Notes : | <u> </u> | | | 77.650 | | ,, | | | |
| 08/24/2011 - | | | | | | | | | | YZDY |
| | | 1 and 2 w | vith no deck). Th | 1 | | | | | | KZMZ |
| Inspection I | | | • | | | | | | | |
| | | | | | | | | | | |
| Element 202 | - Paint Stl Colu | mn Bents | 2=5 and 3=5, 5 | 08mm | Diameter x 1 | 12.7mm wall thick | kness painted ste | el pile filled with | concrete | |
| | 1 | 2 | 10 | ea. | | 100 | 0 | 0 | 0 | C |
| | | | | | | % | % | % | % | % |
| Previous Ins | pection Notes : | | | | | | | | | |
| 08/24/2011 - | (photo Bent 2). | TH | | | | | | | | YZ(DY |
| CHANGED F | ROM ELEMEN | T 205 SIN | ICE THESE ARI | E STEE | L - NMS | | | | | |
| Inspection I | W 15 | | | | | | | | | |
| | | | | | | | | | | |
| Flement 215 | - R/Conc Abuto | ment 1/S | SW and 4 / NNE | F (15.7r | m v 2 = 31 4 | m nlan) | 1 | | | |
| | 1 | 1 | 31 | ů. | 1 72 | 100 | 0 | 0 | 0 | |
| | | | · · | | | % | % | | | |
| Previous Inc | pection Notes : | | | | | 70 | 70 | % | % | % |
| | | oto) and 4 | (nhata) haya ri | proppo | d alanga Ca | entractor is placing | | all accordance. T | 71 | Water |
| | Abut 4 under co | | | prapped | a stopes. Co | nuactor is placing | g graver and tops | son over riprap. I | П | YZĐY
KZNIZ |
| | | moudollor | T(photo). TT | | | | | | | NAMZ |
| Inspection I | votes. | | | | | | | | | |
| | | | | | | | | | | |
| Element 234 | - R/Conc Cap 1 | Bents 2 an | nd 3 (12.3m x 2 | = 24.6m | n) | | | | | |
| | 1 | 1 | 25 | m. | | 100 | 0 | 0 | 0 | |
| E | | | | | TABLE | % | % | % | % | % |
| Previous Ins | pection Notes : | <u> </u> | | | | | | | | |
| 08/24/2011 - | (photo Bent 2). | TH | | | | | | | | YZfaY |
| Inspection N | lotes: | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |



Printing Date : Tuesday, January 10 2012

P00020025+00631

* * Span : Main-0 - Spans 1 - 3 (cont.) * * * * * * * * Element Description Smart Flag | Scale Factor Env Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 313 - Fixed Bearing, Bent 2 = 5 and 5, Bent 3 = 5 and 5 1 ea. 100 % % Previous Inspection Notes: 08/24/2011 - Bearings at Abut 1 and 4 are buried in the backwalls and are not included in quantily. TH 01/05/2011 - Bearings at Abut 1 and 4 are buried in the backwalls and are not included in quantity. TH Inspection Notes: Element 334 - Metal Rail Coated, galvanized W830, double box beam rail with H posts on top of .5m x .15m concrete curb 2 1 120 m. 100 % Previous Inspection Notes: 08/24/2011 - (plan = 120.1m). TH 01/05/2011 - can't install until after deck is poured. TH Inspection Notes: **General Inspection Notes** 08/24/2011 - 11' underclearance to water. TH 01/05/2011 - Opened to traffic on 4-14-11 but not paved until 7-1-11. TH 7-14-11

Form: bms001d

Page 1 of 3

Printing Date: Tuesday, January 10 2012

P00020031+02501

Location: 1M S SAVAGE Structure Name: none

General Location Data

District Code, Number, Location: 04

Dist 4

Division Code, Location: 43

MILES CITY

County Code, Location: 083

RICHLAND

City Code, Location: 00000

RURAL AREA

Kind fo Hwy Code, Description: 3

3 State Hwy

Signed Route Number: 00016

Str Owner Code, Description: 1

State Highway Agency

GLENDIVE

Maintained by Code, Description:1

State Highway Agency

Intersecting Feature: GARDEN COULEE /STOCKPASS

Latitude: 47°26'44"

Kilometer Post, Mile Post: 50.32 km Construction Data

31.27

Structure on the State Highway System: X

Structure on the National Highway System: X

Str Meet or Exceed NBIS Bridge Length: X

Longitude: 104°21'10"

Construction Project Number:

Construction Station Number: 0+00.00

Construction Drawing Number: none

Construction Year: 1975

Reconstruction Year:

Traffic Data

Current ADT: 1,830

ADT Count Year: 2009

Percent Trucks:

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading: | | 5 MS 18 (HS 20) |
|--------------------------|-----------|------------------------|
| Inventory Load, Design : | 32.6 mton | B ASD Assigned |
| Operating Load, Design: | 32.6 mton | B ASD Assigned |
| Posting : | | 5 At/Above Legal Loads |

| Rating Data : | Operating | Inventory | Posting |
|--------------------|-----------|-----------|---------|
| Truck 1 Type 3: | | | |
| Truck 2 Type 3-S3: | | | |
| Truck 3 Type 3-3: | 40 | | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

7.01 m

Deck Area:

0.00 m sq

Deck Roadway Width:

12.19 m

Approach Roadway Width:

12.19 m

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

99.99 m

Reference Feature for Vertical Clearance:

N Feature not hwy or RR

Vertical Clearance Under the Structure:

0.00 m

Reference Feature for Lateral Underclearance:

N Feature not hwy or RR

Minimum Lateral Under Clearance Right:

0.00 m

Minimum Lateral Under Clearance Left:

0.00 m

Span Data

Main Span

Number Spans: 2

Material Type Code, Description: 3 Steel

Span Design Code, Description: 19 Culvert (includes frame culverts)

Deck

Deck Structure Type: N Not applicable

Deck Surfacing Type: N Not Applicable (applies only to strutures with no dec

Deck Protection Type: N Not applicable (applies only to structures with no de

Deck Membrain Type: N Not applicable (applies only to structures with no de

Approach Span

Number of Spans: 0

Material Type Code, Description:

Span Design Code, Description:

(52) Out-to-Out Width:

0.00 m

(50A) Curb Width:

(50B) Curb Width:

0.00 m

0.00 m

Skew Angle: °

| Over / Under Direction Inventory Name Route | South, West or Bi-directional Travel | | | North or East Travel | | |
|---|--------------------------------------|-----------------|--------------------------|-------------------------------------|---|--|
| Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizontal |
| P00020 | Both | 99.99 m | 12.19 m | N/A | | |
| | Route | Route Direction | Route Direction Vertical | Route Direction Vertical Horizontal | Route Direction Vertical Horizontal Direction | Route Direction Vertical Horizontal Direction Vertical |

Page 2 of 3 Form: bms001d

Printing Date: Tuesday, January 10 2012

P00020031+02501

Continue

| Inspection Data | Inspect | ion Due Date : (| 05 January 20 | 13 | | | |
|--|--|--|-------------------|------------------|----------------|---------------|---------------------|
| Sufficiency Rating: 89.9
Health Index: 90 | (91) Inspection Fequency (months) : 24 | | | | | | |
| Structure Status :Not Deficient | | | | | | | |
| NBI Inspection Data | | | | | | | |
| (90) Date of Last Inspection: 05 January | 2011 | | L | ast Inspected B | y :Troy Hafele | - 2056 | |
| (90) Inspection Date : | | | | Inspected E | Ву: | | |
| (58) Deck Rating : N | (68) Deck (| Geometry : 6 | (36C) A | proach Rail Ra | iting :N | (62) Culve | ert Rating : 6 |
| (59) Superstructure Rating : N | (67) Structu | re Rating : 6 | (36A) | Bridge Rail Rai | ting : N | (61) Chanr | el Rating : 8 |
| (60) Substructure Rating : N | (69) Under C | laaranaa i NI | (36B |) Transition Rat | ting : N | (71) Waterway | Adequacy 6 |
| (72) App Rdwy Align : 8 | 27 51 | ng Status : A | (36 | D) End Rail Ral | ting: N | (113) Sco | ur Critical : 8 |
| Unrepaired S | palls : 0 | m sq | | Я | Deck Surfacing | Depth: 0 | .00 in |
| Inspection Hours Crew Hours for inspection : | | Sno | oper Required | : N | | | |
| Helper Hours :1 | | | s for inspection | | 1 | ٦ | |
| Special Crew Hours :1 | | Section (1) to the Common ■ Common (1) confidence | Flagger Hours | | | - | |
| Special Equipment Hours :1 | | | | | UI | _ | |
| Inspection Work Candidates | | | Effected | Sco | pe of | | Covered |
| Candidate ID Date
Requested | Status | Priority | Structure
Unit | We | ork | Action | Condition
States |
| Element Inspection Data | | | | • | | | |
| iement mapeonon Data | ***** | * * * * Span : | Main-01 * | ***** | * | | |
| Element Description | | -1 | Suppressed (15) | | | | |
| Smart Flag Scale Factor Env C | Quantity Unit | s Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| Element 240 - Steel Culvert , DBL CMP ga | Ivanized 10 ft x | 123.5 ft | | | | | |
| 1 2 | 75 m. | | 70 | 30 | | 0 0 | |



P00020031+02501 Continue

| General Inspection Notes | |
|---|--------|
| 01/05/2011 - None | Kell-Z |
| 12/29/2008 - None | Z2(B€ |
| 01/17/2007 - None | XWCF |
| 01/24/2005 - None | ZXOZ |
| 01/24/2003 - None | HIME |
| 12/26/2000 - None | e).le |
| 12/04/1998 - None | GAIV |
| 10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$a0241 at 8/15/97 14:28:21
OPS\$A0241 inspection comments -
Structure P00020031+02501 -
Date 10/2/96 - | HIVWe |
| Previous comments > Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:37 Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:05 | |
| 10/01/1994 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:37
Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:05 | REFI |
| 01/01/1993 - Updated with tape 1994 | NB94 |
| 01/01/1991 - Updated with tape 1992 | NIS92 |
| 02/01/1989 - Updated with tape 1991 | N891 |
| 01/01/1987 - Updated with tape 1988 | NB88 |
| 01/01/1985 - Updated with tape 1986 | 78:0V |
| 01/01/1983 - Updated with tape 1984 | NB84 |
| | |
| | |
| | |
| | |

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Printing Date: Tuesday, January 10 2012

P00020032+01071

Location: SAVAGE Structure Name: none

General Location Data

District Code, Number, Location: 04

Dist 4

GLENDIVE

Division Code, Location: 43

MILES CITY

County Code, Location: 083

RICHLAND

City Code, Location: 00000

RURAL AREA

Kind fo Hwy Code, Description: 3

3 State Hwy

Signed Route Number: 00016

Str Owner Code, Description: 1

State Highway Agency

Maintained by Code, Description:1

State Highway Agency

Intersecting Feature: USBR MAIN CANAL

Kilometer Post, Mile Post: 51.66 km 32.10

Structure on the State Highway System:

Latitude: 47°27'26"

Construction Data

Construction Project Number: F RF-245(26)

Structure on the National Highway System: X Str Meet or Exceed NBIS Bridge Length: X

Longitude: 104°20'36"

Construction Station Number: 175+52.00 Construction Drawing Number: 10466

Construction Year: 1974

Traffic Data Current ADT: 2,260

ADT Count Year: 2009

Percent Trucks: 2 %

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading: | | 5 MS 18 (HS 20) |
|--------------------------|-----------|------------------------|
| Inventory Load, Design: | 32.6 mton | A LFD Assigned |
| Operating Load, Design : | 69.8 mton | A LFD Assigned |
| Posting : | | 5 At/Above Legal Loads |

| Rating Data : | Operating | Inventory | Posting |
|--------------------|-----------|-----------|---------|
| Truck 1 Type 3: | 79 | | |
| Truck 2 Type 3-S3: | 95 | | |
| Truck 3 Type 3-3: | 104 | | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

28.96 m

Deck Area:

409.00 m sq

Deck Roadway Width:

13.26 m

Approach Roadway Width:

12.19 m

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure :

99.99 m

Reference Feature for Vertical Clearance: Vertical Clearance Under the Structure: N Feature not hwy or RR 0.00 m

Reference Feature for Lateral Underclearance:

N Feature not hwy or RR

Minimum Lateral Under Clearance Right:

0.00 m

Minimum Lateral Under Clearance Left:

0.00 m

Span Data

Main Span

Number Spans: 1

Material Type Code, Description: 5 Prestressed concrete

Span Design Code, Description: 2 Stringer/Multi-beam or Girder

Deck

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Surfacing Type: 1 Monolithic concrete (concurrently placed with struct

Deck Protection Type: 0 None

Deck Membrain Type: 0 None

Approach Span

Number of Spans: 0

Material Type Code, Description:

Span Design Code, Description:

(52) Out-to-Out Width:

14.14 m

(50A) Curb Width:

(50B) Curb Width:

0.00 m

0.00 m

Skew Angle: 30°

Structure Vertical and Horizontal Clearance Data Inventory Route:

| Over / Under Direction | Inventory | South, We | est or Bi-direction | al Travel | N | orth or East Tra | vel |
|------------------------|-----------|-----------|---------------------|------------|-----------|------------------|------------|
| Name | Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizontal |
| Route On Structure | P00020 | Both | 99.99 m | 13.26 m | N/A | | |
| | | | | | | | |

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P00020032+01071 Continue

| Inspection Data | | Inspectio | n Due Date : 2 | December 2 | 012 | | | |
|---|---------------|----------------|-----------------|-------------------|--|----------------|-----------------|---------------------|
| Sufficiency Rating: 87.8
Health Index: 91.81 | | (91) Inspe | ection Fequency | (months): 48 | | | | |
| Structure Status :Not Deficie | ent | | | | | | | |
| NBI Inspection Data | | | | | | | | |
| (90) Date of Last Inspection | 29 Decembe | r 2008 | | La | ast Inspected By: | Greg Int-Hou | t - 2050 | |
| (90) Inspection Date | : | | | | Inspected By : | | | |
| (58) Deck Rating: | 6 | (68) Deck Ge | eometry: 6 | (36C) Ap | proach Rail Rating | 9 1 | (62) Culver | t Rating : N |
| (59) Superstructure Rating: | 7 | (67) Structure | Rating: 7 | (36A) | Bridge Rail Rating | : 1 | (61) Channe | Rating: 8 |
| (60) Substructure Rating: | 7 | (69) Under Cle | | (36B |) Transition Rating | : 1 | (71) Waterway A | dequacy 8 |
| (72) App Rdwy Align: | 6 | (41) Posting | | (36) | D) End Rail Rating | : 1 | (113) Scou | r Critical : 8 |
| į, | Jnrepaired Sp | alls: 0 r | n sq | | Dec | ck Surfacing I | Depth: 0.0 | 00 in |
| Inspection Hours | , o | | | | | 3 | | |
| Crew Hours for inspection : | 1 | | Snoo | per Required | : N | | | |
| Helper Hours : | -1 | | Snooper Hours | for inspection | -1 | | 1 | |
| Special Crew Hours : | -1 | | F | lagger Hours | AND DESCRIPTION OF THE PARTY OF | | 1 | |
| Special Equipment Hours : | -1 | | | | | | _ | |
| Inspection Work Cand | didates | | | Effected | Scope | | 50 STA | Covered |
| 100 | Date | Status | Priority | Structure
Unit | Work | | Action | Condition
States |



Printing Date: Tuesday, January 10 2012

P00020032+01071 Continue

Element Inspection Data

* * Span : Main-0 - -1 * * * * * * * * * Element Description Smart Flag Scale Factor Env Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 12 - Bare Concrete Deck 1 2 409 sq.m. X 100 % % Previous Inspection Notes: 12/29/2008 - Total spalls less than 2pct. (28.96 X 14.14 = 409.494) 01/24/2005 - Same as previously reported. 12/26/2000 - Large spalls in south bound lane and some others in north bound lanes. This was caused by fire, 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 109 - P/S Conc Open Girder 1 174 m. 100 Previous Inspection Notes: 12/29/2008 - None 707481 01/24/2005 - Same as previously reported. 12/26/2000 - Large spalled area at lower flange of rt outside beam. 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 215 - R/Conc Abutment 2 35 m. 100 % % % Previous Inspection Notes: 12/29/2008 - None 01/24/2005 - None 12/26/2000 - None 10/02/1996 - None 01/01/1993 - None Inspection Notes:



P00020032+01071 Continue

******* Span : Main-0 - -1 (cont.) *******

| - IDDI 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | orintian | | | | | 1000 | | | | |
|--|-------------------------------------|-------------------------------|------------------|----------|--------------|------------------|------------|------------|------------|------------|
| | scription
Scale Factor | Env | Quantity | Heite | lass Est | Dat Clat 4 | Datolate | D-101-10 | | |
| | - Metal Rail Co | | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| I I | 1 | 3 | 58 | d | 1 | 0.0 | 0.0 | | 3 | |
| | | 3 | 30 | m. | | 80 | | | 0 | |
| | | | | | | % | % | % | % | |
| Previous Ins | pection Notes : | | | | | | | | | |
| 12/29/2008 - | Minor rust and | peeling pa | int. (28.96 X 2 | = 57.92 | 2) | | | | | 72733 |
| 01/24/2005 - | Same as previo | ously repo | rted. | | | | | | | Z(10)Z |
| 12/26/2000 - | Paint is gone a | nd light co | ating of rust oc | curring. | | | | | | (OILIE) |
| 10/02/1996 - | None | | | | | | | | | Vskou |
| 01/01/1993 - | None | | | | | | | | | 1815 |
| Inspection N | lotes: | | | | | | | | | |
| | | | | | | | | | | |
| General | Inspection N | Notes | | | | | | | | |
| 12/29/2008 - | | | | | | | | | | ZZBF |
| 01/24/2005 - | None | | | | | | | | | Z,JDZ' |
| 12/26/2000 - | None | | | | | | | | | OLIR |
| OPS\$A0241
Structure P0
Date 10/2/96
Previous con | | ments -
I -
lency Ratir | ng Calculation / | Accepte | d by ops\$u5 | 963 at 3/10/97 1 | 1:34:37 | | | VSOU |
| 01/01/1993 - | Sufficiency Rat
ating Calculatio | ing Calcula | ation Accepted | by ops | Su5963 at 3/ | 10/97 11:34:37 | | | | REAL |
| 01/01/1991 - | Updated with ta | ne 1992 | | | | | | | | NB92 |
| | Updated with ta | | | | | | | | | NB94 |
| | Updated with ta | | | | | | | | | NBBB |
| | Updated with ta | | | | | | | | | NBH |
| | Updated with ta | | | | | | | | | MBGK |
| | Updated with ta | | | | | | | | | Mark |
| | Updated with ta | | | | | | | | | |
| _0111010- | opudiod milit to | .pc 1300 | | | | | | | | MERO |
| | | | | | | | | | | |
| | | | | | | 18.50 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | • | |

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P00020032+03991

Location: 1M N SAVAGE Structure Name: none

General Location Data

District Code, Number, Location: 04 Dist 4

GLENDIVE

Division Code, Location: 42

WOLF POINT

County Code, Location: 083

RICHLAND

City Code, Location: 00000 Signed Route Number: 00016 **RURAL AREA**

Kind fo Hwy Code, Description: 3

3 State Hwy

Kilometer Post, Mile Post:

State Highway Agency

Str Owner Code, Description: 1

State Highway Agency

Maintained by Code, Description:1

32.39

Intersecting Feature: DUNLAP CREEK

Latitude: 47°27'41"

52.13 km

Structure on the State Highway System: X Structure on the National Highway System: X

Longitude: 104°20'34"

Construction Data

Construction Project Number: F RF-245(26) Construction Station Number: 190+60.00

Str Meet or Exceed NBIS Bridge Length: X

Construction Drawing Number: 10470

Construction Year: 1974

Traffic Data Current ADT: 2,260

ADT Count Year: 2009

Percent Trucks: 2 %

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading: | | 5 MS 18 (HS 20) |
|--------------------------|-----------|------------------------|
| Inventory Load, Design: | 32.6 mton | A LFD Assigned |
| Operating Load, Design : | 51.7 mton | A LFD Assigned |
| Posting : | | 5 At/Above Legal Loads |

| Rating Data: | Operating | Inventory | Posting |
|--------------------|-----------|-----------|---------|
| Truck 1 Type 3: | 55 | | |
| Truck 2 Type 3-S3: | 86 | | |
| Truck 3 Type 3-3: | 102 | | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

37.19 m

Deck Area:

526.00 m sq

Deck Roadway Width:

13.26 m

Approach Roadway Width:

12.19 m

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

99.99 m

Reference Feature for Vertical Clearance:

N Feature not hwy or RR 0.00 m

Vertical Clearance Under the Structure:

Reference Feature for Lateral Underclearance:

N Feature not hwy or RR

Minimum Lateral Under Clearance Right:

0.00 m 0.00 m

Minimum Lateral Under Clearance Left:

Span Data

Main Span

Number Spans: 3

Material Type Code, Description: 5 Prestressed concrete

Span Design Code, Description: 2 Stringer/Multi-beam or Girder

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Surfacing Type: 1 Monolithic concrete (concurrently placed with struct

Deck Protection Type: 0 None Deck Membrain Type: 0 None

Approach Span

Number of Spans: 0 Material Type Code, Description:

Span Design Code, Description:

(52) Out-to-Out Width:

(50B) Curb Width:

(50A) Curb Width: 0.00 m

0.00 m Skew Angle: °

14.14 m

Structure Vertical and Horizontal Clearance Data Inventory Route:

| Over / Under Direction | Inventory | South, We | est or Bi-direction | al Travel | No | orth or East Tra | vel |
|------------------------|-----------|-----------|---------------------|------------|-----------|------------------|------------|
| Name | Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizontal |
| Route On Structure | P00020 | Both | 99.99 m | 13.26 m | N/A | | |

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P00020032+03991 Continue

| Inspection D | ata | | on Due Date : 2 | | | | | |
|--|-----------------------|----------------|-----------------|-------------------|-----------------------|--------------|-----------------|---------------------|
| Sufficiency Rating: 8
Health Index: 98.16 | 37.8 | (91) Insp | ection Fequency | (months) : 48 | • | | | |
| Structure Status :Not | Deficient | | | | | | | |
| NBI Inspection Da | ata | | | | | | | |
| (90) Date of Last Ins | pection : 29 December | er 2008 | | L | ast Inspected By | Greg Int-Hou | t - 2050 | |
| (90) Inspection | on Date : | | | | Inspected By : | | | |
| (58) Deck | Rating: 7 | (68) Deck G | eometry : 6 | (36C) A | oproach Rail Rating | 1 | (62) Culver | t Rating : N |
| (59) Superstructure | Rating : 8 | (67) Structure | e Rating : 7 | (36A) | Bridge Rail Rating: | 1 | (61) Channe | I Rating : 8 |
| (60) Substructure | Rating : 7 | (69) Under Cle | earance : N | (36B |) Transition Rating : | 1 | (71) Waterway A | dequacy :8 |
| (72) App Rdwy | / Align : 8 | | g Status : A | (36 | D) End Rail Rating : | 1 | (113) Scour | Critical : 5 |
| | Unrepaired Sp | palls: 0 | m so | = | Deck | Surfacing | Depth: 0.0 | 00 in |
| Inspection Hours | | | | | | • | | |
| Crew Hours for inspec | tion: 1 | | Snoo | per Required | : N | | | |
| Helper He | ours: -1 | | Snooper Hours | for inspection | -1 | | 7 | |
| Special Crew Ho | ours: -1 | | ı | lagger Hours | : -1 | | 1 | |
| Special Equipment Ho | ours: -1 | | | | | | _ | |
| Inspection Worl | k Candidates | | | Effected | Scope o | f | 68 (208) | Covered |
| Candidate ID | Date
Requested | Status | Priority | Structure
Unit | Work | | Action | Condition
States |

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P00020032+03991 Continue

Element Inspection Data

******* Span : Main-0 - -1 *******

| Element Des | cription | | | | | | | | | |
|----------------|-------------------|---------------|-------------|-------|------------|------------|------------|------------|-------------------|------------|
| | Scale Factor | Env | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| Element 12 - | Bare Concrete | Deck | | | | | | | | |
| | 1 | 2 | 526 | sq.m. | X | 100 | 0 | 0 | 0 | |
| | | | | | | % | % | % | % | |
| Previous Insp | ection Notes : | | | | | l. | | | | |
| 12/29/2008 - | None. (37.19) | (14.14 = 5 | 25.867) | | | | | | | 7Z(3K |
| 01/24/2005 - | Same as previo | ously report | ted. | | | | | | | ZNBZ |
| 12/26/2000 - | Light mapcrack | ing to deck | | | | | | | | (OJLJA) |
| 10/02/1996 - | None | | | | | | | | | 1813); |
| 01/01/1993 - | None | | | | | | | | | REFI |
| Inspection N | otes: | | | | | | | | | |
| | | | | | | | | | | |
| Element 109 | - P/S Conc Ope | | | | | | | | | |
| | 1 | 3 | 224 | m. | | 100 | 0 | 0' | 0 | |
| Previous Insp | ection Notes : | | | 100 | n (5. 18. | 70 | 70 | 70 | 70 | |
| 12/29/2008 - | None | | | | | | | | a Selifonto (Grac | ZZBK |
| 01/24/2005 - | None | | | | | | | | | ZNDZ |
| 12/26/2000 - | None | | | | | | | | | OH,J/A |
| 10/02/1996 - | None | | | | | | | | | IREH |
| 01/01/1993 - | None | | | | | | | | | REF |
| Inspection N | otes: | | | | | | | | | |
| | | | | | | | | | | |
| Element 202 | Paint Stl Colu | mn | | | | | | | | |
| | 1 | 2 | 12 | ea. | | 80 | 20 | 0 | 0 | |
| | | | | | | % | % | % | % | |
| Previous Insp | ection Notes : | | | | | | | | 1 | |
| 12/29/2008 - 1 | Lose of paint at | water line, | minor rust. | | | | | | | 22616 |
| 01/24/2005 - : | same as previo | usly reporte | ed. | | | | | | | ZNOZ |
| 12/26/2000 - 1 | Paint scalling fr | om all piling | g. | | | | | | | (OH,UA) |
| 10/02/1996 - 1 | None | | | | | | | | | lets)- |
| 01/01/1993 - 1 | Vone | | | | | | | | | RIF |
| Inspection N | otes: | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

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Continue

| Element Des | crintion | | | | 120101200000000000000000000000000000000 | | t.) * * * * * * * | | | |
|---------------|-----------------|------------|-----------------|------------|---|----------------|--------------------|------------------------|--------------|----------------|
| | Scale Factor | Env | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| | - R/Conc Abutr | nent | | | | | | | | |
| | 1 | 3 | 33 | m. | | 95 | 5 | 0 | 0 | |
| | | | | | - | % | % | % | % | |
| revious Ins | pection Notes : | | | | | | | | | |
| 2/29/2008 - | Minor spalls. | | | | | | | | | 77(3) |
| 01/24/2005 - | None | | | | | | | | | 2(3(0) |
| 12/26/2000 - | None | | | | | | | | | OLA |
| 10/02/1996 - | | | | | | | | | | IRIBI |
| 01/01/1993 - | None | | | | | | | | | REF |
| Inspection N | lotes: | | | | | | | | | |
| | | | | | | | | | | |
| lement 220 | - R/C Sub Pile | | 10 | | , | 100 | d | Q ¹ | 0 | |
| | 1 | 2 | 12 | ea. | | 100 | 0 | Accessed to the second | | |
| Previous Ins | pection Notes : | | | | | % | % | % | % | |
| 2/29/2008 - | None | | | | | | | | Harden Armin | 7/2(3) |
| 01/24/2005 - | None | | | | | | | | | Z(N(D) |
| 2/26/2000 - | | | | | | | | | | (0)1,1) |
| Inspection N | lotes: | | | | | | | | | |
| | - W | | | | | | | | | |
| | | | | | | | | | | |
| Element 234 | - R/Conc Cap | | | | | | | | | |
| | 1 | 1 | 28 | m. | 1 | 100 | 0 | | 0 | |
| | | | | . F. (\$1) | | % | % | % | % | |
| Previous Ins | pection Notes: | · | | | | | | | | |
| 12/29/2008 - | None | | | | | | | | | 22(6) |
| 01/24/2005 - | | | | | | | | | | ZNO |
| 12/26/2000 - | | | | | | | | | | O)L <i>iji</i> |
| 10/02/1996 - | | | | | | | | | | ाश्च |
| 01/01/1993 - | | | | | | | | | | RE |
| Inspection N | lotes: | | | | | | | | | |
| | | | | | | | | | | |
| Element 302 | - Compressn Jo | oint Seal | | | | | 2 | | | |
| | 1 | 2 | 28 | m. | | 0 | 100 | | | |
| | | | | | | % | % | % | % | |
| revious Ins | pection Notes: | | | | | | | | | |
| 2/29/2008 - | None | | | | | | | | | 27(8) |
| | same as previo | | | | | | | | | Z(ND) |
| | | earing and | leaking at both | joints, s | snow plow d | amage to south | oint on the It lan | e. (see photo) | | (0)1,1/ |
| 0/02/1996 - | | | | | | | | | | 12(4) |
| 1/01/1993 - | None | | | | | | | | | RH |
| , 110 11 1000 | | | | | | | | | | |

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| Element De: | scription | | | | | | | | |
|--|---|--|-------------------|--------------|-------------------------|---------------------|------------------|-------------|--|
| | Scale Factor | Env | Quantity | Units Insp | Each Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| | 3 - Fixed Bearing | | additity | Onno Imop | Luon 1 or oldr 1 | 1 of Oldi 2 | 1 Ct Gtat 3 | 1 Ct Stat 4 | r ct Stat 5 |
| | 1 | 1 | 24 | ea. | 100 | 0 | | | |
| | Control of the Control | in a section of the s | | | % | | | | 6 |
| Previous Ins | spection Notes : | | | diam'r. | | | | 1 | 1 |
| 12/29/2008 | (1) | | | | | | | | ZZBK |
| 01/24/2005 | | | | | | | | | ZINDZ |
| 12/26/2000 | | | | | | | | | OLIA |
| 10/02/1996 | | | | | | | | | TREF |
| 01/01/1993 | | | | | | | | | Rest |
| Inspection I | | | | | | | | | |
| тороскоп | | | | | | | | | |
| Element 321 | 1 - R/Conc Appro | ach Slab | | | | | | | |
| FERENCE IN | 1 | 2 | 1 | ea. | 0 | 100 | (|)(| 0 |
| | | | | | % | | % | | the state of the state of |
| | | | | | ,, | ,,, | | 1 | |
| Previous Ins | enection Notes | | | | | | | | |
| | spection Notes : | | | | | | | | 2700 |
| 12/29/2008 - | - None | uely report | ad | | | | | | ZZEK |
| 12/29/2008 -
01/24/2005 - | - None
- same as previo | | | racke South | elah le haavina un in v | uinter time 2" free | n franzina waat | hor | ZNDZ |
| 12/29/2008 -
01/24/2005 -
12/26/2000 - | - None
- same as previo
- Both appr. slab | | | racks. South | slab is heaving up in v | winter time 2" from | n freezing weall | her. | ZNDZ
OLJA |
| 12/29/2008 -
01/24/2005 -
12/26/2000 -
10/02/1996 - | - None
- same as previo
- Both appr. slab
- None | | | racks. South | slab is heaving up in v | winter time 2" from | n freezing weatl | her. | ZNDZ
OLJA
IRBF |
| 12/29/2008 -
01/24/2005 -
12/26/2000 -
10/02/1996 -
01/01/1993 - | - None
- same as previo
- Both appr. slab
- None
- None | | | racks. South | slab is heaving up in v | winter time 2" fron | n freezing weall | her. | ZNDZ
OLJA |
| 12/29/2008 -
01/24/2005 -
12/26/2000 -
10/02/1996 - | - None
- same as previo
- Both appr. slab
- None
- None | | | racks. South | slab is heaving up in v | winter time 2" from | n freezing weall | her. | ZNDZ
OLJA
IRBF |
| 12/29/2008 -
01/24/2005 -
12/26/2000 -
10/02/1996 -
01/01/1993 - | - None
- same as previo
- Both appr. slab
- None
- None | | | racks. South | slab is heaving up in v | winter time 2" fron | n freezing weall | her. | ZNDZ
OLJA
IRBF |
| 12/29/2008 -
01/24/2005 -
12/26/2000 -
10/02/1996 -
01/01/1993 -
Inspection I | - None
- same as previo
- Both appr. slab
- None
- None | s has deep | | racks. South | slab is heaving up in v | winter time 2" froi | n freezing weatl | her. | ZNDZ
OLJA
IRBF |
| 12/29/2008 -
01/24/2005 -
12/26/2000 -
10/02/1996 -
01/01/1993 -
Inspection I | - None - same as previo - Both appr. slabs - None - None Notes: | s has deep | | | slab is heaving up in v | | | | ZNDZ
OLJA
IRBF |
| 12/29/2008 -
01/24/2005 -
12/26/2000 -
10/02/1996 -
01/01/1993 -
Inspection I | - None - same as previo - Both appr. slab: - None - None Notes: | s has deep | o longitutional c | | | 0 | | | ZNDZ
OLJA
IRBF
REFI |
| 12/29/2008 -
01/24/2005 -
12/26/2000 -
10/02/1996 -
01/01/1993 -
Inspection I | - None - same as previo - Both appr. slab: - None - None Notes: | s has deep | o longitutional c | | 100 | 0 | | | ZNDZ
OLJA
IRBF
REFI |
| 12/29/2008 -
01/24/2005 -
12/26/2000 -
10/02/1996 -
01/01/1993 -
Inspection I | - None - same as previo - Both appr. slabs - None - None Notes: 4 - Metal Rail Coa | s has deep | o longitutional c | | 100 | 0 | | | ZNDZ
OLJA
IRBF
REFI |
| 12/29/2008 -
01/24/2005 -
12/26/2000 -
10/02/1996 -
01/01/1993 -
Inspection I | - None - same as previo - Both appr. slabs - None - None Notes: 4 - Metal Rail Coa 1 spection Notes: | s has deep | o longitutional c | | 100 | 0 | | | ZNDZ
OLJA
IRBF
REFI |
| 12/29/2008 - 01/24/2005 - 12/26/2000 - 10/02/1996 - 01/01/1993 - Inspection I Element 334 Previous Ins 12/29/2008 - 01/24/2005 - | - None - same as previo - Both appr. slabs - None - None Notes: 4 - Metal Rail Coa 1 spection Notes: - None | s has deep | o longitutional c | | 100 | 0 | | | ZNDZ
GLJA
IRBF
REFI
O
O |
| 12/29/2008 - 01/24/2005 - 12/26/2000 - 10/02/1996 - 01/01/1993 - 10/02/1996 - 01/01/1993 - 10/02/1996 - 10/02/1996 - 12/29/2008 - 12/26/2000 - 12/26/2000 - 12/26/2000 - 12/26/2000 - 12/26/2000 - 12/26/2000 - 12/26/2000 | - None - same as previo - Both appr. slabs - None - None Notes: 4 - Metal Rail Coa 1 spection Notes : - None - None - None | s has deep | o longitutional c | | 100 | 0 | | | ZNDZ
OLJA
IRBF
REFI
ZZBK
ZNDZ
OLJA |
| 12/29/2008 - 01/24/2005 - 12/26/2000 - 10/02/1996 - 01/01/1993 - Inspection I Element 334 Previous Ins 12/29/2008 - 01/24/2005 - | - None - same as previo - Both appr. slabs - None - None Notes: 4 - Metal Rail Coa 1 spection Notes: - None - None - None - None | s has deep | o longitutional c | | 100 | 0 | | | ZNDZ
OLJA
IRBF
REFI
ZZBK
ZNDZ
OLJA
IRBF |
| 12/29/2008 - 01/24/2005 - 12/26/2000 - 10/02/1996 - 01/01/1993 - Inspection I Element 334 Previous Ins 12/29/2008 - 01/24/2005 - 12/26/2000 - 10/02/1996 - | - None - same as previo - Both appr. slabs - None - None Notes: 4 - Metal Rail Coa 1 - None | s has deep | o longitutional c | | 100 | 0 | | | ZNDZ
OLJA
IRBF
REFI
ZZBK
ZNDZ
OLJA |

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Continue

| General Inspection Notes | |
|---|----------|
| 12/29/2008 - None | ZZEK |
| 01/24/2005 - None | SKINDS |
| 12/26/2000 - None | OLUA |
| 10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$a0241 at 8/15/97 14:31:26 OPS\$A0241 inspection comments - Structure P00020032+03991 - Date 10/2/96 - Previous comments > Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:38 Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:06 | IRtoF |
| 01/01/1993 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:38
Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:06 | Refit |
| 01/01/1991 - Updated with tape 1992 | N(892 |
| 02/01/1989 - Updated with tape 1991 | NEGAL |
| 01/01/1987 - Updated with tape 1988 | Nede |
| 01/01/1985 - Updated with tape 1986 | N(200) |
| 01/01/1983 - Updated with tape 1984 | Mease |
| 12/01/1980 - Updated with tape 1983 | NISE(VE) |
| 12/01/1978 - Updated with tape 1980 | W(S180) |
| | |

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Location: 1M N SAVAGE Structure Name: none

General Location Data

District Code, Number, Location: 04

Dist 4

GLENDIVE

State Highway Agency

Division Code, Location: 42

WOLF POINT

County Code, Location: 083

RICHLAND

City Code, Location: 00000

Kind fo Hwy Code, Description: 3

3 State Hwy

Signed Route Number: 00016

RURAL AREA

Str Owner Code, Description: 1

Maintained by Code, Description:1

State Highway Agency

Intersecting Feature: DUNLAP CREEK

Kilometer Post, Mile Post:

32.39

Structure on the State Highway System: X

Latitude: 47°27'41"

Construction Data

Structure on the National Highway System: X

Longitude: 104°20'34"

Construction Station Number: 190+60.00

Construction Project Number: F RF-245(26)

Str Meet or Exceed NBIS Bridge Length: X

Construction Drawing Number: 10470

Traffic Data

Current ADT: 2,260

ADT Count Year: 2009

Percent Trucks:

2 %

Construction Year: 1974

52.13 km

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading : | | 5 MS 18 (HS 20) |
|--------------------------|-----------|------------------------|
| Inventory Load, Design: | 32.6 mton | A LFD Assigned |
| Operating Load, Design : | 51.7 mton | A LFD Assigned |
| Posting : | | 5 At/Above Legal Loads |

| Rating Data : | Operating | Inventory | Posting |
|--------------------|-----------|-----------|---------|
| Truck 1 Type 3: | 55 | | - |
| Truck 2 Type 3-S3: | 86 | | |
| Truck 3 Type 3-3: | 102 | | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

37.19 m

Deck Area:

526.00 m sq

Deck Roadway Width:

13.26 m

Approach Roadway Width:

12.19 m

Median Code, Description: 0 No median

Span Data

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

99.99 m

Reference Feature for Vertical Clearance:

N Feature not hwy or RR

Vertical Clearance Under the Structure:

0.00 m

Reference Feature for Lateral Underclearance: Minimum Lateral Under Clearance Right:

N Feature not hwy or RR 0.00 m

Minimum Lateral Under Clearance Left:

0.00 m

Main Span Approach Span

Number Spans: 3

Material Type Code, Description: 5 Prestressed concrete

Span Design Code, Description: 2 Stringer/Multi-beam or Girder

Deck

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Surfacing Type: 1 Monolithic concrete (concurrently placed with struct

Deck Protection Type: 0 None Deck Membrain Type: 0 None Number of Spans: 0

Material Type Code, Description: Span Design Code, Description:

(52) Out-to-Out Width:

14.14 m

(50A) Curb Width:

(50B) Curb Width:

0.00 m

0.00 m

Skew Angle: °

Structure Vertical and Horizontal Clearance Data Inventory Route:

| Inventory | South, We | est or Bi-direction | al Travel | North or East Travel | | |
|-----------|-----------|---------------------|--------------------------|-------------------------------------|--|--|
| Route | Direction | Vertical , | Horizontal | Direction | Vertical | Horizontal |
| P00020 | Both | 99.99 m | 13.26 m | N/A | - Control of the Cont | |
| | Route | Route Direction | Route Direction Vertical | Route Direction Vertical Horizontal | Route Direction Vertical Horizontal Direction | Route Direction Vertical Horizontal Direction Vertical |

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Continue

| Inspection I | Data | Inspection Due Date : 29 December 2012 | | | | | | |
|--|---|--|-----------------|-------------------|-----------------------------|---------------------------------|---------------------|--|
| Sufficiency Rating :
Health Index : 98.16 | | (91) Insp | ection Fequency | (months) : 48 | | | | |
| Structure Status :No | t Deficient | | | | | | | |
| NBI Inspection D | ata | | | | | | | |
| (90) Date of Last In: | spection : 29 Decembe | 2008 | | La | st Inspected By: Greg Int-H | lout - 2050 | | |
| (90) Inspecti | ion Date : | | | | Inspected By | | | |
| (58) Deck | Rating: 7 | (68) Deck G | eometry : 6 | (36C) Ap | proach Rail Rating | (62) Culve | ert Rating : N | |
| (59) Superstructure |) Superstructure Rating : 8 (67) Structure Rating : 7 | | | (36A) | Bridge Rail Rating : 1 | (61) Channel Rating : 8 | | |
| (60) Substructure | (60) Substructure Rating : 7 (69) Under Clearance : N | | | | (36B) Transition Rating : 1 | | Adequacy 8 | |
| (72) App Rdv | vy Align : 8 | | g Status : A | (360 |) End Rail Rating : 1 | Rail Rating : 1 (113) Scour Cri | | |
| Inspection Hours | Unrepaired Sp | alls: 0 | m sq | | Deck Surfacir | ng Depth : 0 | 0.00 in | |
| Crew Hours for inspe | | | Snoo | per Required : | N | | | |
| Helper H | fours: -1 | | Snooper Hours | for inspection : | -1 | | | |
| Special Crew H | lours: -1 | | F | lagger Hours : | | | | |
| Special Equipment F | lours: -1 | | | | | | | |
| Inspection Wor | k Candidates | | | Effected | Scope of | | Covered | |
| Candidate ID | Date
Requested | Status | Priority | Structure
Unit | Work | Action | Condition
States | |

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Element Inspection Data

******** Span : Main-0 - -1 * * * * * * * *

| Element Desci | | | | | | | | | | |
|-----------------|----------------|--------------|------------|-------|-----------|------------|------------|------------|------------|------------|
| Smart Flag | | Env | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| Element 12 - E | | | | | | | | | | |
| | 1 | 2 | 526 | sq.m. | X | 100 | 0 | 0 | 0 | |
| | | | | | | % | % | % | % | 9 |
| Previous Inspe | ction Notes: | - | | | | | | | | |
| 12/29/2008 - N | lone. (37.19) | X 14.14 = 5 | 25.867) | | | | | | | 7Z8K |
| 01/24/2005 - S | ame as previ | ously repor | ted. | | | | | | | ZNDZ |
| 12/26/2000 - L | ight mapcrack | king to deck | ζ. | | | | | | | OLUM |
| 10/02/1996 - N | lone | | | | | | | | | Irla); |
| 01/01/1993 - N | one | | | | | | | | | RES |
| Inspection No | tes: | | | | | | | | | |
| Floment 100 | D/C Cana Oa | an Cirda | | | | | | | | |
| Element 109 - | | | 004 | 1723 | | | | | | |
| | 1 | 3 | 224 | m. | | 100 | 0 | 0 | 0 | |
| | | | | | | % | % | % | % | 9 |
| Previous Inspe | | | | | | | | | | |
| 12/29/2008 - N | | | | | | | | | | ZZEK |
| 01/24/2005 - N | | | | | | | | | | ZNEZ |
| 12/26/2000 - N | | | | | | | | | | (e)(,)//;\ |
| 10/02/1996 - N | | | | | | | | | | TREST |
| 01/01/1993 - N | | 85-2-10-2 | | | | | | | | PLE |
| Inspection Not | les: | | | | | 7 | | | | |
| Element 202 - I | Paint Stl Colu | mn | | | | | | | | |
| 1 | 1 | 2 | 12 | ea. | | 80 | 20 | ٨ | ۵' | |
| | | _ | ,,, | ou. | | | | 0 | 0 | |
| Previous Inspe | ction Notes : | | | | L. Con. | % | % | % | % | % |
| 2/29/2008 - Lo | | water line | minor ruet | | | | | | | |
| 1/24/2005 - sa | | | | | | | | | | 24HK |
| 2/26/2000 - Pa | | | | | | | | | | ZNDZ |
| 0/02/1996 - No | | om an pinn | | | | | | | | (OLJA) |
| 1/01/1993 - No | | | | | | | | | | INSE |
| | | | | | | | | | | 1810[5] |
| Inspection Not | es. | | | | | | | | | |
| | | | | | | | | | | |
| | | - | | | | | | | | 100 PS |

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******* Span : Main-0 - -1 (cont.) * * * * * * * Element Description Smart Flag Scale Factor Env Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 215 - R/Conc Abutment 1 3 33 m. 95 % % Previous Inspection Notes: 12/29/2008 - Minor spalls. 01/24/2005 - None 12/26/2000 - None 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 220 - R/C Sub Pile Cap/Ftg 12 ea. 100 % Previous Inspection Notes: 12/29/2008 - None 01/24/2005 - None 12/26/2000 - _ Inspection Notes: Element 234 - R/Conc Cap 1 28 1 m. 100 % % Previous Inspection Notes: 12/29/2008 - None 01/24/2005 - None 12/26/2000 - None 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 302 - Compressn Joint Seal 2 28 m. 0 100 % Previous Inspection Notes: 12/29/2008 - None 01/24/2005 - same as previously reported. 12/26/2000 - Seal material tearing and leaking at both joints, snow plow damage to south joint on the It lane. (see photo) 10/02/1996 - None 01/01/1993 - None Inspection Notes:

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****** * * * Span : Main-0 - -1 (cont.) * * * * * * * *

| 1 | Del Clair 4 Del Clair 9 Del Cl | | | | | a a da Mara | Classacto |
|---|--|------------------|--------------------|--------------------|--------------|---|---|
| 1 | | | | 0 8 1 | | | |
| 1 1 24 ea. 100 0 0 Previous Inspection Notes: 1/2/29/2008 - None 1/29/2008 - None 1/2/29/2008 - None | Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 | Pct Stat 1 | Units Insp Each | Quantity | | | |
| Previous Inspection Notes: 12/28/2008 - None 11/2/28/2000 - None 10/02/1996 - None 11/02/1908 - None 11/02/1908 - None 11/02/1906 - None 11/02/1906 - None 11/02/1909 - None | | 400 | | | | | Liement 515 |
| Previous Inspection Notes : 12/29/2008 - None 11/24/2005 - None 11/26/2000 - None 10/02/1996 - None 10/10/11/1993 - None Inspection Notes: Element 321 - R/Conc Approach Slab 1 2 1 ea. 0 100 0 0 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 | | | ea. | 24 | 1 | • | |
| 12/29/2008 - None 11/28/2000 - None 11/28/2008 - None 11/28/2008 - None 11/28/2000 - Same as previously reported. 11/28/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2* from freezing weather. 11/28/2000 - None | % % % | % | | | | | |
| 01/24/2005 - None 12/26/2000 - None 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 321 - R/Conc Approach Slab 1 2 1 ea. 0 100 0 0 0 Previous Inspection Notes: 12/29/2008 - None 01/24/2005 - same as previously reported. 12/26/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2" from freezing weather. 10/02/1996 - None 01/01/1993 - None Inspection Notes: | | | | | | pection Notes : | Previous Ins |
| Element 321 - R/Conc Approach Slab 1 2 1 ea. 0 100 0 0 % % % % % Previous Inspection Notes: 12/29/2008 - None 01/24/2005 - same as previously reported. 12/26/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2" from freezing weather. 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 334 - Metal Raii Coated 1 3 75 m. 100 0 0 0 % % % % Previous Inspection Notes: | ZZBK | | | | | - None | 12/29/2008 - |
| 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 321 - R/Conc Approach Slab 1 2 1 ea. 0 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ZNIDX | | | | | - None | 01/24/2005 - |
| Inspection Notes: | OLUA COLUM | | | | | - None | 12/26/2000 - |
| Inspection Notes: | IRIST | | | | | - None | 10/02/1996 - |
| Element 321 - R/Conc Approach Slab 1 2 1 ea. 0 100 0 0 0 % % % % % % Previous Inspection Notes: 12/29/2008 - None 01/24/2005 - same as previously reported. 12/26/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2" from freezing weather. 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 334 - Metal Rail Coated 1 3 75 m. 100 0 0 0 0 % % % % % | REF | | | | | - None | 01/01/1993 - |
| Previous Inspection Notes: 12/29/2008 - None 01/24/2005 - same as previously reported. 12/26/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2" from freezing weather. 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 334 - Metal Rail Coated 1 3 75 m. 100 0 0 0 0 96 96 96 96 96 Previous Inspection Notes: | | | | | | Notes: | Inspection N |
| Previous Inspection Notes: 12/29/2008 - None 01/24/2005 - same as previously reported. 12/26/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2" from freezing weather. 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 334 - Metal Rail Coated 1 3 75 m. 100 0 0 0 0 96 96 96 96 96 Previous Inspection Notes: | | | | | | | |
| Previous Inspection Notes: 12/29/2008 - None 01/24/2005 - same as previously reported. 12/26/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2" from freezing weather. 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 334 - Metal Rail Coated 1 3 75 m. 100 0 0 0 Previous Inspection Notes: | | | | | | 60.8 | Element 321 |
| Previous Inspection Notes : 12/29/2008 - None 01/24/2005 - same as previously reported. 12/26/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2" from freezing weather. 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 334 - Metal Rail Coated 1 3 75 m. 100 0 0 0 Previous Inspection Notes : | | | ea. | 1 (| 2 | 1 | |
| 12/29/2008 - None 01/24/2005 - same as previously reported. 12/26/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2" from freezing weather. 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 334 - Metal Rail Coated 1 3 75 m. 100 0 0 0 Previous Inspection Notes : | % % % | % | | 18 | | | #AY U |
| 12/26/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2" from freezing weather. 10/02/1996 - None 10/02/1993 - None Inspection Notes: Element 334 - Metal Rail Coated 1 3 75 m. 100 0 0 0 Previous Inspection Notes : 12/29/2008 - None | | | | | | pection Notes : | Previous Insp |
| 12/26/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2" from freezing weather. 10/02/1996 - None 10/02/1993 - None Inspection Notes: Element 334 - Metal Rail Coated 1 3 75 m. 100 0 0 0 Previous Inspection Notes : 12/29/2008 - None | ZZEK | | | | | None | 12/29/2008 - |
| 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 334 - Metal Rail Coated 1 3 75 m. 100 | ZNDZ | | | ed. | usly reporte | same as previou | 01/24/2005 - |
| 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 334 - Metal Rail Coated 1 3 75 m. 100 | | heaving up in wi | cks. South slab is | longitutional crac | s has deep | Both appr. slabs | 12/26/2000 - |
| Inspection Notes: | · IRBI | | | | | | |
| Element 334 - Metal Rail Coated 1 3 75 m. 100 0 0 0 % % % % % Previous Inspection Notes : 12/29/2008 - None | REF | | | | | None | 01/01/1993 - |
| 1 3 75 m. 100 0 0 0 0 Previous Inspection Notes : 12/29/2008 - None | | | | | | Notes: | Inspection N |
| 1 3 75 m. 100 0 0 0 Previous Inspection Notes : 12/29/2008 - None | | | | | | | |
| % % % % Previous Inspection Notes : 12/29/2008 - None | | | | | | | |
| Previous Inspection Notes : | | | | | | | Element 334 |
| 2/29/2008 - None | 100' 0 0 0 | 100 | m. | 75 | | | Element 334 |
| | | | m. | 75 | | | Element 334 |
| MOURONE IN THE SECOND PROPERTY OF THE SECOND | | | m. | 75 | | 1 | |
| 11/24/2005 - None | % % % | | m. | 75 | | 1 pection Notes : | Previous Insp |
| 2/26/2000 - None | % % % % | | m. | 75 | | pection Notes : | Previous Insp
2/29/2008 - |
| 10/02/1996 - None | % % % % % % % % % % % % % % % % % % % | | m. | 75 | | pection Notes : None None | Previous Insp
12/29/2008 -
01/24/2005 - |
| 01/01/1993 - None | % % % % % | | m. | 75 | | pection Notes : None None None | Previous Insp
2/29/2008 -
01/24/2005 -
2/26/2000 - |
| Inspection Notes: | % % % % % 2Z(5); ZND2 ©)1,17: | | m. | 75 | | pection Notes :
None
None
None
None | Previous Insp
12/29/2008 -
01/24/2005 -
12/26/2000 -
10/02/1996 - |
| | | | m. | 75 | | pection Notes : None None None None None | Previous Insp
12/29/2008 -
01/24/2005 -
12/26/2000 -
10/02/1996 -
01/01/1993 - |

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P00020032+03991 Continue

| General Inspection Notes | |
|--|-------|
| 12/29/2008 - None | Z/28K |
| 01/24/2005 - None | ZNIOZ |
| 12/26/2000 - None | OLJA |
| 10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$a0241 at 8/15/97 14:31:26 OPS\$A0241 inspection comments - Structure P00020032+03991 - Date 10/2/96 - Previous comments > Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:38 | IRBF |
| Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:06 | |
| 01/01/1993 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:38
Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:06 | REST |
| 01/01/1991 - Updated with tape 1992 | N892 |
| 02/01/1989 - Updated with tape 1991 | NEON |
| 01/01/1987 - Updated with tape 1988 | Maas |
| 01/01/1985 - Updated with tape 1986 | NEGG |
| 01/01/1983 - Updated with tape 1984 | N984 |
| 12/01/1980 - Updated with tape 1983 | NB88 |
| 12/01/1978 - Updated with tape 1980 | N680 |
| | |
| | |
| | |
| | |
| | |
| | |

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Printing Date: Tuesday, January 10 2012

P00020032+06521

Location: 1M N SAVAGE Structure Name: none

General Location Data

District Code, Number, Location: 04 Dist 4

GLENDIVE

Division Code, Location: 42

WOLF POINT

County Code, Location: 083

RICHLAND

City Code, Location: 00000

RURAL AREA

Kind fo Hwy Code, Description: 3

3 State Hwy

Signed Route Number: 00016

Str Owner Code, Description: 1

State Highway Agency

Maintained by Code, Description:1

State Highway Agency

Intersecting Feature: USBR MAIN CANAL

Kilometer Post, Mile Post:

52.55 km 32.65

Structure on the State Highway System: X

Latitude: 47°27'54" Longitude: 104°20'34"

Construction Project Number: F RF-245(26) Construction Station Number: 204+09.00

Construction Data

Structure on the National Highway System : X Str Meet or Exceed NBIS Bridge Length: X

Construction Drawing Number: 10475

Construction Year: 1974

Traffic Data Current ADT: 2,260

ADT Count Year: 2009

2 % Percent Trucks:

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading : | | 5 MS 18 (HS 20) |
|--------------------------|-----------|------------------------|
| Inventory Load, Design : | 32.6 mton | A LFD Assigned |
| Operating Load, Design : | 61.6 mton | A LFD Assigned |
| Posting : | | 5 At/Above Legal Loads |

| Operating | Inventory | Posting | | |
|-----------|-----------|----------|--|--|
| 67 | | | | |
| 87 | | | | |
| 98 | | | | |
| | 67
87 | 67
87 | | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

22.86 m

Deck Area:

379.00 m sq

Deck Roadway Width:

15.70 m

Approach Roadway Width:

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

99.99 m

0.00 m

Reference Feature for Vertical Clearance:

N Feature not hwy or RR

Vertical Clearance Under the Structure:

Reference Feature for Lateral Underclearance:

N Feature not hwy or RR

Minimum Lateral Under Clearance Right: Minimum Lateral Under Clearance Left:

Number of Spans: 0

(52) Out-to-Out Width:

0.00 m 0.00 m

Span Data

Main Span

Number Spans: 1

Material Type Code, Description: 5 Prestressed concrete

Span Design Code, Description: 2 Stringer/Multi-beam or Girder

Deck

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Surfacing Type: 1 Monolithic concrete (concurrently placed with struct

Deck Protection Type: 0 None Deck Membrain Type: 0 None

Material Type Code, Description: Span Design Code, Description:

Approach Span

16.58 m

(50A) Curb Width:

(50B) Curb Width:

0.00 m

0.00 m

Skew Angle: 12°

Structure Vertical and Horizontal Clearance Data Inventory Route:

| Over / Under Direction | Inventory | South, We | est or Bi-direction | al Travel | North or East Travel | | | |
|------------------------|-----------|-----------|---------------------|------------|----------------------|----------|------------|--|
| Name | Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizontal | |
| Route On Structure | P00020 | Both | 99.99 m | 15.70 m | N/A | | | |

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Printing Date: Tuesday, January 10 2012

P00020032+06521 Continue

| Inspection Data Inspection Due Date : 29 December 2012 | | | | | | | |
|--|-----------------------|-----------------|-----------------|-------------------|-------------------------|-----------------|---------------------|
| Sufficiency Rating: 8
Health Index: 99.36 | 35.8 | (91) Inspe | ction Fequency | (months) : 48 | | | |
| Structure Status :Not | Deficient | | | | | | |
| NBI Inspection Da | ata | | | | | | |
| (90) Date of Last Insp | pection : 29 December | er 2008 | | La | ast Inspected By | out - 2050 | |
| (90) Inspectio | n Date : | | | | Inspected By : | X1 | |
| (58) Deck | Rating : 7 | (68) Deck Ge | ometry: 9 | (36C) Ap | pproach Rail Rating :0 | (62) Culver | t Rating : N |
| (59) Superstructure I | Rating: 8 | (67) Structure | Rating: 7 | (36A) | Bridge Rail Rating: 1 | (61) Channe | I Rating : 8 |
| (60) Substructure I | Rating : 7 | (69) Under Clea | arance : N | (36B |) Transition Rating : 0 | (71) Waterway A | dequacy :8 |
| (72) App Rdwy | / Align : 8 | (41) Posting | | (36 | D) End Rail Rating : 0 | (113) Scou | r Critical : 8 |
| | Unrepaired Sp | palls: 0 m | ı so | Ħ | Deck Surfacin | g Depth : 0.0 | 00 in |
| Inspection Hours | 450A 250 | | | | | | |
| Crew Hours for inspec | tion: 1 | | Snoo | per Required | : N | | |
| Helper Ho | ours: _1 | | Snooper Hours f | or inspection | -1 | \neg | |
| Special Crew Ho | ours: _1 | | F | lagger Hours | | | |
| Special Equipment Ho | | | | | | | |
| Inspection World | Candidates | 0.4 | D | Effected | Scope of | | Covered |
| Candidate ID | Date | Status | Priority | Structure
Unit | Work | Action | Condition
States |



P00020032+06521 Continue

Element Inspection Data

******** Span : Main-0 - -1 * * * * * * * *

| Smart Flag Scale Factor | Env | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
|-------------------------------|-------------|----------|--------|-----------|------------|--------------------|------------|------------|------------|
| Element 12 - Bare Concrete | Deck | | | | | | | | |
| 1 | 2 | 359 | sq.m. | X | 100 | 0 | 0 | 0 | |
| | | | | | % | % | % | % | |
| Previous Inspection Notes : | | | | | | | | | |
| 12/29/2008 - None | | | | | | | | | 72785 |
| 01/24/2005 - Same as previo | ously repor | ted. | | | | | | | ZUBZ |
| 12/26/2000 - Light surface ci | | | | | | | | | @JLJN/ |
| 10/02/1996 - None | | | | | | | | | ZZXG |
| 01/01/1993 - None | | | | | | | | | REPL |
| Inspection Notes: | | | | | | | | | |
| | | | | | | | | | |
| Element 109 - P/S Conc Ope | en Girder | | | | | | | | |
| 1 | 3 | 183 | m. | | 100 | 0 | 0 | 0 | |
| | | | | | % | % | % | % | |
| Previous Inspection Notes : | | | Herman | (K) (1) | | | | | |
| 12/29/2008 - None | | | | | | Till other section | | | - Z(Z(3)S) |
| 01/24/2005 - None | | | | | | | | | ZUDZ |
| 12/26/2000 - None | | | | | | | | | O1.31V |
| 10/02/1996 - None | | | | | | | | | ZZXG |
| 01/01/1993 - None | | | | | | | | | REF. |
| Inspection Notes: | | | | | | | | | |
| | | | | | | | | | |
| Element 215 - R/Conc Abutn | nent | | | | | | | | |
| 1 | 2 | 38 | m. | | 100 | 0 | 0 | 0 | |
| | | | | | % | % | % | % | |
| Previous Inspection Notes : | | | | 23/14/0 | | | | | |
| 12/29/2008 - None | | | | | | | | | Z/26/S |
| 01/24/2005 - None | | | | | | | | | Z(UID)Z |
| 12/26/2000 - None | | | | | | | | | OLJV |
| 10/02/1996 - None | | | | | | | | | ZZXG |
| 01/01/1993 - None | | | | | | | | | INEFF |
| | | | | | | | | | |
| Inspection Notes: | | | | | | | | | |



P00020032+06521 Continue

******* Span : Main-0 - -1 (cont.) * * * * * * * *

| | | | | | opan . W | ain-01 (COII | , | | | |
|--------------|-----------------------------------|--------------|----------|------------|--|--------------|------------|--|------------|-----------------------|
| Element De | | | 0 | 11-4- |
 | Dat Otal 4 | D-101-10 | D. 16: 16 | D. 16: . 1 | D. 10. 15 |
| | Scale Factor
3 - Fixed Bearing | Env | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| | 1 | 1 | 16 | ea. | | 100 | C | | | |
| | | | 10 | ca. | | % | % | | | 6 |
| Denvious Inc | nastian Natas : | | | | 337 | 70 | 70 | ĭ | 7 | 9 |
| | spection Notes : | | | | | | | | | |
| 12/29/2008 | | | | | | | | | | ZZ68 |
| 12/26/2000 | | | | | | | | | | ZUDZ |
| 10/02/1996 | | | | | | | | | | ZZXG |
| 01/01/1993 | | | | | | | | | | REF |
| Inspection | | | | | | | | | | |
| оросион | | | | | | | | | | |
| Element 32° | I - R/Conc Appro | oach Slab | = | | | | | | | |
| | 1 | 2 | 1 | ea. | | 0 | 100 | |) (| |
| TOUR STREET | | | | | C 100 100 100 100 100 100 100 100 100 10 | % | % | | | 6 |
| Previous Ins | pection Notes : | | | | | | | | I | 1 |
| | - Spall at guard : | anole. | | | Service All In | | | | | ZZES |
| | - Same as previ | | ted. | | | | | | | ZUDZ |
| | Light mapcrack | | | | | | | | | (9)1,169 |
| 10/02/1996 | | | | | | | | | | 2/2746 |
| 01/01/1993 | - None | | | | | | | | | (\${ = -) |
| Inspection | Notes: | | | | | | | | | |
| * | | | | | | | ** | | | |
| Element 334 | - Metal Rail Co | ated | | | | | | | | |
| | 1 | 2 | 46 | m. | | 80 | 20 | |) (|)
 |
| 34210 (520) | | | | Total Cont | | % | % | | | 6 |
| Previous Ins | pection Notes : | l | | | 100 | | | | | 1 |
| | None. (22.86) | X 2 = 45.72 | 2) | | | | | | | 202(3)\$ |
| | - Same as previ | | | | | | | | | Z(UD)Z |
| 12/26/2000 | Light rusted are | eas on rail. | | | | | | · · · · · · · · · · · · · · · · · · · | | (O)L,I\V |
| 10/02/1996 | | | | | | | | | | ZZXG |
| 01/01/1993 | - None | | | | | | | | | REF |
| Inspection | Notes: | | | | | | | A CONTRACTOR OF THE PARTY OF TH | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

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P00020032+06521 Continue

| General Inspection Notes | |
|---|---------|
| 12/29/2008 - None | 7//2/BS |
| 01/24/2005 - None | Z(#I#)≥ |
| 12/26/2000 - None | OLAV |
| 10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$a0241 at 8/15/97 14:32:47 OPS\$A0241 inspection comments - Structure P00020032+06521 - Date 10/2/96 - Previous comments > Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:38 | Z2X(C |
| Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:07 | |
| 01/01/1993 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:38
Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:07 | REFI |
| 01/01/1991 - Updated with tape 1992 | N(392 |
| 02/01/1989 - Updated with tape 1991 | NB91 |
| 01/01/1987 - Updated with tape 1988 | INB/88 |
| 01/01/1985 - Updated with tape 1986 | NE86 |
| 01/01/1983 - Updated with tape 1984 | NB64 |
| 12/01/1980 - Updated with tape 1983 | NB/8/3 |
| 12/01/1978 - Updated with tape 1980 | NEXO |
| | |
| | |
| | |
| | |

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P00020037+05151

Location: 4M SW CRANE Structure Name: none

General Location Data

District Code, Number, Location: 04

Dist 4

GLENDIVE

Division Code, Location: 42

WOLF POINT

County Code, Location: 083

RICHLAND

City Code, Location: 00000

RURAL AREA

Kind fo Hwy Code, Description: 3

3 State Hwy

Signed Route Number: 00016

Str Owner Code, Description: 1

State Highway Agency

Maintained by Code, Description:1

State Highway Agency

Intersecting Feature: USBR MAIN CANAL

Latitude: 47°31'43"

Kilometer Post, Mile Post: 60.37 km 37.51

Structure on the State Highway System: Structure on the National Highway System: X

Str Meet or Exceed NBIS Bridge Length: X

Longitude: 104°18'30"

Construction Data

Construction Project Number: BRF 20 2 11 38

Construction Station Number: 459+90.00

Construction Drawing Number: 13438

Construction Year: 1984

Reconstruction Year:

Traffic Data

Current ADT: 2,260

ADT Count Year: 2009

Percent Trucks:

2 %

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading: | | 5 MS 18 (HS 20) |
|-------------------------|-----------|------------------------|
| Inventory Load, Design: | 32.6 mton | A LFD Assigned |
| Operating Load, Design: | 32.6 mton | A LFD Assigned |
| Posting : | | 5 At/Above Legal Loads |

| Rating Data : | Operating | Inventory | Posting |
|--------------------|-----------|-----------|---------|
| Truck 1 Type 3: | | | |
| Truck 2 Type 3-S3: | | | |
| Truck 3 Type 3-3: | 40 | | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

28.65 m

Deck Area:

370.00 m sq

Deck Roadway Width:

12.01 m

Approach Roadway Width:

12.19 m

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

99.99 m

Reference Feature for Vertical Clearance:

N Feature not hwy or RR

Vertical Clearance Under the Structure:

0.00 m

Reference Feature for Lateral Underclearance: Minimum Lateral Under Clearance Right: N Feature not hwy or RR 0.00 m

Minimum Lateral Under Clearance Left:

0.00 m

Span Data

Main Span

Number Spans: 1

Material Type Code, Description: 5 Prestressed concrete

Span Design Code, Description: 2 Stringer/Multi-beam or Girder

Deck

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Surfacing Type: 1 Monolithic concrete (concurrently placed with struct

Deck Protection Type: 1 Epoxy Coated Reinforcing

Deck Membrain Type: 0 None

Approach Span

Number of Spans: 0

Material Type Code, Description: Span Design Code, Description:

(52) Out-to-Out Width:

12.92 m

(50A) Curb Width:

(50B) Curb Width:

0.00 m

0.00 m

Skew Angle: 38°

Structure Vertical and Horizontal Clearance Data Inventory Route:

| Inventory | South, We | est or Bi-direction | al Travel | N | orth or East Tra | vel |
|-----------|-----------|---------------------|--------------------------|-------------------------------------|---|--|
| Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizontal |
| P00020 | Both | 99.99 m | 12.01 m | N/A | | |
| | Route | Route Direction | Route Direction Vertical | Route Direction Vertical Horizontal | Route Direction Vertical Horizontal Direction | Route Direction Vertical Horizontal Direction Vertical |

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P00020037+05151 Continue

| Inspection I | Data | Inspection | Due Date : 0 | 5 January 2013 | 3 | | |
|--|----------------------|-----------------|----------------|-------------------|------------------------|-----------------|---------------------|
| Sufficiency Rating :
Health Index : 98.83 | | (91) Inspe | ction Fequency | / (months) : 24 | | | |
| Structure Status :No | t Deficient | | | | | | |
| NBI Inspection D | ata | | | | | | |
| (90) Date of Last Ins | pection : 05 January | 2011 | | Las | st Inspected By | e - 2056 | |
| (90) Inspection | on Date : | | | | Inspected By : | | |
| (58) Deck | Rating : 7 | (68) Deck Ge | ometry : 5 | (36C) App | proach Rail Rating :1 | (62) Culve | ert Rating : N |
| (59) Superstructure | Rating: 7 | (67) Structure | Rating : 7 | (36A) E | Bridge Rail Rating : 1 | (61) Chann | el Rating : 7 |
| (60) Substructure | Rating: 7 | (69) Under Clea | | (36B) | Transition Rating : 0 | (71) Waterway A | Adequacy :8 |
| (72) App Rdw | y Align : 8 | (41) Posting | | (36D |) End Rail Rating : 1 | (113) Scot | r Critical : 8 |
| The Sale Sales | Unrepaired S | palls: 0 m | so | | Deck Surfacin | g Depth : 0. | .00 in |
| Inspection Hours | | | | | | | |
| Crew Hours for inspec | 1.0 | | | oper Required: | | | |
| Helper H | ours: _1 | S | nooper Hours | for inspection: | -1 | | |
| Special Crew H | ours: _1 | | 1 | Flagger Hours : | -1 | | |
| Special Equipment H | ours: -1 | | | ! | 1 | | |
| Inspection World | k Candidates | | | Effected | Scope of | | Covered |
| Candidate ID | Date
Requested | Status | Priority | Structure
Unit | Work | Action | Condition
States |



P00020037+05151 Continue

Element Inspection Data

******** Span : Main-0 - -1 *******

| Element De
Smart Flag
Element 12 | scription | | | | | | | | | |
|--|--|--------------|-------------------|----------|---------------|------------------|-------------------|-----------------|------------|---|
| | Cools FL | | 0 | 11.2 | h | D 101 11 1 | B . Z | | | |
| | - Bare Concrete | Env | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| Elomont 12 | 1 | 2 | 370 | sq.m. | X | 100 | ۵ | o' | 6 ! | |
| | | | 370 | oq.m. | ^ | | 0 | 0 | 0 | |
| Dravious In | nnation Natas . | | | | | % | % | % | % | C |
| | spection Notes : | | | | | | | | | |
| | - deck cracking | at Abut 1(p | hoto), see elen | ient 358 | deck cracki | ng. TH | | | | 160,869 |
| 12/29/2008 | | V 12 02 - 2 | 70.450\ | | | | | | | 224372 |
| 05/19/2003 | - None. (28.65) | A 12.92 = 3 | 370.158) | | | | | | | ZEOP |
| | | al cracking | on dack near h | oth abut | mente Efflo | acanca at batton | n of deck near bo | th about a said | | CNKZ |
| 10/02/1996 | | ar cracking | on deck near b | oui abui | ments, Enio | ecence at botton | i or deck near bo | in abutments. | | OLKO |
| 01/01/1993 | | | | | | | | | | TOVM |
| | | | | open me | | | | | | REFI |
| Inspection | Notes. | | | | | | | | | |
| Element 109 | 9 - P/S Conc Ope | en Girder | 5 I beams | | | | | | | |
| | 1 | 1 1 | 143 | m. | 1 | 95 | el . | ď | | |
| | | | 140 | | | % | 5 | 0 | 0 | |
| Dravious Inc | nastian Natas | | | | 1063 | 76 | % | % | % | 9 |
| | spection Notes : | | | - | | | | | | |
| 01/05/2011
12/29/2008 | | | | | | | | | | KV68Z |
| 11/06/2006 | | | | | | | | | | 727(6)2 |
| 11/00/2000 | INOTIC | | | | | | | | | |
| 15/19/2003 | - None | | | | | | | | | ZECP |
| 05/19/2003 -
12/26/2000 - | | m has laro | e snall with reh | ar eynos | sed (8' NE of | Abut 1 TH 1-10 | L11\ | | | CNKZ |
| 12/26/2000 | - LT outside bea | m has large | e spall with reb | ar expos | sed.(8' NE of | Abut 1. TH 1-10 | P-11) | | | CINKZ
OLKO |
| 12/26/2000 -
10/02/1996 - | - LT outside bea
- None | m has large | e spall with reba | ar expos | sed.(8' NE of | Abut 1. TH 1-10 |)-11) | | | OLKO
OLKO
NWOT |
| 12/26/2000 -
10/02/1996 -
01/01/1993 - | - LT outside bea
- None
- None | m has large | e spall with reb | ar expos | sed.(8' NE of | Abut 1. TH 1-10 |)-11) | | | CINKZ
OLKO |
| 12/26/2000 -
10/02/1996 - | - LT outside bea
- None
- None | m has large | e spall with reb | ar expos | sed.(8' NE of | Abut 1. TH 1-10 |)-11) | | | OLKO
OLKO
NWOT |
| 12/26/2000 -
10/02/1996 -
01/01/1993 -
Inspection I | - LT outside bea
- None
- None | | | ar expos | sed.(8' NE of | Abut 1. TH 1-10 |)-11) | | | OLKO
OLKO
NWOT |
| 12/26/2000 -
10/02/1996 -
01/01/1993 -
Inspection I | - LT outside bea
- None
- None
Notes: | | | | sed.(8' NE of | | | ď | 0 | OLKO
OLKO
NWOT |
| 12/26/2000 -
10/02/1996 -
01/01/1993 -
Inspection I | - LT outside bea
- None
- None
Notes: | nent 1 and | d 2 | er expos | sed.(8' NE of | 95 | 5 | 0 | 0 | CNK2
QLKO
NVQT
REFI |
| 12/26/2000
10/02/1996
01/01/1993
Inspection I | - LT outside bea
- None
- None
Notes:
5 - R/Conc Abutn | nent 1 and | d 2 | | sed.(8' NE of | | | 0 % | 0 % | OLKO
OLKO
NWOT |
| 12/26/2000
10/02/1996
01/01/1993
Inspection I | - LT outside bear
- None
- None
Notes:
5 - R/Conc Abutn
1 | nent 1 and | d 2 | | sed.(8' NE of | 95 | 5 | | | CINKZ
QLKO
NVQT
REFI |
| 12/26/2000
10/02/1996
01/01/1993
Inspection I
Element 215
Previous Ins | - LT outside bear
- None
- None
Notes:
5 - R/Conc Abutin
1
pection Notes : | nent 1 and | d 2 | | sed.(8' NE of | 95 | 5 | | | CNK2
QLKO
NVQT
REFT |
| 12/26/2000
10/02/1996
01/01/1993
Inspection I
Element 215
Previous Ins
01/05/2011 | - LT outside bear-None - None Notes: 6 - R/Conc Abutn 1 pection Notes : - Abut 2(photo). | nent 1 and | d 2 | | sed.(8' NE of | 95 | 5 | | | CNK2
OLKO
NVOT
REFI
8
KZKZ
ZZBZ |
| 12/26/2000
10/02/1996
01/01/1993
Inspection I
Element 215
Previous Ins | - LT outside bear-None - None Notes: 6 - R/Conc Abutn 1 pection Notes: - Abut 2(photo) None - None | nent 1 and | d 2 | | sed.(8' NE of | 95 | 5 | | | CINKZ
QLKO
NVQT
REET
**
**
**
**
**
**
**
**
**
**
**
**
** |
| 12/26/2000 - 10/02/1996 - 10/01/1993 - 10/01/1993 - 10/01/1993 - 10/05/2011 - 12/29/2008 - 11/06/2006 - 15/19/2003 - 15/19/2003 - 10/05/2000 - 10/05 | - LT outside bear-None - None Notes: 6 - R/Conc Abutn 1 pection Notes: - Abut 2(photo) None - None | nent 1 and 2 | d 2
42 | m. | | 95 % | 5 | | | CINKZ OLKO NWOT REFT KZKZ ZZBZ ZEOF CINKZ |
| 12/26/2000 - 10/02/1996 - 10/01/1993 - 10/01/1993 - 10/01/1993 - 10/05/2011 - 12/29/2008 - 11/06/2006 - 15/19/2003 - 15/19/2003 - 10/05/2000 - 10/05 | LT outside bear- None Notes: - R/Conc Abutin 1 pection Notes: - Abut 2(photo) None - None - None - Light diagonal of | nent 1 and 2 | d 2
42 | m. | | 95 % | 5 | | | CNK2 OLKO NVOT REFT KZKZ ZZ8Z ZECP GNKZ OLKO |
| 12/26/2000 - 10/02/1996 - 10/02/1996 - 10/01/1993 - 10/02/1996 - 10/05/2011 - 12/29/2008 - 11/06/2006 - 10/05/2001 - 12/26/2000 - 12/26/2000 - 10/06/2000 - 12/26/2000 - 10/06 | - LT outside bear-None - None Notes: 6 - R/Conc Abutn 1 pection Notes : - Abut 2(photo) None - None - None - Light diagonal contents | nent 1 and 2 | d 2
42 | m. | | 95 % | 5 | | | CINKZ OLKO NVOT REET KZKZ ZZBZ ZECF CINKZ OLKO NVOT |
| 12/26/2000 - 10/02/1996 - 10/02 | - LT outside bear None - None Notes: 6 - R/Conc Abutn 1 pection Notes : - Abut 2(photo) None - None - None - Light diagonal contents - None - None | nent 1 and 2 | d 2
42 | m. | | 95 % | 5 | | | CNKZ QLKO NVQT REFT KZKZ ZZ8Z ZEGP GNKZ QLKO |

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P00020037+05151 Continue

****** * Span : Main-0 - -1 (cont.) * * * * * * * *

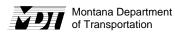
Element Description Smart Flag | Scale Factor Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 313 - Fixed Bearing Abut 1=5, 2=5 1 1 ea. 95 % % % Previous Inspection Notes: 01/05/2011 - added element, bearings at Abut 1 and 2 have 1 bolt visible and are included in quantily. Some bearings have freckled rust, changed from 100,0 to 95,5 percent. TH 11/06/2006 - None 05/19/2003 - None 12/26/2000 - RT outside bearing device covered in dirt at abut. 1. 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 331 - Conc Bridge Railing 1 57 m. 100 % % Previous Inspection Notes: 01/05/2011 - some end pieces at bridge ends are square(not tapered). TH 12/29/2008 - None 11/06/2006 - None. (28.65 X 2 = 57.30) 05/19/2003 - None 12/26/2000 - None 10/02/1996 - None 01/01/1993 - None Inspection Notes: Element 358 - Deck Cracking SmFlag X ea. 100 % % % Previous Inspection Notes: 01/05/2011 - added element for diagonal cracking near both Abuts 1(photo) and 2. Underside of deck also has efflorescence, TH Inspection Notes:

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P00020037+05151

| | v | · | | • | |
|----|----|----|----|---|--|
| Cc | 'n | 41 | nı | | |

| General Inspection Notes | |
|---|----------|
| 01/05/2011 - 9' underclearance to bottom of channel. TH | 162162 |
| 12/29/2008 - None | 7.7(3)7 |
| 11/06/2006 - Erosion problems at NW and SE corners if the structure. Silt fence and plant mix has been placed to help control erosion. | ZEICIP |
| 05/19/2003 - None | CNKZ |
| 12/26/2000 - None | OLKO |
| 10/02/1996 - OPS\$U5963 inspection comments -
Structure P00020037+05151 -
Date 10/2/96 - | 1,0744 |
| Previous comments > Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:38 Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:07 | |
| 01/01/1993 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:38
Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:07 | REFI |
| 01/01/1991 - Updated with tape 1992 | NB9/2 |
| 02/01/1989 - Updated with tape 1991 | N(\$\0)1 |
| 01/01/1987 - Updated with tape 1988 | MBIOB |
| 01/01/1985 - Updated with tape 1986 | MERRO |
| | |
| | |
| | |
| | |
| | |
| | |



P00020041+03501

Location: CRANE Structure Name: none

Page 1 of 4 Form: bms001d

Printing Date: Monday, April 23 2012

General Location Data

GLENDIVE District Code, Number, Location: 04 **WOLF POINT** Division Code, Location: 42

County Code, Location: 083 **RICHLAND** City Code, Location: 00000 **RURAL AREA**

Kind fo Hwy Code, Description: 3 3 State Hwy Signed Route Number: 00016

State Highway Agency State Highway Agency Str Owner Code, Description: 1 Maintained by Code, Description:1

Intersecting Feature: CRANE CREEK Kilometer Post, Mile Post: 66.51 km 41.33

Structure on the State Highway System: Latitude: 47°34'26"

Structure on the National Highway System: Longitude: 104°15'47"

Str Meet or Exceed NBIS Bridge Length:

Traffic Data

Current ADT: 2,260 ADT Count Year: 2009 2 % Percent Trucks:

Construction Data

Construction Project Number:

Construction Station Number: 0+00.00

Construction Drawing Number: none

Construction Year: 1986

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading: | | 0 Unknown |
|-------------------------|-----------|------------------------|
| Inventory Load, Design: | 32.6 mton | B ASD Assigned |
| Operating Load, Design: | 32.6 mton | B ASD Assigned |
| Posting : | | 5 At/Above Legal Loads |

| Rating Data : | Operating | Inventory | Posting |
|--------------------|-----------|-----------|---------|
| Truck 1 Type 3: | | | |
| Truck 2 Type 3-S3: | | | |
| Truck 3 Type 3-3: | 40 | | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length: 9.45 m Deck Area: 0.00 m sq

Deck Roadway Width:

12.20 m Approach Roadway Width:

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure: 99.99 m

N Feature not hwy or RR Reference Feature for Vertical Clearance:

0.00 m Vertical Clearance Under the Structure:

N Feature not hwy or RR Reference Feature for Lateral Underclearance:

0.00 m Minimum Lateral Under Clearance Right: 0.00 m Minimum Lateral Under Clearance Left:

Span Data

Main Span

Number Spans: 2

Material Type Code, Description: 3 Steel

Span Design Code, Description: 19 Culvert (includes frame culverts)

Deck

Deck Structure Type: N Not applicable

Deck Surfacing Type: N Not Applicable (applies only to strutures with no dec

Deck Protection Type: N Not applicable (applies only to structures with no de

Deck Membrain Type: N Not applicable (applies only to structures with no de

Approach Span

Number of Spans: 0

Material Type Code, Description:

Span Design Code, Description:

0.00 m (52) Out-to-Out Width: (50A) Curb Width: (50B) Curb Width: 0.00 m 0.00 m

Skew Angle: "

Structure Vertical and Horizontal Clearance Data Inventory Route:

| Over / Under Direction | Inventory | South, W | est or Bi-direction | nal Travel | N | orth or East Trav | /el |
|------------------------|-----------|-----------|---------------------|------------|-----------|-------------------|------------|
| Name | Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizontal |
| Route On Structure | P00020 | Both | 99.99 m | 7.62 m | N/A | | |
| | | | | | | | |



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Printing Date : Monday, April 23 2012

P00020041+03501 Continue

Inspection Data Inspection Due Date : 22 December 2012

| Sufficiency Rating: *7 Health Index: 93.33 Structure Status: Not | | (91) Inspect | on Fequency | (months) : 24 | ı | | |
|--|---------------------------|------------------|--------------|-------------------|------------------------------|-----------------|---------------------|
| NBI Inspection Da | ıta | | | | | | |
| (90) Date of Last Insp | pection : 22 December | er 2010 | | Li | ast Inspected By: Troy Hafel | e - 2056 | |
| (90) Inspectio | n Date : | | | | Inspected By : | | |
| (58) Deck I | Rating : N | (68) Deck Geor | metry : | (36C) Ap | oproach Rail Rating :N | (62) Culver | t Rating : 5 |
| (59) Superstructure F | Rating : N | (67) Structure R | ating : 5 | (36A) | Bridge Rail Rating : N | (61) Channe | el Rating : 6 |
| (60) Substructure I | Rating : N | (69) Under Clear | onoo : NI | (36B | 3) Transition Rating : N | (71) Waterway A | dequacy :8 |
| (72) App Rdwy | Align : 6 | (41) Posting S | | (36 | D) End Rail Rating : N | (113) Scou | r Critical : 8 |
| | Unrepaired S _I | palls: 0 m s | sq | | Deck Surfacir | g Depth : 0.0 | 00 in |
| Inspection Hours | | | | | | | |
| Crew Hours for inspec | tion : 1 | | Snoo | per Required | : N | | |
| Helper Ho | ours: -1 | Sr | nooper Hours | for inspection | -1 | | |
| Special Crew Ho | ours: -1 | | F | lagger Hours | -1 | | |
| Special Equipment Ho | ours: -1 | | | | | | |
| Inspection Work | c Candidates | 01-1 | D.: 1: 14- | Effected | Scope of | A - 41 | Covered |
| Candidate ID | Date | Status | Priority | Structure
Unit | Work | Action | Condition
States |



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Element Inspection Data

******** Span : Main-0 - -1 *******

| Smart Flag | Scale Factor | Env | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
|--|--|-------------|-------------------|----------|----------------|-------------------|-----------------|------------|------------|--------------------------------------|
| | - Steel Culvert | , SSPP do | ouble 13 ft 3 inc | ch x | | | l_ | I. | | |
| | 1 | 2 | 92 | m. | | 80 | 20 | 0 | 0 | |
| | | | | | | % | % | % | % | |
| revious Insp | pection Notes : | | | | | | | | | |
| 2/22/2010 - | None | | | | | | | | | DEE |
| 2/29/2008 - | None | | | | | | | | | ZMBZ |
| 1/06/2006 - | None | | | | | | | | | ZACZ |
| 2/14/2005 - | None | | | | | | | | | RPD |
| 5/19/2003 - | None | | | | | | | | | CZKZ |
| 2/26/2000 - | Same as last in | isp. | | | | | | | | OLKS |
| 2/04/1998 - | Light rust at bo | ttms of cul | verts. Flared e | nd secti | on at outlet e | end of south pipe | is bent inward. | | | GAIY |
| 0/02/1996 - | _ | | | | | | | | | CVK |
| nspection N | Jotes. | | | | | | | | | |
| | | 71 | | | | | | | | |
| | - Scour Smart I | Flag | 1 | ea. | X | 0 | 100 | 0 | | |
| Element 361 | - Scour Smart I | | 1 | ea. | X | 0 % | 100 | 0 % | % | |
| Element 361 | - Scour Smart I | | 1 | ea. | X | | | | % | |
| Element 361 X Previous Insp | - Scour Smart I 1 pection Notes : | | 1 | ea. | X | | | | % | |
| lement 361 X revious Insp 2/22/2010 - | - Scour Smart I 1 pection Notes : None | | 1 | ea. | X | | | | % | DEEZ
ZMBZ |
| lement 361 X revious Insp 2/22/2010 - 2/29/2008 - | - Scour Smart I 1 pection Notes : None None | | 1 | ea. | X | | | | % | DEE.
ZMB2 |
| Previous Insp
2/22/2010 -
2/29/2008 -
1/06/2006 - | - Scour Smart I 1 pection Notes : None None None | | 1 | ea. | X | | | | % | DEE |
| lement 361
X
revious Insp
2/22/2010 -
2/29/2008 -
1/06/2006 -
2/14/2005 - | - Scour Smart I 1 pection Notes : None None None None None | | 1 | ea. | X | | | | % | DEEZ
ZMB.
ZACZ
RPD. |
| lement 361 X revious Insp 2/22/2010 - 2/29/2008 - 1/06/2006 - 2/14/2005 - 5/19/2003 - | - Scour Smart I 1 pection Notes : None None None None None | 1 | 1 | ea. | X | | | | % | DEE;
ZMB;
ZAC; |
| Previous Insp
2/22/2010 -
2/29/2008 -
1/06/2006 -
1/2/14/2005 -
1/2/14/2003 -
1/2/26/2000 - | - Scour Smart I pection Notes : None None None None None None | 1 present. | occurring. | ea. | X | | | | % | DEE.
ZMB.
ZAC.
RPD.
CZK. |
| Previous Insp
2/22/2010 -
2/29/2008 -
1/06/2006 -
02/14/2005 -
05/19/2003 -
2/26/2000 -
2/04/1998 - | - Scour Smart I pection Notes : None None None None None The scour is sti Inlet and outlet | 1 present. | occurring. | ea. | X | | | | % | DEE.
ZMB.
ZAC.
RPD.
CZK. |
| Ziement 361
X Previous Insp
2/22/2010 -
2/29/2008 -
1/06/2006 -
2/14/2005 -
5/19/2003 -
2/26/2000 - | - Scour Smart I pection Notes : None None None None None The scour is sti Inlet and outlet | 1 present. | occurring. | ea. | X | | | | % | DEE.
ZMB.
ZAC.
RPD.
CZK. |



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P00020041+03501

Continue

| General Inspection Notes | |
|--|------|
| 12/22/2010 - Both shoulders have box beam guardrail. TH | DEEZ |
| 12/29/2008 - None | ZMBZ |
| 11/06/2006 - Some minor distortion in pipe probably from construction. | ZACZ |
| 02/14/2005 - None | RPDZ |
| 05/19/2003 - None | CZKZ |
| 12/26/2000 - None | OLKS |
| 12/04/1998 - IN A HORIZONTAL CURVE. | |
| 10/02/1996 - Sufficiency Rating Calculation Accepted by ops\$a0241 at 8/15/97 14:34:58 OPS\$A0241 inspection comments - Structure P00020041+03501 - Date 10/2/96 - Previous comments > Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:38 Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:09 | CVKA |
| 10/01/1994 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 11:34:38 Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:09 | REFI |
| 01/01/1993 - Updated with tape 1994 | NB94 |
| 01/01/1991 - Updated with tape 1992 | NB92 |
| 02/01/1989 - Updated with tape 1991 | NB91 |
| 01/01/1987 - Updated with tape 1988 | NB88 |
| | |
| | |
| | |
| | |
| | |
| | |

Form: bms001d

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P00020046+06831

Location: 5M SW SIDNEY Structure Name: none

General Location Data

District Code, Number, Location: 04

Division Code, Location: 42

WOLF POINT

County Code, Location: 083

RICHLAND

Dist 4

City Code, Location: 00000

RURAL AREA

Kind fo Hwy Code, Description:

3 State Hwy

Signed Route Number: 00016

Str Owner Code, Description: 1

State Highway Agency

Maintained by Code, Description:1

State Highway Agency

Intersecting Feature: FOX CREEK

Kilometer Post, Mile Post:

75.12 km 46.68

Structure on the State Highway System: X

Latitude: 47°38'28"

Longitude: 104°12'34"

GLENDIVE

Construction Station Number: 275+08.00

Construction Data

Structure on the National Highway System: X Str Meet or Exceed NBIS Bridge Length: X

Construction Project Number: F RF-245(24)

Construction Drawing Number: 10366

Construction Year: 1974

Traffic Data

Current ADT: 3,150

ADT Count Year: 2009

2 % Percent Trucks:

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading: | | 5 MS 18 (HS 20) |
|-------------------------|-----------|------------------------|
| Inventory Load, Design: | 32.6 mton | A LFD Assigned |
| Operating Load, Design: | 54.4 mton | A LFD Assigned |
| Posting : | | 5 At/Above Legal Loads |

| Rating Data : | Operating | Inventory | Posting |
|--------------------|-----------|-----------|---------|
| Truck 1 Type 3: | 58 | | |
| Truck 2 Type 3-S3: | 83 | | |
| Truck 3 Type 3-3: | 96 | | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

55.78 m

Deck Area:

789.00 m sq

Deck Roadway Width:

13.29 m

Approach Roadway Width:

13.41 m

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

Reference Feature for Vertical Clearance:

N Feature not hwy or RR

Vertical Clearance Under the Structure:

0.00 m

Reference Feature for Lateral Underclearance:

N Feature not hwy or RR

Minimum Lateral Under Clearance Right: Minimum Lateral Under Clearance Left: 0.00 m 0.00 m

Span Data

Main Span

Number Spans: 3

Material Type Code, Description: 5 Prestressed concrete

Span Design Code, Description: 2 Stringer/Multi-beam or Girder

Deck

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Surfacing Type: 1 Monolithic concrete (concurrently placed with struct

Deck Protection Type: 0 None

Deck Membrain Type: 0 None

Approach Span

Number of Spans: 0

Material Type Code, Description:

Span Design Code, Description:

(52) Out-to-Out Width:

14.14 m

(50A) Curb Width:

(50B) Curb Width:

0.08 m

0.08 m

Skew Angle: °

Structure Vertical and Horizontal Clearance Data Inventory Route:

| The state of the s | Inventory | South, We | est or Bi-direction | al Travel | North or East Travel | | | |
|--|-----------|-----------|---------------------|------------|----------------------|----------|------------|--|
| Name | Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizontal | |
| Route On Structure | P00020 | Both | 99.99 m | 13.29 m | N/A | | | |

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P00020046+06831 Continue

| Inspection Data | Inspection | n Due Date : 22 | December | 2012 | | | |
|---|-------------------|-----------------|-------------------|---------------------|---------------|-----------------|---------------------|
| Sufficiency Rating: 83
Health Index: 99.04 | (91) Inspec | ction Fequency | (months) : 24 | 1 | | | |
| Structure Status :Not Deficient | | | | | | | |
| NBI Inspection Data | | | | | | | |
| (90) Date of Last Inspection: 22 De | ecember 2010 | | L | ast Inspected By | Troy Hafele | - 2056 | |
| (90) Inspection Date : | | | | Inspected By | | | |
| (58) Deck Rating: 5 | (68) Deck Ge | ometry : 6 | (36C) A | pproach Rail Ratir | ng 1 | (62) Culver | t Rating : N |
| (59) Superstructure Rating : 8 | (67) Structure | Rating: 7 | (36A) | Bridge Rail Ratin | g : 1 | (61) Channe | I Rating : 7 |
| (60) Substructure Rating : 7 | (69) Under Clea | rance : N | (36E | 3) Transition Ratin | g : 1 | (71) Waterway A | dequacy 8 |
| (72) App Rdwy Align : 8 | (41) Posting | | (36 | D) End Rail Ratin | g : 1 | (113) Scou | Critical: 5 |
| Unrepa | ired Spalls : 0 m | so | = | De | eck Surfacing | Denth : 7.8 | 30 in |
| Inspection Hours | | | | | on canaoing | Dopuit. | |
| Crew Hours for inspection : | 1.5 | Snoo | er Required | : N | | | |
| Helper Hours : | | Snooper Hours f | or inspection | -1 | | 7 | |
| Special Crew Hours : | -1 | F | agger Hours | | | 7 | |
| Special Equipment Hours : | -1 | | | | | | |
| Inspection Work Candidate | | | Effected | Scope | | | Covered |
| Candidate ID Date
Requeste | Status | Priority | Structure
Unit | Worl | k | Action | Condition
States |



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P00020046+06831 Continue

Element Inspection Data

***** Span : Main-0 - -1 * * * * * * * * * Element Description Smart Flag | Scale Factor Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 12 - Bare Concrete Deck 1 2 789 X sq.m. 100 0 % % % % % Previous Inspection Notes: 12/22/2010 - None 11/06/2006 - None. (55.78 X 14.14 = 788.729) 05/19/2003 - None 12/26/2000 - Moderate to heavy transverse cracking thru-out deck. 10/01/1996 - None 11/01/1992 - None Inspection Notes: Element 109 - P/S Conc Open Girder , 6 I beams 2 335 100 m. % % % Previous Inspection Notes: 12/22/2010 - Span 2(photo). TH 11/06/2006 - None 05/19/2003 - None 12/26/2000 - None 10/01/1996 - None 11/01/1992 - None Inspection Notes: Element 205 - R/Conc Column , Bent 2=3, Bent 3=3 1 3 6 100 ea. % Previous Inspection Notes: 12/22/2010 - Bent 2 and 3(photos). TH 11/06/2006 - None 05/19/2003 - None 12/26/2000 - None 10/01/1996 - None 11/01/1992 - None Inspection Notes:



P00020046+06831 Continue

******* Span : Main-0 - -1 (cont.) *******

| Element Descript Smart Flag Sca Element 215 - R/ Previous Inspecti 12/22/2010 - Nor 11/06/2006 - Nor 12/26/2000 - Bac 10/01/1996 - Nor | ale Factor Conc Abutin 1 ion Notes : | Env
nent
2 | Quantity
34 | | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
|--|--|------------------|----------------|----------|-----------------|-------------------------|------------|------------|------------|----------------|
| Previous Inspecti
12/22/2010 - Nor
11/06/2006 - Nor
05/19/2003 - Nor
12/26/2000 - Bac
10/01/1996 - Nor | Conc Abutn 1 ion Notes : | | | | | via 1900-1000-2000-2000 | | | | |
| 12/22/2010 - Nor
11/06/2006 - Nor
05/19/2003 - Nor
12/26/2000 - Bac
10/01/1996 - Nor | ion Notes :
ne | 2 | 34 | m. | 20 | 95 | 5 | O, | 0 | |
| 12/22/2010 - Nor
11/06/2006 - Nor
05/19/2003 - Nor
12/26/2000 - Bac
10/01/1996 - Nor | ne
ne | | | | | | Y | 4 | U U | |
| 12/22/2010 - Nor
11/06/2006 - Nor
05/19/2003 - Nor
12/26/2000 - Bac
10/01/1996 - Nor | ne
ne | | | | OR THE | % | % | % | % | |
| 11/06/2006 - Nor
05/19/2003 - Nor
12/26/2000 - Bac
10/01/1996 - Nor | ne | | | | to an inches | | | | | |
| 05/19/2003 - Non
12/26/2000 - Bac
10/01/1996 - Non | | | | | | | | | | IDXIII |
| 12/26/2000 - Bac
10/01/1996 - Non | | | | | | | | | | Z2C) |
| 10/01/1996 - Non | ie | | | | | | | | | CZK |
| | kwalls spall | ing around | bearing device | es at ab | ut.1 and 4. | | | | | OLK |
| 410414000 N | ne | | | | | | | | | (B)XF1 |
| 11/01/1992 - Non | ie | | | | | | | | | RIEF |
| Inspection Notes | s: | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Element 234 - R/ | Conc Cap , | Bent 2 an | d 3 | | | | | | | |
| | 1 | 1 | 28 | m. | | 100 | 0 | 0 | 0 | |
| PASSELL! | | | | | MIN | % | % | % | % | |
| revious Inspecti | on Notes : | - | | | | | | | | |
| 2/22/2010 - Non | ie | | | | | | | | 7 | 10)2/40 |
| 1/06/2006 - Non | e. (14.14 X | 2 = 28.28 |) | | | | | | | ZZC/ |
| 5/19/2003 - Non | e | | | | | | | | | czk |
| 2/26/2000 - Non | e | | | | | | | | | OLK(|
| 0/01/1996 - Non | е | | | | | | | | | UXR |
| 1/01/1992 - Non | е | | | | | | | | | RE |
| Inspection Notes | s: | | | | | | | | | |
| * | | | | 1 | | | | | | |
| | | | | | | | | | | |
| lement 302 - Co | mpressn Jo | int Seal , | Abut 1 and 4 | | | | | | 119 040 | |
| | 1 | 2 | 28 | m. | | 80 | 20 | 0 | 是我是李宝宝 | DATE OF STREET |
| | | | | Name of | | % | % | % | % | CONTROL DE |
| revious Inspecti | on Notes : | | | | Company of the | | | | - 1 | |
| 2/22/2010 - Non | | | | | | | | | | D)X \$1 |
| 1/06/2006 - Non | | | | | | | | | | ZZ(0Z |
| 5/19/2003 - Non | | | | | | | | | | CZK. |
| 2/26/2000 - Both | | eaking in a | reas. | | | | | | | OLK |
| Inspection Notes | | | | | E CONTRACTOR TO | | | | | |
| POURIUM INCIGO | 578 | | | | | | | | | |

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****** * Span : Main-0 - -1 (cont.) * * * * * * * *

| oman riau | Scale Factor | Env | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
|---|---|----------------------|---|---------------|--------------|-------------------|------------------|-------------------|--------------|---|
| | - Fixed Bearing | | | Omio | mop Edon | 1 of Olar 1 | 1 Ct Otat 2 | r ct stat s | FCI Stat 4 | ru stat s |
| F 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 1 | 1 | 24 | ea. | | 90 | 10 | 0 | | |
| | | | dinastra de la | | | % | % | % | | |
| Provious Inc | pection Notes : | | | | -714 | 70 | 76 | 70 | 76 |)
 |
| | | | | | | | | | | |
| | Bearings at Abu | | | e backw | alls and are | not included in o | uantity. Change | d quantity from 3 | 36 to 24. TH | HEXA: |
| | Outside shoes a | t abutmer | nts nave rust. | | | | | | | 751.(|
| 5/19/2003 - | | | | | | | | | | 624 |
| 2/26/2000 -
0/01/1996 - | | | | | | | | | | Oluf |
| 1/01/1990 - | | | | | | | | | | UXF |
| | | | | | | | | | | INS |
| Inspection N | Notes: | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| lement 321 | - R/Conc Approa | | | | | | | | | |
| | 1 | 3 | 1 | ea. | | 0 | 0 | 100 | 0 | |
| THE PERSON | | | | | 416 41 | % | % | % | % | |
| | | - | | | | | | | | |
| revious Ins | pection Notes : | | | | | <u> </u> | | | | |
| | pection Notes :
Quantity of 1 inc | ludes botl | h slabs. TH | | | | | | | DZI |
| 2/22/2010 - | | | | overlay - | · Nate. | | | | | DZI
2/2(0 |
| 2/22/2010 -
1/06/2006 - | Quantity of 1 inc
Changed to con- | | | overlay - | Nate. | | | | | |
| 2/22/2010 -
1/06/2006 -
5/19/2003 - | Quantity of 1 inc
Changed to con- | dition state | | overlay - | · Nate. | | | , | | 220 |
| 2/22/2010 -
1/06/2006 -
5/19/2003 - | Quantity of 1 inc
Changed to cond
None
Covered with as | dition state | | overlay - | · Nate, | | | | | Z2(0
C/2() |
| 2/22/2010 -
1/06/2006 -
5/19/2003 -
2/26/2000 - | Quantity of 1 inc
Changed to cond
None
Covered with as
None | dition state | | overlay - | Nate. | | | | | ZZ(C
CZ(S
OLA |
| 2/22/2010 -
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2/26/2000 -
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None | dition state | | overlay - | Nate. | | | | | ZZC
CZK
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UXF |
| 2/22/2010 -
1/06/2006 -
5/19/2003 -
2/26/2000 -
0/01/1996 -
1/01/1992 - | Quantity of 1 inc
Changed to cond
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Covered with as
None
None | dition state | | overlay - | Nate, | | | | | ZZC
CZK
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| 2/22/2010 -
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5/19/2003 -
2/26/2000 -
0/01/1996 -
1/01/1992 - | Quantity of 1 inc
Changed to cond
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Covered with as
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CZK
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| 2/22/2010 -
1/06/2006 -
5/19/2003 -
2/26/2000 -
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Changed to cond
None
Covered with as
None
None | dition state | e 3 for asphalt o | | | ests with 16w x 1 | 2h concrete curb | | | ZZC
CZK
OLK
UXF |
| 2/22/2010 -
1/06/2006 -
15/19/2003 -
2/26/2000 -
0/01/1996 -
1/01/1992 -
Inspection N | Quantity of 1 inc
Changed to cond
None
Covered with as
None
None | dition state | e 3 for asphalt o | beam an | | ests with 16w x 1 | 2h concrete curb | o O | 0 | ZZC
GZK
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UXG |
| 2/22/2010 -
1/06/2006 -
15/19/2003 -
2/26/2000 -
0/01/1996 -
1/01/1992 -
Inspection N | Quantity of 1 inc
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Covered with as
None
None
Iotes: | phalt. | e 3 for asphalt o | beam an | | 90 | 10 | 0 | | ZZC
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| 2/22/2010 -
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5/19/2003 -
2/26/2000 -
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1/01/1992 -
Inspection N | Quantity of 1 inc
Changed to cond
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Covered with as
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Iotes: | phalt. | e 3 for asphalt o | beam an | | | | | 0 % | ZZC
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| 2/22/2010 -
1/06/2006 -
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0/01/1996 -
1/01/1992 -
Inspection N | Quantity of 1 inc Changed to cond None Covered with as None None Iotes: - Metal Rail Coal a pection Notes : | phalt. ted , pain | e 3 for asphalt of the second | beam an
m. | nd I beam po | 90 | 10 | 0
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1/01/1992 -
nspection N | Quantity of 1 inc Changed to cond None Covered with as None None dotes: - Metal Rail Coal 1 Dection Notes: | phalt. ted , pain 2 | e 3 for asphalt of the second | beam an
m. | nd I beam po | 90 | 10 | 0
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m. | nd I beam po | 90 | 10 | 0
% | % | ZZC
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| 2/22/2010 - 1/06/2006 - 5/19/2003 - 2/26/2000 - 0/01/1996 - 1/01/1992 - Inspection N Iement 334 revious Insp 2/22/2010 - 1/06/2006 - 5/19/2003 - | Quantity of 1 inc Changed to cond None Covered with as None None Iotes: - Metal Rail Coal 1 Dection Notes: rail has some sc None. (55.78 X | phalt. ted , pain 2 | e 3 for asphalt of the second | beam an
m. | nd I beam po | 90 | 10 | 0
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CZK
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| 2/22/2010 - 1/06/2006 - 5/19/2003 - 2/26/2000 - 0/01/1996 - 1/01/1992 - nspection N lement 334 revious Insp 2/22/2010 - 1/06/2006 - 5/19/2003 - 2/26/2000 - | Quantity of 1 inc Changed to cond None Covered with as None None Iotes: - Metal Rail Coa 1 Dection Notes: rail has some so None. (55.78 X None None | phalt. ted , pain 2 | e 3 for asphalt of the second | beam an
m. | nd I beam po | 90 | 10 | 0
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| 2/22/2010 - 1/06/2006 - 5/19/2003 - 2/26/2000 - 0/01/1996 - 1/01/1992 - Inspection N Ilement 334 revious Insp 2/22/2010 - 1/06/2006 - 5/19/2003 - 2/26/2000 - 0/01/1996 - | Quantity of 1 inc Changed to cond None Covered with as None None Idea: - Metal Rail Coal 1 Dection Notes: rail has some sc None. (55.78 X None None None | phalt. ted , pain 2 | e 3 for asphalt of the second | beam an
m. | nd I beam po | 90 | 10 | 0
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OLK |
| 2/22/2010 - 1/06/2006 - 15/19/2003 - 2/26/2000 - 0/01/1996 - 1/01/1992 - Inspection N | Quantity of 1 inc Changed to cond None Covered with as None None Iotes: - Metal Rail Coad 1 Dection Notes: rail has some sc None. (55.78 X None None None None None | phalt. ted , pain 2 | e 3 for asphalt of the second | beam an
m. | nd I beam po | 90 | 10 | 0
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******* Span : Main-0 - -1 (cont.) * * * * * * * *

| Element Des | porintion | | | | | | | | | |
|---|--|-----------------------------------|--------------------------------|---------------------|------------------------------|---------------------|------------|------------|------------|---|
| | Scription
Scale Factor | Env | Quantity | Units | Insp Each | Pct Stat 1 | Dot Stat 2 | Dot Ctat 2 | Dat Stat 4 | Dat Class |
| | 3 - Deck Crackin | | Quantity | Units | linsh Each | FUI SIBI I | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| X | 1 | 2 | | 1 ea. | 1 x 1 | 0 | (| 100 | 0 | |
| ^ | | 2 | | i Ga. | ^ | % | | | | |
| Halla | | | | | | 70 | 70 | % | % | |
| | pection Notes : | | | | | | | | | 2 - E |
| 12/22/2010 - | | | | | | | | | | IDVZIHV |
| | moderate to he | eavey crack | ing through o | it deck. | | | | | | ZZC7 |
| Inspection I | Notes: | | | | | | | | | |
| | • | | | | | | | | | |
| General | Inspection N | Notes | | | 6: | | | | | |
| 12/22/2010 - | · 13' undercleara | ance to wat | er. TH | | | | | | | DMEN |
| 11/06/2006 - | None | | | | | | | | | Z/Z/G/Z |
| 05/19/2003 - | None | | | | | | | | | CZKZ |
| 12/26/2000 - | None | | | | | | | | | OLKO |
| Structure P0
Date 10/1/96
Previous cor
Sufficiency F | nments > Suffici
Rating Calculation | l -
lency Ratin
on Accepted | d by ops\$u900 | 14 at 2/1 | 9/97 14:59:1 | 0 | 11:34:38 | | | |
| 11/01/1992 -
Sufficiency F | Sufficiency Rat
Rating Calculation | ing Calcula
on Accepted | ition Accepted
by ops\$u900 | by ops:
4 at 2/1 | Su5963 at 3/
9/97 14:59:1 | 10/97 11:34:38
0 | | | | RES |
| 01/01/1991 - | Updated with ta | ape 1993 | | | | | | | | \{\ \ \ \ \ \ \ \ \ \ \ \ \ \ |
| 10/01/1988 - | Updated with ta | ape 1991 | | | | | | | | Mestri |
| 01/01/1987 - | Updated with ta | ape 1988 | | | | | | | | 1815(31 |
| 01/01/1985 - | Updated with ta | ape 1986 | | | | | | | | [4] |
| 01/01/1983 - | Updated with ta | ape 1984 | | | | | | | | ¥8481 |
| | Updated with ta | ape 1983 | | | | | | | | Ment |
| 12/01/1980 - | | ape 1980 | | | | | | | | |

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Location: SIDNEY Structure Name: none

General Location Data

District Code, Number, Location: 04

Dist 4

GLENDIVE

Division Code, Location: 42

WOLF POINT

County Code, Location: 083

RICHLAND

City Code, Location: 67900

SIDNEY

Kind fo Hwy Code, Description: 3

3 State Hwy

Signed Route Number: 00016

Str Owner Code, Description: 1

State Highway Agency

Maintained by Code, Description:1

State Highway Agency

Intersecting Feature: LONE TREE CREEK

Kilometer Post, Mile Post: 83.11 km Construction Data

51.64

Structure on the State Highway System: X Structure on the National Highway System: X

Latitude: 47°42'20" Longitude: 104°09'50"

Construction Station Number: 537+04.00

Construction Project Number: F RF-245(24)

Str Meet or Exceed NBIS Bridge Length: X

Construction Drawing Number: 10663

Construction Year: 1974

Current ADT: 10,290

Traffic Data

ADT Count Year: 2009

Percent Trucks:

2 %

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading : | | 5 MS 18 (HS 20) |
|-------------------------|-----------|------------------------|
| Inventory Load, Design: | 32.6 mton | B ASD Assigned |
| Operating Load, Design: | 49.8 mton | B ASD Assigned |
| Posting : | | 5 At/Above Legal Loads |

| Rating Data : | Operating | Inventory | Posting |
|--------------------|-----------|-----------|---------|
| Truck 1 Type 3: | | | |
| Truck 2 Type 3-S3: | | | |
| Truck 3 Type 3-3: | 88 | 11 | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

27.43 m

Deck Area:

794.00 m sq

Deck Roadway Width:

25.30 m

Approach Roadway Width:

25.30 m

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

Reference Feature for Vertical Clearance:

N Feature not hwy or RR

Vertical Clearance Under the Structure:

0.00 m N Feature not hwy or RR

Reference Feature for Lateral Underclearance: Minimum Lateral Under Clearance Right:

0.00 m

Minimum Lateral Under Clearance Left:

0.00 m

Span Data

Main Span

Number Spans: 4

Material Type Code, Description: 2 Concrete continuous

Span Design Code, Description: 1 Slab

Deck

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Membrain Type: 0 None

Deck Surfacing Type: 1 Monolithic concrete (concurrently placed with struct

Deck Protection Type: 0 None

Approach Span

Number of Spans: 0

Material Type Code, Description:

Span Design Code, Description:

(52) Out-to-Out Width: 28.96 m

(50A) Curb Width:

(50B) Curb Width:

1.52 m

1.52 m

Skew Angle: °

Structure Vertical and Horizontal Clearance Data Inventory Route:

| Over / Under Direction | Inventory | South, We | North or East Travel | | | | |
|------------------------|-----------|-----------|----------------------|------------|-----------|----------|------------|
| Name | Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizontal |
| Route On Structure | P00020 | Both | 99.99 m | 25.30 m | N/A | | |

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| Inspection D | ata | | Due Date : 2 | | | | | |
|--|-----------------------|-----------------|----------------|----------------------|----------------------|---------------|-----------------|---------------------|
| Sufficiency Rating: 8 Health Index: 99.42 Structure Status:Not | | (91) Inspec | ction Fequency | (months) : 24 | L | | | |
| NBI Inspection Da | ata | | | | | | | |
| (90) Date of Last Insp | pection : 22 December | er 2010 | | L | ast Inspected By | Troy Hafele - | - 2056 | |
| (90) Inspectio | on Date : | | | | Inspected By | | | |
| (58) Deck | Rating: 7 | (68) Deck Ge | ometry : 9 | (36C) A ₁ | pproach Rail Ratin | ng IN | (62) Culver | t Rating : N |
| (59) Superstructure | Rating: 7 | (67) Structure | Rating: 7 | (36A) | Bridge Rail Ratin | g : 0 | (61) Channe | Rating: 7 |
| (60) Substructure | Rating: 7 | (69) Under Clea | | (36B | 3) Transition Rating | g : N | (71) Waterway A | dequacy 8 |
| (72) App Rdwy | y Align : 8 | (41) Posting | | (36 | D) End Rail Rating | g : 0 | (113) Scour | Critical : 5 |
| | Unrepaired S | palls: 0 m | so | | De | ck Surfacing | Depth : 0.0 | 00 in |
| Inspection Hours | 785 | | | | - | | | |
| Crew Hours for inspec | tion : 1.5 | ا اد | Snoo | per Required | : N | | | |
| Helper Ho | ours: _1 | 5 | Snooper Hours | for inspection | -1 | | 7 | |
| Special Crew Ho | | | F | lagger Hours | -1 | | 7 | |
| Special Equipment Ho | ours: _1 | | | | | | _ | |
| Inspection World | k Candidates | 0.1 | | Effected | Scope | | | Covered |
| Candidate ID | Date
Requested | Status | Priority | Structure
Unit | Worl | k | Action | Condition
States |

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Element Inspection Data

| Smart Flag | Scale Factor | Env | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
|--|--|-------------|------------------|----------|-----------|------------|------------|------------|------------|--|
| | - Bare Concrete | Slab | | | | | | 5 30 50505 | | |
| | 1 | 3 | 794 | sq.m. | X | 100 | 0 | 0 | 0 | |
| | | | | | | % | % | % | % | |
| Previous Ins | pection Notes : | | | | | | | | | |
| 2/22/2010 - | - None | | | | | | | | | 10)24/2 |
| 2/29/2008 - | Snow covered. | | | | | | | | | Z(R(8) |
| 1/06/2006 - | None. (27.43 | X 28.96 = 7 | 794.373) | | | | | | | 22C |
| 2/14/2005 - | - None | | | | | | | | | F(CID) |
| 5/19/2003 - | - None | | | | | | | | | CZKO |
| 2/26/2000 - | - None | | | | | | | | | OLL |
| 2/04/1998 - | None | | | | | | | | | G/AJ) |
| 0/01/1996 - | None | | | | | | | | | DILX |
| 0/01/1994 - | None | | | | | | | | | rleft |
| Inspection I | Notes: | | | | | | | | | |
| | Notes:
5 - R/Conc Colur | mn , Bents | s 2, 3 and 4 hav | re 6 eac | h | | | | | |
| Inspection N | 1 | mn , Bents | s 2, 3 and 4 hav | | h | 100 | 0 | 0 | 0 | |
| | i - R/Conc Colur | 200 | | | h | 100 | 0 % | 0'% | 0 | |
| Element 205 | i - R/Conc Colur | - 20 | | | h | | | | | |
| Element 205
Previous Ins | i - R/Conc Colur
1 | 2 | | | h | | | | | .DZQ |
| Previous Ins | i - R/Conc Colur
1
pection Notes :
Bent 3 and 4(p | 2 | | | h | | | | | |
| Previous Ins
2/22/2010 -
2/29/2008 - | 6 - R/Conc Colur
1
pection Notes :
Bent 3 and 4(p | 2 | | | h | | | | | ZRB |
| Previous Ins
2/22/2010 -
2/29/2008 -
1/06/2006 - | i - R/Conc Colur
1
pection Notes :
Bent 3 and 4(p
None | 2 | | | h | | | | | ZRB
ZZC |
| Previous Ins
2/22/2010 -
2/29/2008 -
1/06/2006 -
2/14/2005 - | pection Notes : Bent 3 and 4(p None None | 2 | | | h | | | | | ZRB
ZZC
RGD |
| revious Ins
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2/29/2008 -
1/06/2006 -
2/14/2005 -
5/19/2003 -
2/26/2000 - | pection Notes : Bent 3 and 4(p None None None None | 2 | | | h | | | | | ZRB
ZZC
RGD
CZK |
| Previous Ins
2/22/2010 -
2/29/2008 -
1/06/2006 -
2/14/2005 -
5/19/2003 -
2/26/2000 -
2/04/1998 - | pection Notes: Bent 3 and 4(p None None None None None None | 2 | | | h | | | | | ZRB
ZZC
RGD
CZK
OLL
GAJ |
| Previous Ins
2/22/2010 -
2/29/2008 -
1/06/2006 -
2/14/2005 -
5/19/2003 -
2/26/2000 -
2/04/1998 -
0/01/1996 - | pection Notes : Bent 3 and 4(p None None None None None None None | 2 | | | h | | | | | ZRB,
ZZC,
RGD
CZK,
OLL,
GAJI
DLX |
| Element 205
Previous Ins | pection Notes : Bent 3 and 4(p None None None None None None None | 2 | | | h | | | | | DZIZ
ZRB
ZZC;
RGD
CZK;
OLL,
GAJI
DLX; |

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******* Span : Main-0 - -1 (cont.) * * * * * * * *

| Cmart Elan Cools Foster | T Cov. | Overtitus | 1 11-4- 11 | DIOLIA I | D 101 10 | 5.0 | | |
|--|----------------|-----------------|------------------|--------------------|------------|------------|------------|------------|
| Smart Flag Scale Factor
Element 215 - R/Conc Abut | Env | Quantity | Units Insp Ea | ach Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| 1 | 2 | 8 | | 00 | 40 | ۸ | | |
| | 2 | 0 | 6 m. | 90 | 10 | 0 | 0 | |
| All distances | | | | % | % | % | % | |
| Previous Inspection Notes : | | | | | | | | |
| 12/22/2010 - None | | | | | | | | (BZ4)Z |
| 12/29/2008 - None | | | | | | | | ZRBZ |
| 11/06/2006 - None | | | | | | | | ZZC |
| 02/14/2005 - None | | | | | | | | (R(Glb) |
| 05/19/2003 - None | | | | | | | | CZK |
| 12/26/2000 - Backwalls has | | | | | | | | ONE |
| 12/04/1998 - Backwalls hav | e light vertic | cal cracks at a | bout 12 foot cen | ters in both abut. | | | | (C/A/J) |
| 10/01/1996 - None | | | | | | | | B)LX(|
| 0/01/1994 - None | | | | | | | | REF |
| Inspection Notes: | | | | | | | | |
| Theres 1 004 - DIO O | D1-0.0 | | | | | | | |
| Element 234 - R/Conc Cap | | | | | | | | |
| _1 | 1 | 85.9 | m. | 100 | 0 | 0 | 0 | |
| ADS REC | | | | % | % | % | % | |
| Previous Inspection Notes: | | | | · · | · | • | | |
| 2/22/2010 - Bents 3 and 4 | (photo). TH | | | | | | | (D)ZI/Z |
| 2/29/2008 - None | | | | | | | | ZHW |
| Inspection Notes: | | | | | | | | |
| Element 321 - R/Conc Appr | aaah Clah | | | | | | | |
| | | | d 1 | 100 | al | al | | ě |
| 1 | 3 | | ea. | 100 | 0 | 0 | 0 | |
| | | | | % | % | % | % | |
| revious Inspection Notes : | | | | | | · | | |
| 2/22/2010 - Quantity of 1 in | ncludes both | slabs. TH | | | | | | (D)Z(). |
| 2/29/2008 - Snow covered | | | | | | | | ZRB |
| 1/06/2006 - None | | | | | | | | Z7(C) |
| 2/14/2005 - None | | | | | | | | RGD |
| | | | | | | | | CZK |
| 5/19/2003 - None | | | | | | | | OHL |
| 5/19/2003 - None
2/26/2000 - None | | | | | | | | CYAdl |
| 5/19/2003 - None
2/26/2000 - None
2/04/1998 - None | | | | | | | | |
| 5/19/2003 - None
2/26/2000 - None
2/04/1998 - None
0/01/1996 - None | | | | | | | | DILX |
| 5/19/2003 - None
2/26/2000 - None
2/04/1998 - None | | | | | | | | DIX
REH |
| 5/19/2003 - None
2/26/2000 - None
2/04/1998 - None
0/01/1996 - None | | | | | | | | |

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P00020051+06421 Continue

| Element Description | | | | | | | | |
|---|----------------------------|-------------------------------|---|------------------------|-------------------|---------------|------------------------|------------|
| Smart Flag Scale Factor | 1 | Quantity | Units Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| Element 334 - Metal Rail Coat | ted , painted | d 4 inch triple | box beam rail with | 6 inch I beam po | osts | | | |
| 1 | 2 | 55 | m. | 90 | 10 | 0 | 0 | |
| | | | | % | % | % | % | |
| Previous Inspection Notes : | | | | | | | | |
| 12/22/2010 - rail has some pri | imer showing | g and posts | have some freckled | rust, changed fro | om 100.0 to 90.10 | D percent, TH | Session of the session | (p)Z/Z |
| 12/29/2008 - None | | | | | | | | ZRISZ |
| 11/06/2006 - None. (27.43 X | 2 = 54.86) | | | | | | | 722072 |
| 02/14/2005 - None | | | | | | | | 18(G10)Z |
| 05/19/2003 - None | | | | | | | | CZKZ |
| 12/26/2000 - None | | | | | | | | OHEZ |
| 12/04/1998 - None | | | | | | | | CAJN |
| 10/01/1996 - None | | | | | | | | (D)L)X(e |
| 10/01/1994 - None | | | | | | | | RHH |
| Inspection Notes: | | | | | | | | |
| | | | | | **** | | | |
| | | | | | | | | |
| Canaval Inspection N | | | | | | | | |
| General Inspection No | | -6-11 | O:1 W | | | WWW. | | |
| 12/22/2010 - 7' underclearance | e to bottom | of channel. | sidewalks on both le | ft and right side: | s. IH | | | 7/2(0) |
| 12/29/2008 - None | | | | | | | | .Zirlaz |
| 11/06/2006 - None | | | | | | | | ZZ.CZ |
| 02/14/2005 - None | | | | | | | | iR(GID)Z |
| 05/19/2003 - None | | | | | | | | CZK/Z |
| 12/26/2000 - None | | | | | | | | OLLZ |
| 12/04/1998 - None | | | | | | | | GAJN |
| 10/01/1996 - Sufficiency Ratin
OPS\$A0241 inspection comm
Structure P00020051+06421 -
Date 10/1/96 - | nents - | n Accepted t | oy ops\$a0241 at 8/1 | 5/97 14:39:00 | | | | DLXG |
| Previous comments > Sufficier
Sufficiency Rating Calculation | ncy Rating C
Accepted b | Calculation A
y ops\$u9004 | ccepted by ops\$u59
I at 2/19/97 14:59:10 | 963 at 3/11/97 10
) | 0:45:18 | | | |
| 10/01/1994 - Sufficiency Ratin
Sufficiency Rating Calculation | g Calculatio
Accepted b | n Accepted t
y ops\$u9004 | oy ops\$u5963 at 3/1
I at 2/19/97 14:59:10 | 1/97 10:45:18
) | | | | [24] |
| 01/01/1993 - Updated with tap | e 1994 | | | | | | | NE94 |
| 01/01/1991 - Updated with tap | e 1993 | | | | | | | NB)93 |
| 02/01/1989 - Updated with tap | e 1991 | | | | | | | N/18(9) |
| 01/01/1987 - Updated with tap | e 1988 | | | | | | | Ners |
| 01/01/1985 - Updated with tap | e 1986 | | | | | | | NE86 |
| 01/01/1983 - Updated with tap | e 1984 | | | | | | | NE84 |
| 12/01/1980 - Updated with tap | ie 1983 | | | | | | | NB83 |
| 12/01/1978 - Updated with tap | e 1980 | | | | | | | 1818181 |
| idonitoro opadioa martap | | | | | | | | |
| 12077 TOTO Operation Institute | | | | | | | | |
| | | | - | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| - Cpadod militap | | | | | | | | |
| | | | | | | | | |
| La mara Capada di mirrap | | | | | | | | |

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P00020059+05101

Location: 3M SW FAIRVIEW Structure Name: none

General Location Data

District Code, Number, Location: 04

Dist 4

GLENDIVE

Division Code, Location :42

WOLF POINT

County Code, Location: 083

RICHLAND

City Code, Location: 00000

RURAL AREA

Kind fo Hwy Code, Description: 3

3 State Hwy

Signed Route Number: 00200

Str Owner Code, Description: 1

State Highway Agency

Maintained by Code, Description:1

State Highway Agency

Intersecting Feature: FIRST HAY CREEK

Kilometer Post, Mile Post:

59.51

Structure on the State Highway System: X

Latitude: 47°48'30"

Construction Data

Construction Project Number: RTFBRF20-2(7)52

Structure on the National Highway System:

Longitude: 104°05'26"

Construction Station Number: 367+22.00

Str Meet or Exceed NBIS Bridge Length: X

Construction Drawing Number: 13594

Construction Year: 1986

95.77 km

Traffic Data

Current ADT: 3,410

ADT Count Year: 2009

Percent Trucks:

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading : | | 5 MS 18 (HS 20) |
|--------------------------|-----------|------------------------|
| Inventory Load, Design: | 32.6 mton | B ASD Assigned |
| Operating Load, Design : | 32.6 mton | B ASD Assigned |
| Posting : | | 5 At/Above Legal Loads |

| Rating Data : | Operating | Inventory | Posting |
|--------------------|-----------|-----------|----------|
| Truck 1 Type 3: | | , | <u> </u> |
| Truck 2 Type 3-S3: | | | |
| Truck 3 Type 3-3: | 40 | | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

33.38 m

Deck Area:

428.00 m sq

Deck Roadway Width:

11.98 m

Approach Roadway Width:

12.19 m

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

99.99 m

Reference Feature for Vertical Clearance:

N Feature not hwy or RR

Vertical Clearance Under the Structure:

0.00 m

Reference Feature for Lateral Underclearance:

N Feature not hwy or RR

Minimum Lateral Under Clearance Right:

0.00 m

Minimum Lateral Under Clearance Left:

0.00 m

Span Data

Main Span

Number Spans: 4

Material Type Code, Description: 2 Concrete continuous

Span Design Code, Description: 1 Slab

Number of Spans: 0

Approach Span

Material Type Code, Description: Span Design Code, Description:

Deck

Deck Structure Type: 1 Concrete Cast-in-Place

Deck Protection Type: 1 Epoxy Coated Reinforcing

Deck Surfacing Type: 1 Monolithic concrete (concurrently placed with struct

Deck Membrain Type: 0 None

(52) Out-to-Out Width:

12.83 m

(50A) Curb Width:

(50B) Curb Width:

0.00 m

0.00 m

Skew Angle: 40°

Structure Vertical and Horizontal Clearance Data Inventory Route:

| Inventory | South, We | est or Bi-direction | al Travel | N | orth or East Tra | vel |
|-----------|-----------|---------------------|--------------------------|-------------------------------------|---|--|
| Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizontal |
| P00020 | Both | 99.99 m | 11.98 m | N/A | | |
| | Route | Route Direction | Route Direction Vertical | Route Direction Vertical Horizontal | Route Direction Vertical Horizontal Direction | Route Direction Vertical Horizontal Direction Vertical |

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P00020059+05101 Continue

| Inspection E | Data | Inspectio | on Due Date : 2 | December : | 2012 | | | |
|---|-----------------------|--|-----------------------|--------------------------------|--|--------------|-------------------------------|---------------------|
| Sufficiency Rating : Health Index : 97.78 | | (91) Inspe | ection Fequency | (months) : 24 | 1 | | | |
| Structure Status :Not | Deficient | | | | | | | |
| NBI Inspection D | ata | | | | | | | |
| (90) Date of Last Ins | pection : 27 December | er 2010 | | L | ast Inspected By | Troy Hafele | - 2056 | |
| (90) Inspection | on Date : | | | | Inspected By | | | |
| (58) Deck
(59) Superstructure
(60) Substructure | Rating: 7 | (68) Deck Ge
(67) Structure
(69) Under Cle | Rating : 7 | (36A)
(36B | pproach Rail Ratin
Bridge Rail Rating | 9:1
9:0 | (61) Chann
(71) Waterway A | |
| (72) App Rdw | | (41) Posting | | (36 | D) End Rail Rating | a: 0 | (113) Scou | r Critical : 5 |
| Inspection Hours | | palls: 5 n | n sa | | De | ck Surfacing | Depth: 15. | 00 in |
| Crew Hours for inspect | 1.0 | | Snoo
Snooper Hours | per Required
for inspection | | | 7 | |
| Special Crew Ho | ours: -1 | | F | lagger Hours | | | 1 | |
| Special Equipment He | ours: -1 | | | | | | _ | |
| Inspection Worl | k Candidates | | | Effected | Scope | | | Covered |
| Candidate ID | Date
Requested | Status | Priority | Structure
Unit | Work | | Action | Condition
States |

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P00020059+05101 Continue

Element Inspection Data

* * * Span : Main-0 - -1 * * * * * * * * * Element Description Smart Flag Scale Factor Env Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 38 - Bare Concrete Slab 2 428 sq.m. Х 100 0 % % % Previous Inspection Notes: 12/27/2010 - some spalls near Abut 5 and random cracking entire deck. Abut 1 and 5, right outside bottom corner at backwall is spalled. TH 12/29/2008 - None 11/06/2006 - None. (33.38 X 12.83 = 428.265) 02/14/2005 - None 05/19/2003 - None 12/26/2000 - Damaged areas from milling machine over abut.5. 12/04/1998 - Caps are part of the slab. They are not coded separately as element 181.(Yes, caps need rated see element 234. TH 1-5-11) 10/01/1996 - None 10/01/1994 - None Inspection Notes: Element 202 - Paint Stl Column, Bents 2, 3 and 4, 16 inch diameter, 4 per bent 2 12 ea. 80 15 0 % % % Previous Inspection Notes: 12/27/2010 - 2' - 4' of bottom of columns has surface rust prevalent(photos), changed from 80,20 to 80,5,15 percent. TH 12/29/2008 - None 11/06/2006 - None 02/14/2005 - None 05/19/2003 - None 12/26/2000 - Same comments as last insp. 12/04/1998 - None 10/01/1996 - Paint failing at bottoms of piling. 10/01/1994 - None Inspection Notes:



P00020059+05101

****** * * * Span : Main-0 - -1 (cont.) * * * * * * * *

Element Description Smart Flag Scale Factor Env Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 215 - R/Conc Abutment 1 and 5 2 34 m. 95 % % % Previous Inspection Notes : 12/27/2010 - see element 361 for repaired scour. TH 12/29/2008 - None 11/06/2006 - None 02/14/2005 - ADD: Backwalls have vertical cracks that have rust colored efflorescence. The rest of the backwalls have water stains below where the deck meets the backwall at the cork. 05/19/2003 - None 12/26/2000 - Same condition as last insp. 12/04/1998 - None 10/01/1996 - Small vertical cracks in both abutments. Endfills stuffed under extended curbs. 10/01/1994 - None Inspection Notes: Element 234 - R/Conc Cap , Bents 2, 3 and 4 1 1 49.05 m. 100 % % % % Previous Inspection Notes: 12/27/2010 - None 12/29/2008 - None Inspection Notes: Element 331 - Conc Bridge Railing, barrier rail 2 1 67 m. 95 % % % Previous Inspection Notes: 12/27/2010 - the 4 end pieces at bridge ends are square(not tapered). Some vertical cracks, changed from 100,0 to 95,5 percent. TH 12/29/2008 - None 11/06/2006 - None. (33.38 X 2 = 66.76) 02/14/2005 - None 05/19/2003 - None 12/26/2000 - None 12/04/1998 - None 10/01/1996 - None 10/01/1994 - None Inspection Notes:

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P00020059+05101

\$200 FORTHWOOD (1)

Span: Main-0 - -1 (cont.) * * * * * * Element Description Smart Flag Scale Factor Env Quantity Units Insp Each Pct Stat 1 Pct Stat 2 Pct Stat 3 Pct Stat 4 Pct Stat 5 Element 361 - Scour Smart Flag X 1 1 X 100 ea. % % Previous Inspection Notes: 12/27/2010 - Abut 1 right/downstream half and Abut 5 has riprap(photos). TH 12/29/2008 - Since this is in condition state 1, the substructure rating has been changed back to a 7 - Nate. 11/06/2006 - SW upstream bank and halfway under the structure at abut 1 was repaired with gabion baskets after the scour damage. 02/14/2005 - None 05/19/2003 - None 12/26/2000 - Same comments as last insp. 12/04/1998 - None 10/01/1996 - Channel scoured out in summer of 1997. Washed out endfills. Inspection Notes: General Inspection Notes 12/27/2010 - 13' underclearance to water. TH 12/29/2008 - None 11/06/2006 - None 02/14/2005 - None 05/19/2003 - None 12/26/2000 - None 12/04/1998 - None 10/01/1996 - Sufficiency Rating Calculation Accepted by ops\$a0241 at 8/15/97 14:40:12 OPS\$A0241 inspection comments -Structure P00020059+05101 -Date 10/1/96 -Previous comments > Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 14:31:25 Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:11 10/01/1994 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 14:31:25 Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14:59:11 01/01/1993 - Updated with tape 1994 01/01/1991 - Updated with tape 1993 02/01/1989 - Updated with tape 1991 01/01/1987 - Updated with tape 1988

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P00020060+00061

Location: 2M SW FAIRVIEW Structure Name: none

| General L | ocation | Data |
|-----------|---------|------|
|-----------|---------|------|

District Code, Number, Location: 04

Dist 4

GLENDIVE

Division Code, Location: 42

WOLF POINT

County Code, Location: 083

RICHLAND

City Code, Location: 00000

RURAL AREA

Kind fo Hwy Code, Description: 3

3 State Hwy

Signed Route Number: 00200

Str Owner Code, Description: 1

State Highway Agency

Maintained by Code, Description:1

State Highway Agency

Intersecting Feature: SECOND HAY CREEK

Kilometer Post, Mile Post:

60.03

Structure on the State Highway System: X

Structure on the National Highway System:

Latitude: 47°48'52"

Longitude: 104°05'08"

Construction Data

Construction Project Number: RTFBRF20-2(7)52

96.61 km

Str Meet or Exceed NBIS Bridge Length: X

Construction Station Number: 393+13.00 Construction Drawing Number: none

Construction Year: 1986

Current ADT: 3,410

Traffic Data

ADT Count Year: 2009

Percent Trucks:

2 %

Reconstruction Year:

Structure Loading, Rating and Posting Data

Loading Data:

| Design Loading : | | 5 MS 18 (HS 20) |
|-------------------------|-----------|------------------------|
| Inventory Load, Design: | 32.6 mton | B ASD Assigned |
| Operating Load, Design: | 32.6 mton | B ASD Assigned |
| Posting: | | 5 At/Above Legal Loads |

| Rating Data : | Operating | Inventory | Posting |
|--------------------|-----------|-----------|---------|
| Truck 1 Type 3: | | | |
| Truck 2 Type 3-S3: | | | |
| Truck 3 Type 3-3: | 40 | | |

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data:

Structure Length:

8.84 m

Deck Area:

0.00 m sq

Deck Roadway Width:

15.85 m

Approach Roadway Width:

15.85 m

Median Code, Description: 0 No median

Structure Vertical and Horizontal Clearance Data:

Vertical Clearance Over the Structure:

99.99 m

Reference Feature for Vertical Clearance:

N Feature not hwy or RR

Vertical Clearance Under the Structure:

0.00 m

Reference Feature for Lateral Underclearance:

N Feature not hwy or RR

Minimum Lateral Under Clearance Right: Minimum Lateral Under Clearance Left: 0.00 m 0.00 m

Span Data

Main Span

Number Spans: 1

Material Type Code, Description: 3 Steel

Span Design Code, Description: 19 Culvert (includes frame culverts)

Deck

Deck Structure Type: N Not applicable

Deck Surfacing Type: N Not Applicable (applies only to strutures with no dec

Deck Protection Type: N Not applicable (applies only to structures with no de

Deck Membrain Type: N Not applicable (applies only to structures with no de

Approach Span

Number of Spans: 0

Material Type Code, Description:

Span Design Code, Description:

(52) Out-to-Out Width:

0.00 m

(50A) Curb Width:

(50B) Curb Width:

0.00 m

0.00 m

Skew Angle: 38°

Structure Vertical and Horizontal Clearance Data Inventory Route:

| Over / Under Direction | Inventory | South, We | est or Bi-direction | al Travel | North or East Travel | | | |
|------------------------|-----------|-----------|---------------------|------------|----------------------|----------|-----------|--|
| Name | Route | Direction | Vertical | Horizontal | Direction | Vertical | Horizonta | |
| Route On Structure | P00020 | Both | 99.99 m | 15.82 m | N/A | | | |



Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE:

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| Inspe | ction D | ata | | Ins | spection | n Due Date : | 27 December 2 | 2012 | | | |
|---|------------------|-----------|-------------------|--------------------|----------|-----------------|-------------------|--|------------------|---------------|---------------------|
| Sufficiency
Health Ind | Rating: 9 ex:100 | 7 | | (9 | 1) Inspe | ction Fequer | cy (months) : 24 | ļ. | | | |
| Structure S | Status :Not | Defic | ient | | | | | | | | |
| NBI Inspe | ction Da | ta | | | | | | 14 | | Ē. | |
| (90) Date | of Last Insp | ection | 27 Dece | ember 2010 | | | L | ast Inspected B | Troy Hafele - | 2056 | |
| (90 |) Inspection | n Date | э: | | | | | Inspected B | у : | | |
| (| 58) Deck F | Rating | :N | (68) | Deck Ge | ometry: 9 | (36C) A | oproach Rail Ra | ting N | (62) Culve | ert Rating : 7 |
| (59) Supe | rstructure F | Rating | : N | (67) S | tructure | Rating: 7 | (36A) | Bridge Rail Rat | ing : N | (61) Chann | el Rating : 7 |
| (60) Sub | bstructure F | Rating | : N | 1 2 2 | | | (368 |) Transition Rat | ing : N | (71) Waterway | Adequacy 19 |
| | | | | (69) Un | der Clea | arance : N | | | | | |
| (12) | App Rdwy | Align | .0 | (41) | Posting | Status : A | (30 | D) End Rail Rat | ing : [V | (113) 500 | ur Critical : 8 |
| | | | Unrepaire | ed Spalls : | 0 п | n sq | | 9 | Deck Surfacing I | Denth : 0 | .00 in |
| Inspection | n Hours | | от оран | o opalio . | | | | 2.************************************ | Jeck Surfacing I | Берш. | .00 111 |
| Crew Hours | for inspect | tion : | | 1 | | Sr | ooper Required | : N | | | |
| | Helper Ho | urs : | | -1 | | Snooper Hou | rs for inspection | -1 | | 7 | |
| Speci | ial Crew Ho | urs : | | -1 | | | Flagger Hours | -1 | | 1 | |
| Special Eq | uipment Ho | urs : | | -1 | | | | | | _ | |
| Inspecti | on Work | Car | ndidates | | | | Effected | Sco | e of | | Covered |
| Candida | | | Date
lequested | - Sta | tus | Priority | Structure
Unit | Wo | ork | Action | Condition
States |
| Element Ir | nspection | n Da | ta | | | | | | | 775-75-77 | .1 |
| 19 | | | | * * * | **** | * * * Span | : Main-01 * | ***** | • | | |
| Element Des | NA 1070 Y I | | | | | I | | | | | |
| Smart Flag
Element 240 | | | Env | Quantity | Units | Insp Each | Pct Stat 1 | Pct Stat 2 | Pct Stat 3 | Pct Stat 4 | Pct Stat 5 |
| Liement 240 | 1 | Ivert | 3 | PROGRAM BAS AL SAN | m | | 400 | 0 | (=) | N . | |
| | | | 3 | 16 | m. | | 100 | 0 | | 0 | |
| Previous Ins | naction No | tos · | | | | | % | % | 9/ | % | % |
| DE 000000000000000000000000000000000000 | | | concrete | haadwalla with | aanarat | a alana neale | ation along sub- | and become Till | Asidement conce | | |
| 12/29/2008 - | | | | neauwans with | concret | e stope prote | ection along culv | ert bevei. 1 H | | | DZEZ |
| 11/06/2006 | | . 011 111 | vert. | | | | | | | | ZZCI |
| 02/14/2005 | | | | | | | | | | | ZZCZ |
| 05/19/2003 | | | | | | | | | | | RBGZ |
| | | | | | | | | | | | CZKZ |
| 12/26/2000 - | | on! | aabin = a | und rate!=!- | volle 14 | latas alta la t | allow of subsect | | | | OLAH |
| | | ent w | asning are | una retaining v | valis. V | vater sits in b | ottom of culverts | s year around. | | | GAJV |
| 10/01/1996 - | - None | | | | | | | | | | 1002 |

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| General Inspection Notes | |
|--|------|
| 12/27/2010 - None | DZEZ |
| 12/29/2008 - None | ZZGI |
| 11/06/2006 - None | ZZCZ |
| 02/14/2005 - None | Recz |
| 05/19/2003 - None | czkz |
| 12/26/2000 - None | OLAH |
| 12/04/1998 - None | GAJV |
| 10/01/1996 - Sufficiency Rating Calculation Accepted by ops\$a0241 at 8/15/97 14:44:12 OPS\$A0241 inspection comments - Structure P00020060+00061 - Date 10/1/96 - Previous comments > Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 14:31:26 Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 14:31:26 | JOUZ |
| 10/01/1994 - Sufficiency Rating Calculation Accepted by ops\$u5963 at 3/10/97 14;31:26
Sufficiency Rating Calculation Accepted by ops\$u9004 at 2/19/97 14;59:12 | REFI |
| 01/01/1993 - Updated with tape 1994 | N894 |
| 01/01/1991 - Updated with tape 1993 | NB98 |
| 02/01/1989 - Updated with tape 1991 | Maga |
| 01/01/1987 - Updated with tape 1988 | NB86 |
| | |
| | |



Appendix 3

Right-of-Way Information

MT 16 / MT 200 Corridor

| | | West | | East | | | |
|-------|------|--------------------|----------|-------|------|---------------------|----------|
| R | Р | R/W offset from | Distance | R | P. | R/W offset from | Distance |
| Begin | End | Centerline (ft) | (mi) | Begin | End | Centerline (ft) | (mi) |
| 0.8 | 1.3 | 60 | 0.4 | 0.8 | 1.6 | 60 | 0.8 |
| 1.3 | 3.5 | 80 | 2.3 | 1.6 | 2.2 | 100 | 0.5 |
| 3.5 | 4.0 | 100 | 0.5 | 2.2 | 3.5 | 80 | 1.3 |
| 4.0 | 4.2 | 80 | 0.1 | 3.5 | 4.0 | 100 | 0.5 |
| 4.2 | 4.3 | 130 | 0.2 | 4.0 | 6.1 | 80 | 2.1 |
| 4.3 | 4.9 | 80 | 0.6 | 6.1 | 9.7 | 80 | 3.6 |
| 4.9 | 5.1 | 100 | 0.2 | 9.7 | 9.9 | 100 | 0.1 |
| 5.1 | 6.1 | 80 | 1.0 | 9.9 | 12.3 | 80 | 2.4 |
| 6.1 | 8.5 | 80 | 2.4 | 12.3 | 12.4 | 110 | 0.2 |
| 8.5 | 8.7 | 90 | 0.2 | 12.4 | 13.0 | 80 | 0.5 |
| 8.7 | 11.3 | 80 | 2.6 | 13.0 | 13.3 | 80 | 0.3 |
| 11.3 | 11.5 | 90 | 0.3 | 13.3 | 13.3 | 135 | 0.1 |
| 11.5 | 12.2 | 80 | 0.7 | 13.3 | 13.7 | 120 | 0.4 |
| 12.2 | 12.4 | 110 | 0.2 | 13.7 | 13.9 | 67 | 0.2 |
| 12.4 | 13.0 | 80 | 0.5 | 13.9 | 14.1 | 125 | 0.2 |
| 13.0 | 13.2 | 80 | 0.2 | 14.1 | 14.2 | 105 | 0.0 |
| 13.2 | 13.7 | 120 | 0.5 | 14.2 | 15.0 | 110 | 0.9 |
| 13.7 | 14.0 | 80 | 0.3 | 15.0 | 15.2 | 90 | 0.2 |
| 14.0 | 14.2 | 165 | 0.2 | 15.2 | 15.3 | 120 | 0.1 |
| 14.2 | 15.2 | 110 | 1.0 | 15.3 | 15.6 | 90 | 0.3 |
| 15.2 | 15.4 | 140 | 0.1 | 15.6 | 15.8 | 100 | 0.2 |
| 15.4 | 15.6 | 90 | 0.3 | 15.8 | 16.0 | 110 | 0.2 |
| 15.6 | 17.4 | 100 | 1.8 | 16.0 | 17.5 | 100 | 1.4 |
| 17.4 | 17.7 | 125 | 0.3 | 17.5 | 17.7 | 125 | 0.2 |
| 17.7 | 18.4 | 80 | 0.7 | 17.7 | 18.3 | 85 | 0.6 |
| 18.4 | 18.5 | 140 | 0.2 | 18.3 | 18.4 | Varies (borders RR) | 0.2 |
| 18.5 | 18.6 | 90 | 0.1 | 18.4 | 18.6 | 70 | 0.1 |
| 18.9 | 19.1 | 90 | 0.2 | 18.9 | 18.9 | 70 | 0.0 |
| 19.1 | 19.6 | 80 | 0.5 | 18.9 | 19.1 | 90 | 0.1 |
| 19.6 | 19.7 | 150 | 0.1 | 19.1 | 19.1 | 100 | 0.0 |
| 19.7 | 19.7 | 180 | 0.0 | 19.1 | 19.6 | 70 | 0.5 |
| 19.7 | 19.9 | 160 | 0.2 | 19.6 | 19.7 | 100 | 0.1 |
| 19.9 | 20.0 | 128 | 0.1 | 19.7 | 19.8 | 145 | 0.1 |
| 20.0 | 20.1 | 112 | 0.1 | 19.8 | 19.9 | 210 | 0.1 |
| 20.1 | 22.1 | Varies (~100' avg) | 2.0 | 19.9 | 20.1 | 108 | 0.2 |
| 22.1 | 22.2 | 98 | 0.1 | 20.1 | 20.3 | 90 | 0.1 |
| 22.2 | 22.5 | 89 | 0.3 | 20.3 | 20.7 | 82 | 0.4 |
| 22.5 | 22.7 | 95 | 0.2 | 20.7 | 20.8 | 100 | 0.1 |
| 22.7 | 22.7 | 154 | 0.1 | 20.8 | 21.1 | 90 | 0.4 |
| 22.7 | 22.8 | 102 | 0.1 | 21.1 | 21.3 | 80 | 0.1 |
| 22.8 | 23.1 | Varies (~165') | 0.2 | 21.3 | 21.5 | Varies (~57') | 0.2 |
| 23.1 | 24.7 | Varies (~80'-100') | 1.6 | 21.5 | 21.7 | 80 | 0.2 |

| | | West | | East | | | | | | |
|--------------|--------------|--------------------|------------|--------------|--------------|-----------------------|----------|--|--|--|
| R | !P | R/W offset from | Distance | R | !P | R/W offset from | Distance | | | |
| Begin | End | Centerline (ft) | (mi) | Begin | End | Centerline (ft) | (mi) | | | |
| 24.4 | 24.9 | Varies (~80'-100') | 0.5 | 21.7 | 21.8 | 100 | 0.1 | | | |
| 24.8 | 24.9 | 164 | 0.1 | 21.8 | 22.1 | 92 | 0.3 | | | |
| 24.9 | 25.0 | 131 | 0.2 | 22.1 | 22.2 | 118 | 0.0 | | | |
| 25.0 | 25.1 | 112 | 0.1 | 22.2 | 22.4 | 92 | 0.2 | | | |
| 25.1 | 25.2 | 98 | 0.2 | 22.4 | 22.6 | Varies (~100') | 0.2 | | | |
| 25.2 | 25.4 | Varies (~80') | 0.3 | 22.6 | 22.8 | 161 | 0.2 | | | |
| 25.4 | 25.6 | 98 | 0.2 | 22.8 | 23.1 | Varies (~225') | 0.3 | | | |
| 25.6 | 25.6 | 157 | 0.1 | 23.1 | 23.4 | 131 | 0.4 | | | |
| 25.6 | 26.6 | Varies (~95') | 1.0 | 23.4 | 23.6 | 102 | 0.2 | | | |
| 26.5 | 26.8 | Varies (~150') | 0.2 | 23.6 | 23.7 | 141 | 0.0 | | | |
| 26.7 | 26.9 | Varies (~125') | 0.2 | 23.7 | 24.4 | 102 | 0.7 | | | |
| 26.8 | 27.1 | 121 | 0.3 | 24.4 | 24.5 | 89 | 0.1 | | | |
| 27.1 | 27.3 | 270' avg | 0.2 | 24.5 | 24.7 | 82 | 0.1 | | | |
| 27.2 | 27.4 | 112 | 0.2 | 24.4 | 24.5 | 89 | 0.2 | | | |
| 27.4 | 27.7 | Varies (~230') | 0.3 | 24.5 | 24.8 | 82 | 0.3 | | | |
| 27.7 | 27.8 | 213 | 0.1 | 24.8 | 25.0 | Varies (~80') | 0.2 | | | |
| 27.7 | 27.8 | 348 | 0.1 | 24.9 | 25.1 | 144 | 0.2 | | | |
| 27.8 | 28.2 | 194 | 0.4 | 25.0 | 25.2 | 95 | 0.1 | | | |
| 28.1 | 28.2 | 98 | 0.1 | 25.1 | 25.5 | 92 | 0.3 | | | |
| 28.2 | 28.6 | 89 | 0.5 | 25.4 | 26.0 | 112 | 0.5 | | | |
| 28.6 | 29.0 | Varies (~70') | 0.4 | 25.9 | 26.1 | 144 | 0.2 | | | |
| 31.5 | 31.8 | 80 | 0.3 | 26.1 | 26.2 | 102 | 0.2 | | | |
| 31.8 | 31.9 | 90 | 0.1 | 26.2 | 26.3 | 112 | 0.1 | | | |
| 31.9 | 32.1 | 80 | 0.2 | 26.3 | 26.6 | 95 | 0.3 | | | |
| 32.1 | 32.1 | 60 | 0.1 | 26.5 | 26.7 | 118 | 0.2 | | | |
| 32.1 | 32.2 | 90 | 0.1 | 26.7 | 26.9 | 158 | 0.2 | | | |
| 32.2 | 32.3 | 80 | 0.1 | 26.9 | 27.0 | 187 | 0.1 | | | |
| 32.3 | 32.8 | 90 | 0.5 | 26.9 | 27.5 | Varies (~155') | 0.5 | | | |
| 32.8 | 32.9 | 100 | 0.1 | 27.4 | 28.1 | Varies (~165') | 0.7 | | | |
| 32.9 | 33.0 | 90
80 | 0.1 | 28.0 | 28.4 | Varies (~105')
102 | 0.4 | | | |
| 33.0
34.0 | 34.0
34.2 | 60 | 1.0
0.1 | 28.4
28.5 | 28.6
29.0 | Varies (~100') | 0.2 | | | |
| 34.0 | 34.2 | 80 | 0.1 | 31.5 | 31.6 | 80 | 0.4 | | | |
| 34.2 | 34.6 | 70 | 0.4 | 31.5 | 31.6 | 50 | 0.0 | | | |
| 34.6 | 34.7 | 80 | 0.1 | 31.6 | 31.7 | 50
 | 0.0 | | | |
| 34.7 | 35.0 | 90 | 0.1 | 31.7 | 31.7 | 60 | 0.1 | | | |
| 35.0 | 36.0 | 80 | 1.0 | 31.7 | 31.9 | 80 | 0.1 | | | |
| 36.0 | 36.1 | 70 | 0.1 | 31.9 | 31.9 | 68 | 0.0 | | | |
| 36.1 | 37.0 | 80 | 0.1 | 31.9 | 32.0 | 94 | 0.0 | | | |
| 37.0 | 37.1 | 60 | 0.7 | 32.0 | 32.0 | 81 | 0.0 | | | |
| 37.1 | 37.1 | 80 | 0.1 | 32.0 | 32.0 | 87 | 0.0 | | | |
| 37.1 | 37.9 | 90 | 0.4 | 32.0 | 32.2 | 93 | 0.0 | | | |
| 37.9 | 39.2 | 80 | 1.3 | 32.2 | 32.2 | 80 | 0.1 | | | |

| Begin | | | West | | | | East | |
|--|-------|------|-----------------|----------|-------|------|-----------------|----------|
| 39.2 39.4 60 0.1 32.2 32.3 100 0.1 39.4 39.7 80 0.3 32.3 32.4 90 0.1 39.7 39.8 100 0.2 32.4 32.7 80 0.3 39.8 40.6 80 0.7 32.7 32.9 1110 0.2 40.6 40.7 100 0.2 32.9 33.0 90 0.1 40.7 41.2 80 0.5 33.0 34.1 80 1.1 41.2 41.4 100 0.2 34.1 34.3 65 0.1 41.4 42.0 80 0.6 34.3 35.1 80 0.8 42.0 42.5 80 0.6 34.3 35.1 80 0.8 42.0 42.5 80 0.5 35.1 35.6 70 0.5 42.6 42.9 80 0.3 39.0 39.2 70 0.1 42.9 43.5 Varies (-95') 0.6 39.2 39.2 70 0.1 43.6 44.3 80 0.8 40.0 40.0 100 0.3 43.6 44.3 80 0.8 40.0 40.0 60 0.1 44.4 45.2 80 0.7 40.5 40.0 100 0.3 43.6 44.3 80 0.8 40.0 40.0 60 0.1 44.4 45.2 80 0.7 40.5 40.6 65 0.1 45.2 45.3 50 0.1 40.6 41.3 80 0.4 45.2 45.5 80 0.8 40.0 100 0.0 43.6 44.4 45.2 80 0.7 40.5 40.6 65 0.1 45.2 45.3 50 0.1 40.6 41.3 80 0.4 45.2 45.3 50 0.1 40.0 40.0 60 0.1 45.2 45.3 45.6 80 0.3 41.3 41.3 80 0.4 44.4 45.2 80 0.7 40.5 40.6 65 0.1 45.2 45.3 50 0.1 40.6 41.3 80 0.4 45.6 45.6 45.6 80 0.3 41.3 41.4 110 0.1 45.7 45.7 45.7 42 0.0 42.0 42.3 60 0.3 45.6 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.6 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.6 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.7 45.7 45.7 80 0.0 42.0 42.3 60 0.3 45.7 45.7 45.7 80 0.0 42.0 42.3 60 0.3 45.7 45.7 45.7 80 0.0 42.0 42.3 60 0.3 45.6 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.7 45.7 45.7 80 0.0 42.0 42.3 60 0.3 45.6 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.7 45.7 45.7 80 0.0 42.0 42.3 60 0.3 45.6 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.6 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.7 45.7 45.7 80 0.0 42.0 42.3 42.5 80 0.2 45.7 45.7 80 0.0 42.0 42.3 42.5 80 0.2 45.7 45.7 80 0.0 42.0 42.3 42.5 80 0.2 45.7 45.7 45.7 80 0.0 42.0 42.3 80 0.2 45.7 45.7 45.7 80 0.0 42.0 42.3 80 0.2 45.7 45.7 45.7 80 0.0 42.0 42.3 80 0.2 45.7 45.7 45.7 80 0.0 42.0 42.3 80 0.0 46.9 80 0.0 42.0 42.3 80 0.0 46.9 80 0.0 42.0 42.3 80 0.0 46.9 80 0.0 42.0 42.3 80 0.0 46.9 80 0.0 42.0 42.3 80 0.0 46.9 80 0.0 42.0 42.3 80 0.0 46.9 80 0.0 42.0 42.3 80 0.0 48.0 48.0 90 0.0 42.0 42.0 42.3 80 0.0 48.0 48.0 49.0 90 0.0 42.0 42.0 42.3 80 0.0 48.0 48.0 49.0 90 0.0 44.0 40.0 80 0.0 48.0 48.0 49.0 90 0.0 40.0 40.0 80 0.0 48.0 49.0 4 | R | !P | R/W offset from | Distance | R | !P | R/W offset from | Distance |
| 39,4 39,7 80 0.3 32,3 32,4 90 0.1 | Begin | End | Centerline (ft) | (mi) | Begin | End | Centerline (ft) | (mi) |
| 39.7 39.8 100 0.2 32.4 32.7 80 0.3 39.8 40.6 80 0.7 32.7 32.9 1110 0.2 40.6 40.7 100 0.2 32.9 33.0 90 0.1 40.7 41.2 80 0.5 33.0 34.1 80 1.1 41.2 41.4 100 0.2 34.1 34.3 65 0.1 41.4 42.0 80 0.6 34.3 35.1 80 0.8 42.0 42.5 80 0.5 35.1 35.6 70 0.5 42.5 42.6 105 0.1 35.6 39.0 80 3.5 42.6 42.9 80 0.3 39.0 39.2 70 0.1 42.9 43.5 Varies(-95) 0.6 39.2 39.6 80 0.5 43.5 43.6 100 0.1 39.6 40.0 | 39.2 | 39.4 | 60 | 0.1 | 32.2 | 32.3 | 100 | 0.1 |
| 39.8 40.6 80 0.7 32.7 32.9 110 0.2 40.6 40.7 100 0.2 32.9 33.0 90 0.1 40.7 41.2 80 0.5 33.0 34.1 80 1.1 41.2 41.4 100 0.2 34.1 34.3 65 0.1 41.4 42.0 80 0.6 34.3 35.1 80 0.8 42.0 42.5 80 0.5 35.1 35.6 70 0.5 42.6 42.9 80 0.3 39.0 80 3.5 42.6 42.9 80 0.3 39.0 39.2 70 0.1 42.9 43.5 Varies(-95) 0.6 39.2 39.6 80 0.5 43.5 43.6 100 0.1 39.6 40.0 100 0.3 43.5 43.6 44.3 80 0.8 40.0 40.0 | 39.4 | 39.7 | 80 | 0.3 | 32.3 | 32.4 | 90 | 0.1 |
| 40.6 40.7 100 0.2 32.9 33.0 90 0.1 40.7 41.2 80 0.5 33.0 34.1 80 1.1 41.2 41.4 100 0.2 34.1 34.3 35.1 80 0.8 42.0 42.5 80 0.5 35.1 35.6 70 0.5 42.5 42.6 105 0.1 35.6 39.0 80 35.1 42.6 42.9 80 0.3 39.0 39.2 70 0.1 42.9 43.5 Varies (-95') 0.6 39.2 39.6 80 0.5 43.5 43.6 100 0.1 39.6 40.0 100 0.3 43.5 43.6 100 0.1 39.6 40.0 100 0.3 43.5 43.6 100 0.1 40.0 40.5 80 0.4 44.4 45.2 80 0.7 40.5 </td <td>39.7</td> <td>39.8</td> <td>100</td> <td>0.2</td> <td>32.4</td> <td>32.7</td> <td>80</td> <td>0.3</td> | 39.7 | 39.8 | 100 | 0.2 | 32.4 | 32.7 | 80 | 0.3 |
| 40.7 41.2 80 0.5 33.0 34.1 80 1.1 41.2 41.4 100 0.2 34.1 34.3 65 0.1 41.4 42.0 80 0.6 34.3 35.1 80 0.8 42.5 80 0.5 35.1 35.6 70 0.5 42.5 42.6 105 0.1 35.6 39.0 80 3.5 42.6 42.9 80 0.3 39.0 39.2 70 0.1 42.9 43.5 Varies (-95') 0.6 39.2 39.6 80 0.5 43.5 43.6 100 0.1 39.6 40.0 100 0.3 43.6 44.3 80 0.8 40.0 40.0 60 0.1 44.4 45.2 80 0.7 40.5 40.6 65 0.1 45.2 45.3 50 0.1 40.6 41.3 80 | 39.8 | 40.6 | 80 | 0.7 | 32.7 | 32.9 | 110 | 0.2 |
| 41.2 41.4 100 0.2 34.1 34.3 65 0.1 41.4 42.0 80 0.6 34.3 35.1 80 0.8 42.0 42.5 80 0.5 35.1 35.6 70 0.5 42.5 42.6 105 0.1 35.6 39.0 80 3.5 42.6 42.9 80 0.3 39.0 39.2 70 0.1 42.9 43.5 Varies (-95') 0.6 39.2 39.6 80 0.5 43.5 43.6 100 0.1 39.6 40.0 100 0.3 43.6 44.3 80 0.8 40.0 40.0 60 0.1 44.4 45.2 80 0.7 40.5 80 0.4 44.4.4 45.2 80 0.7 40.5 40.6 65 0.1 45.3 45.6 80 0.3 41.3 80 0.7 | 40.6 | 40.7 | 100 | 0.2 | 32.9 | 33.0 | 90 | 0.1 |
| 41.4 42.0 80 0.6 34.3 35.1 80 0.8 42.0 42.5 80 0.5 35.1 35.6 70 0.5 42.5 42.6 105 0.1 35.6 39.0 80 3.5 42.6 42.9 80 0.3 39.0 39.2 70 0.1 42.9 43.5 Varies (-95') 0.6 39.2 39.6 80 0.5 43.5 43.6 100 0.1 39.6 40.0 100 0.0 43.5 43.6 100 0.1 39.6 40.0 100 0.0 43.3 44.4 60 0.1 40.0 40.0 60 0.1 44.3 44.4 60 0.1 40.0 40.5 80 0.4 44.4 45.2 80 0.7 40.5 40.6 65 0.1 45.2 45.3 50 0.1 40.6 41.3 | 40.7 | 41.2 | 80 | 0.5 | 33.0 | 34.1 | 80 | 1.1 |
| 42.0 42.5 80 0.5 35.1 35.6 70 0.5 42.5 42.6 105 0.1 35.6 39.0 80 3.5 42.6 42.9 80 0.3 39.0 39.2 70 0.1 42.9 43.5 Varies (-95) 0.6 39.2 39.6 80 0.5 43.5 43.6 100 0.1 39.6 40.0 100 0.3 43.6 44.3 80 0.8 40.0 40.0 60 0.1 44.3 44.4 60 0.1 40.0 40.5 80 0.4 44.4 45.2 80 0.7 40.5 40.6 65 0.1 45.2 45.3 50 0.1 40.6 41.3 80 0.7 45.3 45.6 80 0.3 41.3 41.4 110 0.1 45.6 45.6 56 0.0 41.7 42.0 | 41.2 | 41.4 | 100 | 0.2 | 34.1 | 34.3 | 65 | 0.1 |
| 42.5 42.6 105 0.1 35.6 39.0 80 3.5 42.6 42.9 80 0.3 39.0 39.2 70 0.1 42.9 43.5 Varies (-95') 0.6 39.2 39.6 80 0.5 43.5 43.6 100 0.1 39.6 40.0 100 0.3 43.6 44.3 80 0.8 40.0 40.0 60 0.1 44.3 44.4 60 0.1 40.0 40.5 80 0.4 44.4 45.2 80 0.7 40.5 40.6 65 0.1 45.2 45.3 50 0.1 40.6 41.3 80 0.7 45.3 45.6 80 0.3 41.3 41.4 110 0.1 45.6 45.6 45.6 56 0.0 41.7 42.0 60 0.3 45.6 45.6 45.6 45.0 42.0 <td>41.4</td> <td>42.0</td> <td>80</td> <td>0.6</td> <td>34.3</td> <td>35.1</td> <td>80</td> <td>0.8</td> | 41.4 | 42.0 | 80 | 0.6 | 34.3 | 35.1 | 80 | 0.8 |
| 42.6 42.9 80 0.3 39.0 39.2 70 0.1 42.9 43.5 Varies (-95') 0.6 39.2 39.6 80 0.5 43.5 43.6 100 0.1 39.6 40.0 100 0.3 43.6 44.3 80 0.8 40.0 40.0 60 0.1 44.3 44.4 60 0.1 40.0 40.5 80 0.4 44.4 45.2 80 0.7 40.5 40.6 65 0.1 45.2 45.3 50 0.1 40.6 41.3 80 0.7 45.3 45.6 80 0.3 41.3 41.4 110 0.1 45.6 45.6 56 0.0 41.4 41.7 80 0.3 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.6 45.7 42 0.0 42.3 42.5 | 42.0 | 42.5 | 80 | 0.5 | 35.1 | 35.6 | 70 | 0.5 |
| 42.9 43.5 Varies (-95') 0.6 39.2 39.6 80 0.5 43.5 43.6 100 0.1 39.6 40.0 100 0.3 43.6 44.3 80 0.8 40.0 40.0 60 0.1 44.3 44.4 60 0.1 40.0 40.5 80 0.4 44.4 45.2 80 0.7 40.5 40.6 65 0.1 45.2 45.3 50 0.1 40.6 41.3 80 0.7 45.3 45.6 80 0.3 41.3 41.4 110 0.1 45.6 45.6 56 0.0 41.4 41.7 80 0.3 45.6 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.7 45.7 64 0.0 42.3 42.5 80 0.2 45.7 45.7 80 0.0 42.5 | 42.5 | 42.6 | 105 | 0.1 | 35.6 | 39.0 | 80 | 3.5 |
| 43.5 43.6 100 0.1 39.6 40.0 100 0.3 43.6 44.3 80 0.8 40.0 40.0 60 0.1 44.3 44.4 60 0.1 40.0 40.5 80 0.4 44.4 45.2 80 0.7 40.5 40.6 655 0.1 45.2 45.3 50 0.1 40.6 41.3 80 0.7 45.3 45.6 80 0.3 41.3 41.4 110 0.1 45.6 45.6 80 0.3 41.3 41.4 110 0.1 45.6 45.6 45.6 45.6 45.6 45.0 0.0 41.7 42.0 60 0.3 45.6 45.7 42 0.0 42.3 42.5 80 0.3 45.7 45.7 64 0.0 42.3 42.5 80 0.2 45.7 45.7 80 | 42.6 | 42.9 | 80 | 0.3 | 39.0 | 39.2 | 70 | 0.1 |
| 43.6 44.3 80 0.8 40.0 40.0 60 0.1 44.3 44.4 60 0.1 40.0 40.5 80 0.4 44.4 45.2 80 0.7 40.5 40.6 65 0.1 45.2 45.3 50 0.1 40.6 41.3 80 0.7 45.6 45.6 80 0.3 41.3 41.4 110 0.1 45.6 45.6 56 0.0 41.4 41.7 80 0.3 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.6 45.6 45 45 0.0 41.7 42.0 60 0.3 45.7 45.7 42 0.0 42.0 42.3 60 0.3 45.7 45.7 80 0.0 42.5 80 0.2 45.7 46.3 60 0.6 42.6 42.9 80 <td>42.9</td> <td>43.5</td> <td>Varies (~95')</td> <td>0.6</td> <td>39.2</td> <td>39.6</td> <td>80</td> <td>0.5</td> | 42.9 | 43.5 | Varies (~95') | 0.6 | 39.2 | 39.6 | 80 | 0.5 |
| 44.3 44.4 60 0.1 40.0 40.5 80 0.4 44.4 45.2 80 0.7 40.5 40.6 65 0.1 45.2 45.3 50 0.1 40.6 41.3 80 0.7 45.3 45.6 80 0.3 41.3 41.4 110 0.1 45.6 45.6 56 0.0 41.4 41.7 80 0.3 45.6 45.6 45 0.0 41.4 41.7 80 0.3 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.6 45.7 42 0.0 42.0 42.3 60 0.3 45.7 45.7 64 0.0 42.3 42.5 80 0.2 45.7 45.7 80 0.0 42.5 42.6 110 0.1 45.7 46.3 60 0.6 42.6 42.9 80 | 43.5 | 43.6 | 100 | 0.1 | 39.6 | 40.0 | 100 | 0.3 |
| 44.4 45.2 80 0.7 40.5 40.6 65 0.1 45.2 45.3 50 0.1 40.6 41.3 80 0.7 45.3 45.6 80 0.3 41.3 41.4 110 0.1 45.6 45.6 56 0.0 41.7 42.0 60 0.3 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.6 45.7 42 0.0 42.0 42.3 60 0.3 45.7 45.7 64 0.0 42.5 80 0.2 45.7 45.7 80 0.0 42.5 42.6 110 0.1 45.7 46.3 60 0.6 42.6 42.9 80 0.2 45.7 46.3 60 0.6 42.6 42.9 80 0.3 46.7 46.9 80 0.1 42.9 43.0 50 0.1< | 43.6 | 44.3 | 80 | 0.8 | 40.0 | 40.0 | 60 | 0.1 |
| 45.2 45.3 50 0.1 40.6 41.3 80 0.7 45.3 45.6 80 0.3 41.3 41.4 110 0.1 45.6 45.6 56 0.0 41.4 41.7 80 0.3 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.6 45.7 42 0.0 42.0 42.3 60 0.3 45.7 45.7 64 0.0 42.3 42.5 80 0.2 45.7 45.7 64 0.0 42.5 42.6 110 0.1 45.7 45.7 80 0.0 42.5 42.6 110 0.1 45.7 46.3 60 0.6 42.6 42.9 80 0.3 46.3 46.4 80 0.1 42.9 43.0 50 0.1 46.7 100 0.3 43.0 44.0 80 1. | 44.3 | | | | | | | |
| 45.3 45.6 80 0.3 41.3 41.4 110 0.1 45.6 45.6 56 0.0 41.4 41.7 80 0.3 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.6 45.7 42 0.0 42.0 42.3 60 0.3 45.7 45.7 64 0.0 42.3 42.5 80 0.2 45.7 45.7 80 0.0 42.5 42.6 110 0.1 45.7 46.3 60 0.6 42.6 42.9 80 0.3 46.3 46.3 60 0.6 42.6 42.9 80 0.3 46.3 46.4 80 0.1 42.9 43.0 50 0.1 46.7 46.9 80 0.2 44.0 43.3 60 0.3 46.9 47.2 60 0.3 44.3 44.4 95 | | | | | | | | |
| 45.6 45.6 56 0.0 41.4 41.7 80 0.3 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.6 45.7 42 0.0 42.0 42.3 60 0.3 45.7 45.7 64 0.0 42.3 42.5 80 0.2 45.7 45.7 80 0.0 42.5 42.6 110 0.1 45.7 46.3 60 0.6 42.6 42.9 80 0.3 46.3 46.4 80 0.1 42.9 43.0 50 0.1 46.3 46.4 80 0.1 42.9 43.0 50 0.1 46.4 46.7 100 0.3 43.0 44.0 80 1.0 46.7 46.9 80 0.2 44.0 44.3 60 0.3 46.7 47.9 80 0.7 44.4 47.3 50 | | | | | | | | |
| 45.6 45.6 45 0.0 41.7 42.0 60 0.3 45.6 45.7 42 0.0 42.0 42.3 60 0.3 45.7 45.7 64 0.0 42.3 42.5 80 0.2 45.7 45.7 80 0.0 42.5 42.6 110 0.1 45.7 46.3 60 0.6 42.6 42.9 80 0.3 46.3 46.4 80 0.1 42.9 43.0 50 0.1 46.4 46.7 100 0.3 43.0 44.0 80 1.0 46.7 46.9 80 0.2 44.0 44.3 60 0.3 46.9 47.2 60 0.3 44.3 44.4 95 0.1 47.2 47.9 80 0.7 44.4 47.3 50 (RR converges) 2.9 47.9 48.0 100 0.1 47.3 47.5 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> | | | | | | | | |
| 45.6 45.7 42 0.0 42.0 42.3 60 0.3 45.7 45.7 64 0.0 42.3 42.5 80 0.2 45.7 45.7 80 0.0 42.5 42.6 110 0.1 45.7 46.3 60 0.6 42.6 42.9 80 0.3 46.3 46.4 80 0.1 42.9 43.0 50 0.1 46.4 46.7 100 0.3 43.0 44.0 80 1.0 46.7 46.9 80 0.2 44.0 44.3 60 0.3 46.9 47.2 60 0.3 44.3 44.4 95 0.1 47.2 47.9 80 0.7 44.4 47.3 50 (RR converges) 2.9 47.9 48.0 100 0.1 47.3 47.5 120' avg (RR diverges) 0.2 48.0 48.0 90 0.0 47.5 | | | | | | 41.7 | 80 | |
| 45.7 45.7 64 0.0 42.3 42.5 80 0.2 45.7 45.7 80 0.0 42.5 42.6 110 0.1 45.7 46.3 60 0.6 42.6 42.9 80 0.3 46.3 46.4 80 0.1 42.9 43.0 50 0.1 46.4 46.7 100 0.3 43.0 44.0 80 1.0 46.7 46.9 80 0.2 44.0 44.3 60 0.3 46.9 47.2 60 0.3 44.3 44.4 95 0.1 47.2 47.9 80 0.7 44.4 47.3 50 (RR converges) 2.9 47.9 48.0 100 0.1 47.3 47.5 120' avg (RR diverges) 0.2 48.0 48.0 90 0.0 47.5 47.9 70 0.4 48.0 48.3 70 0.2 47.9 | | | | | | | | |
| 45.7 45.7 80 0.0 42.5 42.6 110 0.1 45.7 46.3 60 0.6 42.6 42.9 80 0.3 46.3 46.4 80 0.1 42.9 43.0 50 0.1 46.4 46.7 100 0.3 43.0 44.0 80 1.0 46.7 46.9 80 0.2 44.0 44.3 60 0.3 46.9 47.2 60 0.3 44.3 44.4 95 0.1 47.2 47.9 80 0.7 44.4 47.3 50 (RR converges) 2.9 47.9 48.0 100 0.1 47.3 47.5 120' avg (RR diverges) 0.2 48.0 48.0 90 0.0 47.5 47.9 70 0.4 48.0 48.3 70 0.2 47.9 48.1 120' avg (RR diverges) 0.2 48.3 48.6 80 0.3 | | | | | | | | |
| 45.7 46.3 60 0.6 42.6 42.9 80 0.3 46.3 46.4 80 0.1 42.9 43.0 50 0.1 46.4 46.7 100 0.3 43.0 44.0 80 1.0 46.7 46.9 80 0.2 44.0 44.3 60 0.3 46.9 47.2 60 0.3 44.3 44.4 95 0.1 47.2 47.9 80 0.7 44.4 47.3 50 (RR converges) 2.9 47.9 48.0 100 0.1 47.3 47.5 120' avg (RR diverges) 0.2 48.0 48.0 90 0.0 47.5 47.9 70 0.4 48.0 48.3 70 0.2 47.9 48.1 120' avg (RR diverges) 0.2 48.3 48.6 80 0.3 48.1 48.2 80 0.1 48.6 48.7 50 0.1 | | | | | | | | |
| 46.3 46.4 80 0.1 42.9 43.0 50 0.1 46.4 46.7 100 0.3 43.0 44.0 80 1.0 46.7 46.9 80 0.2 44.0 44.3 60 0.3 46.9 47.2 60 0.3 44.3 44.4 95 0.1 47.2 47.9 80 0.7 44.4 47.3 50 (RR converges) 2.9 47.9 48.0 100 0.1 47.3 47.5 120' avg (RR diverges) 0.2 48.0 48.0 90 0.0 47.5 47.9 70 0.4 48.0 48.3 70 0.2 47.9 48.1 120' avg (RR diverges) 0.2 48.3 48.6 80 0.3 48.1 48.2 80 0.1 48.6 48.7 50 0.1 48.2 48.2 70 0.1 48.7 49.6 80 0.9 | | | | | | | | |
| 46.4 46.7 100 0.3 43.0 44.0 80 1.0 46.7 46.9 80 0.2 44.0 44.3 60 0.3 46.9 47.2 60 0.3 44.3 44.4 95 0.1 47.2 47.9 80 0.7 44.4 47.3 50 (RR converges) 2.9 47.9 48.0 100 0.1 47.3 47.5 120' avg (RR diverges) 0.2 48.0 48.0 90 0.0 47.5 47.9 70 0.4 48.0 48.3 70 0.2 47.9 48.1 120' avg (RR diverges) 0.2 48.3 48.6 80 0.3 48.1 48.2 80 0.1 48.6 48.7 50 0.1 48.2 48.2 80 0.1 48.7 49.6 80 0.9 48.2 48.7 80 0.4 49.6 49.7 50 0.1 | | | | | | | | |
| 46.7 46.9 80 0.2 44.0 44.3 60 0.3 46.9 47.2 60 0.3 44.3 44.4 95 0.1 47.2 47.9 80 0.7 44.4 47.3 50 (RR converges) 2.9 47.9 48.0 100 0.1 47.3 47.5 120' avg (RR diverges) 0.2 48.0 48.0 90 0.0 47.5 47.9 70 0.4 48.0 48.3 70 0.2 47.9 48.1 120' avg (RR diverges) 0.2 48.0 48.0 90 0.0 47.5 47.9 70 0.4 48.0 48.3 70 0.2 47.9 48.1 120' avg 0.2 48.3 48.6 80 0.3 48.1 48.2 80 0.1 48.6 48.7 50 0.1 48.2 48.2 70 0.1 48.7 49.6 80 0.9 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> | | | | | | | | |
| 46.9 47.2 60 0.3 44.3 44.4 95 0.1 47.2 47.9 80 0.7 44.4 47.3 50 (RR converges) 2.9 47.9 48.0 100 0.1 47.3 47.5 120' avg (RR diverges) 0.2 48.0 48.0 90 0.0 47.5 47.9 70 0.4 48.0 48.3 70 0.2 47.9 48.1 120' avg (RR diverges) 0.2 48.3 48.6 80 0.2 47.9 48.1 120' avg (RR diverges) 0.2 48.3 70 0.2 47.9 48.1 120' avg 0.2 48.3 48.6 80 0.3 48.1 48.2 80 0.1 48.6 48.7 50 0.1 48.2 48.2 70 0.1 48.7 49.6 80 0.9 48.2 48.7 80 0.4 49.6 49.7 50 0.1 48.7 48.8 90 0.1 49.7 49.8 80 | | | | | | | | |
| 47.2 47.9 80 0.7 44.4 47.3 50 (RR converges) 2.9 47.9 48.0 100 0.1 47.3 47.5 120' avg (RR diverges) 0.2 48.0 48.0 90 0.0 47.5 47.9 70 0.4 48.0 48.3 70 0.2 47.9 48.1 120' avg 0.2 48.3 48.6 80 0.3 48.1 48.2 80 0.1 48.6 48.7 50 0.1 48.2 48.2 70 0.1 48.7 49.6 80 0.9 48.2 48.7 80 0.4 49.6 49.7 50 0.1 48.7 48.8 90 0.1 49.7 49.8 80 0.1 48.8 47.8 80 -1.0 49.8 50.0 100 0.2 47.8 49.0 60 1.2 50.0 50.2 80 0.2 49.0 49.0 80 0.0 50.2 50.4 60 0.2 | | | | | | | | |
| 47.9 48.0 100 0.1 47.3 47.5 120' avg (RR diverges) 0.2 48.0 48.0 90 0.0 47.5 47.9 70 0.4 48.0 48.3 70 0.2 47.9 48.1 120' avg 0.2 48.3 48.6 80 0.3 48.1 48.2 80 0.1 48.6 48.7 50 0.1 48.2 48.2 70 0.1 48.7 49.6 80 0.9 48.2 48.7 80 0.4 49.6 49.7 50 0.1 48.7 48.8 90 0.1 49.7 49.8 80 0.1 48.8 47.8 80 -1.0 49.8 50.0 100 0.2 47.8 49.0 60 1.2 50.0 50.2 80 0.2 49.0 49.0 80 0.0 50.2 50.4 60 0.2 49.0 < | | | | | | | | |
| 48.0 48.0 90 0.0 47.5 47.9 70 0.4 48.0 48.3 70 0.2 47.9 48.1 120' avg 0.2 48.3 48.6 80 0.3 48.1 48.2 80 0.1 48.6 48.7 50 0.1 48.2 48.2 70 0.1 48.7 49.6 80 0.9 48.2 48.7 80 0.4 49.6 49.7 50 0.1 48.7 48.8 90 0.1 49.7 49.8 80 0.1 48.8 47.8 80 -1.0 49.8 50.0 100 0.2 47.8 49.0 60 1.2 50.0 50.2 80 0.2 49.0 49.0 80 0.0 50.2 50.4 60 0.2 49.0 49.2 50 0.1 52.6 53.2 40 0.7 49.2 50.0 | | | | | | | | |
| 48.0 48.3 70 0.2 47.9 48.1 120' avg 0.2 48.3 48.6 80 0.3 48.1 48.2 80 0.1 48.6 48.7 50 0.1 48.2 48.2 70 0.1 48.7 49.6 80 0.9 48.2 48.7 80 0.4 49.6 49.7 50 0.1 48.7 48.8 90 0.1 49.7 49.8 80 0.1 48.8 47.8 80 -1.0 49.8 50.0 100 0.2 47.8 49.0 60 1.2 50.0 50.2 80 0.2 49.0 49.0 80 0.0 50.2 50.4 60 0.2 49.0 49.2 50 0.1 52.6 53.2 40 0.7 49.2 50.0 80 0.8 | | | | | | | <u> </u> | |
| 48.3 48.6 80 0.3 48.1 48.2 80 0.1 48.6 48.7 50 0.1 48.2 48.2 70 0.1 48.7 49.6 80 0.9 48.2 48.7 80 0.4 49.6 49.7 50 0.1 48.7 48.8 90 0.1 49.7 49.8 80 0.1 48.8 47.8 80 -1.0 49.8 50.0 100 0.2 47.8 49.0 60 1.2 50.0 50.2 80 0.2 49.0 49.0 80 0.0 50.2 50.4 60 0.2 49.0 49.2 50 0.1 52.6 53.2 40 0.7 49.2 50.0 80 0.8 | | | | | | | | |
| 48.6 48.7 50 0.1 48.2 48.2 70 0.1 48.7 49.6 80 0.9 48.2 48.7 80 0.4 49.6 49.7 50 0.1 48.7 48.8 90 0.1 49.7 49.8 80 0.1 48.8 47.8 80 -1.0 49.8 50.0 100 0.2 47.8 49.0 60 1.2 50.0 50.2 80 0.2 49.0 49.0 80 0.0 50.2 50.4 60 0.2 49.0 49.2 50 0.1 52.6 53.2 40 0.7 49.2 50.0 80 0.8 | | | | | | | | |
| 48.7 49.6 80 0.9 48.2 48.7 80 0.4 49.6 49.7 50 0.1 48.7 48.8 90 0.1 49.7 49.8 80 0.1 48.8 47.8 80 -1.0 49.8 50.0 100 0.2 47.8 49.0 60 1.2 50.0 50.2 80 0.2 49.0 49.0 80 0.0 50.2 50.4 60 0.2 49.0 49.2 50 0.1 52.6 53.2 40 0.7 49.2 50.0 80 0.8 | | | | | | | | |
| 49.6 49.7 50 0.1 48.7 48.8 90 0.1 49.7 49.8 80 0.1 48.8 47.8 80 -1.0 49.8 50.0 100 0.2 47.8 49.0 60 1.2 50.0 50.2 80 0.2 49.0 49.0 80 0.0 50.2 50.4 60 0.2 49.0 49.2 50 0.1 52.6 53.2 40 0.7 49.2 50.0 80 0.8 | | | | | | | | |
| 49.7 49.8 80 0.1 48.8 47.8 80 -1.0 49.8 50.0 100 0.2 47.8 49.0 60 1.2 50.0 50.2 80 0.2 49.0 49.0 80 0.0 50.2 50.4 60 0.2 49.0 49.2 50 0.1 52.6 53.2 40 0.7 49.2 50.0 80 0.8 | | | | | | | | |
| 49.8 50.0 100 0.2 47.8 49.0 60 1.2 50.0 50.2 80 0.2 49.0 49.0 80 0.0 50.2 50.4 60 0.2 49.0 49.2 50 0.1 52.6 53.2 40 0.7 49.2 50.0 80 0.8 | | | | | | | | |
| 50.0 50.2 80 0.2 49.0 49.0 80 0.0 50.2 50.4 60 0.2 49.0 49.2 50 0.1 52.6 53.2 40 0.7 49.2 50.0 80 0.8 | | | | | | | | |
| 50.2 50.4 60 0.2 49.0 49.2 50 0.1 52.6 53.2 40 0.7 49.2 50.0 80 0.8 | | | | | | | | |
| 52.6 53.2 40 0.7 49.2 50.0 80 0.8 | | | | | | | | |
| | | | | | | | | |
| 627 627 76 77 EAA 60 60 60 60 60 60 60 | 53.2 | 53.4 | 40
45 | 0.7 | 50.0 | 50.0 | 60 | 0.8 |
| 53.2 53.4 45 0.2 50.0 50.3 60 0.3 53.4 53.5 55 0.1 50.3 50.3 110 0.0 | | | | | | | | |

| | | West | | | | East | |
|-------|------|-----------------|----------|-------|------|-----------------------|----------|
| R | Р | R/W offset from | Distance | R | .P | R/W offset from | Distance |
| Begin | End | Centerline (ft) | (mi) | Begin | End | Centerline (ft) | (mi) |
| 53.5 | 53.7 | 70 | 0.2 | 50.3 | 50.4 | 70 | 0.0 |
| 53.7 | 53.7 | 60 | 0.1 | 52.6 | 52.7 | 50 | 0.1 |
| 53.7 | 53.9 | 100 | 0.2 | 52.7 | 52.8 | 65 | 0.1 |
| 53.9 | 54.0 | 50 | 0.1 | 52.8 | 53.2 | 170 (includes FR R/W) | 0.5 |
| 54.0 | 54.2 | 105 | 0.2 | 53.2 | 53.9 | 70' avg | 0.6 |
| 54.2 | 54.5 | 50 | 0.3 | 53.9 | 53.9 | 60 | 0.0 |
| 54.5 | 54.7 | 105 | 0.1 | 53.9 | 54.1 | 50 | 0.3 |
| 54.7 | 54.8 | 50 | 0.1 | 54.1 | 54.2 | 80' avg | 0.0 |
| 54.8 | 55.2 | 105 | 0.4 | 54.2 | 54.2 | 50 | 0.1 |
| 55.2 | 55.5 | 50 | 0.4 | 54.2 | 54.8 | 60 | 0.5 |
| 55.5 | 55.6 | 60 | 0.1 | 54.8 | 55.2 | 48 | 0.4 |
| 55.6 | 56.3 | 70 | 0.7 | 55.2 | 57.9 | 60 | 2.7 |
| 56.3 | 56.4 | 50 | 0.1 | 57.9 | 58.0 | 70 | 0.1 |
| 56.4 | 57.0 | 70 | 0.6 | 58.0 | 58.1 | 60 | 0.1 |
| 57.0 | 57.4 | 50 | 0.4 | 58.1 | 59.6 | 50 | 1.5 |
| 57.4 | 57.8 | 70 | 0.4 | 59.6 | 60.0 | 70 | 0.4 |
| 57.8 | 57.9 | 60 | 0.1 | 60.0 | 60.2 | 80 | 0.2 |
| 57.9 | 58.1 | 55 | 0.1 | 60.2 | 61.4 | 70 | 1.2 |
| 58.1 | 58.1 | 50 | 0.0 | 61.4 | 61.5 | 60 | 0.2 |
| 58.1 | 58.2 | 60 | 0.1 | 61.5 | 61.6 | 50 | 0.1 |
| 58.2 | 58.6 | 70 | 0.4 | 61.6 | 61.6 | 45 | 0.0 |
| 58.6 | 58.7 | 50 | 0.1 | 61.6 | 61.7 | 50 | 0.1 |
| 58.7 | 59.2 | 70 | 0.5 | 61.7 | 62.3 | 60 | 0.6 |
| 59.2 | 59.6 | 80 | 0.4 | 62.3 | 62.4 | 70 | 0.1 |
| 59.6 | 59.7 | 60 | 0.1 | 62.4 | 62.5 | 80 | 0.1 |
| 59.7 | 60.1 | 80 | 0.4 | | | | |
| 60.1 | 61.4 | 70 | 1.3 | | | | |
| 61.4 | 61.7 | 60 | 0.2 | | | | |
| 61.7 | 61.7 | 75 | 0.0 | | | | |
| 61.7 | 61.7 | 80 | 0.0 | | | | |
| 61.7 | 62.0 | 70 | 0.3 | | | | |
| 62.0 | 62.2 | 60 | 0.2 | | | | |
| 62.2 | 62.3 | 70 | 0.1 | | | | |
| 62.3 | 62.5 | 80 | 0.2 | | | | |
| 62.5 | 62.5 | 70 | 0.0 | | | | |



Appendix 4

Geometric Characteristics

Table 1 Horizontal Alignment Analysis

| <i>(</i> 0) | | Curve | | | Superelevation Rate ⁽³⁾ | Design/Posted | Min. Sight | Meet Min. Sight | Curve | Correct Spiral | Meet Min. | Required | Meet Min. | |
|---------------------------------|---------------|----------------|----------------|------------------------------------|------------------------------------|----------------|---------------------|----------------------------|--------------------------------|---------------------|---------------------|------------------------|---|--------------------|
| Curve PI ⁽¹⁾
(RP) | Curve
Type | Length
(ft) | Radius
(ft) | Deflection
Angle ⁽²⁾ | Existing / Required | Speed
(mph) | Obstruction
(ft) | Distance (SSD)
(730 ft) | Type
Correct ⁽⁴⁾ | Curve
Dimensions | Radius
(1810 ft) | Superelevation
Rate | Curve Length
(1,050 ft) ⁽⁵⁾ | Curve
Pass/Fail |
| 1.1 | Simple | 867 | 2,865 | 17°20'00" | UNKNOWN / 7% | 70 / 45 | 23.2 | YES | NO | N/A ⁽⁸⁾ | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |
| 1.4 | Simple | 275 | 5,730 | 2°45'00" | UNKNOWN / 4% | 70 / 70 | 11.6 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | NO | PASS |
| 3.2 | Simple | 3,084 | 7,640 | 23°08'00" | UNKNOWN / 3% | 70 / 70 | 8.7 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |
| 5.8 | Simple | 2,133 | 5,730 | 21°20'00" | UNKNOWN / 4% | 70 / 70 | 11.6 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |
| 7.3 | Simple | 485 | 11,460 | 2°25'30" | UNKNOWN / 2% | 60 / 70 | 5.8 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | NO | PASS |
| 9.5 | Simple | 945 | 5,730 | 9°27'00" | UNKNOWN / 4% | 60 / 70 | 11.6 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |
| 10.3 | Simple | 1,013 | 11,460 | 5°04'00" | UNKNOWN / 2% | 60 / 70 | 5.8 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |
| 12.1 | Simple | 2,152 | 5,730 | 21°31'00" | UNKNOWN / 4% | 60 / 70 | 11.6 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |
| 13.5 | Simple | 2,097 | 5,730 | 20°58'00" | UNKNOWN / 4% | 70 / 70 | 11.6 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |
| 15.1 | Simple | 1,142 | 5,730 | 11°25'00" | UNKNOWN / 4% | 70 / 70 | 11.6 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |
| 17.4 | Simple | 321 | 5,730 | 3°12'30" | UNKNOWN / 4% | 70 / 70 | 11.6 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | NO | PASS |
| 18.3 | Simple | 1,993 | 3,820 | 29°54'00" | UNKNOWN / 6% | 70 / 70 | 17.4 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |
| 20.0 | Simple | 1,544 | 5,741 | 15°24'47" | 3 / 3% | 62 / 70 | 8.0 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 20.8 | Simple | 2,143 | 5,741 | 21°23'14" | 3 / 3% | 62 / 70 | 8.0 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 22.5 | Simple | 1,913 | 13,451 | 8°08'48" | 0 / 0% | 62 / 70 | 3.4 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 23.2 | Simple | 2,075 | 4,593 | 25°52'52" | 4 / 4% | 62 / 70 | 10.0 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 23.8 | Simple | 2,215 | 13,451 | 9°26'00" | 0 / 0% | 62 / 70 | 3.4 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 24.4 | Simple | 481 | 11,893 | 2°19'08" | 0 / 0% | 62 / 70 | 0.0 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 24.5 | Simple | 551 | 11,893 | 2°39'11" | 0 / 0% | 62 / 70 | 3.9 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 24.8 | Simple | 1,758 | 4,101 | 24°33'20" | 4 / 4% | 62 / 70 | 11.2 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 25.8 | Simple | 1,604 | 5,741 | 28°46'32" | 3 / 3% | 62 / 70 | 8.0 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 27.1 | Simple | 3,424 | 6,562 | 29°53'54" | 3 / 3% | 62 / 70 | 7.0 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 27.7 | Simple | 1,821 | 13,451 | 7°45'25" | 0 / 0% | 62 / 70 | 3.4 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 31.5 | Simple | 500 | 18,753 | 1°31'41" | 0 / 0% | 70 / 70 | 3.6 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 31.7 | Simple | 500 | 18,753 | 1°31'41" | 0 / 0% | 70 / 55 | 3.6 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 32.1 | Simple | 2,275 | 4,298 | 30°20'00" | 4 / 5% | 70 / 55 | 15.5 | YES | YES | N/A ⁽⁸⁾ | YES | NO | N/A ⁽⁹⁾ | FAIL |
| 32.7 | Simple | 400 | 11,460 | 2°00'00" | 2 / 2% | 70 / 55 | 5.8 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 32.9 | Simple | 423 | 11,460 | 2°07'00" | 2 / 2% | 70 / 70 | 5.8 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 34.5 | Simple | 2,428 | 4,248 | 32°22'30" | 5 / 5% | 70 / 70 | 15.7 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 35.6 | Simple | 529 | 22,920 | 1°19'22" | 0 / 0% | 70 / 70 | 2.9 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 36.0 | Simple | 1,489 | 22,920 | 3°43'22" | 0 / 0% | 70 / 70 | 2.9 | YES | YES | N/A ⁽⁸⁾ | YES | YES | YES | PASS |
| 37.1 | Simple | 1,787 | 22,920 | 4°28'00" | 0 / 0% | 70 / 70 | 2.9 | YES | YES | N/A ⁽⁸⁾ | YES | YES | YES | PASS |
| 37.8 | Simple | 1,617 | 7,640 | 12°07'30" | 3 / 3% | 70 / 70 | 8.7 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 38.3 | Simple | 1,357 | 11,460 | 6°47'00" | 2 / 2% | 70 / 70 | 5.8 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 39.9 | Spiral | 1,000 | 3,820 | 18°00'00" | 5 / 6% | 70 / 70 | 17.4 | YES | YES | YES | YES | NO | N/A ⁽⁹⁾ | FAIL |
| 41.2 | Spiral | 1,529 | 2,865 | 34°34'00" | 6 / 7% | 70 / 70 | 23.2 | YES | YES | NO | YES | NO | N/A ⁽⁹⁾ | FAIL |
| 41.7 | Simple | 1,773 | 4,584 | 22°10'00" | 4 / 5% | 70 / 70 | 14.5 | YES | YES | N/A ⁽⁸⁾ | YES | NO | N/A ⁽⁹⁾ | FAIL |
| 42.4 | Simple | 250 | 11,460 | 1°15'00" | 2 / 2% | 70 / 70 | 5.8 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 43.8 | Simple | 433 | 11,460 | 2°10'00" | UNKNOWN / 2% | 70 / 70 | 5.8 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | NO | PASS |
| 44.4 | Simple | 715 | 5,730 | 7°09'00" | UNKNOWN / 4% | 70 / 70 | 11.6 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |
| 47.2 | Simple | 848 | 5,730 | 8°29'00" | UNKNOWN / 4% | 70 / 70 | 11.6 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |

| 40 | | Curve | | | Superelevation Rate ⁽³⁾ | Design/Posted | Min. Sight | Meet Min. Sight | Curve | Correct Spiral | Meet Min. | Required | Meet Min. | |
|---------------------------------|------------------------|--------------------|--------------------|------------------------------------|------------------------------------|----------------|---------------------|----------------------------|--------------------------------|---------------------|---------------------|------------------------|---|--------------------|
| Curve PI ⁽¹⁾
(RP) | Curve
Type | Length
(ft) | Radius
(ft) | Deflection
Angle ⁽²⁾ | Existing / Required | Speed
(mph) | Obstruction
(ft) | Distance (SSD)
(730 ft) | Type
Correct ⁽⁴⁾ | Curve
Dimensions | Radius
(1810 ft) | Superelevation
Rate | Curve Length
(1,050 ft) ⁽⁵⁾ | Curve
Pass/Fail |
| 48.0 | Spiral | 1,348 | 3,820 | 23°13'00" | UNKNOWN / 6% | 70 / 70 | 17.4 | YES | YES | YES | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |
| 48.6 | Simple | 1,744 | 7,640 | 13°05'00" | UNKNOWN / 3% | 70 / 70 | 8.7 | YES | YES | N/A ⁽⁸⁾ | YES | UNKNOWN | N/A ⁽⁹⁾ | PASS |
| 52.7 | Simple | 300 | 9,292 | 1°51'00" | 0 / 3% | 70 / 45 | 7.2 | YES | YES | N/A ⁽⁸⁾ | YES | NO | NO | FAIL |
| 52.7 | Simple | 300 | 7,813 | 2°12'00" | 0 / 3% | 70 / 45 | 8.5 | YES | YES | N/A ⁽⁸⁾ | YES | NO | NO | FAIL |
| 53.2 | Simple | 999 | 85,579 | 0°40'10" | 0 / 0% | 70 / 45 | 0.8 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 53.5 | Simple | 999 | 85,587 | 0°40'10" | 0 / 0% | 70 / 70 | 0.8 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 53.7 | No H.C. ⁽⁶⁾ | N/A ⁽⁷⁾ | N/A ⁽⁷⁾ | 0°1'00'' | 0 / 0% | 70 / 70 | N/A ⁽⁷⁾ | N/A ⁽⁷⁾ | NO | N/A ⁽⁷⁾ | N/A ⁽⁷⁾ | YES | YES | PASS |
| 55.6 | Simple | 900 | 57,296 | 0°54'01" | 0 / 0% | 70 / 70 | 1.2 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 55.9 | Simple | 900 | 57,276 | 0°54'01" | 0 / 0% | 70 / 70 | 1.2 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 56.4 | No H.C. ⁽⁶⁾ | N/A ⁽⁷⁾ | N/A ⁽⁷⁾ | 0°6'30'' | 0 / 0% | 70 / 70 | N/A ⁽⁷⁾ | N/A ⁽⁷⁾ | NO | N/A ⁽⁷⁾ | N/A ⁽⁷⁾ | YES | YES | PASS |
| 57.8 | Simple | 800 | 26,675 | 1°43'06" | 0 / 0% | 70 / 70 | 2.5 | YES | YES | N/A ⁽⁸⁾ | YES | YES | NO | PASS |
| 58.1 | Simple | 839 | 4,297 | 11°10'55" | 5 / 5% | 70 / 70 | 15.5 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 59.2 | Simple | 895 | 5,730 | 8°57'01" | 4 / 4% | 70 / 70 | 11.6 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 60.2 | Simple | 1,343 | 11,459 | 6°43'00" | 2 / 2% | 70 / 70 | 5.8 | YES | YES | N/A ⁽⁸⁾ | YES | YES | N/A ⁽⁹⁾ | PASS |
| 60.9 | Spiral | 592 | 1,910 | 25°15'00" | 8 / 8% | 70 / 70 | 34.8 | YES | YES | YES | YES | YES | N/A ⁽⁹⁾ | PASS |
| 61.6 | Spiral | 643 | 2,865 | 15°51'00" | 5 / 7% | 70 / 70 | 23.2 | YES | YES | NO | YES | NO | N/A ⁽⁹⁾ | FAIL |

Source: MDT, 2012; DOWL HKM, 2012; MDT Record Drawings; MDT Road Design Manual, pages 9.2(1), 9.2(7), 9.5(1), 12(7). All values are approximated based on available data. Red text indicates information considered in the Pass/Fail determination.

PI indicates the point of tangent intersection, which is defined as the intersection of the initial and final tangents.

Deflection angle indicates the average degree of curvature and is a measure of the sharpness of the curve. A larger deflection angle indicates a sharper curve.

⁽³⁾ Superelevation rate was considered in the Pass/Fail determination where necessary data was available.

Per MDT Road Design Manual page 9.2(1), it is MDT practice to use a spiral curve when the radius is less than 3,820 ft. Because curve type is not listed as a design requirement, curve type is not considered in the Pass/Fail determination.

⁽⁵⁾ Per MDT Road Design Manual page 9.2(7), it is MDT practice to specify a minimum curve length of 1,050 ft. for a design speed of 70 mph. Because curve length is not listed as a design requirement, curve length is not considered in the Pass/Fail determination.

⁽⁶⁾ No H.C. = no horizontal curve. Per MDT Road Design Manual page 9.2(6), horizontal deflections 1-degree or less do not require a curve.

⁽⁷⁾ No horizontal curve was constructed at the horizontal deflection.

⁽⁸⁾ Horizontal curve is a simple type curve.

⁽⁹⁾ Minimum curve length only applies to deflections less than 5-degrees.

Table 2 Vertical Alignment Analysis

| Curve PVI ⁽¹⁾
(RP) | Curve
Type ⁽²⁾ | Curve
Length (ft) | K Value ⁽³⁾
247 (crest)
181 (sag) | Grade
Back | Grade
Ahead | Design / Posted
Speed (mph) | Meet Min. K
Value | Meet Max. Grade
(3% - Level, 4%
Rolling Terrain) | Meet Min. Grade (0.5%) | Meet Min. Curve Length ⁽⁴⁾
(210 ft required / 1,000 ft recommended) | Curve/Tangent
Pass/Fail |
|----------------------------------|------------------------------|----------------------|--|---------------|----------------|--------------------------------|----------------------|--|------------------------|---|----------------------------|
| 1.0 | SAG | 400 | 1,231 | -0.373% | -0.048% | 70 / 45 | YES | YES | NO | YES | PASS |
| 1.4 | CREST | 1,000 | 532 | -0.048% | -1.926% | 70 / 70 | YES | YES | NO | YES | PASS |
| 1.7 | SAG | 1,000 | 571 | -1.926% | -0.176% | 70 / 70 | YES | YES | NO | YES | PASS |
| 2.3 | SAG | 1,000 | 419 | -0.176% | 2.212% | 70 / 70 | YES | YES | NO | YES | PASS |
| 2.7 | CREST | 1,400 | 350 | 2.212% | -1.793% | 70 / 70 | YES | YES | YES | YES | PASS |
| 3.0 | SAG | 800 | 332 | -1.793% | 0.618% | 70 / 70 | YES | YES | YES | YES | PASS |
| 3.4 | CREST | 800 | 948 | 0.618% | -0.226% | 70 / 70 | YES | YES | NO | YES | PASS |
| 3.9 | SAG | 800 | 230 | -0.226% | 3.252% | 70 / 70 | YES | NO | NO | YES | FAIL |
| 4.0 | CREST | 850 | 253 | 3.252% | -0.112% | 70 / 70 | YES | NO | NO | YES | FAIL |
| 4.9 | SAG | 1,000 | 336 | -0.112% | 2.866% | 70 / 70 | YES | YES | NO | YES | PASS |
| 5.2 | CREST | 1,200 | 404 | 2.866% | -0.105% | 70 / 70 | YES | YES | NO | YES | PASS |
| 5.6 | SAG | 1,000 | 614 | -0.105% | 1.523% | 70 / 70 | YES | YES | NO | YES | PASS |
| 5.8 | CREST | 1,000 | 290 | 1.523% | -1.920% | 70 / 70 | YES | YES | YES | YES | PASS |
| 5.9 | SAG | 800 | 870 | -1.920% | -1.000% | 70 / 70 | YES | YES | YES | YES | PASS |
| 6.2 | SAG | 600 | 1,054 | -1.000% | -0.431% | 60 / 70 | YES | YES | NO | YES | PASS |
| 6.4 | CREST | 800 | 1,191 | -0.431% | -1.103% | 60 / 70 | YES | YES | NO | YES | PASS |
| 6.9 | SAG | 600 | 625 | -1.103% | -0.143% | 60 / 70 | YES | YES | NO | YES | PASS |
| 7.2 | CREST | 1,600 | 2,614 | -0.143% | -0.755% | 60 / 70 | YES | YES | NO | YES | PASS |
| 7.5 | SAG | 800 | 1,822 | -0.755% | -0.316% | 60 / 70 | YES | YES | NO | YES | PASS |
| 8.1 | SAG | 800 | 687 | -0.316% | 0.849% | 60 / 70 | YES | YES | NO | YES | PASS |
| 8.6 | CREST | 1,200 | 2,963 | 0.849% | 0.444% | 60 / 70 | YES | YES | NO | YES | PASS |
| 8.9 | CREST | 800 | 12,698 | 0.444% | 0.381% | 60 / 70 | YES | YES | NO | YES | PASS |
| 9.7 | CREST | 2,600 | 821 | 0.381% | -2.784% | 60 / 70 | YES | YES | NO | YES | PASS |
| 10.1 | SAG | 1,200 | 286 | -2.784% | 1.405% | 60 / 70 | YES | YES | YES | YES | PASS |
| 10.5 | CREST | 2,000 | 1,340 | 1.405% | -0.088% | 60 / 70 | YES | YES | NO | YES | PASS |
| 11.4 | CREST | 2,600 | 1,444 | -0.088% | -1.889% | 60 / 70 | YES | YES | NO | YES | PASS |
| 11.8 | SAG | 800 | 389 | -1.889% | 0.167% | 60 / 70 | YES | YES | NO | YES | PASS |
| 12.2 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | 0.167% | 0.066% | 60 / 70 | N/A ⁽⁵⁾ | YES | N/A ⁽⁵⁾ | NO | PASS |
| 12.5 | SAG | 800 | 318 | 0.066% | 2.583% | 60 / 70 | YES | YES | NO | YES | PASS |
| 12.8 | CREST | 1,800 | 1,137 | 2.583% | 1.000% | 60 / 70 | YES | YES | YES | YES | PASS |
| 13.1 | CREST | 1,800 | 707 | 1.000% | -1.545% | 70 / 70 | YES | YES | YES | YES | PASS |
| 13.8 | SAG | 1,000 | 290 | -1.545% | 1.905% | 70 / 70 | YES | YES | YES | YES | PASS |
| 14.4 | CREST | 1,600 | 1,113 | 1.905% | 0.468% | 70 / 70 | YES | YES | NO | YES | PASS |
| 15.0 | CREST | 2,300 | 421 | 0.468% | -5.000% | 70 / 70 | YES | NO | NO | YES | FAIL |
| 15.3 | SAG | 800 | 164 | -5.000% | -0.110% | 70 / 70 | NO | NO | NO | YES | FAIL |
| 15.6 | SAG | 800 | 155 | -0.110% | 5.049% | 70 / 70 | NO | NO | NO | YES | FAIL |
| 16.1 | CREST | 2,500 | 355 | 5.049% | -1.988% | 70 / 70 | YES | NO | YES | YES | FAIL |
| 16.7 | SAG | 1,000 | 236 | -1.988% | 2.250% | 70 / 70 | YES | YES | YES | YES | PASS |
| 17.0 | CREST | 1,900 | 380 | 2.250% | -2.750% | 70 / 70 | YES | YES | YES | YES | PASS |
| 17.4 | SAG | 1,600 | 1,302 | -2.750% | -1.521% | 70 / 70 | YES | YES | YES | YES | PASS |
| 17.6 | CREST | 800 | 1,457 | -1.521% | -2.070% | 70 / 70 | YES | YES | YES | YES | PASS |

| Curve PVI ⁽¹⁾
(RP) | Curve
Type ⁽²⁾ | Curve
Length (ft) | K Value ⁽³⁾
247 (crest)
181 (sag) | Grade
Back | Grade
Ahead | Design / Posted
Speed (mph) | Meet Min. K
Value | Meet Max. Grade
(3% - Level, 4%
Rolling Terrain) | Meet Min. Grade (0.5%) | Meet Min. Curve Length ⁽⁴⁾ (210 ft required / 1,000 ft recommended) | Curve/Tangent
Pass/Fail |
|----------------------------------|------------------------------|----------------------|--|---------------|----------------|--------------------------------|----------------------|--|------------------------|--|----------------------------|
| 18.0 | SAG | 900 | 521 | -2.070% | -0.343% | 70 / 70 | YES | YES | NO | YES | PASS |
| 18.2 | SAG | 200 | 798 | -0.343% | -0.093% | 70 / 70 | YES | YES | NO | NO | PASS |
| 18.3 | CREST | 500 | 456 | -0.093% | -1.190% | 70 / 70 | YES | YES | NO | YES | PASS |
| 18.4 | SAG | 500 | 442 | -1.190% | -0.060% | 70 / 70 | YES | YES | NO | YES | PASS |
| 18.7 | CREST | 700 | 337 | -0.060% | -2.140% | 70 / 70 | YES | YES | NO | YES | PASS |
| 19.1 | CREST | 300 | 231 | -0.203% | -1.500% | 62 / 70 | YES | YES | NO | YES | PASS |
| 18.9 | SAG | 300 | 115 | -1.500% | 1.106% | 62 / 70 | YES | YES | YES | YES | PASS |
| 19.2 | CREST | 300 | 358 | 1.106% | 0.267% | 62 / 70 | YES | YES | NO | YES | PASS |
| 19.4 | SAG | 300 | 112 | 0.267% | 2.953% | 62 / 70 | YES | YES | NO | YES | PASS |
| 19.6 | CREST | 300 | 111 | 2.953% | 0.248% | 62 / 70 | YES | YES | NO | YES | PASS |
| 20.5 | CREST | 600 | 942 | 0.248% | -0.389% | 62 / 70 | YES | YES | NO | YES | PASS |
| 21.4 | CREST | 400 | 1,342 | -0.389% | -0.687% | 62 / 70 | YES | YES | NO | YES | PASS |
| 21.9 | SAG | 400 | 823 | -0.687% | -0.201% | 62 / 70 | YES | YES | NO | YES | PASS |
| 23.0 | SAG | 300 | 743 | -0.201% | 0.203% | 62 / 70 | YES | YES | NO | YES | PASS |
| 23.4 | SAG | 300 | 248 | 0.203% | 1.411% | 62 / 70 | YES | YES | NO | YES | PASS |
| 23.9 | CREST | 600 | 2,083 | 1.411% | 1.123% | 62 / 70 | YES | YES | YES | YES | PASS |
| 24.6 | CREST | 200 | 656 | -1.237% | -1.542% | 62 / 70 | YES | YES | YES | YES | PASS |
| 24.7 | CREST | 200 | 173 | -1.542% | -2.696% | 62 / 70 | YES | YES | YES | YES | PASS |
| 25.0 | SAG | 500 | 114 | -2.696% | 1.681% | 62 / 70 | YES | YES | YES | YES | PASS |
| 25.4 | SAG | 300 | 160 | 1.681% | 3.554% | 62 / 70 | YES | YES | YES | YES | PASS |
| 25.8 | CREST | 700 | 209 | 3.554% | 0.204% | 62 / 70 | YES | YES | NO | YES | PASS |
| 26.4 | CREST | 700 | 209 | 0.204% | -3.148% | 62 / 70 | YES | YES | NO | YES | PASS |
| 27.1 | SAG | 600 | 92 | -3.148% | 3.350% | 62 / 70 | YES | YES | YES | YES | PASS |
| 27.9 | CREST | 800 | 141 | 3.350% | -2.332% | 62 / 70 | YES | YES | YES | YES | PASS |
| 28.4 | SAG | 300 | 227 | -2.332% | -1.008% | 62 / 70 | YES | YES | YES | YES | PASS |
| 28.7 | CREST | 200 | 329 | -1.008% | -1.615% | 62 / 70 | YES | YES | YES | YES | PASS |
| 31.8 | CREST | 400 | 322 | -0.258% | -1.500% | 70 / 55 | YES | YES | NO | YES | PASS |
| 31.9 | SAG | 400 | 229 | -1.500% | 0.250% | 70 / 55 | YES | YES | NO | YES | PASS |
| 32.1 | CREST | 300 | 164 | 0.250% | -1.580% | 70 / 70 | NO | YES | NO | YES | FAIL |
| 32.3 | SAG | 600 | 405 | -1.580% | -0.100% | 70 / 70 | YES | YES | NO | YES | PASS |
| 32.5 | SAG | 600 | 297 | -0.100% | 1.918% | 70 / 70 | YES | YES | NO | YES | PASS |
| 32.6 | CREST | 340 | 226 | 1.918% | 0.410% | 70 / 70 | NO | YES | NO | YES | FAIL |
| 32.9 | CREST | 1,200 | 453 | 2.556% | -0.092% | 70 / 70 | YES | YES | NO | YES | PASS |
| 34.3 | SAG | 1,200 | 3,625 | -0.081% | 0.250% | 70 / 70 | YES | YES | NO | YES | PASS |
| 34.8 | CREST | 1,200 | 2,226 | 0.250% | -0.289% | 70 / 70 | YES | YES | NO | YES | PASS |
| 35.3 | SAG | 1,200 | 8,511 | -0.284% | -0.143% | 70 / 70 | YES | YES | NO | YES | PASS |
| 35.8 | SAG | 1,200 | 1,171 | -0.143% | 0.882% | 70 / 70 | YES | YES | NO | YES | PASS |
| 36.1 | CREST | 1,800 | 812 | 0.882% | -1.336% | 70 / 70 | YES | YES | YES | YES | PASS |
| 36.4 | SAG | 1,200 | 836 | -1.336% | 0.100% | 70 / 70 | YES | YES | NO | YES | PASS |
| 37.0 | CREST | 1,200 | 2,709 | 0.100% | -0.343% | 70 / 70 | YES | YES | NO | YES | PASS |
| 37.7 | CREST | 1,200 | 1,400 | -0.343% | -1.200% | 70 / 70 | YES | YES | NO | YES | PASS |
| 37.9 | SAG | 1,200 | 922 | -1.200% | 0.102% | 70 / 70 | YES | YES | NO | YES | PASS |
| 39.0 | SAG | 1,200 | 3,488 | 0.102% | 0.446% | 70 / 70 | YES | YES | NO | YES | PASS |
| 39.2 | CREST | 1,200 | 1,788 | 0.446% | -0.225% | 70 / 70 | YES | YES | NO | YES | PASS |
| 39.6 | CREST | 1,200 | 897 | -0.225% | -1.563% | 70 / 70 | YES | YES | NO | YES | PASS |

| Curve PVI ⁽¹⁾
(RP) | Curve
Type ⁽²⁾ | Curve
Length (ft) | K Value ⁽³⁾
247 (crest)
181 (sag) | Grade
Back | Grade
Ahead | Design / Posted
Speed (mph) | Meet Min. K
Value | Meet Max. Grade
(3% - Level, 4%
Rolling Terrain) | Meet Min. Grade (0.5%) | Meet Min. Curve Length ⁽⁴⁾ (210 ft required / 1,000 ft recommended) | Curve/Tangent
Pass/Fail |
|----------------------------------|------------------------------|----------------------|--|---------------|----------------|--------------------------------|----------------------|--|------------------------|--|----------------------------|
| 39.9 | SAG | 1,200 | 914 | -1.563% | -0.250% | 70 / 70 | YES | YES | NO | YES | PASS |
| 40.4 | SAG | 1,200 | 3,133 | -0.250% | 0.133% | 70 / 70 | YES | YES | NO | YES | PASS |
| 40.9 | SAG | 1,200 | 5,581 | 0.133% | 0.348% | 70 / 70 | YES | YES | NO | YES | PASS |
| 41.4 | SAG | 1,200 | 1,128 | 0.348% | 1.412% | 70 / 70 | YES | YES | NO | YES | PASS |
| 41.7 | CREST | 1,200 | 732 | 1.412% | -0.227% | 70 / 70 | YES | YES | NO | YES | PASS |
| 41.9 | CREST | 1,200 | 20,339 | -0.227% | -0.286% | 70 / 70 | YES | YES | NO | YES | PASS |
| 42.1 | SAG | 400 | 1,778 | -0.286% | -0.061% | 70 / 70 | YES | YES | NO | YES | PASS |
| 42.7 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.061% | -0.200% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 42.9 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.200% | -0.142% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 43.5 | CREST | 1,600 | 726 | -0.142% | -2.346% | 70 / 70 | YES | YES | NO | YES | PASS |
| 43.7 | SAG | 800 | 354 | -2.346% | -0.083% | 70 / 70 | YES | YES | NO | YES | PASS |
| 44.0 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.083% | -0.091% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 44.2 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.091% | 0.083% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 44.5 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | 0.083% | -0.100% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 44.9 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.100% | 0.086% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 45.0 | CREST | 400 | 1,347 | 0.086% | -0.211% | 70 / 70 | YES | YES | NO | YES | PASS |
| 45.2 | SAG | 400 | 1,190 | -0.211% | 0.125% | 70 / 70 | YES | YES | NO | YES | PASS |
| 45.3 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | 0.125% | -0.054% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 45.8 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.054% | -0.061% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 46.2 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.061% | 0.146% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 46.5 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | 0.146% | 0.083% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 46.7 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | 0.083% | -0.136% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 46.9 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.136% | -0.067% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 47.2 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.067% | -0.154% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 47.5 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.154% | 0.047% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 47.7 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | 0.047% | -0.068% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 47.9 | SAG | 800 | 339 | -0.068% | 2.295% | 70 / 70 | YES | YES | NO | YES | PASS |
| 48.1 | CREST | 1,200 | 507 | 2.295% | -0.073% | 70 / 70 | YES | YES | NO | YES | PASS |
| 48.3 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.073% | -0.190% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 48.5 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.190% | 0.090% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 48.7 | CREST | 400 | 1,208 | 0.090% | -0.241% | 70 / 70 | YES | YES | NO | YES | PASS |
| 48.9 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.241% | -0.047% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 49.2 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | -0.047% | -0.062% | 70 / 70 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 49.7 | CREST | 800 | 1,322 | -0.062% | -0.667% | 70 / 70 | YES | YES | NO | YES | PASS |
| 49.8 | SAG | 500 | 609 | -0.667% | 0.154% | 70 / 45 | YES | YES | NO | YES | PASS |
| 50.0 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | 0.154% | 0.100% | 70 / 45 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 50.3 | No V.C. ⁽⁵⁾ | N/A ⁽⁵⁾ | N/A ⁽⁵⁾ | 0.100% | 0.250% | 70 / 45 | N/A ⁽⁵⁾ | YES | NO | N/A ⁽⁵⁾ | PASS |
| 52.6 | CREST | 200 | 339 | 0.250% | -0.340% | 70 / 45 | YES | YES | NO | NO | PASS |
| 52.9 | SAG | 200 | 313 | -0.340% | 0.300% | 70 / 45 | YES | YES | NO | NO | PASS |
| 52.9 | CREST | 200 | 294 | 0.300% | -0.380% | 70 / 45 | YES | YES | NO | NO | PASS |
| 53.0 | SAG | 200 | 345 | -0.380% | 0.200% | 70 / 45 | YES | YES | NO | NO | PASS |
| 53.1 | CREST | 200 | 370 | 0.200% | -0.340% | 70 / 45 | YES | YES | NO | NO | PASS |
| 53.2 | SAG | 200 | 286 | -0.340% | 0.360% | 70 / 45 | YES | YES | NO | NO | PASS |
| 53.3 | CREST | 200 | 357 | 0.360% | -0.200% | 70 / 45 | YES | YES | NO | NO | PASS |
| 53.8 | SAG | 1,000 | 2,500 | -0.200% | 0.200% | 70 / 70 | YES | YES | NO | YES | PASS |

| Curve PVI ⁽¹⁾
(RP) | Curve
Type ⁽²⁾ | Curve
Length (ft) | K Value ⁽³⁾
247 (crest)
181 (sag) | Grade
Back | Grade
Ahead | Design / Posted
Speed (mph) | Meet Min. K
Value | Meet Max. Grade
(3% - Level, 4%
Rolling Terrain) | Meet Min. Grade (0.5%) | Meet Min. Curve Length ⁽⁴⁾ (210 ft required / 1,000 ft recommended) | Curve/Tangent
Pass/Fail |
|----------------------------------|------------------------------|----------------------|--|---------------|----------------|--------------------------------|----------------------|--|------------------------|--|----------------------------|
| 54.0 | CREST | 1,000 | 2,500 | 0.200% | -0.200% | 70 / 70 | YES | YES | NO | YES | PASS |
| 56.2 | SAG | 1,000 | 3,125 | -0.200% | 0.120% | 70 / 70 | YES | YES | NO | YES | PASS |
| 55.0 | CREST | 1,000 | 4,000 | 0.120% | -0.130% | 70 / 70 | YES | YES | NO | YES | PASS |
| 55.9 | SAG | 1,000 | 4,348 | -0.130% | 0.100% | 70 / 70 | YES | YES | NO | YES | PASS |
| 56.3 | CREST | 1,000 | 5,000 | 0.100% | -0.100% | 70 / 70 | YES | YES | NO | YES | PASS |
| 56.9 | SAG | 1,000 | 3,125 | -0.100% | 0.220% | 70 / 70 | YES | YES | NO | YES | PASS |
| 57.6 | SAG | 1,000 | 1,639 | 0.220% | 0.830% | 70 / 70 | YES | YES | NO | YES | PASS |
| 58.1 | CREST | 2,000 | 1,189 | 0.830% | -0.852% | 70 / 70 | YES | YES | YES | YES | PASS |
| 58.7 | SAG | 1,000 | 774 | -0.852% | 0.440% | 70 / 70 | YES | YES | NO | YES | PASS |
| 59.1 | CREST | 2,000 | 1,449 | 0.440% | -0.940% | 70 / 70 | YES | YES | NO | YES | PASS |
| 59.5 | SAG | 2,000 | 1,754 | -0.940% | 0.200% | 70 / 70 | YES | YES | NO | YES | PASS |
| 60.4 | SAG | 1,000 | 2,439 | 0.200% | 0.610% | 70 / 70 | YES | YES | NO | YES | PASS |
| 61.0 | CREST | 2,000 | 1,357 | 0.610% | -0.864% | 70 / 70 | YES | YES | YES | YES | PASS |
| 61.7 | SAG | 2,000 | 1,880 | -0.864% | 0.200% | 70 / 70 | YES | YES | NO | YES | PASS |
| 62.1 | SAG | 500 | 1,064 | 0.200% | 0.670% | 70 / 70 | YES | YES | NO | YES | PASS |
| 62.4 | CREST | 1,000 | 719 | 0.670% | -0.720% | 70 / 70 | YES | YES | YES | YES | PASS |

Source: MDT, 2012; DOWL HKM, 2012; MDT Record Drawings; MDT Road Design Manual, pages 10.5(1), 10.5(3), 10.5 (5), 10.5(7), 12(7). All values are approximated based on available data. Red text indicates information considered in the Pass/Fail determination.

(1) PVI indicates the point of vertical intersection, which is defined as the intersection of the initial and final grades.
(2) Sag curves have a positive grade change (as in a valley); crest curves have a negative grade change (as on a hill).
(3) K value is the horizontal distance needed to produce a one percent change in gradient.
(4) See MDT Road Design Manual pages 10.5(3) and 10.5(7).
(5) No vertical curve was installed at the PVI (vertical grade only).



Appendix 5

Access Point Locations

Table 1 Access Points in Segment 1 (RP 0.6 to RP 31.5)

| | | Privat Dr | iveways 1 | | C | ommerci | al Access 2 | | | Road A | ccess 3 | | Farm Field | d Access ⁴ |
|--------------|----------------|-----------|-------------|-------|-------------|---------|--------------|-------|----------|--------|---------------|-------|------------|-----------------------|
| Reference | Wes | st | Eas | st | Wes | st | Eas | t | Wes | st | Eas | t | West | East |
| Post | I la marina al | Davis | I lance and | David | I lance and | Davis | Unanavad | D d | Unanasad | Davis | I la marina d | Davis | Unanavad | Unanasad |
| 0.73 | Unpaved
1 | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved
1 | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Unpaved |
| 0.76 | 1 | | | | | | 1 | | | | | | | |
| 0.79 | 1 | | | 1 | | | | | | | | | | |
| 0.80 | | | 1 | | | | | | | | | | | |
| 0.82
0.83 | | | | | 1 | | 1 | | | | | | | |
| 0.84 | | | | | 1 | | 1 | | | | | | | |
| 0.89 | | | | | | | 1 | | | | | | | |
| 0.92 | 1 | | | | | | | | | | | | | |
| 0.97
1.00 | | | 1 | | | | 1 | | | | | | | |
| 1.03 | 1 | | | | | | | | | | | | | |
| 1.06 | 1 | | | | | | | | | | | | | |
| 1.09 | | | 1 | | | | | | | | | | | |
| 1.16
1.22 | | | | | | | 1 | | | 1 | 1 | | | |
| 1.26 | | | | | 1 | | | | | | 1 | | | |
| 1.28 | | | | | | | | | 1 | | | | | |
| 1.31 | | | | | | | 1 | | | | | | | |
| 1.38
1.50 | | | | | 1 | | 1
1 | | | | | | | |
| 1.62 | | | | | 1 | | 1 | | | | | | | |
| 1.73 | | | | | | | 1 | | | | | | | |
| 1.81 | | | 1 | | | | | | | | | | | |
| 1.96
2.37 | 1 | | | | | | | | | | | | 1 | |
| 2.64 | 1 | | 1 | | | | | | | | | | 1 | |
| 2.71 | | | 1 | | | | | | | | | | | |
| 2.75 | | | 1 | | | | | | | | | | | |
| 1.00
2.80 | | | 1
1 | | | | | | | | | | | |
| 2.85 | 1 | | 1 | | | | | | | | | | | |
| 2.97 | | | 1 | | | | | | | | | | | |
| 3.14 | | | | | | | 1 | | | | | | | |
| 3.39
3.53 | 1 | | 1 | | | | | | | | | | | |
| 3.56 | | | 1 | | | | | | | | | | | |
| 3.59 | 1 | | _ | | | | | | | | | | | |
| 3.72 | | | | | | | | | | | | 1 | | |
| 3.86
4.07 | | | | | 1 | | | | | | | | | 1 |
| 4.07 | | | 1 | | 1 | | | | | | | | | 1 |
| 4.50 | 1 | | | | | | | | | | | | | |
| 4.53 | 1 | | | | | | | | | | 1 | | | |
| 4.78 | | | 4 | | | | | | | | | | | 1 |
| 5.05
5.16 | 1 | | 1
1 | | | | | | | | | | | |
| 5.21 | 1 | | | | | | | | | | | | | |
| 5.50 | | | 1 | | | | - | | | | | | - | |
| 5.61 | | | 4 | | | | | | 1 | | | | | |
| 5.71
1.00 | 1 | | 1 | | | | | | | | | | | |
| 5.89 | 1 | | 1 | | | | | | | | | | | |
| 6.13 | 1 | | 1 | | | | | | | | | | | |
| 6.46 | | | 4 | | | | | | | | | | 1 | |
| 6.65
6.80 | | | 1 | | | | | | | | | | | |
| 7.08 | 1 | | | | | | | | | | | | | |
| 7.70 | | | 1 | | | | | | | | | | | |
| 7.95 | 1 | | | | | | | | | | | | | |
| 8.12
8.20 | 1 | | 1 | | | | | | | | | | | |
| 8.20 | 1 | | 1 | | | | | | | | | | | |
| 8.68 | | | | | | | | | 1 | | | | | |
| 1.00 | | | 1 | | | | | | 1 | | | | | |
| 9.35
9.69 | | | 1 | | | | | | | | | | | |
| 10.14 | | | 1
1 | | | | | | | | | | | |
| 10.14 | | | 1 | | | | | | | | | | | |
| 10.27 | L | | | | | | İ | | L | | <u> </u> | | | |

Table 1 Access Points in Segment 1 (RP 0.6 to RP 31.5)

| | | Privat Dri | iveways ¹ | | C | ommerci | al Access 2 | | | Road A | ccess 3 | | Farm Field | d Access ⁴ |
|-----------------|---------|------------|----------------------|--------|---------|---------|-------------|-------|---------|--------|---------|--------|------------|-----------------------|
| Reference | Wes | st | Eas | st | Wes | st | Eas | t | Wes | st | Eas | t | West | East |
| Post | Unpaved | Paved | Unnaved | Paved | Unpaved | Paved | Unpaved | Paved | Unnaved | Paved | Unpaved | Paved | Unpaved | Unpaved |
| 10.32 | Onpavoa | 1 4704 | Onpavoa | 1 4704 | Onpavoa | 1 4704 | Onpavoa | Tavoa | Onpavoa | Tuvou | Onpavoa | 1 4704 | 1 | Onparoa |
| 10.61 | | | | | | | | | 1 | | | | _ | |
| 10.84 | | | | | | | | | | | | | 1 | |
| 10.86 | | | 1 | | | | | | | | | | | |
| 12.18 | | | | | | | | | | | | | 1 | |
| 12.47
13.06 | 1 | | 1 | | 1 | | | | | | | | | |
| 13.16 | 1 | | | | 1 | | | | | | | | | |
| 14.47 | _ | | | | | | | | | | | | | 1 |
| 15.34 | | | 1 | | | | | | | | | | | |
| 17.03 | | | | | | | | | | 1 | | 1 | | |
| 17.37 | 1 | | | | | | | | | | | | | |
| 17.59
18.22 | 1 | | | | | | | | | | 1 | | | |
| 18.22 | | | 1 | | | | | | | | 1 | | | |
| 19.24 | | | 1 | | | | | | | | | | | 1 |
| 19.52 | | | | | | | | | | | | | | 1 |
| 19.63 | | | 1 | | | | | | | | | | | |
| 19.71 | | | | | | | | | | | | | 1 | |
| 19.94 | | | 4 | | | | | | | | | | 1 | |
| 20.70
20.85 | | | 1 | | | | | | | | | | 1 | 1 |
| 21.76 | | | | | | | | | | | | | 1 | 1 |
| 22.13 | | | | | | | | | | | | | _ | 1 |
| 22.51 | | | | | | | | | | | 1 | | 1 | |
| 22.57 | | | 1 | | | | | | | | | | | |
| 23.22 | 1 | | 1 | | | | | | | | | | | |
| 23.63
23.95 | | | 1 | | | | | | 1 | | 1 | | | |
| 24.53 | 1 | | 1 | | | | | | 1 | | 1 | | | |
| 24.80 | - | | | | | | | | | | 1 | | | |
| 25.43 | 1 | | | | | | | | | | | | | |
| 25.56 | | | | | | | | | | | 1 | | | |
| 25.90 | | | | | | | | | 1 | | 1 | | | |
| 26.15
26.55 | | | | | | | | | | | | | 1 | 1 |
| 27.00 | | | | | | | | | | | | | 1 | 1 |
| 27.06 | | | | | | | | | | | | | - | 1 |
| 28.26 | 1 | | 1 | | | | | | | | | | | |
| 28.55 | | | | | | | | | 1 | | 1 | | | |
| 28.88 | | | | | | | | | | | 1 | | | |
| 28.96 | | | | | | | | | 1 | | 4 | | | |
| 29.23
29.57 | | | 1 | | | | | | | | 1 | | | |
| 29.93 | 1 | | 1 | | | | | | | | | | | 1 |
| 30.16 | | | | | | | | | | | | | 1 | 1 |
| 30.69 | | | | | | | | | | | | | 1 | 1 |
| 30.89 | 1 | | 1 | | | | | | | | | | | |
| 30.93 | | | | | | | | | 1 | | | | | |
| 31.00
31.04 | | | 1 | | | | | | | | | | 1 | |
| 31.04 | | | | | | | | | | | | | 1 | 1 |
| 31.32 | 1 | | | | | | | | | | | | • | 1 |
| 31.50 | | | | | | | | | | | | | 1 | 1 |
| Segment 1 | | _ | | _ | | | | | | | | | | |
| Totals | 30 | 0 | 43 | 1 | 6 | 0 | 12 | 0 | 10 | 2 | 12 | 2 | 20 | 18 |
| Total Access Po | nints - | | | 156 | | | | | | | | | | |

Total Access Points = 156
Total Length in Miles = 30.9
Access Point Density (Access Points per Mile) = 5.0

 $^{^{1}\}mbox{The Private Driveways category includes access points originating from a private residence.$

² The Commercial Access category includes access points originating from a commercial business.

 $^{^{3}}$ The Road Access category includes access points originating from county roads, city streets, and rural roads.

 $^{^{\}rm 4}$ The Farm Field Access category includes access points originating from a farm field.

Table 2 Access Points in Segment 2 (RP 31.5 to RP 41.5)

| | | Privat Dr | iveways ¹ | | C | Commerci | al Access 2 | | | Road A | ccess 3 | | Farm Fiel | ld Access ⁴ |
|----------------|---------------|-----------|----------------------|-------|-----------------|----------|-----------------|-------|------------|--------|-----------------|-------|--|------------------------|
| Reference | We | st | Eas | st | We | st | Eas | it | We | st | Eas | st | West | East |
| Post | l lana accord | David | l lan accord | Davis | l loon as so al | Davis | l loon as so al | Davis | l lanana a | Davis | l loon as so al | Davis | l la a a consid | I la a a consid |
| 31.61 | Unpaved | Paved | Unpaved
1 | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Unpaved |
| 31.65 | | | 1 | | | | | 1 | | | | | | |
| 31.67 | | | | | | | | | | | | 1 | | |
| 31.92 | | | | | | | | | | | | 1 | | |
| 31.94 | | | | | | | | | 1 | | | | | |
| 31.98
32.03 | 1 | | | | | | | | | | 1 | 1 | | |
| 32.10 | 1 | | | | | | | | | | | | | |
| 32.15 | | | | | | | | | | 1 | | 1 | | |
| 32.23 | | | | | | | | | | | 1 | | | |
| 32.58
32.63 | 1 | | 1 | | | | | | | | 1 | | | |
| 32.68 | 1 | | 1 | | | | | | | | | | | |
| 32.81 | - | | _ | | | | | | 1 | | 1 | | | |
| 32.83 | | | | | | | | | 1 | | 1 | | | |
| 33.08 | | | | | | | | | | | | | 1 | 1 |
| 33.35
33.43 | | | | | | | | | | | | | 1 | 1 |
| 33.43 | | | | | | | | | | | | | 1 | 1 |
| 33.75 | | | | | | | | | | | | | 1 | 1 |
| 33.83 | | | 1 | | | | | | | | | | | |
| 33.86 | 1 | | | | | | | | | | | | | |
| 33.92
34.03 | 1 | | 1 | | | | | | | | | | | |
| 34.03 | 1 | | | | | | | | | | | | | |
| 34.08 | | | | | | | | | 1 | | 1 | | | |
| 34.09 | | | 1 | | | | | | | | | | | |
| 34.25 | | | | | | | | | | | | | | 1 |
| 34.47
34.64 | | | | | | | | | 1 | | | | | 1 |
| 34.66 | | | | | | | | | | | | | 1 | 1 |
| 34.79 | | | | | | | | | | | | | | 1 |
| 35.11 | | | | | | | | | | | | | 1 | 1 |
| 35.25 | | | | | | | | | 1 | | 1 | | | |
| 35.47
35.65 | | | | | | | | | | | | | 1 | 1 |
| 35.71 | | | | | | | | | | | | | | 1 |
| 35.79 | | | | | | | | | | | | | 1 | |
| 36.00 | 1 | | | | | | | | | | | | | 1 |
| 36.17 | | | | | | | | | 1 | | | | 1 | 1 |
| 36.40
36.47 | | | | | | | | | 1 | | 1 | | | 1 |
| 36.97 | 1 | | | | | | | | | | | | | 1 |
| 37.04 | 1 | | | | | | | | | | | | | |
| 37.23 | | | | | | | | | | | | | 1 | 1 |
| 37.47
37.48 | | | | | | | | | 1 1 | | | | - | |
| 37.48 | | | | | | | | | 1 | | | 1 | | |
| 37.75 | | | 1 | | | | | | | | | | | |
| 37.91 | 1 | _ | 1 | | - | | | _ | | | | _ | | |
| 38.05 | | | | | | | | | | | | | 1 | 1 |
| 38.37
38.53 | 1 | | | | | | | | | | | | 1 | 1 |
| 38.57 | 1 | | | | | | | | | | | | | |
| 38.62 | | | | | | | | | | | 1 | | | |
| 38.70 | | | | | | | | | | | | | 1 | 1 |
| 38.96
39.06 | | | 1 | | | | | | | | | | 1 | 1 |
| 39.06 | | | 1 | | | | | | | | | | 1 | 1 |
| 39.20 | | | | | | | | | | | 1 | | | - |
| 39.45 | | | 1 | | | | | | | | | | | |
| 39.50 | | | | | | | | | | | | | 1 | |
| 1.00 | 4 | | | | | | | | | | | | 1 | |
| 39.87
38.90 | 1 | | 1 | | | | | | | | | | | |
| 40.00 | 1 | | | | | | | | | | | | | |
| 40.05 | 1 | | | | | | | | | | | | | |
| 40.10 | | | | | | | | | | | | | 1 | |
| 40.29 | | | | | | | | | | | | | 1 | 1 |

Table 2 Access Points in Segment 2 (RP 31.5 to RP 41.5)

| | | Privat Dr | iveways 1 | | (| Commerci | al Access 2 | | | Road A | Access 3 | | Farm Fie | ld Access 4 |
|-----------|---------|-----------|-----------|-------|---------|----------|-------------|-------|---------|--------|----------|-------|----------|-------------|
| Reference | We | st | Ea | st | We | st | Ea | st | We | | Ea | st | West | East |
| Post | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Unpaved |
| 40.43 | 1 | | | | | | | | | | | | | |
| 40.52 | | | 1 | | | | | | | | | | | |
| 40.57 | 1 | | | | | | | | | | | | | |
| 40.74 | 1 | | | | | | | | | | 1 | | | |
| 40.96 | 1 | | | | | | | | | | | | | 1 |
| 41.15 | | | | | | | | | | | | | | 1 |
| 41.22 | 1 | | | | | | | | | | | | | |
| 41.32 | | | | | | | | | 1 | | | | | |
| 41.37 | | | | | | | | | | | | | | 1 |
| 41.41 | 1 | | | | | | | | | | | | | |
| Segment 2 | | | | | | | | | | | | | | |
| Totals | 22 | 0 | 12 | 0 | 0 | 0 | 0 | 1 | 11 | 1 | 11 | 5 | 20 | 24 |

 Total Access Points =
 107

 Total Length in Miles =
 10.0

 Access Point Density (Access Points per Mile) =
 10.7

 $^{^{1}\}mbox{The Private Driveways category includes access points originating from a private residence.$

² The Commercial Access category includes access points originating from a commercial business.

 $^{^{3}}$ The Road Access category includes access points originating from county roads, city streets, and rural roads.

 $^{^{\}rm 4}$ The Farm Field Access category includes access points originating from a farm field.

Table 3 Access Points in Segment 3 (RP 41.5 to RP 50.4)

| | | Privat Dr | iveways 1 | | C | Commerci | al Access 2 | | | Road A | Access 3 | | Farm Field | d Access ⁴ |
|----------------|---------|-----------|-----------|-------|---------|----------|-------------|-------|---------|--------|----------|-------|------------|-----------------------|
| Reference | We | st | Eas | t | We | st | Eas | t | Wes | st | Eas | st | West | East |
| Post | Unpaved | Payed | Unpaved | Payed | Unnaved | Payed | Unpaved | Dayod | Unpaved | Payed | Unnaved | Payed | Unpaved | Unpaved |
| 41.52 | 1 | raveu | Unpaveu | raveu | Unpaved | raveu | Unpaved | raveu | Unpaveu | raveu | 1 | raveu | Unpaveu | Unpaveu |
| 41.53 | - | | 1 | | | | | | | | - | | | |
| 41.62 | 1 | | | | | | | | | | | | | 1 |
| 41.72
41.82 | 1 | | 1 | | | | | | | | 1 | | | |
| 41.82 | 1 | | 1 | | | | | | | | | | 1 | |
| 42.06 | | | | | | | | | | | | | - | 1 |
| 42.34 | | | | | | | | | 1 | | 1 | | | |
| 42.55 | | | | | | | | | | | | | | 1 |
| 42.58
42.75 | | | | | | | | | | | | | 1 | 1 |
| 42.98 | | | | | | | | | | | | | 1 | 1 |
| 43.00 | | | 1 | | | | | | 1 | | | | | |
| 43.06
43.13 | | | 1 | | | | | | | | | | | |
| 43.13 | | | 1 | | | | | | | | | | | 1 |
| 43.61 | | | | | | | | | 1 | | 1 | | | _ |
| 43.69 | | | 1 | | | | | | | | | | 1 | |
| 43.80
43.85 | 1 | | | | | | | | | | | | 1 | 1 |
| 44.12 | | | | | | | | | | | | | 1 | 1 |
| 44.23 | | | 1 | | | | | | | | | | | |
| 44.32 | | | | | | | | | | | | | | 1 |
| 44.46
44.50 | 1 | | | | | | | | 1 | | 1 | | | |
| 44.74 | 1 | | | | | | | | 1 | | 1 | | | |
| 44.78 | _ | | | | | | | | 1 | | 1 | | | |
| 44.88 | | | | | | | | | | | | | 1 | 1 |
| 44.92
45.00 | 1 | | | | | | | | | | | | | |
| 45.00 | 1 | | | | | | | | | | | | | |
| 45.10 | _ | | | | | | | | | | | | | 1 |
| 45.26 | 1 | | | | | | | | | | | | | |
| 45.34
45.55 | | | | | | | | | | | | | 1 | |
| 45.88 | | | | | | | | | 1 | | 1 | | 1 | |
| 46.15 | | | | | | | | | - | | - | | 1 | |
| 46.30 | 1 | | | | | | | | | | | | | |
| 46.32
46.37 | 1 | | | | | | | | | | | | 1 | |
| 46.44 | | | | | | | | | 1 | | 1 | | 1 | |
| 46.50 | 1 | | | | | | | | | | | | | |
| 46.57 | | | | | | | | | 1 | | | | | |
| 46.77
46.85 | 1 1 | | | | | | | | | | | | | |
| 46.90 | 1 | | | | | | | | | | | | | |
| 46.94 | | | | | | | | | | | 1 | | | |
| 46.97 | 1 | | | | | | | | | | | | | |
| 47.12
47.16 | 1 | | | | | | | | | | | | 1 | |
| 47.18 | 1 | | | | | | | | | | 1 | | | |
| 47.20 | 1 | | | | | | | | | | | | | |
| 47.26 | | | | | | | | | 1 | | | | | |
| 47.28
47.49 | 1 | | | | | | | | | | 1 | | | |
| 47.62 | | | | | | | | | | | | | | 1 |
| 47.70 | 1 | | | | | | | | | | | | | |
| 47.77 | 1 | | 1 | | | | | | | | | | | |
| 48.00
48.06 | | | | | | | | | 1 | | 1 | | | |
| 48.08 | | | 1 | | | | | | | | | | | |
| 48.12 | | | 1 | | | | | | | | | | | |
| 48.15 | | | | | | | | | | | | | 1 | |
| 48.24
48.26 | 1 1 | | | | | | | | | | | | | |
| 48.27 | 1 | | 1 | | | | | | | | | | | |
| 48.28 | 1 | | | | | | | | | | | | | |
| 48.32 | | | | | | | | | | | | | 1 | 1 |
| 48.62 | | | 1 | | | | | | | | | | | |

Table 3 Access Points in Segment 3 (RP 41.5 to RP 50.4)

| | | Privat Dr | iveways 1 | | (| Commerci | al Access 2 | | | Road A | ccess 3 | | Farm Fiel | d Access ⁴ |
|-----------|---------|-----------|-----------|-------|---------|----------|-------------|-------|---------|--------|---------|-------|-----------|-----------------------|
| Reference | We | st | Eas | st | We | | Eas | | We | st | Eas | st | West | East |
| Post | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Unpaved |
| 48.64 | 1 | | | | | | | | | | | | | |
| 48.69 | | | | | | | | | | | | | | 1 |
| 48.74 | | | | | | | | | | | | | 1 | |
| 48.88 | | | | | | | | | | | | | | 1 |
| 48.98 | | | | | | | | | | | 1 | | 1 | |
| 49.09 | | | 1 | | | | | | | | | | | |
| 49.17 | | | 1 | | | | | | | | | | | |
| 49.19 | | | | | | | | | 1 | | 1 | | | |
| 49.50 | | | | | | | | | | | | | | 1 |
| 49.63 | | | | | | | | | | | | | 1 | |
| 49.71 | 1 | | | | | | | | | | | | | |
| 49.80 | | | | | | | | | | | | | 1 | 1 |
| 49.91 | | | | | | | | | | | | | | 1 |
| 49.95 | | | | | | | | | | | | 1 | | |
| 50.00 | | | | | | | | | | 1 | | 1 | | |
| 50.26 | 1 | | | | | | | | | | | | | |
| 50.32 | 1 | | | | | | | | | | | | | |
| 50.37 | | | | | | | | | 1 | | 1 | | | |
| Segment 3 | 20 | | | | | | | • | 12 | | 45 | | 10 | 40 |
| Totals | 29 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 12 | 1 | 15 | 2 | 19 | 18 |

 Total Access Points =
 110

 Total Length in Miles =
 8.9

 Access Point Density (Access Points per Mile) =
 12.4

 $^{^{1}\}mbox{The Private Driveways category includes access points originating from a private residence.$

² The Commercial Access category includes access points originating from a commercial business.

³ The Road Access category includes access points originating from county roads, city streets, and rural roads.

 $^{^{\}rm 4}$ The Farm Field Access category includes access points originating from a farm field.

Table 4 Access Points in Segment 4 (RP 52.6 to RP 62.2)

| | | Privat Dr | riveways 1 | | | Commerci | al Access 2 | | | Road A | Access ³ | | Farm Fiel | d Access ⁴ |
|----------------|--------------|-----------|---------------|-------|---------------|----------|---------------|-------|------------|------------|---------------------|------------|------------|-----------------------|
| Reference | Wes | st | Eas | st | We | st | Eas | st | We | st | Eas | st | West | East |
| Post | l la a accad | David | l lana accord | D | l lana accord | D | l loo o o o o | Davis | l lanana a | D | l lan accord | Davis | l lanana a | l loor accord |
| 52.60 | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved
1 | Unpaved | Paved
1 | Unpaved | Unpaved |
| 52.61 | | | | | | | | 2 | | 1 | | 1 | | |
| 52.63 | | | | | | 1 | | | | | | | | |
| 52.65 | 1 | | 1 | | | | | | | | | | | |
| 52.67
52.68 | 1 | | 1 | | | | | | | | | | | |
| 52.69 | | | 1 | | | | | | | 1 | | 1 | | |
| 52.70 | 1 | | | | | | | | | | | | | |
| 53.09 | 1 | | | | | | | | | | | | | |
| 53.12
53.22 | | 1 | | | | 1 | | | | | | 1 | | |
| 53.35 | | 1 | 1 | | | | | | | | | 1 | 1 | |
| 53.66 | | | | | | | | | 1 | | 1 | | | |
| 53.68 | 1 | | | | | | | | | | | | | |
| 53.75
53.83 | | | 1 | | | | | | | | | | | 1 |
| 53.90 | | | 1 | | | | | | | | | | | |
| 53.92 | | | 1 | | | | | | | | | | | |
| 53.94 | 1 | | | | | | | | | | | | | |
| 53.97
54.00 | 1 | | 1 | | | | | | | | | | 1 | |
| 54.00 | | | 1 | | | | | | | | | | 1 | |
| 54.08 | | | 1 | | | | | | | | | | | |
| 54.13 | | | | | | | | | | | 1 | | | |
| 54.17
54.20 | 1 | | 1 | | | | | | | | | | | 1 |
| 54.26 | 1 | 1 | | | | | | | | | | | | 1 |
| 54.27 | 1 | _ | | | | | | | | | | | | |
| 54.31 | | | | | | | | | | | | | | 1 |
| 54.32
54.33 | 1 | | | | | | | | | | | | | |
| 54.37 | 1 | | | | | | | | | | | | | |
| 54.40 | 1 | | | | | | | | | | | | | |
| 54.45 | 1 | | | | | | | | | | | | | |
| 54.51
54.65 | 1 | | | | | | | | | | | | | |
| 54.73 | 1 | | | | | | | | 1 | | 1 | | | |
| 54.90 | | | 1 | | | | | | | | | | | |
| 54.97 | | | | | | | | | | | | | 1 | |
| 55.02
55.10 | 1 | | 1 | | | | | | | | | | | 1 |
| 55.16 | 1 | | | | | | | | | | | | | 1 |
| 55.17 | | | 1 | | | | | | | | | | | |
| 55.20 | 1 | | 1 | | | | | | | | | | | |
| 55.27
55.30 | 1 | | 1 | | | | | | | | | | | |
| 55.34 | | | 1 | | | | | | | | | | | |
| 55.47 | | | | | | | | | | | | | 1 | |
| 55.50 | 1 | | <u> </u> | | | | | | | | | | | |
| 55.58
55.61 | | | 1 | | | | | | | | | | 1 | |
| 55.67 | | | 1 | | | | | | | | | | | |
| 55.72 | | | | | | | | | | | | | 1 | |
| 55.73 | | | 1 | | | | | | | | | | | |
| 55.77
55.85 | | | 1 | | | | | | 1 | | 1 | | | |
| 56.14 | | | | | | | | | 1 | | 1 | | 1 | 1 |
| 56.39 | | | | | | | | | | | | | 1 | 1 |
| 56.50 | | | | | | | | | | | | | 1 | |
| 56.62
56.64 | | | 1 | | | | | | | | | | 1 | |
| 56.77 | | | 1 | | | | | | | | | | 1 | |
| 56.89 | | | | | | | | | 1 | | 1 | | | |
| 56.96 | | | | | | | | | | | | | | 1 |
| 57.00
57.16 | | | - | | | | | | | | | | 1 | |
| 57.16 | | | | | | | | | | | | | 1 | 1 |
| 57.44 | | | | | | | | | | | | | 1 | 1 |
| 57.49 | | | | | | | | | | | | | | 1 |

Table 4 Access Points in Segment 4 (RP 52.6 to RP 62.2)

| | | Privat Dr | iveways ¹ | | C | commerci | al Access 2 | | | Road A | ccess 3 | | Farm Fiel | d Access ⁴ |
|-----------------|---------|-----------|----------------------|-------|---------|----------|-------------|-------|---------|--------|---------|--------|-----------|-----------------------|
| Reference | We | st | Eas | st | We | st | Eas | st | We | st | Eas | st | West | East |
| Post | Unpaved | Paved | Unpaved | Doved | Unpaved | Paved | Unnoved | Dovad | Unnoved | Dovad | Unnoved | Doverd | Linnerrad | Unngued |
| 57.75 | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Paved | Unpaved | Unpaved |
| 57.75
57.79 | 1 | | | | | | | | | | | | 1 | |
| 57.79 | 1 | | | | | | | | | | | | | |
| 57.80 | 1 | | 1 | | | | | | | | | | | |
| 57.98 | | | - | | | | | | 1 | | | | | |
| 58.00 | | | | | | | | | | | 1 | | | |
| 58.17 | | | | | | | | | | | | | | 1 |
| 58.28 | | | | | | | | | | | | | 1 | |
| 58.61 | | | | | | | | | | | | | 1 | 1 |
| 58.65 | | | 1 | | | | | | | | | | 1 | |
| 58.75 | | | | | | | | | | | | | 1 | |
| 58.87 | | | | | | | 1 | | | | | | 1 | |
| 59.10 | | | | | | | | | | | | | | 1 |
| 59.26 | | | | | | | | | | | 1 | | 1 | |
| 59.30
59.31 | 1 | | | | | | | | | | | | 1 | |
| 59.31 | 1 | | | | | | | | | | | | 1 | |
| 59.44 | | | 1 | | | | | | | | | | 1 | |
| 59.60 | 1 | | 1 | | | | | | | | | | | |
| 59.69 | | | | | | | | | | | 1 | | 1 | |
| 59.86 | | | | | | | | | | | | | | 1 |
| 59.88 | | | | | | | | | 1 | | | | | |
| 59.90 | | | | | | | | | | | 1 | | | |
| 60.13 | | | | | | | | | | | | | 1 | |
| 60.16 | | 1 | | | | | | | | | | | | |
| 60.17 | | | | | | | | | | | 1 | | | |
| 60.22 | 1 | | | | | | | | | | | | | |
| 60.26 | 1 | | | | | | | | | | | | | 1 |
| 60.43
60.59 | 1 | | | | | | | | | | | | 1 | 1 |
| 60.70 | 1 | | | | | | | | | 1 | 1 | | | |
| 60.96 | | | 1 | | | | | | | 1 | | | 1 | |
| 61.00 | | | 1 | | | | | | | | | | | |
| 61.17 | 1 | | | | | | | | | | | | | |
| 61.22 | 1 | | | | | | | | | | | | | |
| 61.38 | | | | | | | | | | | | | | 1 |
| 61.42 | 1 | | | | | | | | | | | | | |
| 61.72 | | | | | | | | | | | 1 | | | |
| 61.73 | | | | | | | | | | | | | 1 | |
| 61.88 | 1 | | 1 | | | | | | | | | | | |
| 61.93 | | | | | | | | | 1 | | | | | |
| 61.99
62.09 | 1 | | | | | | | | | | | | 1 | 1 |
| 62.18 | 1 | | | | | | | | | | | | 1 | 1 |
| 62.19 | 1 | | 1 | | | | | | | | | | | |
| 62.24 | 1 | | 1 | | | | | | | | | | | |
| 62.26 | • | | 1 | | | | | | | | | | | |
| 62.31 | 1 | | 1 | | | | | | | | | | | |
| 62.34 | | | 2 | | | | | | | | | | | |
| 62.37 | | | 1 | | | | | | | | | | | |
| 62.42 | | | 1 | | | | | | | | | | | |
| 62.45 | 1 | | 1 | | | | | | | | | | | |
| 62.50 | | | 1 | | | | | | | | | | | |
| Segment 4 | | | | | | | | | | | | | | |
| Totals | 38 | 3 | 39 | 0 | 0 | 2 | 1 | 2 | 7 | 3 | 12 | 3 | 28 | 17 |
| Total Access Po | into - | | | 155 | · | | | | · | | | | · | |

 Total Access Points =
 155

 Total Length in Miles =
 9.9

 Access Point Density (Access Points per Mile) =
 15.7

¹ The Private Driveways category includes access points originating from a private residence.

 $^{^{\}rm 2}$ The Commercial Access category includes access points originating from a commercial business.

 $^{^{3}}$ The Road Access category includes access points originating from county roads, city streets, and rural roads.

 $^{^{\}rm 4}$ The Farm Field Access category includes access points originating from a farm field.



Appendix 6

Historic and Projected Traffic Volume Data

Table 1 Count Locations for Historic AADT

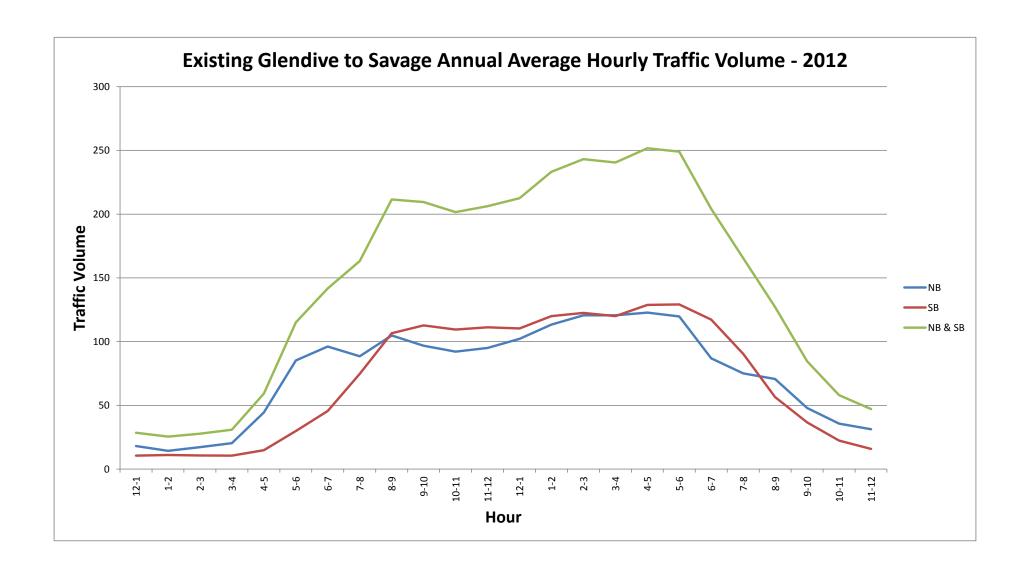
| Portion of
Corridor | 1990-2011 Count Locations | 2012 Count Locations |
|------------------------|---|---|
| | MT 16, north of I-94 MT 16, north of Highland Park | MT 16, RP 16.0, south of County |
| | MT 16, south of County Road
254 | Road 549 |
| | MT 16, RP 4.0, north of
County Road 254 | |
| Glendive
to Sidney | MT 16, RP 12.0, 0.5 miles southwest of Morgan Creek bridge | MT 16, RP 37.0, south of County
Road 112 |
| , | MT 16, RP 23.5, northeast of Dawson County Line | |
| | MT 16, RP 32.0, south of 4th Avenue, Savage, MT | |
| | MT 16, RP 42.0, 0.5 miles northeast of Crane, MT | MT 16, RP 47.0, south of County
Road120 |
| | MT 16, RP 49.5, south of MT 200 | |
| | Central Avenue, north of Holly Street | |
| | MT 200, RP 53.5, 1 mile north of Holly Street | |
| Sidney to
Fairview | MT 200, RP 56, 7.5 mile southwest of County Road 201 | MT 16, RP 57.0, South of County Road 130 |
| T dil view | MT 200, RP 62.0, 1.5 mile southwest of County Road 201 | Nodu 130 |
| | MT 200 between Western
Avenue & South Central
Avenue, south of Fairview | |

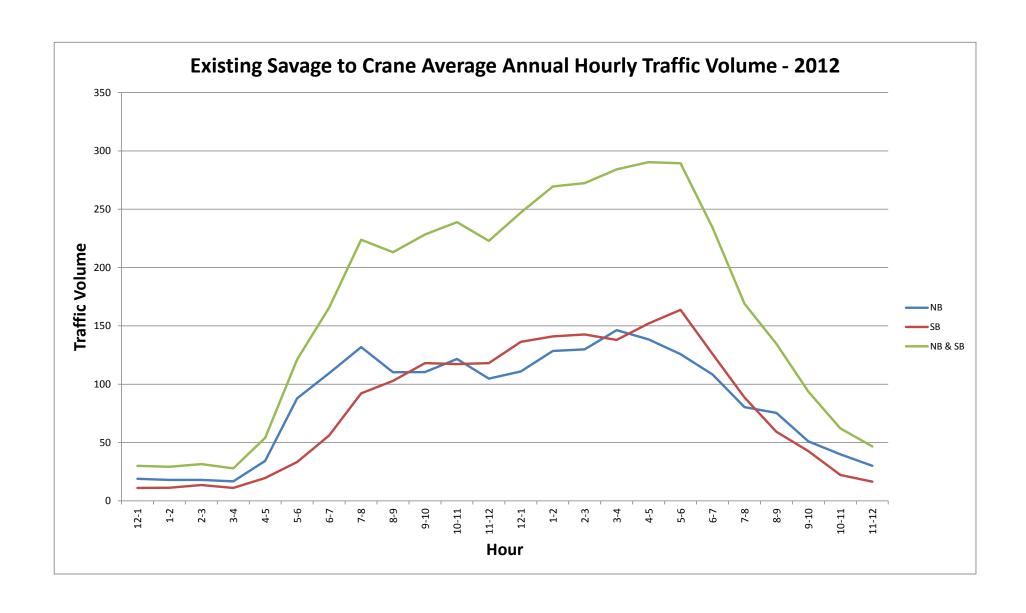
Source: MDT, 2012.

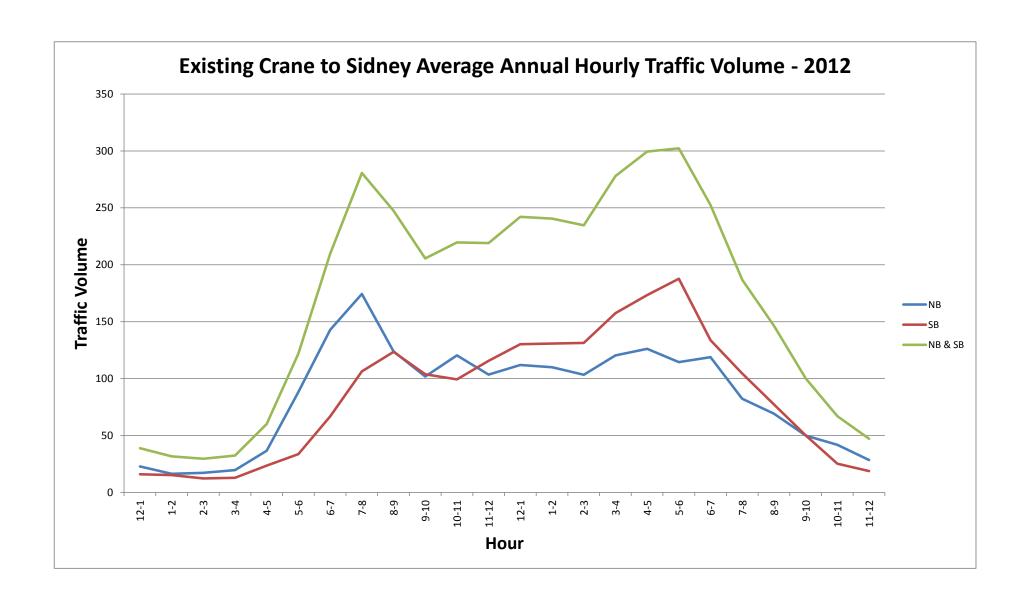
Table 2 Weighted AADT Volumes (1990 – 2012)

| | Weighted AADT | | | |
|------|---|-----------------------------|--|-----------------------------|
| Year | MT 16
Glendive to
Sidney
RP 0.6 to RP 50.4 | Percent
Annual
Change | MT 200
Sidney to Fairview
RP 52.6 to RP 62.5 | Percent
Annual
Change |
| 1990 | 1810 | | 2,810 | |
| 1991 | 1490 | -18% | 2,820 | 0% |
| 1992 | 1630 | 9% | 2,890 | 2% |
| 1993 | 1600 | -2% | 2,620 | -9% |
| 1994 | 1870 | 17% | 3,130 | 19% |
| 1995 | 1940 | 4% | 3,580 | 14% |
| 1996 | 2010 | 4% | 2,920 | -18% |
| 1997 | 1580 | -21% | 3,330 | 14% |
| 1998 | 1800 | 14% | 3,060 | -8% |
| 1999 | 1530 | -15% | 2,640 | -14% |
| 2000 | 1910 | 25% | 2,730 | 3% |
| 2001 | 2,020 | 6% | 2,460 | -10% |
| 2002 | 1,770 | -12% | 2,800 | 14% |
| 2003 | 2,220 | 25% | 3,400 | 21% |
| 2004 | 2,120 | -5% | 3,320 | -2% |
| 2005 | 2,110 | 0% | 3,480 | 5% |
| 2006 | 2,120 | 0% | 3,450 | -1% |
| 2007 | 1,820 | -14% | 3,690 | 7% |
| 2008 | 2,040 | 12% | 3,800 | 3% |
| 2009 | 1,950 | -4% | 3,580 | -6% |
| 2010 | 2,590 | 33% | 4,830 | 35% |
| 2011 | 3,130 | 21% | 6,080 | 26% |
| 2012 | 3,697 | 18% | 6,357 | 5% |

Source: MDT, 2012.







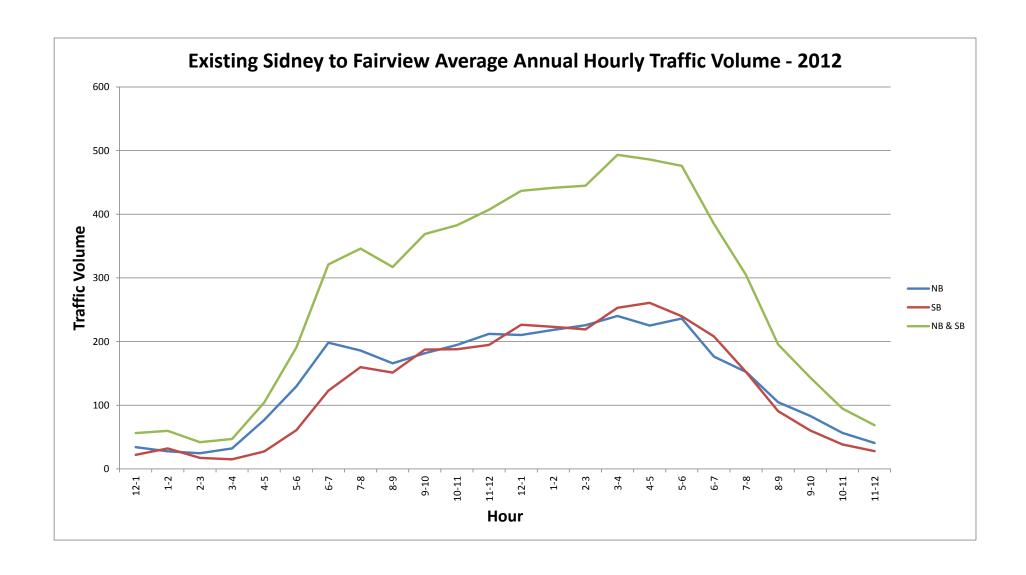


Table 3 Growth Rate Comparison (1990 – 2012)

| | Background (| Frowth Rates | | Rapid Gro | wth Rates |
|----------------|-----------------------|-----------------------|----------------|-----------------------|-----------------------|
| Time
Period | Glendive to
Sidney | Sidney to
Fairview | Time
Period | Glendive to
Sidney | Sidney to
Fairview |
| 1990-2012 | 3.3% | 3.8% | 1990-2012 | 3.3% | 3.8% |
| 1990-2011 | 2.6% | 3.7% | 1991-2012 | 4.4% | 3.9% |
| 1990-2010 | 1.8% | 1.2% | 1992-2012 | 4.2% | 4.0% |
| 1990-2009 | 0.4% | 1.3% | 1993-2012 | 4.5% | 4.8% |
| 1990-2008 | 0.7% | 1.7% | 1994-2012 | 3.9% | 4.0% |
| 1990-2007 | 0.0% | 1.6% | 1995-2012 | 3.9% | 3.4% |
| 1990-2006 | 1.0% | 1.3% | 1996-2012 | 3.9% | 5.0% |
| 1990-2005 | 1.0% | 1.4% | 1997-2012 | 5.8% | 4.4% |
| 1990-2004 | 1.1% | 1.2% | 1998-2012 | 5.3% | 5.4% |
| 1990-2003 | 1.6% | 1.5% | 1999-2012 | 7.0% | 7.0% |
| 1990-2002 | -0.2% | 0.0% | 2000-2012 | 5.7% | 7.3% |
| 1990-2001 | 1.0% | -1.2% | 2001-2012 | 5.6% | 9.0% |
| 1990-2000 | 0.5% | -0.3% | 2002-2012 | 7.6% | 8.5% |
| 1990-1999 | -1.8% | -0.7% | 2003-2012 | 5.8% | 7.2% |
| 1990-1998 | -0.1% | 1.1% | 2004-2012 | 7.2% | 8.5% |
| 1990-1997 | -1.9% | 2.5% | 2005-2012 | 8.3% | 9.0% |
| 1990-1996 | 1.8% | 0.6% | 2006-2012 | 9.7% | 10.7% |
| 1990-1995 | 1.4% | 5.0% | 2007-2012 | 15.2% | 11.5% |
| 1990-1994 | 0.8% | 2.7% | 2008-2012 | 16.0% | 13.7% |
| 1990-1993 | -4.0% | -2.3% | 2009-2012 | 23.8% | 21.1% |
| 1990-1992 | -5.1% | 1.4% | 2010-2012 | 19.5% | 33.3% |
| 1990-1991 | -17.7% | 0.4% | 2011-2012 | 18.1% | 4.6% |

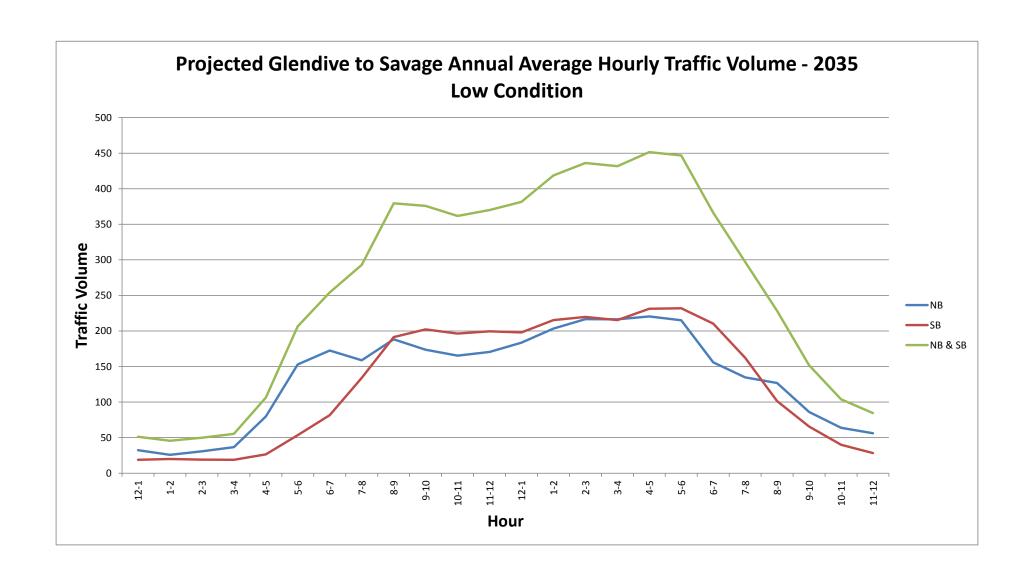
Source: DOWL HKM, 2012.

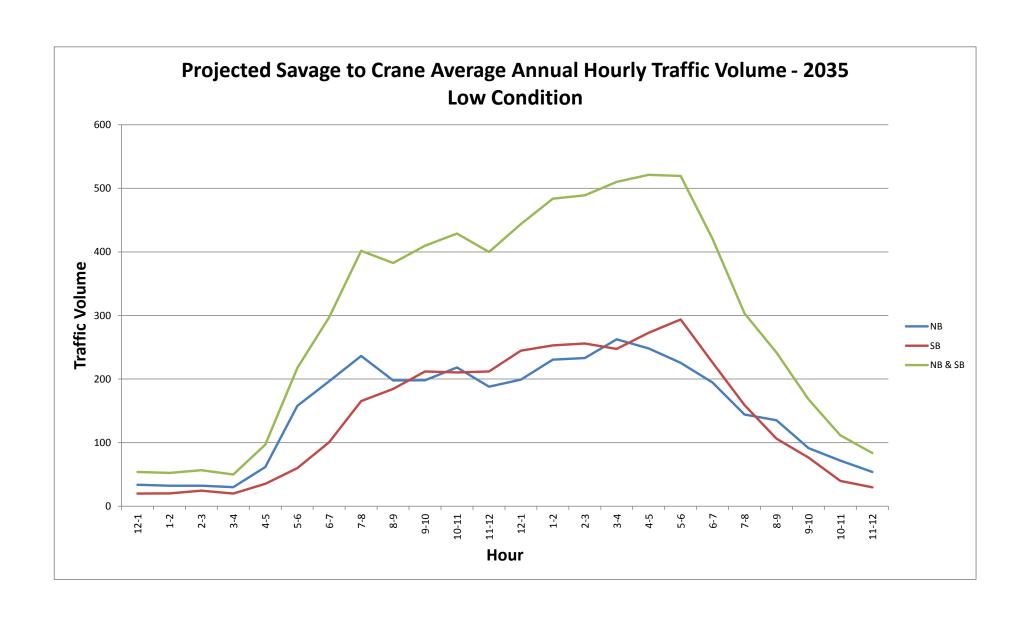
Note: Shaded cells indicate growth rates selected for this corridor study.

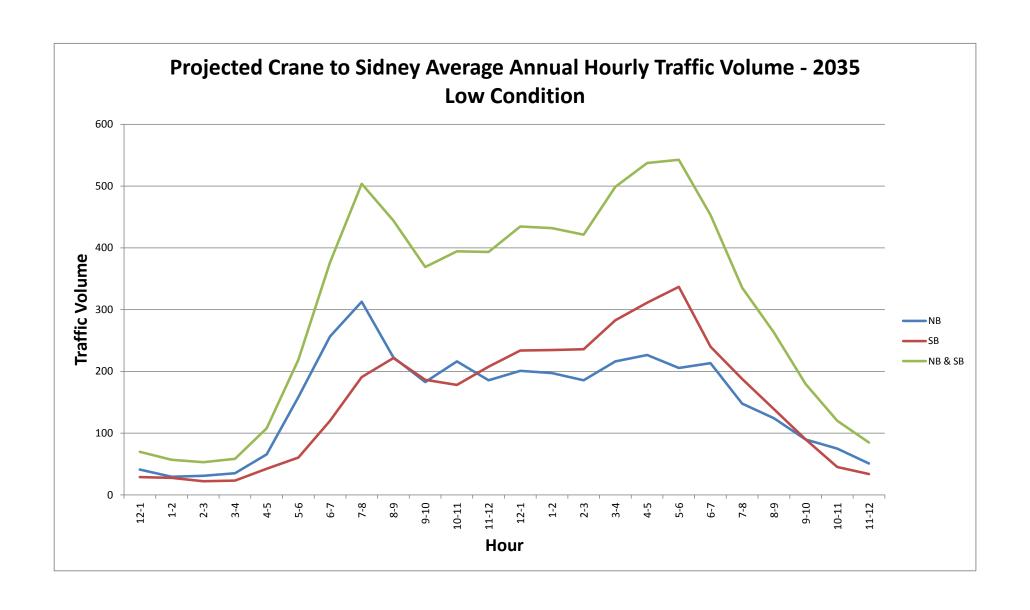
Table 4 Projected AADT Volumes (2013 – 2035)

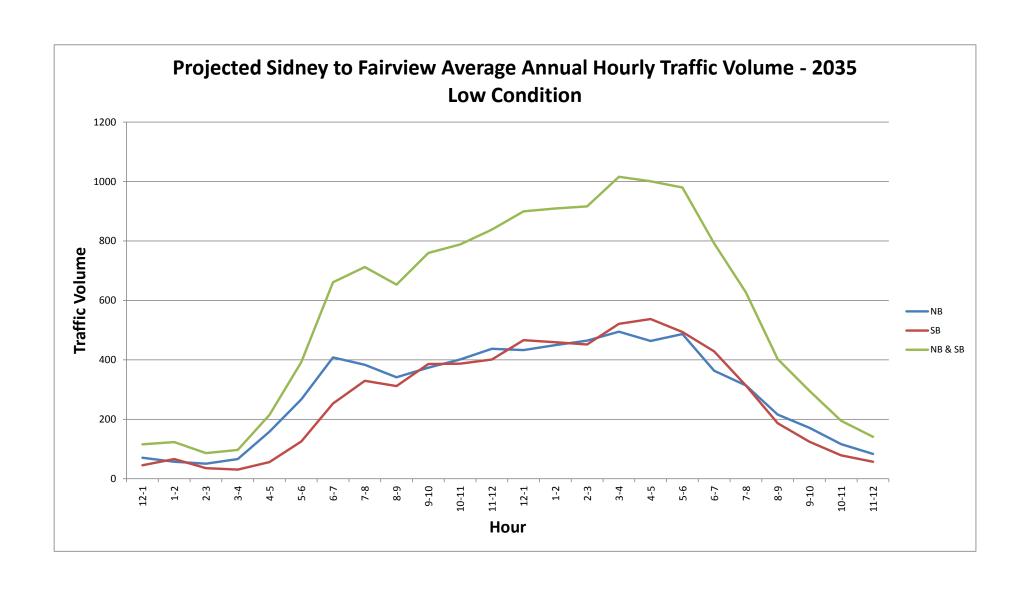
| Vaca | MT 16
Glendive to Sidney
RP 0.6 to RP 50.4 | | MT 200
Sidney to Fairview
RP 52.6 to RP 62.5 | | | | | |
|------|--|---------|--|---------|----------------|---------|----------------|---------|
| Year | Low Es | stimate | High Es | stimate | Low Es | stimate | High Es | stimate |
| | Growth
Rate | AADT | Growth
Rate | AADT | Growth
Rate | AADT | Growth
Rate | AADT |
| 2013 | | 3,658 | | 3,658 | | 7,627 | | 7,627 |
| 2014 | 16.0% | 3,954 | | 3,954 | 13.7% | 8,542 | | 8,542 |
| 2015 | | 3,993 | 16.0% | 4,274 | | 8,653 | 13.7% | 9,567 |
| 2016 | | 4,033 | | 4,620 | | 8,765 | | 10,715 |
| 2017 | | 4,074 | | 4,667 | | 8,879 | | 10,854 |
| 2018 | | 4,114 | | 4,713 | | 8,995 | | 10,995 |
| 2019 | | 4,156 | | 4,760 | | 9,112 | | 11,138 |
| 2020 | | 4,197 | | 4,808 | | 9,230 | | 11,283 |
| 2021 | | 4,239 | | 4,856 | | 9,350 | | 11,430 |
| 2022 | | 4,281 | | 4,905 | | 9,472 | | 11,578 |
| 2023 | | 4,324 | | 4,954 | | 9,595 | | 11,729 |
| 2024 | | 4,368 | | 5,003 | | 9,720 | | 11,881 |
| 2025 | 0.7% | 4,411 | | 5,053 | 1.7% | 9,846 | | 12,036 |
| 2026 | 0.770 | 4,455 | 0.7% | 5,104 | 1.770 | 9,974 | 1.7% | 12,192 |
| 2027 | | 4,500 | 0.770 | 5,155 | | 10,104 | 1.7/0 | 12,351 |
| 2028 | | 4,545 | | 5,206 | | 10,235 | | 12,511 |
| 2029 | | 4,590 | | 5,258 | | 10,368 | | 12,674 |
| 2030 | | 4,636 | | 5,311 | | 10,503 | | 12,839 |
| 2031 | | 4,683 | | 5,364 | | 10,639 | | 13,006 |
| 2032 | | 4,729 | | 5,418 | | 10,778 | | 13,175 |
| 2033 | | 4,777 | | 5,472 | | 10,918 | | 13,346 |
| 2034 | | 4,824 | | 5,527 | | 11,060 | | 13,520 |
| 2035 | | 4,873 | | 5,582 | | 11,204 | | 13,695 |

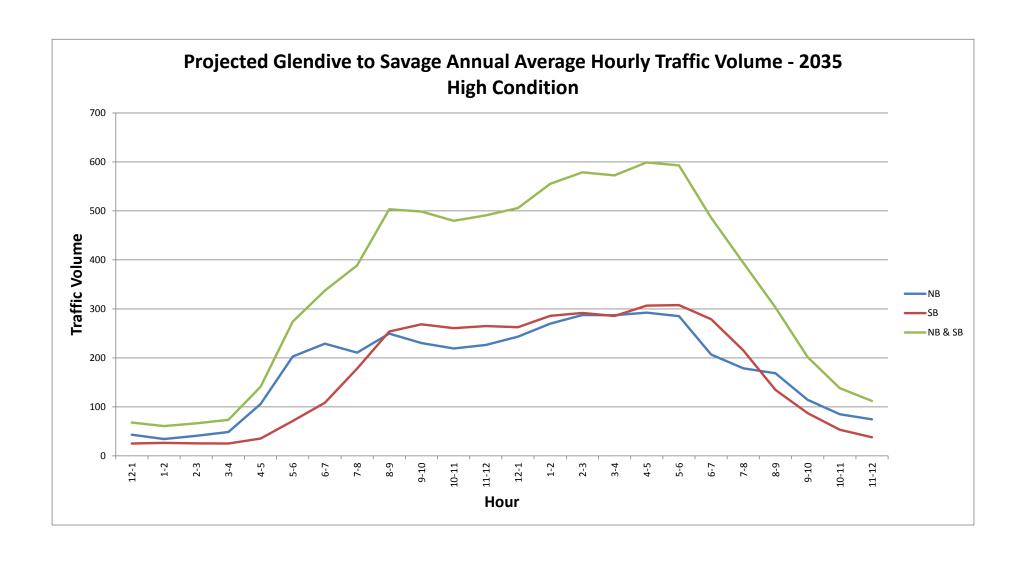
Source: DOWL HKM, 2012.

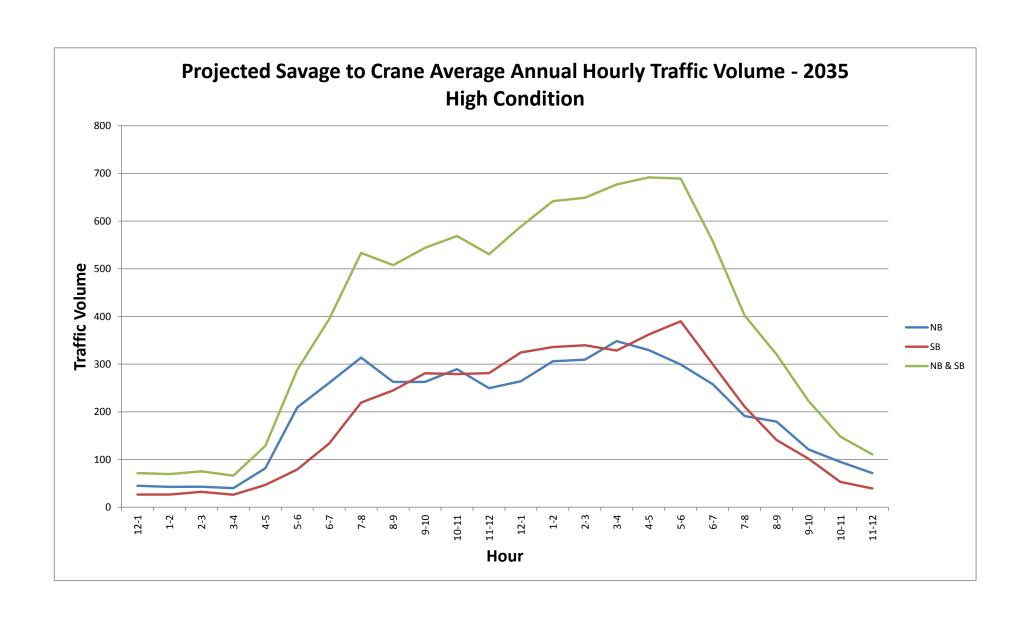


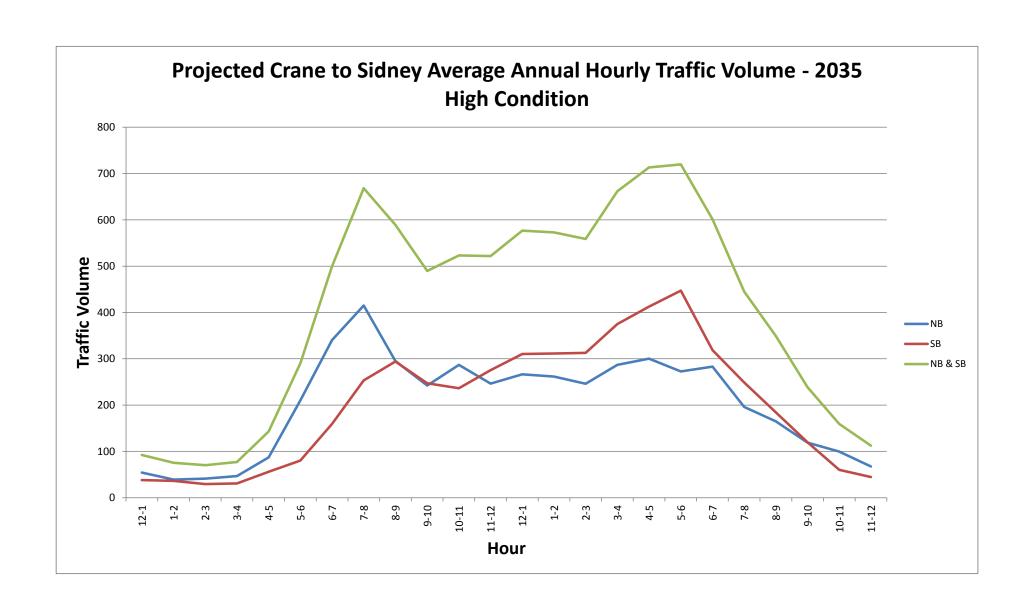


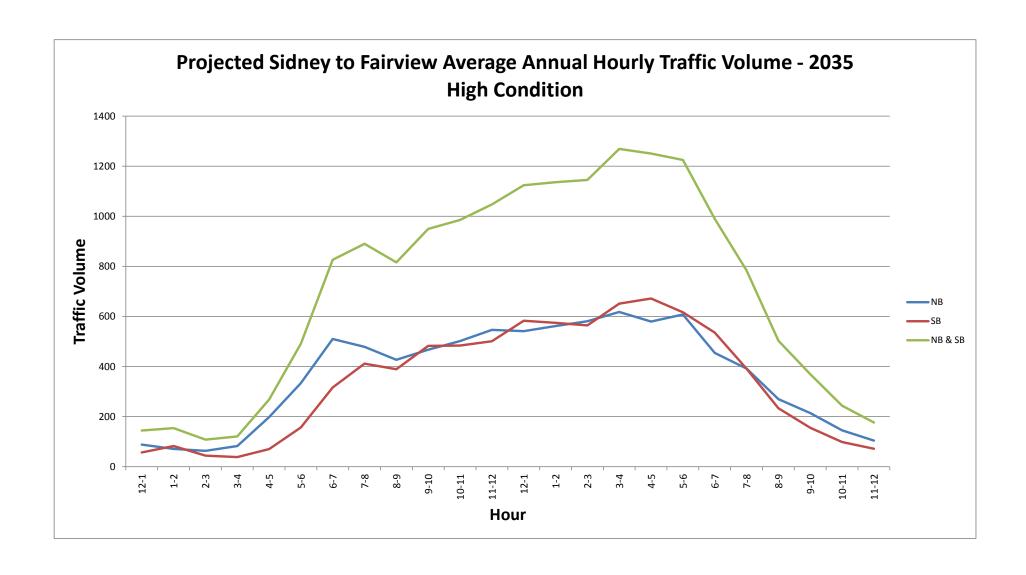














Appendix 7

Operational Analysis Worksheets



Appendix 7

Existing Two-Lane Highway 2012

| AY SEGMENT WORK Site Information Highway / Direction of Travel From/To Jurisdiction Analysis Year | MT 16
RP 0.6 to 20.0 NB
Dawson/Richland County |
|---|---|
| From/Tó
Jurisdiction
Analysis Year | RP 0.6 to 20.0 NB
Dawson/Richland County |
| | |
| dy | 2012 |
| | |
| | |
| | |
| Class I I | hìghway Class II |
| highway | Class III highway |
| | ✓ Level Rolling |
| Grade Lengtl
Peak-hour fa
No-passing z | h mi Up/down
ctor, PHF 0.81 |
| Show North Arrow % Trucks and | d Buses , P _T 27 % |
| % Recreation | nal vehicles, P _R 4% |
| Access points | s <i>mi 5/</i> mi |
| | |
| | |
| Analysis Direction (d) | Opposing Direction (o) |
| 1.6 | 1.6 |
| 1.0 | 1.0 |
| 0.861 | 0.861 |
| 1.00 | 1.00 |
| 194 | 199 |
| Estimated Fro | ee-Flow Speed |
| Base free-flow speed ⁴ , BFFS | 65.0 mi/h |
| Adj. for lane and shoulder width,4 | f _{LS} (Exhibit 15-7) 0.0 mi/h |
| Adj. for access points ⁴ , f _A (Exhibit 15-8) 1.3 mi/h | |
| Free-flow speed, FFS (FSS=BFFS-f _{I,S} -f _A) 63.8 mi/l | |
| Average travel speed, ATS _d =FFS | EO 71 |
| V _{o,ATS}) - f _{np,ATS}
Percent free flow speed, PFFS | 91.3 % |
| Amahaia (2) C (1) | |
| | Opposing Direction (o) |
| | 1.1 |
| | 1.0
0.974 |
| | 1.00 |
| 171 | 176 |
| 18.8 | |
| 42.2 | |
| TSF + 20 6 | |
| 3 | 9.6 |
| | |
| | В |
| | Analysis Direction (d) 1.6 1.0 0.861 1.00 194 Estimated Fro Base free-flow speed ⁴ , BFFS Adj. for lane and shoulder width, ⁴ Adj. for access points ⁴ , f _A (Exhibit Free-flow speed, ATS _d =FFS Average travel speed, ATS _d =FFS Vo,ATS) - f _{np,ATS} Percent free flow speed, PFFS Analysis Direction (d) 1.1 1.0 0.974 1.00 171 |

| Capacity, C _{d,ATS} (Equation 15-12) p <i>cl</i> h | 1464 |
|---|--|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1655 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 91.3 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 166.7 |
| Effective width, Wv (Eq. 15-29) ft | 34.50 |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 11.34 |
| Bicycle level of service (Exhibit 15-4) | F |
| Notes | The second secon |

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^{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 downgrade segments are treated as level terrain.

^{2.} If $v_i(v_d \text{ or } v_o) \ge 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| Mean speed of sample 3 , S_{FM} Total demand flow rate, both directions, v Adj. for lane and shoulder width, 4 f _{LS} (Exhibit 15-7) 0.0 m Adj. for access points 4 , f _A (Exhibit 15-8) 1.8 m Free-flow speed, FFS= $_{K}$ +0.00776(v f f _{HV,ATS}) Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 2.1 mi/n Average travel speed, ATS _d =FFS-0.00776(v d,ATS+ 58.0 m v 0,ATS) 2 f _{np,ATS} Percent free flow speed, PFFS 91.6 9 Percent Time-Spent-Following Analysis Direction (d) Opposing Direction (e) Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) 1.1 1.1 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 1.0 Heavy-vehicle adjustment factor, f _{HV} =1/(1+ P _T (E _T -1)+P _R (E _R -1)) 0.972 0.972 Grade adjustment factor 1 , f _{g,PTSF} (Exhibit 15-16 or Ex 15-17) 1.00 1.00 Directional flow rate ² , v /(pc/h) v /= v //(PHF*f _{HV,PTSF} * f _{g,PTSF}) 183 178 Base percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} * (v d,PTSF+ v d,PT | DIRECTION | NAL TWO-LANE HIGHWA | AY SEGMENT WORK | SHEET |
|---|---|--|---|--|
| Agenty or Company DOWL HRM | | | | |
| Agency of Company DOWL Hridd From From From From From From From From | Analyst | David Stoner | Highway / Direction of Travel | MT 16 |
| Analysis Time Period Post Hour Project Description M 16 / M 200 Glandwe to Fairview Corridor Plenning Study | | DOWL HKM | | |
| Project Description: MT 16 / MT 200 Glandive to Fairview Corridor Planning Study Input Data | | | | Dawson/Richland County |
| Shouldor width It Lane w | | | | 2012 |
| Sinutidar width It Lane width It Shoulder width It Shoulde | | lendive to Fairview Corridor Planning Stu | dy | |
| Lane width It Shoulder Shoulde | Input Data | | | |
| Lane width It Shoulder Shoulde | | Shoulder width | | |
| Lane width It | | | | · · |
| Shoulder width It | | | ✓ Class I I | highway 🧜 Class II |
| Segment length, L ₁ | | | highway | Class III highway |
| Segiment length, L_ | | Shoulder widthIt _ | | |
| Analysis direction vol., V _d 139veh/h Opposing direction vol., V _d 139veh/h Opposing direction vol., V _d 139veh/h Opposing direction vol., V _d 139veh/h Access points m/ 12.0 Segment Length mi 12.0 Segment Length mi 12.0 Passenger-car equivalents for Irticks, E _T (Exhibit 15-11 or 15-13) Average Travel Speed Analysis Direction (d) Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) 1.0 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) 1.0 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-9) 1.00 1.00 Demand flow rate ² , V ₁ (pch) V ₁ =V ₁ /(PHF ² f ₀ ATS ² f ₁ (VATS) Free-flow Speed from Field Measurement Estimated Free-Flow Speed Base free-flow speed ⁴ , BFFS S _{EM} +0.00776(V f ₁ NATS) Adj. for lane and shoulder width; f _{1,S} (Exhibit 15-8) 1.8 m Adj. for access points f ⁴ , f ₄ (Exhibit 15-8) 1.8 m Free-flow speed, FFS=S _{EM} +0.00776(V f ₁ NATS) Adj. for no-passing zones, f ₁ p _A ATS (Exhibit 15-18 or 15-19) 1.1 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RV | | | 1 , 1 , | |
| Analysis direction vol., V _d 139veh/h Opposing direction vol., V _d 139veh/h Opposing direction vol., V _d 139veh/h Shoulder vidith ft 8.0 Lane Width ft 12.0 Segment Length mi 11.8 Average Travel Speed Average Travel Speed Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) 1.6 1.6 Passenger-car equivalents for Rvs, E _R (Exhibit 15-11 or 15-13) 1.0 1.0 Heavy-vehicle adjustment factor, f _{1NATS} = 1/(1+ P _T (E _T -1)+P _R (E _R -1)) 0.852 0.852 Grade adjustment factor, f ₂ ATS (Exhibit 15-9) 1.00 1.00 Demand flow rate ² , v ₁ (pch) v ₂ =V ₁ (PFIF ¹ f ₂ ATS ¹ HVATS) 203 Free-Flow Speed from Field Measurement Estimated Free-Flow Speed Mean speed of sample ³ , S _{FM} Total demand flow rate, both directions, v Free-flow speed, FFS=S _{FM} +0.00776(v ₁ f _{1N} ATS) 2.1 mith VoATS ¹ f ₂ FRS (FSS=BFFS 4], S ¹ f ₃ AS (Exhibit 15-16) 2.1 mith Percent Time-Spent-Following Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for ftrucks, E _T (Exhibit 15-18) 1.1 1.1 Passenger-car equivalents for ftrucks, E _T (Exhibit 15-18 or 15-19) 1.0 1.0 Passenger-car equivalents for ftrucks, E _T (Exhibit 15-18 or 15-19) 1.0 1.0 Passenger-car equivalents for ftrucks, E _T (Exhibit 15-18 or 15-19) 1.0 1.0 Passenger-car equivalents for ftrucks, E _T (Exhibit 15-16 or Ex 15-17) 1.00 1.00 Directional flow rate ² , v ₁ (pch) v ₂ =V ₁ /(PFIF ¹ f ₁ (N) =TSF f ₄ (%) = 100 (fee f ⁴ f ₁ (N) = 100 (fee f ⁴ f ₁ | Segment length | , կ mi | | |
| Analysis direction vol., V _d 139veh/h Opposing direction vol., V _d 139veh/h Shoulder width 1 12.0 Segment Length mi 12.0 Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) Average Travel Speed Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) All 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) All 1.0 Passenger-car equivalents for RVs, E _R (Exhibit 15-19) Demand flow rate ² , V ₁ (pr.h) V ₁ = V ₁ (PHF ⁻¹ (A)Ts ⁻¹ (1-V,A)Ts) Free-Flow Speed from Field Measurement Base free-flow speed ⁴ , BFFS Adj. for lane and shoulder width, 4 (Exhibit 15-7) Adj. for access points, 4, 14 (Exhibit 15-8) Adj. for no-passing zones, f _{Po} ATs (Exhibit 15-18) Parcent time-Spent-Following Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) Analysis Direction (d) Opposing Direction (o) Analysis Direction (d) Opposing Direction (d) Analysis Direction (d) Opposing Direction | • | ľ | | |
| Opposing direction vol., V _o 135veth/h % Recreational vehicles, P _R 4% / 7/ml Shoulder width ft 8.0 Access points m/ 7/ml Segment Length mi 11.9 7/ml 7/ml Average Travel Speed Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for Irucks, E _T (Exhibit 15-11 or 15-12) 1.6 1.6 Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) 1.0 1.0 Heavy-vehicle adjustment factor, f _{th/ARTS} =f(1/t+P _T (E _T -1)+P _R (E _R -1)) 0.852 0.852 Grade adjustment factor, f _{th/ARTS} =f(1/t+P _T (E _T -1)+P _R (E _R -1)) 0.852 0.852 Grade adjustment factor, f _{th/ARTS} =f(Exhibit 15-9) 1.00 1.00 Demand flow rate, y(pch) y=V _t / (PHF f _Q ATS *f _{th/ARTS}) 209 203 Free-Flow Speed from Field Measurement Estimated Free-Flow Speed Mean speed of samples, S _{EM} Adj. for lane and shoulder width, f _{LS} (Exhibit 15-7) 0.0 m Mol for no-passing zones, f _{rp} ATS (Exhibit 15-15) 2.1 mith Average travel seped, ATS_sFFS.O.00776(v _{ATS} + S _A) 83.3 r Adj. for no-passing zones, f _{rp} ATS (Exhibit 15-16 or 15-19) 1.1 1.1 </td <td>Analysis direction yet V 120/</td> <td>ah/h</td> <td>61 11 1</td> <td></td> | Analysis direction yet V 120/ | ah/h | 61 11 1 | |
| Shoulder width ft 12.0 Segment Length mi 11.8 Average Travel Speed Average Travel Speed Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12) 1.6 1.6 1.6 Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13) 1.0 1.0 Heavy-vehicle adjustment factor $I_{P,ATS}$ (Exhibit 15-9) 1.00 1.00 Demand flow rate ² , V_I (prh) V_I = V_I / (PHF $I_{P,ATS}$ $I_{IV,ATS}$) 209 203 Free-Flow Speed from Fiold Measurement Estimated Free-Flow Speed Mean speed of sample $I_{P,ATS}$ (Exhibit 15-19) 2.1 mith 40, for no-passing zones, $I_{P,ATS}$ (Exhibit 15-15) 2.1 mith 51-16 Average travel speed, ATS_=FFS-0.00776(V_I = V_I AVER (Exhibit 15-16) 1.1 1.1 Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19) 1.1 0 1.0 Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19) 1.1 1.1 Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19) 1.1 1.1 Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19) 1.0 0.072 Grade adjustment factor $I_{P,ATS}$ (Exhibit 15-18 or 15-19) 1.0 0.072 Grade adjustment factor $I_{P,ATS}$ (Exhibit 15-16 or Ex 15-17) 1.00 1.00 Directional flow rate ² , V_I (prh) V_I = | ~ | 51011 | | • |
| | · · | eh/h | | •• |
| Segment Length mi 11.8 Average Travel Speed Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12) 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 | | | Access point | s <i>mi</i> 7/mi |
| Average Travel Speed Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12) 1.6 1.0 1.0 1.0 1.0 1.0 Heavy-vehicle adjustment factor, $f_{\text{HVATS}} = f_{\text{HVATS}} = f_{\text{HVATS}$ | | | | |
| Analysis Direction (d) Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) 1.6 1.6 1.6 Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) 1.0 1.0 1.0 Heavy-vehicle adjustment factor, f _{ty,ATS} =1/(1+ P _T (E _T -1)+P _R (E _R -1)) Demand flow rate ² , v _f (pch) v _f =V _f (PHF¹ f _{g,ATS} *f _{ty,ATS}) Pree-Flow Speed from Field Measurement Estimated Froe-Flow Speed Base free-flow speed ⁴ , BFFS Adj. for access points ⁴ , f _g (Exhibit 15-9) Adj. for access points ⁴ , f _g (Exhibit 15-9) Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) Percent Time-Spent-Following Analysis Direction (d) Opposing Direction (o) 1.0 1.0 1.0 1.0 1.0 1.00 1.00 1.00 1.00 Demand flow rate ² , v _f (pch) v _f =V _f (PHF¹ f _{g,ATS} *f _{ty,ATS}) 209 203 Estimated Froe-Flow Speed Base free-flow speed ⁴ , BFFS Adj. for access points ⁴ , f _g (Exhibit 15-7) Adj. for access points ⁴ , f _g (Exhibit 15-9) 1.0 Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 2.1 mi/n Average travel speed, ATS _g =FFS-0.00776(v _{d,ATS} * 56.0 r. v _{o,ATS}) *f _{np,ATS} Percent Time-Spent-Following Analysis Direction (d) Opposing Direction (o) Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) 1.1 1.1 Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) 1.0 1.0 1.0 Heavy-vehicle adjustment factor ¹ , f _{g,PTSF} (Exhibit 15-16 or Ex 15-17) 1.00 1.00 Directional flow rate ² , v _f (pch) v _f =V _f (PHF¹ _{f,M,PTSF} *f _{g,PTSF}) Base percent time-spent-following ⁴ , BPTSF _d (%)=BPTSF _d *f ₁ _{np,PTSF} *(v _{d,PTSF} *V | | | | |
| Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12) 1.6 1.6 Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13) 1.0 1.0 Heavy-vehicle adjustment factor, $f_{\text{PAXIS}} = 1/(1+P_T(E_T^{-1})+P_R(E_R^{-1}))$ 0.852 0.852 Grade adjustment factor, $f_{\text{PAXIS}} = 1/(1+P_T(E_T^{-1})+P_R(E_R^{-1}))$ 0.852 0.852 Grade adjustment factor, $f_{\text{PAXIS}} = 1/(1+P_T(E_T^{-1})+P_R(E_R^{-1}))$ 1.00 1.00 Demand flow rate ² , $v_j(\text{pch}) \text{ vg-V}_j / (\text{PHF}^+ f_{\text{QATS}}^+ f_{\text{INATIS}})$ 209 203 Free-Flow Speed from Field Measurement Estimated Free-Flow Speed Free-Flow Speed from Field Measurement Estimated Free-Flow Speed Base free-flow speed, BFFS 6 65.0 r Adj. for access points ⁴ , f_A (Exhibit 15-7) 0.0 m Adj. for access points ⁴ , f_A (Exhibit 15-7) 0.0 m Adj. for access points ⁴ , f_A (Exhibit 15-8) 1.8 m Free-flow speed, FFS=S _{FM} +0.00776($v_f(N_{\text{PIXAIS}})$ 63.3 r Average travel speed, ATS _q =FFS-0.00776($v_f(N_{\text{ATS}})$ 80.3 r Average travel speed, ATS _q =FFS-0.00776($v_f(N_{\text{ATS}})$ 80.0 r $v_f(N_{\text{CATS}})$ 80.0 r $v_f(N_{$ | ago maros opeca | | Analysis Disastion (d) | Onnocina Disastina (a) |
| Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13) 1.0 1.0 1.0 Heavy-vehicle adjustment factor, $f_{I,NATS}^{-1}$ (1+ $P_T(E_T^{-1})+P_R(E_R^{-1})$) 0.852 0.852 Grade adjustment factor, $f_{I,NATS}^{-1}$ (1+ $P_T(E_T^{-1})+P_R(E_R^{-1})$) 1.00 1.00 1.00 Demand flow rate ² , V_I (pcrh) $V_I = V_I$ (PHF* $f_{I,NATS}^{-1}$) 209 203 Free-Flow Speed from Field Measurement Base free-flow speed, $FFS = FIN $ | | | Analysis Direction (d) | Opposing Direction (o) |
| Heavy-vehicle adjustment factor, $f_{t,NATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ Grade adjustment factor $f_{t,0}$, $f_{g,ATS}$ (Exhibit 15-9) Demand flow rate ² , $V_t(pch)$ $V_t=V_t/(PHF^*f_{g,ATS}^*f_{t,NATS})$ Proe-Flow Speed from Field Measurement Free-Flow Speed from Field Measurement Base free-flow speed f_t BFFS Adj. for lane and shoulder width, f_t (Exhibit 15-7) Adj. for lane and shoulder width, f_t (Exhibit 15-7) Adj. for access points f_t (Exhibit 15-8) 1.8 m Free-flow speed, FFS= f_t 0.00776(W_t f _{tV,ATS}) Adj. for no-passing zones, f_t (Exhibit 15-15) 2.1 mi/n Precent Time-Spent-Following Analysis Direction (d) Passenger-car equivalents for trucks, f_t (Exhibit 15-18 or 15-19) 1.1 1.1 Passenger-car equivalents for RVs, f_t (Exhibit 15-18 or 15-19) 1.0 1.0 Heavy-vehicle adjustment factor, f_t (Exhibit 15-16 or Ex 15-17) Directional flow rate ² , f_t (pch) f_t (Exhibit 15-16 or Ex 15-17) Directional flow rate ² , f_t (pch) f_t (Exhibit 15-16 or Ex 15-17) Proposing zone, f_t (Exhibit 15-16) Adj. for no-passing zone, f_t (Exhibit 15-16 or Ex 15-17) Directional flow rate ² , f_t (Exhibit 15-16 or Ex 15-17) Directional flow rate ² , f_t (Exhibit 15-16 or Ex 15-17) Precent time-spent-following f_t BPTSF f_t (f_t PTSF f_t (f_t PTSF f_t (f_t PTSF f_t (f_t PTSF f_t (f_t FTSF f_t FTSF f_t f_t PTSF f_t (f_t PTSF f_t $f_$ | Passenger-car equivalents for trucks, E _T | (Exhibit 15-11 or 15-12) | 1.6 | 1.6 |
| 1.00 | Passenger-car equivalents for RVs, E _R (| Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Demand flow rate ² , v _j (pc/h) v _j =V _j / (PHF* f _{0,ATS} * f _{1,N,ATS}) | Heavy-vehicle adjustment factor, f _{HV,ATS} | =1/ (1+ P _T (E _T -1)+P _R (E _R -1)) | 0.852 | 0.852 |
| | Grade adjustment factor ¹ , f _{g,ATS} (Exhibi | t 15-9) | 1.00 | 1.00 |
| Mean speed of sample 3 , S_{FM} Total demand flow rate, both directions, v Free-flow speed, FFS= S_{FM} +0.00776(w $f_{HV,ATS}$) Adj. for lane and shoulder width, 4 f_{LS} (Exhibit 15-7) Adj. for access points 4 , 4 , (Exhibit 15-8) 1.8 m Free-flow speed, FFS= S_{FM} +0.00776(w $f_{HV,ATS}$) Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15) 2.1 mi/h Average travel speed, ATS $_a$ =FFS-0.00776(w d_ATS + | Demand flow rate ² , v_j (pc/h) $v_i = V_j$ / (PHF | * f _{g,ATS} * f _{HV,ATS}) | 209 | 203 |
| Mean speed of sample 3 , S_{FM} Total demand flow rate, both directions, v Free-flow speed, FFS= S_{FM} +0.00776(W f_{HVATS}) Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15) 2.1 mi/h Average travel speed, ATS _q =FFS-0.00776($V_{d,ATS}$ + $f_{np,ATS}$ + $f_{np,ATS}$ + $f_{np,ATS}$ - f_{n | Free-Flow Speed from | m Field Measurement | Estimated Fro | ee-Flow Speed |
| Mean speed of sample 3 , S_{FM} Total demand flow rate, both directions, v Free-flow speed, FFS= S_{EM} +0.00776(v f $_{HV,ATS}$) Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15) 2.1 mith Free-flow speed, FFS (FSS=BFFS- 1 C, 1 C, 1 A) Average travel speed, ATS $_0$ =FFS-0.00776(v d, ATS+ 1 B) Average travel speed, ATS $_0$ =FFS-0.00776(v d, ATS+ 1 B) Percent Time-Spent-Following Analysis Direction (d) Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19) 1.1 Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Heavy-vehicle adjustment factor, f_{HV} =1/(1+ P_T (E_T -1)+ P_R (E_R -1)) Oirectional flow rate ² , v_i (pc/h) v_i = v_i /(PHF* $f_{HV,PTSF}$ + $f_{g,PTSF}$) Base percent time-spent-following, PTSF $_0$ (%)=BPTSF $_0$ 4(%)=100(1- $e^{av}d^b$) Percent time-spent-following, PTSF $_0$ (%)=BPTSF $_0$ 4(%)=BPTSF $_0$ 4(v_i PTSF- v_i V, v_i PTSF- v_i PTSF | | | Base free-flow speed ⁴ , BFFS | 65.0 mi/h |
| Mean speed of sample*, S_{FM} Adj. for access points*, f_A (Exhibit 15-8) 1.8 m Adj. for no-passing zones, f_{PM} (Exhibit 15-15) 2.1 mi/h Average travel speed, $FFS = S_{FM} + 0.00776(v_{dATS} + 58.0 \text{ m. No.}) + $ | | | • | 4 = =================================== |
| Total demand flow rate, both directions, v Free-flow speed, FFS=S _{FM} +0.00776(v f $_{HV,ATS}$) Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15) 2.1 mi/n Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15) 2.1 mi/n Average travel speed, ATS $_d$ =FFS-0.00776(v d $_{ATS}$ + 58.0 m. v o,ATS) - $f_{np,ATS}$ Percent free flow speed, PFFS 91.6 9 Percent Time-Spent-Following Analysis Direction (d) Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19) 1.1 Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) 1.0 1.0 Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) O.972 Grade adjustment factor f_{HV} =1/ (1+ P_T (E_T -1)+ P_R (E_R -1) Directional flow rate f_{HV} -7/ (PHF* $f_{HV,PTSF}$ * $f_{g,PTSF}$) Base percent time-spent-following $f_{g,PTSF}$ (Exhibit 15-21) Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21) Percent time-spent-following, PTSF $_d$ (%)=BPTSF $_d$ + $f_{np,PTSF}$ * ($f_{g,PTSF}$) Level of Service and Other Performance Measures Level of Service, LOS (Exhibit 15-3) | Mean speed of sample ³ , S _{EM} | | | |
| Free-flow speed, FFS= S_{FM}^+ 0.00776($v/f_{HV,ATS}$) Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15) 2.1 mi/h Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15) 2.1 mi/h Average travel speed, AFS_d=FFS-0.00776(v/d_{ATS}^+) 8.0 matrix v/d_{ATS}^-) Percent Time-Spent-Following Analysis Direction (d) Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19) 1.1 Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) 1.0 Passenger-car equivalents for RVs, E_R (Exhibit 15-16 or 15-19) 1.0 Passenger-car equivalent factor, f/d_{ATS}^- 1/(1+ P/d_{ATS}^- 1) Passenger-car equivalents for RVs, f/d_{ATS}^- 1/(1+ P/d_{ATS}^- 1/(1+ P/d_{ATS}^- 1) Passenger-car equivalents for RVs, f/d_{ATS}^- 1/(1+ P/d_{ATS}^- 1) Passenger-car equivalents for RVs, f/d_{ATS}^- 1/(1+ P/d_{ATS}^- 1/(1+ P/d_{ATS}^- 1) Passenger-car equivalents for RVs, f/d_{ATS}^- 1/(1+ P/d_{ATS}^- 1) Passenger-car equivalents for RVs, f/d_{ATS}^- 1/(1+ P/d_{ATS}^- 1/(1+ P/d_{ATS}^- 1) Passenger-car equivalents for RVs, f/d_{ATS}^- 1/(1+ P/d_{ATS}^- 1) Passenger-car equivalents for RVs, f/d_{ATS}^- 1/(1+ P/d_{ATS}^- 1) Passenger-car equivalents for RVs, f/d_{ATS}^- 1/(1+ P/d_{ATS}^- | | <i>y</i> | Adj. for access points ⁴ , f _A (Exhibit | it 15-8) 1.8 mi/h |
| Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15) 2.1 mi/h Average travel speed, ATS_d =FFS-0.00776($V_{d,ATS}$ + 58.0 m. $V_{o,ATS}$) - $f_{np,ATS}$ Percent free flow speed, PFFS 91.6 9 Percent Time-Spent-Following Analysis Direction (d) Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19) 1.1 Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) 1.0 1.0 1.0 Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) Directional flow rate ² , V_T (pc/h) V_T = V_T (PHF* V_T (V_T)= V_T (PHF* V_T (PHF* V_T)= V_T (PHF* V_T (PHF* V_T)= V_T (PHF* $V_$ | | | Free-flow speed, FFS (FSS=BFFS-f _{1.S} -f _A) 63.3 mi/h | |
| Percent Time-Spent-Following Analysis Direction (d) Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-10 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-10 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-10 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-10 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-10 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-10 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-10 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RV | | | 20 N | |
| Percent Time-Spent-Following Analysis Direction (d) Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) 1.0 Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) O.972 O.972 Grade adjustment factor f_{HV} =1/ (1+ f_{HV} -1/ f_{HV} - | Adj. for no-passing zones, f _{np,ATS} (Exhib | it 15-15) 2.1 mi/h | | 5-0.00776(v _{d,ATS} + 58.0 mi/h |
| Percent Time-Spent-Following Analysis Direction (d) Opposing Direction (e) Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19) 1.1 1.1 Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) 1.0 1.0 Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) 0.972 0.972 Grade adjustment factor ¹ , $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17) 1.00 1.00 Directional flow rate ² , v_i (pc/h) v_i = v_i /(PHF* $f_{HV,PTSF}$ * $f_{g,PTSF}$) 183 178 Base percent time-spent-following ⁴ , BPTSF $_d$ (%)=100(1- e^{av_d} b) 20.0 Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21) 38.4 Percent time-spent-following, PTSF $_d$ (%)=BPTSF $_d$ + $f_{np,PTSF}$ *($v_{d,PTSF}$) 4.9 $v_{o,PTSF}$) Level of Service and Other Performance Measures Level of Service, LOS (Exhibit 15-3) | | | Vo.ATS) - fnp.ATS | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | Percent free flow speed, PFFS | 91.6 % |
| Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19) 1.1 Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) 1.0 1.0 Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ O.972 O.972 Grade adjustment factor ¹ , $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17) 1.00 1.00 1.00 Directional flow rate ² , v_i (pc/h) v_i = V_i (PHF* $f_{HV,PTSF}$ * $f_{g,PTSF}$) 183 178 Base percent time-spent-following ⁴ , BPTSF $_d$ (%)=100(1- $e^{av_d}^b$) 20.0 Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21) Percent time-spent-following, PTSF $_d$ (%)=BPTSF $_d$ + $f_{np,PTSF}$ *($v_{d,PTSF}$) Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3) | Percent Time-Spent-Following | | | |
| Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) 1.0 1.0 1.0 Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T^{-1})+P_R(E_{R^{-1}}))$ 0.972 0.972 Grade adjustment factor ¹ , $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17) 1.00 1.00 Directional flow rate ² , $v_f(pc/h)$ $v_f^{\perp}=V_f/(PHF^{+}f_{HV,PTSF}^{+})$ 183 178 Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1- $e^{av_d}^b$) 20.0 Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21) Percent time-spent-following, PTSF _d (%)=BPTSF _d + $f_{np,PTSF}^{+}$ ($v_{d,PTSF}^{-}$ / $v_{d,PTSF}^{-}$) Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3) | | | Analysis Direction (d) | Opposing Direction (o) |
| Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ 0.972 0.972 Grade adjustment factor $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ 1.00 1.00 Directional flow rate $f_{HV}=1/(PHF^*f_{HV,PTSF}^*f_{g,PTSF}^*)$ 183 178 Base percent time-spent-following f_{HV}^* , BPTSF $f_{HV,PTSF}^*$, $f_{g,PTSF}^*$, 20.0 Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21) 38.4 Percent time-spent-following, PTSF f_{HV}^* , PTSF $f_{HV,PTSF}^*$, $f_{HV,PTSF}$ | Passenger-car equivalents for trucks, E _T | (Exhibit 15-18 or 15-19) | 1.1 | 1.1 |
| Grade adjustment factor 1 , $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17) 1.00 1.00 1.00 1.00 Directional flow rate 2 , $v_f(pc/h)$ $v_i = V_f(PHF^*f_{HV,PTSF}^*f_{g,PTSF})$ 183 178 Base percent time-spent-following 4 , BPTSF $_d(\%) = 100(1 - e^{aV_d}^b)$ 20.0 Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21) Percent time-spent-following, PTSF $_d(\%) = BPTSF_d + f_{np,PTSF}^*(V_{d,PTSF} / V_{d,PTSF} + V_{d,PTSF})$ Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3) B | Passenger-car equivalents for RVs, E_R (I | Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Directional flow rate ² , v _i (pc/h) v _i =V _i (PHF*f _{HV,PTSF} * f _{g,PTSF}) Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av_db}) Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} / v _{d,PTSF} + v _{d,PTSF}) Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3) | Heavy-vehicle adjustment factor, f _{HV} =1/ | (1+ P _T (E _T -1)+P _R (E _R -1)) | 0.972 | 0.972 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} d ^b) Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} / v _{d,PTSF} + 39.5 V _{o,PTSF}) Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3) B | Grade adjustment factor ¹ , f _{g,PTSF} (Exhibit 15-16 or Ex 15-17) | | 1.00 | 1.00 |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *(V _{d,PTSF} / V _{d,PTSF} + 39.5 V _{o,PTSF}) Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3) B | Directional flow rate ² , v _s (pc/h) v _i =V _j (PHF*f _{HV,PTSF} * f _{g,PTSF}) | | 183 | 178 |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} / v _{d,PTSF} + 39.5 V _{o,PTSF}) Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3) B | Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} d ^b) | | 20.0 | |
| V _{o,PTSF}) Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3) B | \dj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | | 38.4 | |
| V _{o,PTSF}) Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3) B | Percent time-spent-following, PTSF $_{ m d}$ (%)= | BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} / v _{d,PTSF} + | SF + 39.5 | |
| Level of service, LOS (Exhibit 15-3) | | | V | ··· |
| | | ce Measures | | |
| | | | | В |
| Volume to capacity ratio, v/c 0.14 | /olume to capacity ratio, v/c | | 0 | .14 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1448 | |
|---|-------|-------------------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1652 | |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 91.6 | - Andrews Control |
| Bicycle Level of Service | | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 178.2 | |
| Effective width, Wv (Eq. 15-29) ft | 34.10 | |
| Effective speed factor, S ₁ (Eq. 15-30) | 4.79 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 13.06 | |
| Bicycle level of service (Exhibit 15-4) | F | onen |
| 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 downgrade segments are treated as level terrain.

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^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| Site Information Site Information Site Information Site Information Site Information Signify of Travel PP 20 Ib Savings NB Appendix of Travel PP 20 Ib Savings NB PP 20 Ib Savings | | MENT WORKSHEET WITH PASSING LANE |
|---|--|--|
| Analysis Time Period Append or Company Dolto Performed Aff 2020 In Savege NS Jurisdiction Analysis Time Period Aff 2020 In Savege NS Jurisdiction Analysis Time Period Aff 2020 In Savege NS Jurisdiction Analysis Time Period Aff 2020 In Savege NS Jurisdiction Analysis Total Project Description: MT 16 /MT 200 Glondwin to Fairwise Conditor Planning Study Imput Data Class I highway Class II highway Class III highway | | |
| Project Description: MT 16 / MT 200 Glandwo to Fairview Corridor Planning Study Input Date Class Inighway | Agency or Company DOWL HKM Date Performed 4/17/2012 | From/To RP 20.0 to Savage NB Jurisdiction Dawson/Richland County |
| Opposing direction Analysis direction Analysis direction Lu Lu Lpi Lde Ld Lg Shoutler width (th) Sourtien File Segment Length (mi) Total length of analysis segment, Lt Length of two-lane highway upstream of the passing lane, La Length of two-lane highway upstream of the passing lane, La Length of passing lane including upers , Lpi Length of passing lane including upers , Lpi Length of passing lane including upers , Lpi Average travel speed, ATS _q (from Directional Two-Lane Highway Segment Worksheet) Average Travel Speed Longth of the Open Directional Two-Lane Highway Segment Worksheet) Average Travel Speed Longth of the Open Directional Two-Lane Highway Segment Worksheet) Average Travel Speed Longth of the Open Directional Two-Lane Highway Segment Worksheet) Average Travel Speed Length of two-lane highway downstream of office live length of the passing lane for average travel speed, Let Lg Length of two-lane highway downstream of office live length of the passing lane for average travel speed, Let Lg L | Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Plann | |
| Analysis direction Shoulder width (ft) 12.0 Segment Length (ni) 12.1 Total length of analysis segment, L _t 17.3 Length of two-lane highway upstream of the passing lane, L _u Length of two-lane highway upstream of the passing lane, L _u 1.9 Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) 1.8 Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) 1.8 Average Travel Speed 1.7 Analysis direction 3.8.6 Average Travel Speed 1.7 Length of two-lane highway segment within the effective length of passing lane for average travel speed, L _{da} (Erbibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for average travel speed, L _{da} (Erbibit 15-23) And, factor for the effect of passing lane on average speed, f _p (Exhibit 15-28) Average travel speed including passing lane analysis are averaged travel speed, L _{da} (L _p -1 | Input Data | |
| Analysis direction Lu L _{II} Shoulder width (ft) 8.0 Lane Width (ft) 12.0 Segment Length (nit) 11.5 Total length of analysis segment, L _I 11.5 Length of two-lane highway upstream of the passing lane, L _{II} 0.0 Length of passing lane including tapers, L _{II} 1.9 Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway Segment Worksheet) Average Travel Speed Average Travel Speed Length of the downsteam highway segment within the effective length of passing lane for average travel speed, L _{II} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for average travel speed, L _{II} (L _{II} +L _{II} | 「 Class I highway | highway |
| Shoulder width (ft) Lin Width (ft) Segment Length (fti) Lans Width (ft) Segment Length (fti) Langth of Ywo-Inne highway upstream of the passing lane, Lin Length of Ywo-Inne highway upstream of the passing lane, Lin Length of Ywo-Inne highway upstream of the passing lane, Lin Length of yassing lane including topers, Lin Length of passing lane including topers, Lin Length of yassing lane including topers, Lin Length of yassing lane including topers, Lin Length of yassing lane including topers, Lin Length of the Worksheet of the Worksheet of the State of the State of the Worksheet of the State of the Worksheet of the State of the Worksheet of the Worksheet of the State of the Worksheet of the Worksheet of the State of the Worksheet of the State of the Worksheet of the State of the State of the Worksheet of | | |
| Shoulder width (ft) Lane Width (ft) Segment Length (mi) Fotal Length of analysis segment, L_{τ} Length of two-lane highway upstream of the passing lane, L_{u} Length of passing lane including tapers, L_{pl} Average travel speed, ATS _q (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _q (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _q (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _q (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _q (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _q (from Directional Two-Lane Highway Segment Worksheet) Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{qb} (Exhibit 16-23) Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_{qd} = L_{qc} (L_{qc} + L_{pl} + L_{qb}) Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 16-28) Average travel speed including passing lane ² , ATS _{pl} = (ATS _{pl} ' FFS) Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for avg travel speed including passing lane, PFFS _{pl} = (ATS _{pl} ' FFS) Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{qg} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, L_{qg} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-spent-following, L_{qg} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_{qg} (Exhibit 15-23) | —→ Analysis direction —→ | |
| Shoulder width (ft) Lane Width (ft) Segment Length (mi) Fotal Length of analysis segment, L_{τ} Length of two-lane highway upstream of the passing lane, L_{u} Length of passing lane including tapers, L_{pl} Average travel speed, ATS _q (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _q (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _q (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _q (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _q (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _q (from Directional Two-Lane Highway Segment Worksheet) Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{qb} (Exhibit 16-23) Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_{qd} = L_{qc} (L_{qc} + L_{pl} + L_{qb}) Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 16-28) Average travel speed including passing lane ² , ATS _{pl} = (ATS _{pl} ' FFS) Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for avg travel speed including passing lane, PFFS _{pl} = (ATS _{pl} ' FFS) Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{qg} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, L_{qg} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-spent-following, L_{qg} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_{qg} (Exhibit 15-23) | | |
| Shoulder width (ft) 8.0 Lane Width (ft) 12.0 Segment Length (mi) 11.5 Total Length of analysis segment, L_{τ} 11.5 Length of two-lane highway upstream of the passing lane, L_{τ} 0.0 Length of passing lane including tapers , L_{ρ} 1.9 Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) 58.6 Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway Segment Worksheet) 8 Average Travel Speed Level of Service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) 8 Average Travel Speed Length of the downstream highway segment within the effective length of passing lane for average travel speed, $L_{d\alpha}$ (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for average larvel speed, $L_{d\alpha}$ (Exhibit 16-23) Average travel speed including passing lane ² , ATS _{pl} = (ATS _q * L _t) / ($L_{d\alpha}^{+}L_{t\alpha}^{+}L_{t\alpha}^{-}L_$ | 100 | |
| Lane Width (ft) 12.0 Segment Length (mi) 11.5 Total length of analysis segment, L_t 11.5 Length of two-lane highway upstream of the passing lane, L_u 0.0 Length of passing lane including tapers, L_{pl} 1.9 Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) 58.6 Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway Segment Worksheet) 8 Level of service¹, LOS _d (from Directional Two-Lane Highway Segment Worksheet) B Level of service¹, LOS _d (from Directional Two-Lane Highway Segment Worksheet) 1.70 Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{de} (Exhibit 15-23) 1.70 Length of two-lane highway downstream of effective length of the passing lane for average speed, L_{de} (Exhibit 15-23) 1.70 Length of two-lane highway downstream of effective length of the passing lane for average speed, L_{de} (Exhibit 15-23) 1.08 Average travel speed including passing lane on average speed, L_{pl} (Exhibit 15-23) 1.08 Average travel speed including passing lane?, ATS _{pl} = (ATS _{pl} /FFS) 93.6 Percent Time-Spent-Following 13.00 Length of two-lane highway segment within the effective length of the passing lane for percent time-spent-following, $L_{$ | | Snow Harth Anon |
| Segment Length (mi) Total length of analysis segment, L_t Length of two-lane highway upstream of the passing lane, L_u Length of passing lane including tapers , L_{p1} Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Average Travel Speed Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{d_0} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for average speed, $L_{d_0} = L_T (L_0 + L_p + L_{d_0})$ Average travel speed including passing lane on average speed, f_{p1} (Exhibit 15-23) Average travel speed including passing lane ² , ATS _{p1} = (ATS _{p1} /FFS) Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for percent lime-spent-following, L_{d_0} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent lime-spent-following, L_{d_0} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-lime-following, L_{d_0} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-lime-following, L_{d_0} (Exhibit 15-23) | | 8.0 |
| Total length of analysis segment, L_t Length of two-lane highway upstream of the passing lane, L_u Length of passing lane including tapers , $L_{\rm pl}$ Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Average Travel Speed Length of the downstream highway segment within the effective length of passing lane for average travel speed, $L_{\rm d}$ (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_{\rm d}$ $L_{\rm d}$ - $L_{\rm f}$ - $L_{\rm f}$ + $L_{\rm g}$ + $L_{\rm d}$ - $L_{\rm d}$ - $L_{\rm f}$ - $L_{\rm g}$ + $L_{\rm g}$ + $L_{\rm g}$ - $L_{$ | | 12.0 |
| Length of two-lane highway upstream of the passing lane, L_u Length of passing lane including tapers , $L_{\rm pl}$ Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Average Travel Speed Length of the downstream highway segment within the effective length of passing lane for average travel speed, $L_{\rm dc}$ (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_{\rm d}$ $L_{\rm d}$ - $L_{\rm f}$ $L_{\rm fl}$ | Segment Length (mi) | 11.5 |
| Length of passing lane including tapers , L_{p1} Average travel speed, ATS _a (from Directional Two-Lane Highway Segment Worksheet) Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Average Travel Speed Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{do} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_{d-1}L_{$ | | |
| Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Average Travel Speed Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for average travel speed, L_{de} (Exhibit 15-23) AdJ, factor for the effect of passing lane on average speed, f_{pl} (Exhibit 15-28) Average travel speed including passing lane ² , ATS _{pl} = (ATS _p ⁴ L_{tl}) L_{tl} (L_{tl} L_{t | Length of two-lane highway upstream of the passing lane, L_{u} | 0.0 |
| Worksheet) Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) B Average Travel Speed Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for average speed, L_{de} (Exhibit 15-23) Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 15-23) Average travel speed including passing lane 2 , $ATS_{pl} = (ATS_{d}^* L_{l}^*)$ $(L_{u}^+ L_{-l}^+ (L_{pl} f_{pl}^+)^+ (2L_{de}^- (1+f_{plATS}^-)^-)$ Percent free flow speed including passing lane, PFFS _{pl} = (ATS _{pl} /FFS) Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-spent-following, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_{de}^- ($L_{t}^ L_{t}^ L_{t$ | | 1.9 |
| Segment Worksheet) Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment Worksheet) Average Travel Speed Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_{d} = L_{\Gamma}(L_{u}^{+}L_{pl}^{+} + L_{de})$ Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 15-28) Average travel speed including passing lane ² , $ATS_{pl} = (ATS_{d}^{+}L_{t})I$ $(L_{u}^{+}L_{d}^{+}(L_{pl} f_{pl}^{+})^{+}(2L_{de}^{+}(1+f_{pl,ATS})))$ Percent free flow speed including passing lane, PFFS _{pl} = $(ATS_{pl} FFS)$ 93.6 Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_{de}^{-}(L_{u}^{+}L_{pl}^{+}L_{de}^{-})$ | | 58.6 |
| Worksheet) Average Travel Speed Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_{de} | - | 37.3 |
| Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_{d} \perp_{d=L_1^-}(L_u + L_{pl} + L_{de})$ Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 15-28) Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d^* L_t) / (L_u + L_d + (L_p / f_{pl}) + (2L_{de} / (1 + f_{pl,ATS})))$ Percent free flow speed including passing lane, PFFS _{pl} = (ATS_{pl} / FFS) 93.6 Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d = L_1^- (L_u + L_{pl} + L_{de})$ -3.40 $L_d = L_1^- (L_u + L_{pl} + L_{de})$ | | В |
| passing lane for average travel speed, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_{d} \perp_{d} = L_{\Gamma}(L_{u} + L_{pl} + L_{de})$ Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 15-28) Average travel speed including passing lane ² , $ATS_{pl} = (ATS_{d}^* L_{t})$ $(L_{u} + L_{d} + (L_{pl} f_{pl}) + (2L_{de} f(1 + f_{pl,ATS})))$ Percent free flow speed including passing lane, $PFFS_{pl} = (ATS_{pl} / FFS)$ 93.6 Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_{d} = L_{\Gamma}(L_{u} + L_{pl} + L_{de})$ -3.40 $L_{d} = L_{\Gamma}(L_{u} + L_{pl} + L_{de})$ | | |
| lane for avg travel speed, $L_d L_d = L_{1} \cdot (L_u + L_{pl} + L_{de})$ Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 15-28) Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d^* L_t)$ $(L_u + L_d + (L_p)/f_{pl}) + (2L_{de}/(1 + f_{pl,ATS}))$ Percent free flow speed including passing lane, $PFFS_{pl} = (ATS_{pl}/FFS)$ 93.6 Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d = L_1 \cdot (L_u + L_{pl} + L_{de})$ -3.40 | | 1.70 |
| Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d^* L_t) / (L_u + L_d + (L_p)/f_p) + (2L_{de}/(1 + f_{pl,ATS}))$ Percent free flow speed including passing lane, PFFS _{pl} = (ATS _{pl} /FFS) 93.6 Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d = L_t \cdot (L_u + L_{pl} + L_{de})$ | | 7.90 |
| $(L_u + L_d + (L_p f_p) + (2L_de / (1 + f_p, ATS)))$ Percent free flow speed including passing lane, PFFS $_pl = (ATS_pl FFS)$ 93.6 Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_de (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d = L_t \cdot (L_u + L_pl + L_de)$ | | 1.08 |
| Percent free flow speed including passing lane, PFFS _{pl} = (ATS _{pl} /FFS) Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_{d} = L_{t} \cdot (L_{u} + L_{pl} + L_{de})$ 13.00 -3.40 | | 50.7 |
| Percent Time-Spent-Following Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_{d} = L_{t} \cdot (L_{u} + L_{pl} + L_{de})$ -3.40 | · | 39./ |
| Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_{d} = L_{t} \cdot (L_{u} + L_{pl} + L_{de})$ -3.40 | | 93.6 |
| passing lane for percent time-spent-following, L_{de} (Exhibit 15-23) Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_{d} = L_{t} \cdot (L_{u} + L_{pl} + L_{de})$ -3.40 | | |
| lane for percent-time-following, $ L_{\rm d} = L_{\rm t} \cdot (L_{\rm u} + L_{\rm pl} + L_{\rm de}) $ -3.40 | | 13.00 |
| $L_{d} = L_{l} \cdot (L_{u} + L_{pl} + L_{de})$ | | -3 40 |
| Adi, factor for the effect of passing lane on percent time-spent-following | | -5.70 |
| pl,PTSF(Exhibit 15-26) | Adj. factor for the effect of passing lane on percent time-spent-following, f _{pl,PTSF} (Exhibit 15-26) | 0.58 |

| Percent time-spent-following including passing lane ³ , PTSF _{pl} (%) | | |
|---|-----------|--------|
| $PTSF_{pl} = PTSF_{d}[L_{u} + L_{d} + f_{pl,PTSF} + f_{pl} + ((1 + f_{pl,PTSF})/2)L_{de}]/L_{t}$ | 26.5 | |
| Level of Service and Other Performance Measures ⁴ | | |
| Level of service including passing lane LOS _{pl} (Exhibit 15-3) | A | |
| Peak 15-min total travel time, TT ₁₅ (veh-h) TT ₁₅ = VMT ₁₅ /ATS _{pl} | 8.0 | |
| Bicycle Level of Service | | , mine |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 166.7 | |
| Effective width, W _v (Eq. 15-29) ft | 34.50 | |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 11.34 | |
| Bicycle level of service (Exhibit 15-4) | F | |
| Notes | | |
| 1. If LOS _d =F, passing lane analysis cannot be performed. | | |
| 2. If L _d <0, use alternative Equation 15-18. | | |
| 3. If L _d <0, use alternative Equation 15-16. | | |
| 4. v/c, VMT ₁₅ and VMT ₆₀ are calculated on Directional Two-Lane Highway Segment Wo | orksheet. | |

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| DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET | | | |
|--|---|--|--|
| General Information | Site Information | | |
| Analyst David Stoner | Highway of Travel MT 16 | | |
| Agency or Company DOWL HKM Date Performed 4/17/2012 | From/To RP 12.4 to RP 22.0 SB Jurisdiction Dawson/Richland County | | |
| Analysis Time Period Peak Hour | Analysis Year 2012 | | |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Plann | ing Study | | |
| Input Data | | | |
| Class I highway 「Class II highway 「Class III | l highway | | |
| ← Opposing direction | | | |
| → Analysis direction → | | | |
| | | | |
| | | | |
| to the total transfer transfer to the total transfer tran | | | |
| | | | |
| <u> </u> | Show Health Arrow | | |
| Shoulder width (ft) | 8.0 | | |
| Lane Width (ft) | 12.0 | | |
| Segment Length (mi) | 9.6 | | |
| Total length of analysis segment, L _t | 9.6 | | |
| Length of two-lane highway upstream of the passing lane, $\mathbf{L}_{\mathbf{u}}$ | 0.0 | | |
| Length of passing lane including tapers , L _{pl} | 1.9 | | |
| Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) | 59.1 | | |
| Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway | 37.1 | | |
| Segment Worksheet) | 37.1 | | |
| Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment
Worksheet) | В | | |
| Average Travel Speed | | | |
| Length of the downstream highway segment within the effective length of passing lane for average travel speed, L _{de} (Exhibit 15-23) | 1.70 | | |
| Length of two-lane highway downstream of effective length of the passing | | | |
| lane for avg travel speed, $L_d L_d = L_{t^-}(L_u + L_{\rho l} + L_{de})$ | 6.00 | | |
| Adj. factor for the effect of passing lane on average speed, $f_{ m pl}$ (Exhibit 15-28) | 1.09 | | |
| Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d^* L_t)$ / | 607 | | |
| $(L_u + L_d + (L_{pi}f_{pi}) + (2L_{de}/(1 + f_{pi,ATS})))$ | 60.6 | | |
| Percent free flow speed including passing lane, $PFFS_{pl} = (ATS_{pl}/FFS)$ | 93.9 | | |
| Percent Time-Spent-Following | | | |
| Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L _{de} (Exhibit 15-23) | 13.00 | | |
| Length of two-lane highway downstream of effective length of the passing | | | |
| ane for percent-time-following, | 6.30 | | |
| $L_{\mathbf{d}} = L_{\mathbf{t}} - (L_{\mathbf{u}} + L_{\mathbf{pl}} + L_{\mathbf{de}})$ | -5.30 | | |
| Adj. factor for the effect of passing lane on percent time-spent-following, | | | |
| pl, PTSF(Exhibit 15-26) | 0.58 | | |
| U, rior, | | | |

| Percent time-spent-following including passing lane ³ , PTSF _{pl} (%) | | | | |
|---|-------|--------|--|--|
| $PTSF_{pl} = PTSF_{d}[L_{u} + L_{d} + f_{pl,PTSF}L_{pl} + ((1 + f_{pl,PTSF})/2)L_{de}]/L_{t}$ | 25,2 | | | |
| Level of Service and Other Performance Measures ⁴ | | | | |
| Level of service including passing lane LOS _{pl} (Exhibit 15-3) | A | ACC. 1 | | |
| Peak 15-min total travel time, TT ₁₅ (veh-h) TT ₁₅ = VMT ₁₅ /ATS _{pl} | 7.1 | | | |
| Bicycle Level of Service | | | | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 178.2 | | | |
| Effective width, W _v (Eq. 15-29) ft | 34.10 | | | |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 | | | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 13.06 | | | |
| Bicycle level of service (Exhibit 15-4) | F | | | |
| Notes | | | | |
| 1. If LOS _d =F, passing lane analysis cannot be performed. | | | | |
| 2. If L _d <0, use alternative Equation 15-18. | | | | |
| 3. If L _d <0, use alternative Equation 15-16. | | | | |
| 4. v/c, VMT ₁₅ and VMT ₆₀ are calculated on Directional Two-Lane Highway Segment Worksheet. | | | | |

| DIRECTIONAL TWO-LANE HIGHWA | AY SEGMENT WORK | SHEET |
|---|--|---|
| General Information | Site Information | |
| Analyst David Stoner Agency or Company DOWL HKM Date Performed 4/17/2012 Analysis Time Period Peak Hour | Highway / Direction of Travel
From/To
Jurisdiction
Analysis Year | MT 16
RP 22.0 to Savage SB
Dawson/Richland County
2012 |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Stu | The second secon | 2012 |
| Input Data | | |
| <u> </u> | | |
| \$\frac{1}{2} \text{ Shoulder width } \frac{1}{2} \text{ t} | | |
| Lane widthtt | ✓ Class I | highway Class II |
| Lane width tt | highway | Class III highway |
| Shoulder width ft _ | Terrain | V Level Rolling |
| Segment length, L _t mi | Grade Lengt
Peak-hour fa
No-passing 2 | h mi Up/down
ctor, PHF 0.78 |
| Analysis direction vol., V _d 139veh/h | Show Horth Arrow % Trucks an | |
| Opposing direction vol., V _o 135veh/h | | nal vehicles, P _R 4% |
| Shoulder width ft 8.0 | Access point | ** |
| Lane Width ft 12.0
Segment Length mi 9.5 | · | |
| Average Travel Speed | | |
| Arolago Harol Opoca | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.6 | 1.6 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ | 0.852 | 0.852 |
| Grade adjustment factor ¹ , f _{g.ATS} (Exhibit 15-9) | | |
| Demand flow rate ² , v _f (pc/h) v _i =V _i / (PHF* f _{g,ATS} * f _{HV,ATS}) | 209 | 203 |
| Free-Flow Speed from Field Measurement | Estimated Fr | ee-Flow Speed |
| | Base free-flow speed ⁴ , BFFS | 65.0 mi/h |
| 2 | Adj. for lane and shoulder width, | ⁴ f _{r.c} (Exhibit 15-7) 0.0 mi/h |
| Mean speed of sample ³ , S _{FM} | Adj. for access points ⁴ , f _A (Exhib | |
| Total demand flow rate, both directions, v | 1 | |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _{HV,ATS}) | Free-flow speed, FFS (FSS=BF | |
| Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 2.2 mi/h | Average travel speed, ATS _d =FF5 v _{o,ATS}) - f _{np,ATS} | S-0.00776(v _{d,ATS} + 58.3 mi/h |
| Powered Time On and Fallenting | Percent free flow speed, PFFS | 91.5 % |
| Percent Time-Spent-Following | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | 1.1 | 1.1 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) | 0.972 | 0.972 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 |
| Directional flow rate ² , v _/ (pc/h) v =V _/ (PHF*f _{HV,PTSF} * f _{g,PTSF}) | 183 | 178 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} d ^b) | 20.0 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | 3 | 39.7 |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *($v_{d,PTSF}/v_{d,PTSF}$ + | F ⁺ 40.1 | |
| v _{o,PTSF}) | | |
| Level of Service and Other Performance Measures | | |
| Level of service, LOS (Exhibit 15-3) | *************************************** | В |
| Volume to capacity ratio, v∕c | | 0.14 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1448 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1652 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 91.5 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 178.2 |
| Effective width, Wv (Eq. 15-29) ft | 34.10 |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 13.06 |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTIONAL TWO-LANE HIGHWA | Y SEGMENT WORK | SHEET |
|---|---|--|
| General Information | Site Information | |
| Analyst David Stoner Agency or Company DOWL HKM Date Performed 4/17/2012 Analysis Time Period Peak Hour | | MT 16
Savage to Crane NB
Dawson/Richland County
2012 |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Stu | | 2012 |
| Input Data | | |
| Shoulder width It | | p.com |
| Lane width tt Shoulder width tt | highway T | nighway Class II Class III highway |
| Segment length, L ₁ mi | Grade Length
Peak-hour fac
No-passing 2 | ctor, PHF 0.87 |
| Analysis direction vol., V _d 141veh/h | Show North Arrow % Trucks and | Buses , P _T 23 % |
| Opposing direction vol., V _o 171veh/h Shoulder width ft 8.0 Lane Width ft 12.0 | % Recreational vehicles, P _R 4%
Access points <i>mi</i> 11/mi | |
| Segment Length mi 10.0 Average Travel Speed | | Transmitter - Tr |
| Average Travel Speed | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.7 | 1.5 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}$ =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) | 0.861 | 0.897 |
| Grade adjustment factor ¹ ,f _{g.ATS} (Exhibit 15-9) | 1.00 | 1.00 |
| Demand flow rate ² , v _i (pc/h) v _i =V _i / (PHF* f _{g,ATS} * f _{HV,ATS}) | 188 | 219 |
| Free-Flow Speed from Field Measurement | Estimated Fre | e-Flow Speed |
| | Base free-flow speed ⁴ , BFFS 69 | |
| Mean speed of sample ³ , S _{FM} | Adj. for lane and shoulder width, 4 | f _{LS} (Exhibit 15-7) 0.0 mi/h |
| Total demand flow rate, both directions, <i>v</i> | Adj. for access points ⁴ , f _A (Exhibi | t 15-8) 2.8 mi/h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _{HV.ATS}) | Free-flow speed, FFS (FSS=BFFS-f _{LS} -f _A) | |
| Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 2.7 mi/h | Average travel speed, ATS _d =FFS | i-0.00776(v _{d,ATS} + 60.4 mi/h |
| | V _{o,ATS}) - f _{np,ATS}
Percent free flow speed, PFFS 91. | |
| Percent Time-Spent-Following | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | 1.1 | 1.1 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) | 0.978 | 0.978 |
| Grade adjustment factor ¹ , f _{g.PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 |
| Directional flow rate ² , v _s (pc/h) v _i =V _y (PHF*f _{HV,PTSF} * f _{g,PTSF}) | 166 | 201 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} d ^b) | 18.3 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | 43.4 | |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *($v_{d,PTSF}/v_{d,PTSF}+$ | 37.9 | |
| v _{o,PTSF}) Level of Service and Other Performance Measures | | |
| Level of service, LOS (Exhibit 15-3) | | 8 |
| Volume to capacity ratio, v/c | | 12 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1525 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1662 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 91.1 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 162.1 |
| Effective width, Wv (Eq. 15-29) ft | 33.90 |
| Effective speed factor, S _f (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 8.67 |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTIONAL TWO-LANE HIGHW | AY SEGMENT WORK | SHEET |
|---|---|---|
| General Information | Site Information | |
| Analyst David Stoner | Highway / Direction of Travel | MT 16 |
| Agency or Company DOWL HKM | From/To | Savage to Crane SB |
| Date Performed 4/17/2012 Analysis Time Period Peak Hour | Jurisdiction | Dawson/Richland County |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Sto | Analysis Year | 2012 |
| Input Data | idy | |
| <u> </u> | | |
| \$\frac{1}{2} Shoulder widthft | | |
| tt 🛨 🔭 🔭 🔭 | ✓ Class II | highway Class II |
| Lane widthft | | - - |
| \$\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ | highway J | Class III highway |
| | Terrain | ✓ Level ☐ Rolling |
| Segment length, L _t mi | Grade Lengtl | |
| | Peak-hour fa
No-passing z | |
| Analysis direction vol., V., 171veh/h | Show North Arrow % Trucks and | |
| | | • |
| Opposing direction vol., V _o 141veh/h | | nal vehicles, P _R 4% |
| Shoulder width ft 8.0 | Access point | s <i>mi 11/</i> mi |
| Lane Width ft 12.0
Segment Length mi 10.0 | | |
| Average Travel Speed | | |
| | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.5 | 1.6 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}$ =1/ (1+ $P_T(E_T$ -1)+ $P_R(E_R$ -1)) | 0.889 | 0.870 |
| Grade adjustment factor ¹ , f _{g.ATS} (Exhibit 15-9) | 1.00 | 1.00 |
| Demand flow rate ² , v _j (pc/h) v _i =V _i / (PHF* f _{g,ATS} * f _{HV,ATS}) | 229 | 193 |
| Free-Flow Speed from Field Measurement | Estimated Fro | ee-Flow Speed |
| | Base free-flow speed ⁴ , BFFS 66 | |
| | Adj. for lane and shoulder width, | f _{re} (Exhibit 15-7) 0.0 mi/h |
| Mean speed of sample ³ , S _{FM} | | |
| Total demand flow rate, both directions, v | Adj. for access points ⁴ , f _A (Exhib | |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _{HV.ATS}) | Free-flow speed, FFS (FSS=BFf | $FS-f_{LS}-f_A$) 63.3 mi/h |
| Adj. for no-passing zones, f _{np.ATS} (Exhibit 15-15) 2.0 mi/h | Average travel speed, ATS _d =FFS | S-0.00776(V _{d ATC} + |
| np,AIS (= mail to 10) | | 58.0 mi/h |
| | V _{o,ATS}) - f _{np,ATS}
Percent free flow speed, PFFS | 91.6 % |
| Percent Time-Spent-Following | , crosic need near opeco, 1117 o | 31.0 70 |
| | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | 1.1 | 1.1 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ P_{T} (E_{T} -1)+ P_{R} (E_{R} -1)) | 0.976 | 0.976 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 |
| Directional flow rate ² , v _i (pc/h) v _i =V _i (PHF*f _{HV,PTSF} * f _{g,PTSF}) | 209 | 172 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} d ^b) | 22.4 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | 36.7 | |
| | 42.5 | |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d + $f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + | 4 | 2.5 |
| v _{o,PTSF}) | 4 | 2.5 |
| v _{o,PTSF})
Level of Service and Other Performance Measures | 4 | |
| v _{o,PTSF}) | 4 | 2.5
B
.15 |

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| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1479 | |
|---|-------|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1659 | -1-01 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 91.6 | |
| Bicycle Level of Service | | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 203.6 | |
| Effective width, Wv (Eq. 15-29) ft | 28.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 4,79 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 12.00 | |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1579 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1668 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 90.5 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 188.8 |
| Effective width, Wv (Eq. 15-29) ft | 32.90 |
| Effective speed factor, S ₁ (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 6.55 |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTIONAL TWO-LANE HIGHWA | AY SEGMENT WORK | (SHEET |
|---|--|---|
| General Information | Site Information | |
| Analyst David Stoner Agency or Company DOWL HKM Date Performed 4/17/2012 Analysis Time Period Peak Hour | Highway / Direction of Travel
From/To
Jurisdiction
Analysis Year | MT 16
Crane to Sidney SB
Dawson/Richland County
2012 |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Stu | | LVIA |
| input Data | | |
| Shoulder width It Lane width It Lane width It Shoulder width It | hlghway [| highway Class II
Class III highway |
| Segment length, L _t mi | Terrain Grade Lengt Peak-hour fa No-passing z | octor, PHF 0.87
cone 22% |
| Analysis direction vol., V _d 232veh/h | 76 Trucks an | d Buses , P _T 19 % |
| Opposing direction vol., V _o 151veh/h Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 8.9 | % Recreational vehicles, P _R 4% Access points <i>mi</i> 12/n | |
| Average Travel Speed | | |
| | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.4 | 1.6 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ | 0.929 | 0.898 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhibit 15-9) | 1.00 | 1.00 |
| Demand flow rate ² , v _i (pc/h) v _i =V _i / (PHF* f _{g,ATS} * f _{HV,ATS}) | 287 | 193 |
| Free-Flow Speed from Field Measurement | Estimated Free-Flow Speed | |
| | Base free-flow speed ⁴ , BFFS | |
| Mean speed of sample ³ , S _{FM} | Adj. for lane and shoulder width, | LO |
| Total demand flow rate, both directions, v | Adj. for access points ⁴ , f _A (Exhib | it 15-8) 3.0 mi/h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _{HV.ATS}) | Free-flow speed, FFS (FSS=BFI | FS-f _{LS} -f _A) 66.0 mi/h |
| Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 2.2 <i>mi/h</i> | Average travel speed, ATS _d =FFS-0.00776(v _{d,ATS} + 60. | |
| | V _{o,ATS}) - f _{np,ATS} Percent free flow speed, PFFS 91. | |
| Percent Time-Spent-Following | Analysis Direction (d) | Onnosing Direction (a) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | 1.1 | Opposing Direction (o) |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1)) | 0.981 | 0.981 |
| Grade adjustment factor ¹ , f _{g.PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 |
| Directional flow rate ² , v _/ (pc/h) v _i =V _i /(PHF*f _{HV,PTSF} * f _{g,PTSF}) | 272 | 177 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} d ^b) | 27.9 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | 36.8 | |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *($v_{d,PTSF}/v_{d,PTSF}+v_{d,PTSF}$) | 50.2 | |
| 'o,PTSF' Level of Service and Other Performance Measures | | |
| Level of service, LOS (Exhibit 15-3) | | С |
| Volume to capacity ratio, v/c | | 2.19 |

Directional Page 2 of 2

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1527 |
|---|--|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1668 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 91.0 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 266.7 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 8.22 |
| Bicycle level of service (Exhibit 15-4) | F |
| Notes | and the second s |

^{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 downgrade segments are treated as level terrain.

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^{2.} If v_i(v_d or v_o) >=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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTION | NAL TWO-LANE HIGHWA | AY SEGMENT WORK | KSHEET |
|---|---|---|--|
| General Information | | Site Information | |
| Analyst
Agency or Company | David Stoner
DOWL HKM | Highway / Direction of Travel
From/To | MT 200
Sidney to Fairview EB |
| Date Performed
Analysis Time Period | 4/17/2012
Peak Hour | Jurisdiction
Analysis Year | Dawson/Richland County
2012 |
| Project Description: MT 16 / MT 200 G | lendive to Fairview Corridor Planning Stu | | |
| Input Data | | | |
| | Shoulder width | | |
| 4 | Shoulder width It | [| · · · · · · · · · · · · · · · · · · · |
| | Lane width | | highway Class II |
| | Shoulder widthft | highway I | Class III highway |
| 4 | | Terrain | ✓ Level ☐ Rolling |
| Segment length | n, L _t mi | Grade Lengt
Peak-hour fa
No-passing | actor, PHF 0.83 |
| Analysis direction vol., V _d 257v | eh/h | Show Horth Arrow % Trucks an | d Buses , P _T 17 % |
| Opposing direction vol., V _o 254v | eh/h | % Recreatio | nal vehicles, P _P 4% |
| Shoulder width ft 8.0 | | Access poin | 18 |
| Lane Width ft 12.0
Segment Length mi 9.9 | | | |
| Average Travel Speed | | | |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E | (Exhibit 15-11 or 15-12) | 1.4 | 1.4 |
| Passenger-car equivalents for RVs, E _R | (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV,AT} | ₃ =1/(1+P _T (E _T -1)+P _R (E _R -1)) | 0.936 | 0.936 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhib | | 1.00 | 1.00 |
| Demand flow rate ² , v _i (pc/h) v _i =V _i / (PHF | * f _{g,ATS} * f _{HV,ATS}) | 331 | 327 |
| Free-Flow Speed fro | m Fleid Measurement | Estimated Free-Flow Speed | |
| | | Base free-flow speed ⁴ , BFFS | 69.0 mi/h |
| Mean speed of sample ³ , S _{FM} | | Adj. for lane and shoulder width, | ⁴ f _{LS} (Exhibit 15-7) 0.0 mi/h |
| Total demand flow rate, both directions, | v | Adj. for access points ⁴ , f _A (Exhib | oit 15-8) 4.0 mi/h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ | | Free-flow speed, FFS (FSS=BF | FS-f _{(s} -f _A) 65.0 mi/h |
| Adj. for no-passing zones, f _{np,ATS} (Exhib | | Average travel speed, ATS ₄ =FFS-0.00776(v _{4.635} + | |
| | | V _{o,ATS}) - f _{np,ATS} Percent free flow speed, PFFS 89 | |
| Percent Time-Spent-Following | | | |
| Passangar our controller for territor | /Eyhibii 45 40 c- 45 40) | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T | | 1.1 | 1.1 |
| Passenger-car equivalents for RVs, E _R (
Heavy-vehicle adjustment factor, f _{HV} =1/ | | 1.0
0.983 | 0.983 |
| Grade adjustment factor ¹ , f _{g.PTSF} (Exhib | | 1.00 | 1.00 |
| Directional flow rate ² , v ₍ pc/h) v _i =V _/ (PHF | | 315 | 311 |
| Base percent time-spent-following ⁴ , BPT | | 33.8 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhib | | 34.3 | |
| | =BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} / v _{d,PTSF} + | | |
| v _{o,PTSF}) | g upa tor vortor operat | | 51.1 |
| Level of Service and Other Performan | ce Measures | · · · · · · · · · · · · · · · · · · · | |
| Level of service, LOS (Exhibit 15-3) | | | С |
| Volume to capacity ratio, v/c | | | 0.21 |

Directional Page 2 of 2

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1591 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1672 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 89.3 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 309.6 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 7.15 |
| Bicycle level of service (Exhibit 15-4) | F |
| Notes | |

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^{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 downgrade segments are treated as level terrain.

^{2.} If v_i(v_d or v_o) >=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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTION | IAL TWO-LANE HIGHWA | AY SEGMENT WORK | (SHEET |
|--|--|---|--|
| General Information | | Site Information | |
| Analyst | David Stoner | Highway / Direction of Travel | MT 200 |
| Agency or Company Date Performed | DOWL HKM | From/To | Sidney to Fairview WB |
| Analysis Time Period | 4/17/2012
Peak Hour | Jurisdiction
Analysis Year | Dawson/Richland County
2012 |
| The state of the s | endive to Fairview Corridor Planning Stu | | 2012 |
| Input Data | | | |
| | | | |
| | Shoulder widthtt | | |
| | Lane widthtt | Class I | highway Class II |
| | Lane widthtt | | Class III highway |
| | Shoulder widthtt | | • |
| <u></u> | | Terrain | V Level |
| Segment length | , L ₁ mi | Grade Lengt
Peak-hour fa
No-passing z | ctor, PHF 0.86 |
| Analysis direction vol., V _d 254ve | | Show Horth Arrowi % Trucks and | d Buses , P _T 25 % |
| Opposing direction vol., V _o 257ve | eh/h | 1 I | nal vehicles, P _R 4% |
| Shoulder width ft 8.0 Lane Width ft 12.0 | | Access point | s <i>mi</i> 16/mi |
| Segment Length mi 9.9 | | | |
| Average Travel Speed | | | |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T | (Exhibit 15-11 or 15-12) | 1.4 | 1.4 |
| Passenger-car equivalents for RVs, E_R (| Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV,ATS} | =1/(1+P _T (E _T -1)+P _R (E _R -1)) | 0.909 | 0.909 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhibi | | 1.00 | 1.00 |
| Demand flow rate ² , v _j (pc/h) v _j =V _j / (PHF | | 325 | 329 |
| Free-Flow Speed froi | n Field Measurement | | ee-Flow Speed |
| | | Base free-flow speed ⁴ , BFFS | 66.0 mi/h |
| Manager de la constanta de la | | Adj. for lane and shoulder width, | ⁴ f _{LS} (Exhibit 15-7) 0.0 mi/h |
| Mean speed of sample ³ , S _{FM} | | Adj. for access points ⁴ , f _A (Exhib | 20 |
| Total demand flow rate, both directions, v | | 1 | |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f | HV,ATS) | Free-flow speed, FFS (FSS=BFI | 20 71 |
| Adj. for no-passing zones, f _{np,ATS} (Exhibi | t 15-15) 1.7 mi/h | Average travel speed, ATS _d =FF5 | S-0.00776(v _{d,ATS} + 55.3 mi/h |
| | | V _{o,ATS}) - f _{np,ATS} | 33.3 Hish |
| | | Percent free flow speed, PFFS | 89.1 % |
| Percent Time-Spent-Following | | | |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T t | | 1.1 | 1.1 |
| Passenger-car equivalents for RVs, E _R (f | | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV} =1/ (| | 0.976 | 0.976 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhibi | The state of the s | 1.00 | 1.00 |
| Directional flow rate ² , <i>v_i</i> (pc/h) <i>v_i</i> =V _i /(PHF
Base percent time-spent-following ⁴ , BPTs | | 303 | 306 |
| | | 33.2 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibi | | 3 | 2.4 |
| Percent time-spent-following, PTSF _d (%)= | BPISF _d +1 _{np,PTSF} -(V _{d,PTSF} / V _{d,PTSF} + | 4 | 9.3 |
| Vo,PTSF) | | | |
| Level of Service and Other Performance | e measures | | |
| Level of service, LOS (Exhibit 15-3) | | | 8 |
| /olume to capacity ratio, v/c | | 0 | .21 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1545 |
|---|-------|
| Capacity, C _{d,PTSF} (Equalion 15-13) pc/h | 1659 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 89.1 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 295.3 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 12.19 |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If v_i(v_d or v_o) >=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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.



Appendix 7

Projected Two-Lane Highway 2035 – Low Condition

| DIRECTIONAL TWO-LANE HIGHWA | AY SEGMENT WORK | (SHEET |
|--|---|---|
| General Information | Site Information | |
| Analyst David Stoner | Highway / Direction of Travel | MT 16 |
| Agency or Company DOWL HKM Date Performed 4/17/2012 | From/To | RP 0.6 to 20.0 NB |
| Analysis Time Period Peak Hour | Jurisdiction
Analysis Year | Dawson/Richland County
2035 Low |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Stu | dy | |
| input Data | | |
| | | |
| Shoulder width t | дольног | p |
| | ĬV Class I | highway Class II |
| Lane width t | highway 🗔 | Class III highway |
| | Теггаіл | ▼ Level |
| Segment length, L _t mi | Grade Lengt | h mi Up/down |
| , , | Peak-hour fa
No-passing z | |
| Analysis direction vol., V _d 242veh/h | Cl. 11 A | d Buses , P _T 27 % |
| <u> </u> | | • |
| Opposing direction vol., V _o 249veh/h Shoulder width ft 8.0 | | nal vehicles, P _R 4% |
| Lane Width ft 12.0 | Access point | is <i>mi 5l</i> mi |
| Segment Length mi 19.4 | | |
| Average Travel Speed | | |
| , AGE | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.4 | 1.4 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ | 0.903 | 0.903 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhibit 15-9) | 1.00 | 1.00 |
| Demand flow rate ² , v_i (pc/h) $v_i = V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$) | 331 | 340 |
| Free-Flow Speed from Field Measurement | Estimated Fr | ee-Flow Speed |
| | Base free-flow speed ⁴ , BFFS | 65.0 mi/h |
| | Adj. for lane and shoulder width, | ⁴ f _{i.e} (Exhibit 15-7) 0.0 mi/h |
| Mean speed of sample ³ , S _{FM} | Adj. for access points ⁴ , f _A (Exhib | - |
| Total demand flow rate, both directions, v | 1 " | |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _{HV,ATS}) | Free-flow speed, FFS (FSS=BFI | |
| Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 2.0 mi/h | Average travel speed, ATS _d =FFS | S-0.00776(v _{d,ATS} + 56.5 <i>mi/h</i> |
| | v _{o,ATS}) - f _{np,ATS} | 00.0 11 |
| | Percent free flow speed, PFFS | 88.7 % |
| Percent Time-Spent-Following | Anchesia Dissellan (d) | O |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| | 0.974 | |
| Heavy-vehicle adjustment factor, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1)) Grade adjustment factor ¹ , f _{g,PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 0.974 |
| Directional flow rate ² , v _s (pc/h) v _i =V _s (PHF*f _{HV,PTSF} * f _{g,PTSF}) | | |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av_d b}) | 307 316 | |
| | | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | 4 | 10.7 |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} / v _{d,PTSF} + | 5 | 64.6 |
| v _{o,PTSF}) | | |
| Level of Service and Other Performance Measures | | |
| Level of service, LOS (Exhibit 15-3) | | С |
| Volume to capacity ratio, v∕c | | .22 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1535 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1655 |
| Percent Free-Flow Speed PFFS _d (Equalion 15-11 - Class III only) | 88.7 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 298.8 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 13.66 |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If v_i(v_d or v_o) >=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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTIONAL TWO-LANE HIGHWA | AY SEGMENT WORK | |
|---|---|---|
| General Information | Site Information | |
| Analyst David Stoner | Highway / Direction of Travel | MT 16 |
| Agency or Company DOWL HKM Date Performed 4/17/2012 | From/To | RP 0.6 to RP 12.4 SB |
| Analysis Time Period Peak Hour | Jurisdiction
Analysis Year | Dawson/Richland County
2035 Low |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Stu | | |
| Input Dala | | |
| T Shoulder width | | |
| ☐ Shoulder width | puncy. | - |
| | l ✓ Class I | highway Class II |
| Lane width It Shoulder width It | highway highway | Class III highway |
| | Terrain | Level Rolling |
| Segment length, L ₁ mi | Grade Lengt
Peak-hour fa | h mi Up/down
ictor, PHF 0.78 |
| Analysis direction vol., V _d 249veh/h | Show North Arrow % Trucks an | zone 20%
d Buses , P _T 29 % |
| Opposing direction vol., V _o 242veh/h | | nal vehicles, P _R 4% |
| Shoulder width ft 8.0 | Access point | • |
| Lane Width ft 12.0
Segment Length mi 11.8 | · · | |
| Average Travel Speed | 1,000,000,000,000,000 | |
| | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.4 | 1.4 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}$ =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) | 0.896 | 0.896 |
| Grade adjustment factor ¹ , f _{g.ATS} (Exhibit 15-9) | 1.00 | 1.00 |
| Demand flow rate ² , v _f (pc/h) v _i =V _i / (PHF* f _{g,ATS} * f _{HV,ATS}) | 356 | 346 |
| Free-Flow Speed from Field Measurement | Estimated Fr | ee-Flow Speed |
| | Base free-flow speed ⁴ , BFFS | 65.0 mi/h |
| Mean speed of sample 3 , S $_{FM}$ | Adj. for lane and shoulder width, | f _{LS} (Exhibit 15-7) 0.0 mi/h |
| Total demand flow rate, both directions, <i>v</i> | Adj. for access points ⁴ , f _A (Exhib | it 15-8) 1.8 mi/h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _{HVATS}) | Free-flow speed, FFS (FSS=BF | |
| **** | 1 | /. |
| Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 1.7 mi/h | Average travel speed, ATS _d =FF5
v _{o,ATS}) - f _{np,ATS} | S-0.00776(V _{d,ATS} + 56.1 mi/h |
| Percent Time-Spent-Following | Percent free flow speed, PFFS | 88.7 % |
| rercent Time-Spent-ronowing | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | 1.1 | 1.1 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ | 0.972 | 0.972 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 |
| Directional flow rate ² , v _/ (pc/h) v _i =V _/ (PHF*f _{HV,PTSF} * f _{g,PTSF}) | 328 | 319 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} d ^b) | 36.1 | |
| Adj. for no-passing zone, f _{np.PTSF} (Exhibit 15-21) | 3 | 7.0 |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *($v_{d,PTSF} / v_{d,PTSF}$ + | 5 | 4.9 |
| v _{o,PTSF}) | | |
| Level of Service and Other Performance Measures | | |
| Level of service, LOS (Exhibit 15-3) | | С |
| /olume to capacity ratio, <i>v/c</i> | | .23 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1523 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1652 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 88.7 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 319.2 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _f (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 15.25 |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET | | | |
|--|---|--|--|
| General Information | Site Information | | |
| Analyst David Stoner Agency or Company DOWL HKM Date Performed 4/17/2012 Analysis Time Period Peak Hour | Highway of Travel MT 16 From/To RP 20.0 to Savage NB Jurisdiction Dawson/Richland County Analysis Year 2035 Low | | |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Plannia | ng Study | | |
| Input Data | | | |
| Class I highway Class II highway Class III | highway | | |
| ← Opposing direction < | | | |
| —→ Analysis direction —→ | | | |
| L _{it} L _{p!} L _{do} L _d | | | |
|], | Strow Houth Auron | | |
| Shoulder width (ft) | 8.0 | | |
| Lane Width (ft) | 12.0 | | |
| Segment Length (mi) | 11.5 | | |
| Total length of analysis segment, $L_{\rm t}$ | 11.5 | | |
| Length of two-lane highway upstream of the passing lane, $\mathbf{L}_{\mathbf{u}}$ | 0.0 | | |
| Length of passing lane including tapers , L _{pl} | 1.9 | | |
| Average travel speed, ATS _d (from Directional Two-Lane Highway Segment
Worksheet) | 56.8 | | |
| Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway
Segment Worksheet) | 53.0 | | |
| Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment
Worksheet) | С | | |
| Average Travel Speed | | | |
| Length of the downstream highway segment within the effective length of passing lane for average travel speed, L _{de} (Exhibit 15-23) | 1.70 | | |
| Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d L_d = L_t - $(L_u$ + L_{ρ} + L_{de}) | 7.90 | | |
| Adj. factor for the effect of passing lane on average speed, f _{pl} (Exhibit 15-
28) | 1.10 | | |
| Average travel speed including passing lane ² , ATS _{p1} = (ATS _d * L _t) / $(L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1 + f_{pl,ATS})))$ | 58.1 | | |
| Percent free flow speed including passing lane, PFFS _{pl} = (ATS _{pl} /FFS) | 91.1 | | |
| Percent Time-Spent-Following | 71.1 | | |
| Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L _{de} (Exhibit 15-23) | 11.36 | | |
| Length of two-lane highway downstream of effective length of the passing ane for percent-time-following, | -1.76 | | |
| Adj. factor for the effect of passing lane on percent time-spent-following, p _{P,PTSF} (Exhibit 15-26) | 0.60 | | |

| Percent time-spent-following including passing lane ³ , PTSF _{pl} (%) | | |
|---|---------------------------------------|--|
| $PTSF_{pl} = PTSF_{d}[L_{u} + L_{d} + f_{pl,PTSF} L_{pl} + ((1 + f_{pl,PTSF})/2)L_{de}]/L_{t}$ | 39.3 | |
| Level of Service and Other Performance Measures ⁴ | , , , , , , , , , , , , , , , , , , , | |
| Level of service including passing lane LOS _{pl} (Exhibit 15-3) | В | |
| Peak 15-min total travel time, TT ₁₅ (veh-h) TT ₁₅ = VMT ₁₅ /ATS _{pl} | 14.8 | |
| Bicycle Level of Service | | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 298.8 | |
| Effective width, W _v (Eq. 15-29) ft | 28.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 13.66 | |
| Bicycle level of service (Exhibit 15-4) | F | |
| Notes | | |
| 1. If LOS _d =F, passing lane analysis cannot be performed. | | |
| 2. If L _d <0, use alternative Equation 15-18. | | |
| 3. If L _d <0, use alternative Equation 15-16. | | |
| 4. v/c, VMT ₁₅ and VMT ₆₀ are calculated on Directional Two-Lane Highway Segment Wo | arksheet | |

| DIRECTIONAL TWO-LANE HIGHWAY SEG | MENT WORKSHEET WITH PASSING LA | NE |
|--|---|----|
| General Information | Site Information | |
| Analyst David Stoner Agency or Company DOWL HKM | Highway of Travel <i>MT 16</i> From/To <i>RP 12.4 to RP 22.0 SB</i> | |
| Date Performed 4/17/2012 Analysis Time Period Peak Hour | Jurisdiction Dawson/Richland County Analysis Year 2035 Low | |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planni | | |
| Input Data | | |
| Class I highway Class II highway Class III | l hìghway | |
| ← Opposing direction | | |
| —→ Analysis direction —→ | | |
| L _{ii} L _{pl} L _{do} L _d | | |
| - | | |
| ļ, | Stron Raits Inon | |
| Shoulder width (ft) | 8.0 | |
| Lane Width (ft) | 12.0 | |
| Segment Length (mi) | 9.6 | |
| Total length of analysis segment, L _t | 9.6 | |
| Length of two-lane highway upstream of the passing lane, L _u | 0.0 | |
| Length of passing lane including tapers , Lpl | 1.9 | |
| Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) | 57.3 | |
| Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway | 52.7 | |
| Segment Worksheet) | | |
| Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment
Worksheet) | С | |
| Average Travel Speed | | |
| Length of the downstream highway segment within the effective length of passing lane for average travel speed, L _{de} (Exhibit 15-23) | 1.70 | |
| Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_d = L_{t'} (L_u + L_{ol} + L_{de})$ | 6.00 | |
| Adj. factor for the effect of passing lane on average speed, f _{pl} (Exhibit 15-28) | 1.10 | |
| Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d^* L_l)$ | 50.0 | |
| $(L_u + L_d + (L_{\rho l}/f_{\rho l}) + (2L_{d\theta}/(1+f_{\rho l,ATS})))$ | 58.9 | |
| Percent free flow speed including passing lane, PFFS _{pl} = (ATS _{pl} / FFS) | 91.3 | |
| Percent Time-Spent-Following | | |
| Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L _{de} (Exhibit 15-23) | 10.62 | |
| Length of two-lane highway downstream of effective length of the passing | | • |
| lane for percent-time-following, | -2.92 | |
| $L_d = L_{t^-}(L_u + L_{pl} + L_{de})$ | | |
| Adj. factor for the effect of passing lane on percent time-spent-following, f _{pl,PTSF} (Exhibit 15-26) | 0.60 | • |
| pl.rior. | | |

| Percent time-spent-following including passing lane ³ , PTSF _{pl} (%) | | |
|---|-----------|--|
| $PTSF_{pl} = PTSF_{d}[L_{u} + L_{d} + f_{pl,PTSF} L_{pl} + ((1 + f_{pl,PTSF})/2)L_{de}]/L_{t}$ | 37.7 | |
| Level of Service and Other Performance Measures ⁴ | | |
| Level of service including passing lane LOS _{pl} (Exhibit 15-3) | В | |
| Peak 15-min total travel time, TT ₁₅ (veh-h) TT ₁₅ = VMT ₁₅ /ATS _{pl} | 13.0 | |
| Bicycle Level of Service | | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 319.2 | |
| Effective width, W _v (Eq. 15-29) ft | 28.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 15.25 | |
| Bicycle level of service (Exhibit 15-4) | F | |
| Notes | | |
| If LOS_d=F, passing lane analysis cannot be performed. | | |
| 2. If L _d <0, use alternative Equation 15-18. | | |
| 3. If L _d <0, use alternative Equation 15-16. | | |
| 4. v/c, VMT ₁₅ and VMT ₆₀ are calculated on Directional Two-Lane Highway Segment W | orksheet. | |

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| DIRECTION | NAL TWO-LANE HIGHWA | Y SEGMENT WORK | SHEET |
|---|--|---|--|
| General Information | | Site Information | |
| Analyst | David Stoner | Highway / Direction of Travel | MT 16 |
| Agency or Company | DOWL HKM | From/To | RP 22.0 to Savage SB |
| Date Performed | 4/17/2012
Page Hour | Jurisdiction | Dawson/Richland County |
| Analysis Time Period | Peak Hour | Analysis Year | 2035 Low |
| Input Data | lendive to Fairview Corridor Planning Stud | ју
- | |
| | 1 | | and the second s |
| | Shoulder width It | | |
| - | Lane width It | [7] Ohn 11 | lighway |
| | Lane width | | |
| | Shoulder width | highway 🗀 | Class III highway |
| | Y | Terrain | Level Rolling |
| Segment length | , Լլ mi | Grade Length | |
| Jegineni jengu | " H ———— IIII | Peak-hour fac | otor, PHF 0.78 |
| | | No-passing z | |
| Analysis direction vol., V _d 249v | eh/h | Show Horth Arrow % Trucks and | Buses , P _T 29 % |
| Opposing direction vol., V 242v | oh/h | % Recreation | al vehicles, P _R 4% |
| Opposing direction vol., V _o 242v
Shoulder width ft 8.0 | OIVII | Access points | • • • |
| Lane Width ft 12.0 | | Access politic | , mi VIIII |
| Segment Length ml 9.5 | | | |
| Average Travel Speed | | | |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E- | (Exhibit 15-11 or 15-12) | 1.4 | 1.4 |
| Passenger-car equivalents for RVs, E _R | (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV,AT} | $S=1/(1+P_T(E_T-1)+P_R(E_R-1))$ | 0.896 | 0.896 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhib | | 1.00 | 1.00 |
| Demand flow rate ² , v _i (pc/h) v _i =V _i / (PHF | * f _{g,ATS} * f _{HV,ATS}) | 356 | 346 |
| Free-Flow Speed fro | m Field Measurement | Estimated Fre | ee-Flow Speed |
| | | Base free-flow speed ⁴ , BFFS | 65.0 mi/h |
| | | Adj. for lane and shoulder width,4 | f. (Exhibit 15-7) 0.0 mi/h |
| Mean speed of sample ³ , S _{FM} | | | |
| Total demand flow rate, both directions, | v | Adj. for access points ⁴ , f _A (Exhibi | t 15-8) 1.3 mi/h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ | | Free-flow speed, FFS (FSS=BFF | 'S-f _{I S} -f _A) 63.8 mi/h |
| Adj. for no-passing zones, f _{np,ATS} (Exhit | | Average travel speed, ATS _d =FFS | 3-0.00776(V _{d ATC} + |
| np,AIS | , | | * G,A18 56.5 mi/h |
| | | v _{o,ATS}) - f _{np,ATS}
Percent free flow speed, PFFS | 88.7 % |
| Percent Time-Spent-Following | | And the Direction (A) | |
| December our conjustants for tweets P | /Evhibit 45 49 c- 45 40) | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E ₁ | | 1.1 | 1.1 |
| Passenger-car equivalents for RVs, E _R (| | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV} =1/ | | 0.972 | 0.972 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhib | · · · · · · · · · · · · · · · · · · · | 1.00 | 1.00 |
| Directional flow rate ² , v _/ (pc/h) v _i =V _i /(PHF | | 328 | 319 |
| Base percent time-spent-following ⁴ , BP1 | | 36.1 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhit | | 3 | 7.9 |
| | =BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} /v _{d,PTSF} + | 5 | 5.3 |
| v _{o.PTSF}) | | | |
| Level of Service and Other Performan | ce Measures | | |
| Level of service, LOS (Exhibit 15-3) | TO STATE OF THE ST | | С |
| Volume to capacity ratio, v/c | | I 0 | .23 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1523 |
|---|--|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1652 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 88.7 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 319.2 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 15.25 |
| Bicycle level of service (Exhibit 15-4) | F |
| Notes | and the second s |

^{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 downgrade segments are treated as level terrain.

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^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| | ormation | #3 |
|--|---|--------------------------------|
| Analyst David Stoner Highway Agency or Company DOWL HKM From/To Date Performed 4/17/2012 Jurisdict Analysis Time Period Peak Hour Analysis | | |
| Agency or Company DOWL HKM From/To Date Performed 4/17/2012 Jurisdict Analysis Time Period Peak Hour Analysis | | T 16 |
| Analysis Time Period Peak Hour Analysis | o Sa | avage to Crane NB |
| | tion Da | awson/Richland County |
| | s Year 20 | 035 - Low |
| Input Data | | 1. 18 ¹⁰ 1111 |
| | | |
| \$ Shoulder widthtt | | |
| Lane width | [J.] | |
| Lane width tt | | hway Class II |
| Shoulder width tt | highway Cla | ass III highway |
| | Terrain F | Level Rolling |
| Segment length, L ₁ mi | Grade Length | mi Up/down |
| Segment rengal, LI IIII | Peak-hour facto | |
| | No-passing zone مسيل | e 31% |
| Analysis direction vol., V _d 253veh/h | North Arrow % Trucks and B | Buses, P _T 23 % |
| Opposing direction vol., V ₂ 307veh/h | % Recreational | ' |
| Shoulder width ft 8.0 | Access points m | |
| Lane Width ft 12,0 | Access points II. | <i>ni 11/</i> mi |
| Segment Length mi 10.0 | | |
| Average Travel Speed | | |
| An | nalysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.4 | 1.3 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ | | |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhibit 15-9) | 1.00 | 1.00 |
| Demand flow rate ² , v _j (pc/h) v _i =V ₁ / (PHF* f _{g,ATS} * f _{HV,ATS}) | 317 | 377 |
| Free-Flow Speed from Fleid Measurement | Estimated Free- | Flow Speed |
| Base fre- | e-flow speed ⁴ , BFFS | 69.0 mi/h |
| | ane and shoulder width, 4 fr | e(Exhibit 15-7) 0.0 mi/h |
| mean speed of sample, S_{cM} | | • |
| Total demand flow rate, both directions, v | access points ⁴ , f _A (Exhibit 1: | 5-8) 2.8 mi/h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _{HV,ATS}) | w speed, FFS (FSS=BFFS- | $f_{(S}-f_{\Delta})$ 66.3 mi/h |
| · | travel speed, ATS _d =FFS-0. | 00776/0 + |
| ***** | | .00770(Vd,ATS + 58.8 mi/h |
| V _{o,ATS}) - | · f _{np,} ATS | |
| Percent Time-Spent-Following | free flow speed, PFFS | 88.7 % |
| | alysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | 1.1 | 1.1 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ | 0.978 | 0.978 |
| Grade adjustment factor ¹ , f _{a,PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 |
| Directional flow rate ² , v _/ (pc/h) v _i =V _/ (PHF*f _{HV,PTSF} * f _{g,PTSF}) | 297 | 361 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av_d^b}) | 33.3 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | 39.9 | |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} / v _{d,PTSF} + | | |
| V _{o,PTSF}) | 51.3 | ł |
| Level of Service and Other Performance Measures | | Amazara Amazara |
| Level of service, LOS (Exhibit 15-3) | C | |
| Volume to capacity ratio, v/c | 755.000 | |
| Totalio to capacity ratio, wo | 0.20 | |

Directional Page 2 of 2

| Capacity, C _{d,ATS} (Equation 15-12) pc/ħ | 1590 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1662 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 88.7 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 290.8 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 10.79 |
| Bicycle level of service (Exhibit 15-4) | F |
| Notes | |

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file:///C:/Users/dstoner/AppData/Local/Temp/s2k378E.tmp

^{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 downgrade segments are treated as level terrain.

^{2.} If v_i(v_d or v_o) >=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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| Analyst David Stoner HI Agency or Company DOWL HKM Fr Date Performed 4/17/2012 Ju | Ilighway / Direction of Travel From/To Urisdiction Analysis Year V Class I h highway Crade Length Peak-hour face No-passing zo % Trucks and | MT 16 Savage to Crane SB Dawson/Richland County 2035 - Low Ighway Class II Class III highway Level Rolling mi Up/down stor, PHF 0.84 one 19% Buses , P _T 25 % al vehicles, P _R 4% |
|--|--|--|
| Agency or Company DOWL HKM 4/17/2012 July Analysis Time Period Peak Hour Are Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Study Input Data Shoulder width It Lane width It Shoulder | Terrain Grade Length Peak-hour fac No-passing zo % Trucks and % Recreation: Access points | Savage to Crane SB Dawson/Richland County 2035 - Low Ilghway Class II Class III highway Level Rolling mi Up/down ctor, PHF 0.84 one 19% Buses , P _T 25 % al vehicles, P _R 4% |
| Date Performed Analysis Time Period Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Study Input Data Shoulder width It Lane width It Shoulder width It | Class I h highway Car Terrain Grade Length Peak-hour fac No-passing zo % Trucks and % Recreations Access points | Dawson/Richland County 2035 - Low Ilghway Class II Class III highway Level Rolling mi Up/down stor, PHF 0.84 one 19% Buses , P _T 25 % al vehicles, P _R 4% |
| Analysis Time Period Peak Hour Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Study Input Data Shoulder width It Lane width It Shoulder width It Shoulder width It Shoulder width It Analysis direction vol., V _d 307veh/h Opposing direction vol., V _o 253veh/h Shoulder width It Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h Shoulder width It Analysis direction vol., V _o 253veh/h | Class I h highway Car Terrain Grade Length Peak-hour fac No-passing zo % Trucks and % Recreations Access points | Ighway Class II Class III highway Level Rolling mi Up/down one 19% Buses , P _T 25 % al vehicles, P _R 4% |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Study Input Data Shoulder width It Lane width It Shoulder width It Segment length, L ₁ mi Analysis direction vol., V _d 307veh/h Opposing direction vol., V _o 253veh/h Shoulder width It Shoulder width It Segment Length It Shoulder width It Shoulder width It Segment Length It Shoulder width It Shoulder width It Segment Length It Shoulder width It Segment Length It Shoulder width It Shoulder width It Shoulder width It Segment Length It Shoulder width It Shoulder width It Shoulder width It Shoulder width It | Terrain Grade Length Peak-hour fac No-passing zo % Trucks and % Recreations Access points | Ighway Class II Class III highway Level Rolling mi Up/down tor, PHF 0.84 one 19% Buses , P _T 25 % al vehicles, P _R 4% |
| Shoulder width It Lane width It Lane width It Shoulder width It Shoulder width It Segment length, L ₁ mi Analysis direction vol., V _d 307veh/h Opposing direction vol., V _o 253veh/h Shoulder width It Shoulder width It Analysis direction vol., V _o 307veh/h Opposing direction vol., V _o 253veh/h Shoulder width It Lane Width It Segment Length mi 10.0 Average Travel Speed | highway Terrain Grade Length Peak-hour fac No-passing zo % Trucks and % Recreations Access points | Class III highway Level Rolling mi Up/down ctor, PHF 0.84 one 19% Buses , P _T 25 % al vehicles, P _R 4% |
| Lane width It Lane width It Shoulder width It Segment length, L ₁ mi Analysis direction vol., V _d 307veh/h Opposing direction vol., V _o 253veh/h Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 10.0 Average Travel Speed | highway Terrain Grade Length Peak-hour fac No-passing zo % Trucks and % Recreations Access points | Class III highway Level Rolling mi Up/down ctor, PHF 0.84 one 19% Buses , P _T 25 % al vehicles, P _R 4% |
| Lane width It Lane width It Shoulder width It Segment length, L ₁ mi Analysis direction vol., V _d 307veh/h Opposing direction vol., V _o 253veh/h Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 10.0 Average Travel Speed | highway Terrain Grade Length Peak-hour fac No-passing zo % Trucks and % Recreations Access points | Class III highway Level Rolling mi Up/down ctor, PHF 0.84 one 19% Buses , P _T 25 % al vehicles, P _R 4% |
| Analysis direction vol., V _d 307veh/h Opposing direction vol., V _o 253veh/h Shoulder width t 8.0 Lane Width ft 12.0 Segment Length mi 10.0 Average Travel Speed | highway Terrain Grade Length Peak-hour fac No-passing zo % Trucks and % Recreations Access points | Class III highway Level Rolling mi Up/down ctor, PHF 0.84 one 19% Buses , P _T 25 % al vehicles, P _R 4% |
| Segment length, L ₁ mi Segment length, L ₁ mi Analysis direction vol., V _d 307veh/h Opposing direction vol., V _o 253veh/h Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 10.0 Average Travel Speed | Terrain Grade Length Peak-hour fac No-passing zo % Trucks and % Recreations Access points | Level Rolling mi Up/down stor, PHF 0.84 one 19% Buses , P _T 25 % al vehicles, P _R 4% |
| Segment length, L ₁ mi Analysis direction vol., V _d 307veh/h Opposing direction vol., V _o 253veh/h Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 10.0 Average Travel Speed | Terrain Grade Length Peak-hour fac No-passing zo % Trucks and % Recreations Access points | Level Rolling mi Up/down stor, PHF 0.84 one 19% Buses , P _T 25 % al vehicles, P _R 4% |
| Analysis direction vol., V _d 307veh/h Opposing direction vol., V _o 253veh/h Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 10.0 Average Travel Speed | Show North Arrow % Trucks and % Recreations Access points | mi Up/down
stor, PHF 0.84
one 19%
Buses , P _T 25 %
al vehicles, P _R 4% |
| Analysis direction vol., V _d 307veh/h Opposing direction vol., V _o 253veh/h Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 10.0 Average Travel Speed | Show North Arrow % Trucks and % Recreation: Access points | one 19% Buses , P _T 25 % al vehicles, P _R 4% |
| Opposing direction vol., V _o 253veh/h Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 10.0 Average Travel Speed | Show North Arrow % Trucks and % Recreation: Access points | Buses , P _T 25 % al vehicles, P _R 4% |
| Opposing direction vol., V _o 253veh/h Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 10.0 Average Travel Speed | % Recreation: Access points | al vehicles, P _R 4% |
| Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 10.0 Average Travel Speed | Access points | • • |
| Lane Width ft 12.0 Segment Length mi 10.0 Average Travel Speed | | . <i>mi 11/</i> mi |
| Segment Length mi 10.0 Average Travel Speed | Analysis Direction (d) | |
| | Analysis Direction (d) | |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | Analysis Direction (d) | |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | | Opposing Direction (o) |
| | 1.3 | 1.4 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}$ =1/ (1+ $P_T(E_T$ -1)+ $P_R(E_R$ -1)) | 0.930 | 0.909 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhibit 15-9) | 1.00 | 1.00 |
| Demand flow rate ² , v _/ (pc/h) v _i =V _i / (PHF* f _{g,ATS} * f _{HV,ATS}) | 393 | 331 |
| Free-Flow Speed from Field Measurement | Estimated Fre | e-Flow Speed |
| Ba | ase free-flow speed ⁴ , BFFS | 66.0 mi/h |
| Ac | dj. for lane and shoulder width,4 | f _{LS} (Exhibit 15-7) 0.0 mi/h |
| mean speed of sample*, S _{FM} | dj. for access points ⁴ , f _A (Exhibit | |
| | • • | |
| 111,0110 | ree-flow speed, FFS (FSS=BFF | - - |
| Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 1.7 mi/h Av | verage travel speed, ATS _d =FFS | -0.00776(v _{d,ATS} + 55.9 <i>mi/h</i> |
| v _o | o,ATS ^{) - f} np,ATS | 00.0 11.211 |
| Pe | ercent free flow speed, PFFS | 88.4 % |
| Percent Time-Spent-Following | Analysis Direction (d) | Opposing Disastian (a) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | 1.1 | Opposing Direction (o) 1.1 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_{R}-1))$ | 0.976 | 0.976 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 |
| Directional flow rate ² , $v_i(pc/h)$ $v_i^{=}V_i/(PHF^*f_{HV,PTSF}^*f_{g,PTSF})$ | 375 | 309 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av_d^b}) | | 3.7 |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | | 3.9 |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} / v _{d,PTSF} + | | |
| V _{o,PTSF}) | 57 | 7.3 |
| *o.PTSF* Level of Service and Other Performance Measures | AND THE RESERVE OF THE PROPERTY OF THE PROPERT | |
| Level of Service, LOS (Exhibit 15-3) | | <u> </u> |
| Volume to capacity ratio, v/c | 0.3 |)
05 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1545 | |
|---|-------|---|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1659 | |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 88.4 | |
| Bicycle Level of Service | | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 365.5 | |
| Effective width, Wv (Eq. 15-29) ft | 28.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 12.29 | |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If $v_l(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTIO | NAL TWO-LANE HIGHWA | AY SEGMENT WORK | (SHEET |
|---|--|--|---|
| General Information | | Site Information | |
| Analyst | David Stoner | Highway / Direction of Travel | MT 16 |
| Agency or Company Date Performed | DOWL HKM
4/17/2012 | From/To
Jurisdiction | Crane to Sidney NB |
| Analysis Time Period | Peak Hour | Analysis Year | Dawson/Richland County
2035 - Low |
| Project Description: MT 16 / MT 200 G | Blendive to Fairview Corridor Planning Stud | | |
| Input Data | | | |
| | 1 Shoulder width | | |
| | I Shoulder width t | puicus | |
| | Lane width It | | highway Class II |
| | I Shoulder width | hlghway [| Class III highway |
| | · | Terrain | ✓ Level ☐ Rolling |
| Segment lengtl | 1, L _t nii | Grade Lengli
Peak-hour fa
No-passing z | h mi Up/down
ctor, PHF 0.80 |
| Analysis direction vol., V _d 271v | veh/h | Show North Arrow % Trucks and | |
| Opposing direction vol., V _o 416 | /eh/h | | nal vehicles, P _R 4% |
| Shoulder width ft 8.0 | | Access point | s <i>mi 12/</i> mi |
| Lane Width ft 12.0
Segment Length mi 8.9 | | | |
| Average Travel Speed | | | |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E | T (Exhibit 15-11 or 15-12) | 1.4 | 1.2 |
| Passenger-car equivalents for RVs, E _R | (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ | | 0.929 | 0.963 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhib | | 1.00 | 1.00 |
| Demand flow rate ² , v_i (pc/h) $v_i = V_i$ / (PHF | 1.00 | 365 | 540 |
| Free-Flow Speed fro | om Field Measurement | Estimated Fr | ee-Flow Speed |
| | | Base free-flow speed ⁴ , BFFS | 65.0 mi/h |
| | | Adj. for lane and shoulder width, | ⁴ f _{I S} (Exhibit 15-7) 0.0 mi/h |
| Mean speed of sample ³ , S _{FM} | | Adj. for access points ⁴ , f _A (Exhibit 15-8) 3.0 mi/h | |
| Total demand flow rate, both directions, | | 1 | |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ | | Free-flow speed, FFS (FSS=BFI | 20 /1 |
| Adj. for no-passing zones, f _{np,ATS} (Exhil | bit 15-15) 1.4 mi/h | Average travel speed, ATS _d =FFS | S-0.00776(v _{d,ATS} + 53.6 mi/h |
| | | v _{o,ATS}) - f _{np,ATS}
Percent free flow speed, PFFS | 86.5 % |
| Percent Time-Spent-Following | | | |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E- | (Exhibit 15-18 or 15-19) | 1.1 | 1.0 |
| Passenger-car equivalents for RVs, E _R | | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV} =1/ | | 0.981 | 1.000 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhit | | 1.00 | 1.00 |
| Directional flow rate ² , v _i (pc/h) v _i =V _i /(PHF | | 345 | 520 |
| Base percent time-spent-following ⁴ , BPT | rsF _d (%)=100(1-e ^{av} d) | 41.1 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhit | | 2 | 77.9 |
| | =BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} /v _{d,PTSF} + | 5 | 52.2 |
| v _{o,PTSF}) | | | |
| Level of Service and Other Performan | ce Measures | 1 | |
| Level of service, LOS (Exhibit 15-3) | | | С |
| Volume to capacity ratio, <i>v/c</i> | | <i>0</i> |),22 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1637 | |
|---|-------|--|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1700 | |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 86.5 | |
| Bicycle Level of Service | | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 338.8 | |
| Effective width, Wv (Eq. 15-29) ft | 28.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 8.34 | |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If v_i(v_d or v_o) >=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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTION | NAL TWO-LANE HIGHWA | AY SEGMENT WORK | SHEET |
|---|---|---|---|
| General Information | | Site Information | A CONTRACT OF THE PROPERTY OF |
| Analyst | David Stoner | Highway / Direction of Travel | MT 16 |
| Agency or Company Date Performed | DOWL HKM
4/17/2012 | From/To Jurisdiction | Crane to Sidney SB |
| Analysis Time Period | Peak Hour | Analysis Year | Dawson/Richland County
2035 - Low |
| Project Description: MT 16 / MT 200 G | lendive to Fairview Corridor Planning Stud | | |
| Input Data | | | |
| | . | | |
| | Shoulder width tt | | |
| | Lane width tt | V Class II | highway Class II |
| - | Lane width It | highway [| Class III highway |
| | Shoulder widthtt | Terrain | Level Rolling |
| Sagment langth | ı, L _t mi | Grade Length | • |
| Segment lengu | , r | Peak-hour fa | ctor, PHF 0.87 |
| | | Show North Arrow of Trucks and | |
| Analysis direction vol., V _d 416v | eh/h | Show north Priow % Trucks and | d Buses , P _T 19 % |
| Opposing direction vol., V _o 271v | eh/h | % Recreation | nal vehicles, P _R 4% |
| Shoulder width ft 8.0 | | Access point | |
| Lane Width ft 12.0
Segment Length mi 8.9 | | | |
| Average Travel Speed | | | |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E | (Exhibit 15-11 or 15-12) | 1.2 | 1.4 |
| Passenger-car equivalents for RVs, E _R | (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV,AT} ; | $_{3}$ =1/(1+P _T (E _T -1)+P _R (E _R -1)) | 0.963 | 0.929 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhib | it 15-9) | 1.00 | 1.00 |
| Demand flow rate ² , v _i (pc/h) v _i =V _i / (PHF | * f _{g,ATS} * f _{HV,ATS}) | 497 | 335 |
| | m Fleid Measurement | Estimated Fro | ee-Flow Speed |
| | | Base free-flow speed ⁴ , BFFS | 69.0 mi/h |
| | | Adj. for lane and shoulder width, | |
| Mean speed of sample ³ , S _{FM} | | | |
| Total demand flow rate, both directions, | v | Adj. for access points ⁴ , f _A (Exhib | |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ | (HVATS) | Free-flow speed, FFS (FSS=BFI | FS-f _{LS} -f _A) 66.0 mi/h |
| Adj. for no-passing zones, f _{no.ATS} (Exhib | oit 15-15) 1.9 mi/h | Average travel speed, ATS _d =FFS | S-0.00776(V _{d ATS} + |
| , i o inpars | | v _{o,ATS}) - f _{np,ATS} | 57.7 mi/h |
| | 32X-30 | Percent free flow speed, PFFS | 87.4 % |
| Percent Time-Spent-Following | | | |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T | | 1.0 | 1.1 |
| Passenger-car equivalents for RVs, E _R (| | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV} =1/ | | 1.000 | 0.981 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhib | | 1.00 | 1.00 |
| Directional flow rate ² , v _i (pc/h) v _i =V _i /(PHF | | 478 | 317 |
| Base percent time-spent-following ⁴ , BPT | | | 77.4 |
| Adj. for no-passing zone, f _{np,PTSF} (Exhib | | 2 | 28.7 |
| Percent time-spent-following, PTSF _d (%): | =BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} / v _{d,PTSF} + | 6 | 34.7 |
| v _{o,PTSF}) | | | |
| Level of Service and Other Performan | ce Measures | | |
| Level of service, LOS (Exhibit 15-3) | | | С |
| Volume to capacity ratio, v/c | | <u> </u> | .31 |

| 1579 | |
|-------|--|
| 1668 | |
| 87.4 | |
| | |
| 478.2 | |
| 28.00 | |
| 4.79 | |
| 8.51 | . , , , , , , , , , , , , , , , , , , , |
| F | |
| | 1668
87.4
478.2
28.00
4.79
8.51 |

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^{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 downgrade segments are treated as level terrain.

^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| Analyst David Stoner Agency or Company DOWL HKM Date Performed 4/17/2012 | Jurisdiction
Analysis Year
ly | MT 200
Sidney to Fairview EB
Dawson/Richland County
2035 - Low |
|--|---|---|
| Agency or Company DOWL HKM Date Performed 4/17/2012 Analysis Time Period Peak Hour Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Study Input Data Shoulder width tt Lane width tt Lane width tt | From/To
Jurisdiction
Analysis Year
ly | Sidney to Fairview EB Dawson/Richland County |
| Analysis Time Period Peak Hour Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Study Input Data Shoulder width tt Lane width It Lane width It | Analysis Year
ly
✓ Class I h | |
| | | |
| Shoulder width tt Lane width tt Lane width tt | | |
| Lane width tt Lane width tt | | |
| Lane width tt | | |
| Lane widthtt | | |
| | | - • |
| | | Class III highway |
| Segment length, L _t mi | Grade Length
Peak-hour fac | tor, PHF 0.83 |
| Analysis direction vol., V _d 529veh/h | No-passing zo
Show North Arrow % Trucks and | |
| Opposing direction vol., V _o 523veh/h | % Recreation | al vehicles, P _R 4% |
| Shoulder width ft 8.0 | Access points | <i>mi</i> 16/mi |
| Lane Width ft 12.0
Segment Length mi 9.9 | | |
| Average Travel Speed | | |
| | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.1 | 1.1 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ | 0.983 | 0.983 |
| Grade adjustment factor ¹ , f _{g.ATS} (Exhibit 15-9) | 1.00 | 1.00 |
| Demand flow rate ² , v _j (pc/h) v _j =V _j / (PHF* f _{g,ATS} * f _{HV,ATS}) | 648 | 641 |
| Free-Flow Speed from Field Measurement | Estimated Fre | e-Flow Speed |
| | Base free-flow speed ⁴ , BFFS | 69.0 mi∕h |
| Manager and of committee of | Adj. for lane and shoulder width,4 | f _{LS} (Exhibit 15-7) 0.0 mi/h |
| Mean speed of sample ³ , S _{FM}
Total demand flow rate, both directions, <i>v</i> | Adj. for access points ⁴ , f _A (Exhibi | : 15-8) 4.0 mi/h |
| | Free-flow speed, FFS (FSS=BFF | |
| 110 | | |
| ALE ALE | Average travel speed, ATS _d =FFS
v _{o.ATS}) - f _{np.ATS} | -0.00776(v _{d,ATS} + 53.7 <i>mi/h</i> |
| Percent Time-Spent-Following | Percent free flow speed, PFFS | 82.7 % |
| Teredit Time-opener onoming | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1)) | 1.000 | 1.000 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 |
| Directional flow rate ² , v _f (pc/h) v _i =V _f (PHF*f _{HV,PTSF} * f _{g,PTSF}) | 637 | 630 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} d ^b) | 60 | 0.4 |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | 21 | 1.6 |
| Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+$ | 71 | 1.3 |
| V _{o,PTSF}) | | |
| Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3) | , , , , , , , , , , , , , , , , , , , | 3 |
| Volume to capacity ratio, v/c | | O
39 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1671 |
|---|--|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1700 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 82.7 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 637.3 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 7.52 |
| Bicycle level of service (Exhibit 15-4) | F |
| Notes | The state of the s |

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^{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 downgrade segments are treated as level terrain.

^{2.} If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.

^{3.} For the analysis direction only and for v>200 veh/h.

For the analysis direction only
 Evaluation 15-10.
 Exhibit 15-20 provides coefficients a and b for Equation 15-10.
 Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| Analyst David Stoner Agency or Company DOWL HKM Date Performed 4/17/2012 | From/To Jurisdiction Analysis Year / Class I h highway Terrain Grade Length | MT 200 Sidney to Fairview WB Dawson/Richland County 2035 - Low ighway |
|---|--|--|
| Agency or Company Dowl HKM Date Performed A/17/2012 Peak Hour Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Study Input Data Shoulder width It Lane width It Lane width It Shoulder width It | From/To Jurisdiction Analysis Year / Class I h highway Terrain Grade Length | Sidney to Fairview WB Dawson/Richland County 2035 - Low ighway |
| Project Description: MT 16 / MT 200 Glendive to Feirview Corridor Planning Study Input Data Shoulder width | Class I h | ighway Class II
Class III highway |
| Shoulder width It Lane width It Lane width It Shoulder width It Shoulder width It Segment length, L ₁ mi Analysis direction vol., V _d 523veh/h | highway Tierrain
Grade Length | Class III highway |
| Lane width It Lane width It Shoulder width It Segment length, L ₁ mi Analysis direction vol., V _d 523veh/h | highway Tierrain
Grade Length | Class III highway |
| - | Peak-hour fac
No-passing zo | tor, PHF 0.86 |
| Opposing direction vol., V 529veh/h | Show Horth Arrow % Trucks and | Buses , P _T 25 % |
| Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 9.9 | % Recreational vehicles, P _R 4%
Access points <i>mi</i> 16/mi | |
| Average Travel Speed | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.1 | 1.1 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ | 0.976 | 0.976 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhibit 15-9) | 1.00 | 1.00 |
| Demand flow rate ² , v _j (pc/h) v _i =V _i / (PHF* f _{g,ATS} * f _{HV,ATS}) | 623 | 630 |
| Free-Flow Speed from Field Measurement | Estimated Fre | e-Flow Speed |
| Ε | Base free-flow speed ⁴ , BFFS | 66.0 mi/h |
| Mean speed of sample ³ , S _{FM} | Adj. for lane and shoulder width,4 | f _{LS} (Exhibit 15-7) 0.0 mi/h |
| Total demand flow rate, both directions, v | Adj. for access points ⁴ , f _A (Exhibit | 15-8) 4.0 mi/h |
| | Free-flow speed, FFS (FSS=BFF | S-f _{LS} -f _A) 62.0 mi/h |
| Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 1.1 mi/h | Average travel speed, ATS _d =FFS-0.00776(v _{d,ATS} + 51. | |
| <u> </u> | ^v o,ATS ^{) - f} np,ATS
Percent free flow speed, PFFS | 82.5 % |
| Percent Time-Spent-Following | Anglusia Discretes (A) | Ozzasia Bi di di |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | Analysis Direction (d) 1.0 | Opposing Direction (o) |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1)) | 1.000 | 1.000 |
| Grade adjustment factor ¹ , f _{q,PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 |
| Directional flow rate ² , v _i (pc/h) v _i =V _i /(PHF*f _{HV,PTSF} * f _{g,PTSF}) | 608 | 615 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} _d ^b) | 58 | 0.6 |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | 21 | .4 |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} / v _{d,PTSF} + | . 69 | 0.2 |
| v _{o,PTSF}) | | |
| Level of Service and Other Performance Measures | . MACCORD | |
| Level of service, LOS (Exhibit 15-3) Volume to capacity ratio, v/c | | |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1659 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1700 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 82.5 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 608.1 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 12.55 |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.



Appendix 7

Projected Two-Lane Highway 2035 – High Condition

| DIRECTIONAL TWO-LANE HIGHWA | AY SEGMENT WORK | SHEET | |
|--|--|--|--|
| General Information | Site Information | | |
| Analyst David Stoner | Highway / Direction of Travel | MT 16 | |
| Agency or Company DOWL HKM | From/To | RP 0.6 to 20.0 NB | |
| Date Performed 4/17/2012 Analysis Time Period Peak Hour | Jurisdiction | Dawson/Richland County | |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Stu | Analysis Year | 2035 High | |
| Input Data | oy | | |
| | | | |
| \$ Shoulder widthtt | | | |
| Lane width tt | ✓ Class II | nighway Class II | |
| \$\ Lane widthtt | | - · | |
| \$\frac{1}{2} \text{ Shoulder width } \frac{1}{2} | highway I | Class III highway | |
| | Terrain | Level Rolling | |
| Segment length, L _t mi | Grade Length
Peak-hour fa
No-passing z | ctor, PHF 0.81 | |
| Analysis direction vol., V _d 321veh/h | Show North Arrow % Trucks and | Buses , P _T 27 % | |
| Opposing direction vol., V _o 331veh/h | 3 | al vehicles, P _R 4% | |
| Shoulder width ft 8.0 Lane Width ft 12.0 | Access points | s <i>mi 5/</i> mi | |
| Lane Width ft 12.0
Segment Length mi 19.4 | | | |
| Average Travel Speed | | | |
| | Analysis Direction (d) | Opposing Direction (o) | |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.3 | 1.3 | |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 | |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}$ =1/ (1+ $P_T(E_T$ -1)+ $P_R(E_R$ -1)) | 0.925 | 0.925 | |
| Grade adjustment factor ¹ , f _{g.ATS} (Exhibit 15-9) | 1.00 | 1.00 | |
| Demand flow rate ² , v _i (pc/h) v _i =V _i / (PHF* f _{g,ATS} * f _{HV,ATS}) | 428 | 442 | |
| Free-Flow Speed from Field Measurement | Estimated Fre | ee-Flow Speed | |
| | Base free-flow speed ⁴ , BFFS | 65.0 mi/h | |
| | Adj. for lane and shoulder width,4 | f _{LC} (Exhibit 15-7) 0.0 mi/h | |
| Mean speed of sample ³ , S _{FM} | Adj. for access points ⁴ , f _A (Exhibi | - | |
| Total demand flow rate, both directions, v | 1 | | |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _{HV,ATS}) | Free-flow speed, FFS (FSS=BFF | (S-f _{LS} -f _A) 63.8 mi/h | |
| Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 1.7 mi/h | Average travel speed, ATS _d =FFS | 6-0.00776(v _{d,ATS} + 55.3 <i>mi/</i> n | |
| | V _{o,ATS}) - f _{np,ATS}
Percent free flow speed, PFFS 86.7 | | |
| Percent Time-Spent-Following | Analysis Direction (d) | Opposing Discretes (c) | |
| Page anger our equivalents facturates F. (Fubilities A.F. 40 and F. 40) | Analysis Direction (d) | Opposing Direction (o) | |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | 1.1 | 1.0 | |
| Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19) Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) | 0.974 | 1.00 | |
| Grade adjustment factor ¹ , f _{g.PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 | |
| Directional flow rate ² , $v_i(pc/h)$ $v_i=V_i/(PHF^*f_{HV,PTSF}^*f_{g,PTSF})$ | 407 | 409 | |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av_d b}) | 42.7 | | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | 35.3 | | |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} $^*(v_{d,PTSF} / v_{d,PTSF} + v_{d,PTSF})$ | | | |
| optsf) | 60 | 2.3 | |
| | I | | |
| | | | |
| Level of Service and Other Performance Measures Level of Service, LOS (Exhibit 15-3) | | C | |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1573 | |
|---|-------|--|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1700 | |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 86.7 | |
| Bicycle Level of Service | | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 396.3 | |
| Effective width, Wv (Eq. 15-29) ft | 28.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 13.81 | |
| Bicycle level of service (Exhibit 15-4) | F | |
| Notes | | |

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^{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 downgrade segments are treated as level terrain.

^{2.} If v_i(v_d or v_o) >=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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTION | IAL TWO-LANE HIGHWA | AY SEGMENT WORK | SHEET |
|--|--|--|--|
| General Information | | Site Information | |
| Analyst | Davíd Stoner | Highway / Direction of Travel | MT 16 |
| Agency or Company | DOWL HKM | From/To | RP 0.6 to RP 12.4 SB |
| Date Performed
Analysis Time Period | 4/17/2012
Peak Hour | Jurisdiction
Analysis Year | Dawson/Richland County |
| Project Description: MT 16 / MT 200 GI | | | 2035 High |
| Input Data | share to real view contrast realising otto | uy | · · · · · · · · · · · · · · · · · · · |
| | | | |
| | Shoulder widthft | | |
| * | Lane width tt | ✓ Class II | highway Class II |
| | , Lane widthtt | | |
| | Shoulder width tt | highway I | Class III highway |
| | | Terrain | ▼ Level Rolling |
| Segment length, | L _t mi | Grade Length Peak-hour fa No-passing z | ctor, PHF 0.78 |
| Analysis direction vol., V _d 331ve | h/h | Show Horth Arrow % Trucks and | |
| Opposing direction vol., V _o 321ve | h/h | % Recreation | nal vehicles, P _R 4% |
| Shoulder width ft 8.0 | | Access point | s <i>mi</i> 7/mi |
| Lane Width ft 12.0
Segment Length mi 11.8 | | | |
| Average Travel Speed | , | | |
| , | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T | (Exhibit 15-11 or 15-12) | 1.3 | 1.3 |
| Passenger-car equivalents for RVs, E_R (I | Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV,ATS} | =1/(1+P _T (E _T -1)+P _R (E _R -1)) | 0.920 | 0.920 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhibit | 15-9) | 1.00 | 1.00 |
| Demand flow rate 2 , v_i (pc/h) v_i = V_i / (PHF * | f _{g,ATS} * f _{HV,ATS}) | 461 | 447 |
| Free-Flow Speed from | n Field Measurement | Estimated Fro | ee-Flow Speed |
| | | Base free-flow speed ⁴ , BFFS | 65.0 mi/h |
| _ | | Adj. for lane and shoulder width, | f, c(Exhibit 15-7) 0.0 mi/h |
| Mean speed of sample ³ , S _{FM} | | | = - |
| Total demand flow rate, both directions, v | , | Adj. for access points ⁴ , f _A (Exhibi | it 15-8) 1.8 <i>mi/</i> h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _j | _{IV.ATS}) | Free-flow speed, FFS (FSS=BFf | FS-f _{LS} -f _A) 63.3 mi/h |
| Adj. for no-passing zones, f _{np,ATS} (Exhibi | · | Average travel speed, ATS _d =FFS | S-0.00776(v _{d,ATS} + 54.7 mi/h |
| | | v _{o,ATS}) - f _{np,ATS}
Percent free flow speed, PFFS | 86.5 % |
| Percent Time-Spent-Following | | Applysis Disserts (4) | Onnestic Division (Constitution) |
| Passanger our service and the territory | C. M. D. A.C. 40 45 40 | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (| | 1.0 | 1.0 |
| Passenger-car equivalents for RVs, E _R (E
Heavy-vehicle adjustment factor, f _{HV} =1/ (| | 1.00 | 1.00 |
| Grade adjustment factor ¹ , f _{q,PTSF} (Exhibit | | 1.00 | 1.00 |
| Directional flow rate ² , v _i (pc/h) v _i =V _i /(PHF | 1000 | 424 | 412 |
| Base percent time-spent-following ⁴ , BPTS | | 45.2 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibi | | 32.6 | |
| Percent time-spent-following, PTSF _d (%)= | | The state of the s | |
| o, _{PTSF}) | g opportunit vycholi vycholi | 6 | 1.7 |
| | | 1 | |
| Level of Service and Other Performanc | e Measures | | 7.11.11.11.11.11.11.11.11.11.11.11.11.11 |
| | e Measures | | С |

Directional Page 2 of 2

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1564 | |
|---|-------|--|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1700 | |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 86.5 | |
| Bicycle Level of Service | | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 424.4 | |
| Effective width, Wv (Eq. 15-29) ft | 28.00 | |
| Effective speed factor, S ₁ (Eq. 15-30) | 4.79 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 15.39 | |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If $v_l(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET | | | |
|--|--|--|--|
| General Information | Site Information | | |
| Analyst | Highway of Travel MT 16 From/To RP 20.0 to Savage NB Jurisdiction Dawson/Richland County | | |
| Analysis Time Period Peak Hour | Analysis Year 2035 High | | |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planni | ing Study | | |
| Input Data | | | |
| Class I highway Class II highway Class III | highway | | |
| Opposing direction - | | | |
| Analysis direction | | | |
| L _{II} L _{de} L _d | | | |
| Į. | Snow Heath Anow | | |
| Shoulder width (ft) | 8.0 | | |
| Lane Width (ft) | 12.0 | | |
| Segment Length (mi) | 11.5 | | |
| Total length of analysis segment, \mathbf{L}_t | 11.5 | | |
| Length of two-lane highway upstream of the passing lane, L _u | 0.0 | | |
| Length of passing lane including tapers , L _{p!} | 1.9 | | |
| Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) | 55.5 | | |
| Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway | 59.2 | | |
| Segment Worksheet) | | | |
| Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment
Worksheet) | С | | |
| Average Travel Speed | | | |
| Length of the downstream highway segment within the effective length of passing lane for average travel speed, L _{de} (Exhibit 15-23) | 1.70 | | |
| Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, $L_d = L_t - (L_u + L_{pl} + L_{de})$ | 7.90 | | |
| Adj. factor for the effect of passing lane on average speed, $f_{ m pl}$ (Exhibit 15-28) | 1.10 | | |
| Average travel speed including passing lane ² , ATS _{pl} = (ATS _d [*] L _t) / | 56.7 | | |
| (L _u +L _d +(L _p)/f _{pl})+ (2L _{de} /(1+f _{pl,ATS}))) | 00.0 | | |
| Percent free flow speed including passing lane, PFFS _{pl} = (ATS _{pl} / FFS) Percent Time-Spent-Following | 89.0 | | |
| Length of the downstream highway segment within the effective length of | | | |
| passing lane for percent time-spent-following, L _{de} (Exhibit 15-23) | 8.04 | | |
| Length of two-lane highway downstream of effective length of the passing | | | |
| lane for percent-time-following, | 1.56 | | |
| $L_{d} = L_{t} - (L_{u} + L_{pl} + L_{de})$ | 1,00 | | |
| Adj. factor for the effect of passing lane on percent time-spent-following, | 0.61 | | |
| f _{pl,PTSF} (Exhibit 15-26) | V.U1 | | |

| Percent time-spent-following including passing lane ³ , PTSF _{p1} (%) | 47.3 | |
|---|-----------|--|
| $PTSF_{pl} = PTSF_{dl} L_{u} + L_{d} + f_{pl,PTSF} L_{pl} + ((1 + f_{pl,PTSF})/2) L_{de} J/L_{t}$ | | |
| Level of Service and Other Performance Measures ⁴ | | |
| Level of service including passing lane LOS _{pl} (Exhibit 15-3) | В | |
| Peak 15-min total travel time, TT ₁₅ (veh-h) TT ₁₅ = VMT ₁₅ /ATS _{pl} | 20.1 | |
| Bicycle Level of Service | | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 396.3 | |
| Effective width, W _v (Eq. 15-29) ft | 28.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 13.81 | |
| Bicycle level of service (Exhibit 15-4) | F | |
| Notes | | |
| 1. If LOS _d =F, passing lane analysis cannot be performed. | | |
| 2. If L _d <0, use alternative Equation 15-18. | | |
| 3. If L _d <0, use alternative Equation 15-16. | | |
| 4. v/c, VMT ₁₅ and VMT ₆₀ are calculated on Directional Two-Lane Highway Segment W | orksheet. | |

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| DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET | | | |
|---|---|--|--|
| General Information | Site Information | | |
| Analyst David Stoner Agency or Company DOWL HKM Date Performed 4/17/2012 Analysis Time Period Peak Hour | Highway of Travel MT 16 From/To RP 12.4 to RP 22.0 SB Jurisdiction Dawson/Richland County | | |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning | | | |
| Input Data | ng Otto) | | |
| Class I highway Class II highway Class III | highway | | |
| ← Opposing direction ← | | | |
| → Analysis direction → | | | |
| L _u L _{pl} L _{de} L _d | Show Heath Arrow | | |
| Shoulder width (ft) | 8.0 | | |
| Lane Width (ft) | 12.0 | | |
| Segment Length (mi) | 9.6 | | |
| Total length of analysis segment, $\mathbf{L}_{\mathbf{t}}$ | 9.6 | | |
| Length of two-lane highway upstream of the passing lane, $\mathbf{L}_{\mathbf{u}}$ | 0.0 | | |
| Length of passing lane including tapers , \mathbf{L}_{pl} | 1.9 | | |
| Average travel speed, ATS _d (from Directional Two-Lane Highway Segment Worksheet) | 55.9 | | |
| Percent time-spent-following, PTSF _d (from Directional Two-Lane Highway
Segment Worksheet) | 60.0 | | |
| Level of service ¹ , LOS _d (from Directional Two-Lane Highway Segment
Worksheet) | С | | |
| Average Travel Speed | | | |
| Length of the downstream highway segment within the effective length of passing lane for average travel speed, L _{de} (Exhibit 15-23) | 1.70 | | |
| Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L _d L _d =L _t -(L _u +L _{pt} + L _{de}) | 6.00 | | |
| Adj, factor for the effect of passing lane on average speed, f _{pl} (Exhibit 15-
28) | 1.10 | | |
| Average travel speed including passing lane ² , ATS _{pl} = (ATS _d * L _l) / $(L_u + L_d + (L_p / f_{pl}) + (2L_{de} / (1 + f_{pl,ATS})))$ | 57.4 | | |
| Percent free flow speed including passing lane, PFFS _{pl} = (ATS _{pl} / FFS) | 89.1 | | |
| Percent Time-Spent-Following | | | |
| Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L _{de} (Exhibit 15-23) | 7.91 | | |
| Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, | -0.21 | | |
| Adj. factor for the effect of passing lane on percent time-spent-following, f _{pl,PTSF} (Exhibit 15-26) | 0.61 | | |

| Percent time-spent-following including passing lane ³ , PTSF _{pl} (%) | 45.7 | |
|---|-----------|----------------|
| $PTSF_{pl} = PTSF_{d}[L_{u} + L_{d} + f_{pl,PTSF} L_{pl} + ((1 + f_{pl,PTSF})/2)L_{de}]/L_{t}$ | | |
| Level of Service and Other Performance Measures ⁴ | | , and a second |
| Level of service including passing lane LOS _{pl} (Exhibit 15-3) | В | |
| Peak 15-min total travel time, TT ₁₅ (veh-h) TT ₁₅ = VMT ₁₅ /ATS _{pl} | 17.7 | |
| Bicycle Level of Service | | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 424.4 | |
| Effective width, W _v (Eq. 15-29) ft | 28.00 | |
| Effective speed factor, S ₁ (Eq. 15-30) | 4.79 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 15.39 | |
| Bicycle level of service (Exhibit 15-4) | F | |
| Notes | | |
| 1. If LOS _d =F, passing lane analysis cannot be performed. | | |
| 2. If L _d <0, use alternative Equation 15-18. | | |
| 3. If L _d <0, use alternative Equation 15-16. | | |
| 4. v/c, VMT ₁₅ and VMT ₆₀ are calculated on Directional Two-Lane Highway Segment Wo | orksheet. | |

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| DIRECTIONAL TWO-LANE HIGHWA | AY SEGMENT WORK | SHEET |
|---|---|--|
| General Information | Site Information | |
| Analyst David Stoner Agency or Company DOWL HKM Date Performed 4/17/2012 Analysis Time Period Peak Hour | Highway / Direction of Travel
From/To
Jurisdiction
Analysis Year | MT 16
RP 22.0 to Savage SB
Dawson/Richland County
2035 High |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Stu | | |
| Input Data | | |
| Shoulder width ft Lane width ft Lane width ft | | highway Class II
Class III highway |
| Segment length, L ₁ mi | Terrain
Grade Lengtl
Peak-hour fa
No-passing z | Level Rolling h mi Up/down ctor, PHF 0.78 |
| Analysis direction vol., V _d 321veh/h | Show North Arrow % Trucks and | d Buses , P _T 29 % |
| Opposing direction vol., V _o 331veh/h Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 9.5 | % Recreational vehicles, P _R 4% Access points <i>mi</i> 5/mi | |
| Average Travel Speed | | |
| | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.3 | 1.3 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}$ =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) | 0.920 | 0.920 |
| Grade adjustment factor ¹ , f _{g.ATS} (Exhibit 15-9) | 1.00 | 1.00 |
| Demand flow rate ² , v _/ (pc/h) v _i =V _i / (PHF* f _{g,ATS} * f _{HV,ATS}) | 447 | 461 |
| Free-Flow Speed from Field Measurement | Estimated Fr | ee-Flow Speed |
| | Base free-flow speed ⁴ , BFFS | 65.0 mi/h |
| Mean speed of sample 3 , S $_{{\scriptscriptstyle FM}}$ | Adj. for lane and shoulder width, | ⁴ f _{LS} (Exhibit 15-7) 0.0 mi/h |
| Total demand flow rate, both directions, <i>v</i> | Adj. for access points ⁴ , f _A (Exhib | it 15-8) 1.3 mi/h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _{HV,ATS}) | Free-flow speed, FFS (FSS=BF) | FS-f _{LS} -f _A) 63.8 <i>mi/</i> h |
| Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 1.5 mi/h | Average travel speed, ATS _d =FFS | |
| Developed Time County To Visualism | v _{o,ATS}) - f _{np,ATS}
Percent free flow speed, PFFS | 86.5 % |
| Percent Time-Spent-Following | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) | 1.000 | 1.000 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 |
| Directional flow rate ² , v _/ (pc/h) v _i =V _/ (PHF*f _{HV,PTSF} * f _{g,PTSF}) | 412 | 424 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} d ^b) | 43.7 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | 33.2 | |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} / v _{d,PTSF} + | 60.1 | |
| V _{o,PTSF}) | | |
| Level of Service and Other Performance Measures Level of service, LOS (Exhibit 15-3) | | C |
| Volume to capacity ratio, v/c | | 0.29 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1564 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1700 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 86.5 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 411.5 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _{f.} (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 15.38 |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If $v_l(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTION | NAL TWO-LANE HIGHWA | AY SEGMENT WORK | SHEET |
|--|---|--|--|
| General Information | | Site Information | |
| Analyst | David Stoner | Highway / Direction of Travel | MT 16 |
| Agency or Company | DOWL HKM | From/To | Savage to Crane NB |
| Date Performed
Analysis Time Period | 4/17/2012
Peak Hour | Jurisdiction
Analysis Year | Dawson/Richland County |
| | lendive to Fairview Corridor Planning Stu | | 2035 - High |
| Input Data | conduct to randor volume r lanning otto | oy . | |
| | | | |
| | Shoulder width ft | | |
| | Lane width tt | V Class I I | nighway 🗀 Class II |
| | Lane widtht | bighuou [| Class III highway |
| | Shouider widthit | | - · |
| | <u> </u> | Terrain | Level Rolling |
| Segment length | ı, L _t mi | Grade Length
Peak-hour fac
No-passing z | ctor, PHF 0.87 |
| Analysis direction vol., V _d 336v | eh/h | Show North Arrow % Trucks and | |
| Opposing direction vol., V _o 407v | eh/h | | al vehicles, P _R 4% |
| Shoulder width ft 8.0 | | Access points | •• |
| Lane Width ft 12.0 | | 1 | |
| Segment Length mi 10.0 Average Travel Speed | | | |
| Average Traver Speed | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E | (Exhibit 15-11 or 15-12) | 1.3 | 1.2 |
| Passenger-car equivalents for RVs, E _R | | 1.0 | 1.0 |
| | | 0.935 | 0.956 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$
Grade adjustment factor ¹ , $f_{g,ATS}$ (Exhibit 15-9) | | 1.00 | 1.00 |
| Demand flow rate ² , $v_j(pc/h)$ $v_i = V_i/(PHF)$ | | 413 | 489 |
| | m Field Measurement | Estimated Fre | l
e-Flow Speed |
| | | Base free-flow speed ⁴ , BFFS | 69.0 mi/h |
| | | · · | |
| Mean speed of sample ³ , S _{FM} | | Adj. for lane and shoulder width,4 | |
| Total demand flow rate, both directions, | v | Adj. for access points ⁴ , f _A (Exhibi | t 15-8) 2.8 mi/h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ t | | Free-flow speed, FFS (FSS=BFF | (S-f _{IS} -f _A) 66.3 mi/h |
| Adj. for no-passing zones, f _{np,ATS} (Exhib | • | Average travel speed, ATS _d =FFS | , |
| | | Vo,ATS) - Inp,ATS | |
| Percent Time-Spent-Following | | r crossit free from opecu, 1 1 1 0 | 86.8 % |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T | (Exhibit 15-18 or 15-19) | 1.1 | 1.0 |
| Passenger-car equivalents for RVs, E _R (| Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV} =1/ | (1+ P _T (E _T -1)+P _R (E _R -1)) | 0.978 | 1.000 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhib | | 1.00 | 1.00 |
| Directional flow rate ² , v _/ (pc/h) v _i =V _/ (PHF | | 395 | 468 |
| Base percent time-spent-following ⁴ , BPT | SF _d (%)=100(1-e ^{av} d ^b) | 4- | 4.1 |
| Adj. for no-passing zone, f _{np,PTSF} (Exhib | | 3. | 3.0 |
| Percent time-spent-following, PTSF _d (%)= | *BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} / v _{d,PTSF} + | 5 | 9.2 |
| v _{o,PTSF}) | | | |
| Level of Service and Other Performan | ce Measures | | |
| Level of service, LOS (Exhibit 15-3) | | | C |
| Volume to capacity ratio, v/c | | 0. | 25 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1625 |
|---|--|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1700 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 86.8 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 386.2 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 10.93 |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If $v_l(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTIONAL TWO-LAI | VE HIGHWA' | Y SEGMENT WORK | SHEET |
|---|--------------------------------|--|--|
| General Information | | Site Information | |
| Analyst David Stoner Agency or Company DOWL HKM Date Performed 4/17/2012 Analysis Time Period Peak Hour | F | Highway / Direction of Travel
From/To
Jurisdiction | MT 16
Savage to Crane SB
Dawson/Richland County |
| Analysis Time Period Peak Hour Project Description: MT 16 / MT 200 Glendive to Fairview Co | | Analysis Year | 2035 - High |
| Input Data | riddi i farming olddy | | American Control of the Control of t |
| | | | |
| \$\$ \$\tag{\text{Shoulder width}}\$\$ \$\displays{2} \displays{2} \display | | gentamoy | |
| Lane width | | V Class I I | nighway Class II |
| Shoulder width | ft l | highway 🗔 | Class III highway |
| Segment length, L _t mi | | Terrain Grade Length Peak-hour far No-passing z | ctor, PHF 0.84 |
| Analysis direction vol., V _d 407veh/h | | Show Horth Arrow % Trucks and | Buses , P _T 25 % |
| Opposing direction vol., V _o 336veh/h Shoulder width ft 8.0 Lane Width ft 12.0 | | % Recreation
Access points | al vehicles, P _R 4%
s <i>mi</i> 11/mi |
| Segment Length mi 10.0 Average Travel Speed | | | |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-1 | 2) | 1.2 | 1.3 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13 |) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}$ =1/ (1+ P_T (E_T -1)+ P_E | (E _R -1)) | 0.952 | 0.930 |
| Grade adjustment factor ¹ 、f _{g,ATS} (Exhibit 15-9) | | 1.00 | 1.00 |
| Demand flow rate ² , v_j (pc/h) $v_i = V_1 / (PHF^* f_{g,ATS}^* f_{HV,ATS})$ | | 509 430 | |
| Free-Flow Speed from Fletd Measuremen | <u> </u> | EstImated Fre | e-Flow Speed |
| | E | Base free-flow speed ⁴ , BFFS | 66.0 mi/h |
| Mean speed of sample ³ , S _{FM} | ۸ | Adj. for lane and shoulder width, ⁴ | f _{LS} (Exhibit 15-7) 0.0 mi/h |
| Total demand flow rate, both directions, v | A | Adj. for access points ⁴ , f _A (Exhibi | t 15-8) 2.8 mi/h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _{HV.ATS}) | | Free-flow speed, FFS (FSS=BFF | |
| Adj. for no-passing zones, f _{npATS} (Exhibit 15-15) | <i>1.5 mi⁄</i> h A | Average travel speed, ATS _d =FFS | |
| | v,
P | o,ATS ^{) - f} np,ATS
Percent free flow speed, PFFS | 86.1 % |
| Percent Time-Spent-Following | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-1 |)) | 1.0 | 1.1 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19 | <u> </u> | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ P_T (E_T -1)+ P_R (E_R -1 |)) | 1.000 | 0.976 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhibit 15-16 or Ex 15-17) | | 1.00 | 1.00 |
| Directional flow rate ² , v _/ (pc/h) v _i =V _i /(PHF*f _{HV,PTSF} * f _{g,PTSF}) | | 485 | 410 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} d ^b) | | 49.3 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | | 28.5 | |
| Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v)$ | d,PTSF / V _{d,PTSF} + | 64 | 4.7 |
| V _{o,PTSF}) | | | |
| Level of Service and Other Performance Measures | | | ····· |
| Level of service, LOS (Exhibit 15-3) | T** | | 0 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1581 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1700 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 86.1 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 484.5 |
| Effective width, Ww (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _f (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 12.44 |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTION | NAL TWO-LANE HIGHWA | AY SEGMENT WORK | SHEET |
|--|--|---|---|
| General Information | | Site Information | |
| Analyst | David Stoner | Highway / Direction of Travel | MT 16 |
| Agency or Company | DOWL HKM | From/To | Crane to Sidney NB |
| Date Performed | 4/17/2012 | Jurisdiction | Dawson/Richland County |
| Analysis Time Period | Peak Hour | Analysis Year | 2035 - High |
| Project Description: MT 16/MT 200 G | lendive to Fairview Corridor Planning Stu | dy | |
| I I | 1 | | |
| | Shoulder width ft | | |
| - | Lane width | range. | harren |
| | Lane width tt | IY: Class I I | nighway Class II |
| | | highway | Class III highway |
| | Shoulder widthtt _ | 1 / 1 \ | |
| S | | Terrain Grade Length | |
| Segment terigit | ı, L _l mi | Peak-hour fact No-passing ze | ctor, PHF 0.80 |
| Analysis direction vol., V _d 360v | eh/h | Show North Arrow % Trucks and | • |
| Opposing direction vol., V _o 552v | eh/h | I I | al vehicles, P _R 4% |
| Shoulder width ft 8.0 | | Access points | s <i>mi 12/</i> mi |
| Lane Width ft 12.0
Segment Length mi 8.9 | | | |
| Average Travel Speed | | | |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E | (Exhibit 15-11 or 15-12) | 1.3 | 1.1 |
| Passenger-car equivalents for RVs, E _R (| (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV,AT} s | Heavy-vehicle adjustment factor, f _{HV,ATS} =1/ (1+ P _T (E _T -1)+P _R (E _R -1)) | | 0.981 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhib | | 1.00 | 1.00 |
| Demand flow rate ² , v _i (pc/h) v _i =V _i / (PHF | | 476 | 703 |
| Free-Flow Speed fro | m Field Measurement | Estimated Fre | e-Flow Speed |
| | | Base free-flow speed ⁴ , BFFS | 65.0 mi/h |
| | | Adj. for lane and shoulder width,4 | f, c(Exhibit 15-7) 0.0 mi/h |
| Mean speed of sample ³ , S _{FM} | | | |
| Total demand flow rate, both directions, | v | Adj. for access points ⁴ , f _A (Exhibi | 115-8) 3.0 mi/h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/1 | | Free-flow speed, FFS (FSS=BFF | $S-f_{LS}-f_{A}$) 62.0 mi/h |
| | , | Average travel speed, ATS _d =FFS | |
| Adj. for no-passing zones, f _{np,ATS} (Exhib | nt 13-13) 1.0 mm | | -0.00770(V _{d,ATS} + 51.9 mi/h |
| | | v _{o,ATS}) - f _{np,ATS}
Percent free flow speed, PFFS | 83.7 % |
| Percent Time-Spent-Following | | Anatori Di ii | |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T | | 1.0 | 1.0 |
| Passenger-car equivalents for RVs, E _R (| | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV} =1/ | | 1.000 | 1.000 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhib | | 1.00 | 1.00 |
| Directional flow rate ² , v _/ (pc/h) v _i =V _/ (PHF
Base percent time-spent-following ⁴ , BPT | | 450 | 690 |
| | | 50.2 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhib | | 23 | 3.5 |
| Percent time-spent-following, PTSF _d (%)= | -BET OF d TI np,PISE (Vd,PISE / Vd,PISE + | 59 | 0.5 |
| V _{o,PTSF}) | | | |
| Level of Service and Other Performant | ce measures | | |
| evel of service, LOS (Exhibit 15-3) | | | <u> </u> |
| /olume to capacity ratio, v/c | | | 29 |

Directional Page 2 of 2

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1668 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1700 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 83.7 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 450.0 |
| Effeclive width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _f (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 8.48 |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, 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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTIONAL TWO-LANE HIGHWA | AY SEGMENT WORK | SHEET |
|---|---|--|
| General Information | Site Information | |
| Analyst David Stoner Agency or Company DOWL HKM Date Performed 4/17/2012 Analysis Time Period Peak Hour | Highway / Direction of Travel
From/To
Jurisdiction
Analysis Year | MT 16
Crane to Sidney SB
Dawson/Richland County
2035 - High |
| Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Stu | | 1.000 1.1911 |
| Input Data | | |
| Shoulder width It Lane width It Lane width It Shoulder width It Shoulder width It Shoulder width It | | |
| Analysis direction vol., V _d 552veh/h Opposing direction vol., V _o 360veh/h | Show Horth Arrow % Trucks and % Recreation | |
| Shoulder width ft 8.0 Lane Width ft 12.0 Segment Length mi 8.9 | Access point | |
| Average Travel Speed | | |
| | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.1 | 1.3 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$ | 0.981 | 0.946 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhibit 15-9) | 1.00 | 1.00 |
| Demand flow rate ² , $v_i(pc/h) v_i = V_i I (PHF^* f_{g,ATS}^* f_{HV,ATS})$ | 647 437 | |
| Free-Flow Speed from Field Measurement | Estimated Free-Flow Speed | |
| | Base free-flow speed ⁴ , BFFS | 69.0 mi/h |
| Mean speed of sample ³ , S _{FM} | Adj. for lane and shoulder width, | f _{LS} (Exhibit 15-7) 0.0 mi/h |
| Total demand flow rate, both directions, <i>v</i> | Adj. for access points ⁴ , f _A (Exhibit 15-8) 3.0 <i>mi/n</i> | |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _{HV,ATS}) | Free-flow speed, FFS (FSS=BFI | =S-f _{LS} -f _A) 66.0 mi/h |
| Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 1.6 mi/n | Average travel speed, ATS _d =FFS-0.00776(v _{d,ATS} + 56.0 r | |
| Percent Time-Spent-Following | Percent free flow speed, PFFS | 84.8 % |
| | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) | 1.000 | 1.000 |
| Grade adjustment factor ¹ , f _{g.PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 |
| Directional flow rate ² , v _/ (pc/h) v _i =V _/ (PHF*f _{HV,PTSF} * f _{g,PTSF}) | 634 | 414 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} d ^b) | 57.9 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | 2 | 4.6 |
| Percent time-spent-following, PTSF _d (%)=BPTSF _d +f _{np,PTSF} *($v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF}$) | 7 | 2.8 |
| Level of Service and Other Performance Measures | | , |
| Level of service, LOS (Exhibit 15-3) | | D |
| Volume to capacity ratio, v∕c | 0 | .40 |

Directional Page 2 of 2

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1608 |
|---|---|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1700 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 84.8 |
| Bicycle Level of Service | , |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 634.5 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _t (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 8.66 |
| Bicycle level of service (Exhibit 15-4) | 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 downgrade segments are treated as level terrain.

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^{2.} If v_i(v_d or v_o) >=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. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTION | NAL TWO-LANE HIGHWA | Y SEGMENT WORK | SHEET |
|--|--|---|---|
| General Information | | Site Information | |
| Analyst
Agency or Company
Date Performed | David Stoner
DOWL HKM
4/17/2012 | Highway / Direction of Travel
From/To
Jurisdiction | MT 200
Sidney to Fairview EB
Dawson/Richland County |
| Analysis Time Period | Peak Hour | Analysis Year | 2035 - High |
| Input Data | lendive to Fairview Corridor Planning Stud | dy | 20 |
| L | | | |
| | Shoulder widthft | | |
| | Lane widthtt | V Class I h | nighway Class II |
| | Lane width It | highway | Class III highway |
| | Shoulder width tt | 1 / 1 ~ | V Level Rolling |
| Segment length | , L _t mi | Grade Length
Peak-hour fac
No-passing zo | n mi Up/down
ctor, PHF 0.83 |
| Analysis direction vol., V _d 661v | eh/h | Show North Arrow % Trucks and | I Buses , P _T 17 % |
| Opposing direction vol., V _o 654v | eh/h | % Recreation | al vehicles, P _R 4% |
| Shoulder width ft 8.0 | | Access points | • |
| Lane Width ft 12.0
Segment Length mi 9.9 | | | |
| Average Travel Speed | | | |
| | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E ₁ | (Exhibit 15-11 or 15-12) | 1.1 | 1.1 |
| Passenger-car equivalents for RVs, E _R (| Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV,ATS} | _S =1/ (1+ P _T (E _T -1)+P _R (E _R -1)) | 0.983 | 0.983 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhib | | 1.00 | 1.00 |
| Demand flow rate ² , v _j (pc/h) v _i =V _i / (PHF | | 810 802 | |
| Free-Flow Speed fro | m Fleid Measurement | Estimated Fre | ee-Flow Speed |
| | | Base free-flow speed ⁴ , BFFS | 69.0 mi/h |
| Mean speed of sample ³ , S _{FM} | | Adj. for lane and shoulder width,4 | f _{LS} (Exhibit 15-7) 0.0 mi/h |
| Total demand flow rate, both directions, | v | Adj. for access points ⁴ , f _A (Exhibi | t 15-8) 4.0 mi/h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ | | Free-flow speed, FFS (FSS=BFF | $-S-f_{LS}-f_{A}$) 65.0 mi/h |
| Adj. for no-passing zones, f _{np,ATS} (Exhib | • | Average travel speed, ATS _d =FFS | 20 11 |
| | | v _{o,ATS}) - f _{np,ATS}
Percent free flow speed, PFFS | 79.7 % |
| Percent Time-Spent-Following | | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T | (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Passenger-car equivalents for RVs, E _R (| · · · · · · · · · · · · · · · · · · · | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV} =1/ | | 1.000 | 1.000 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhib | | 1.00 | 1.00 |
| Directional flow rate ² , v _/ (pc/h) v _i =V _/ (PHF | | 796 | 788 |
| Base percent time-spent-following ⁴ , BPT | | 68.8 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhib | | 1 | 7.1 |
| Percent time-spent-following, PTSF _d (%): | =BPTSF _d +f _{np,PTSF} *(v _{d,PTSF} /v _{d,PTSF} + | 7 | 7.4 |
| V _{o,PTSF}) | | <u>, </u> | |
| Level of Service and Other Performan | ce Measures | American and a second a second and a second | Δ. |
| Level of service, LOS (Exhibit 15-3) | | | D |
| Volume to capacity ratio, v/c | | 0. | .48 |

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1671 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1700 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 79.7 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 796.4 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S ₁ (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 7.63 |
| Bicycle level of service (Exhibit 15-4) | F |
| Bicycle level of service (Exhibit 15-4) | F |

^{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 downgrade segments are treated as level terrain.

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^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, terminate analysis--the LOS is F.

^{3.} For the analysis direction only and for v>200 veh/h.

For the analysis direction only
 For the analysis direction only
 Exhibit 15-20 provides coefficients a and b for Equation 15-10.
 Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

| DIRECTIONAL TWO-LANE HIGHWA | | SHEET |
|---|---|---|
| General Information | Site Information | |
| Analyst David Stoner Agency or Company DOWL HKM Date Performed 4/17/2012 | Highway / Direction of Travel
From/To
Jurisdiction | MT 200
Sidney to Fairview WB
Dawson/Richland County |
| Analysis Time Period Peak Hour Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Stu | Analysis Year | 2035 - High |
| Input Data | ay | |
| | | |
| Shoulder width tt | | |
| Lane width tt | Class I t | nighway Class II |
| Lane width tt | highway 🗔 | Class III highway |
| | Terrain | V Level Rolling |
| Segment length, L ₁ mi | Grade Length
Peak-hour far
No-passing z | ctor, PHF 0.86 |
| Analysis direction vol., V _d 654veh/h | Show North Arrow % Trucks and | |
| Opposing direction vol., V _o 661veh/h | | al vehicles, P _R 4% |
| Shoulder width ft 8.0 | Access points | |
| Lane Width ft 12.0
Segment Length mi 9.9 | | |
| Average Travel Speed | | |
| | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-11 or 15-12) | 1.1 | 1.1 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-11 or 15-13) | 1.0 | 1.0 |
| eavy-vehicle adjustment factor, $f_{HV,ATS}$ =1/ (1+ P_T (E_T -1)+ P_R (E_R -1)) 0.976 | | 0.976 |
| Grade adjustment factor ¹ , f _{g,ATS} (Exhibit 15-9) | 1.00 1.00 | |
| Demand flow rate ² , $v_i(pc/h) v_i = V_i / (PHF^* f_{g,ATS}^* f_{HV,ATS})$ | 779 | 788 |
| Free-Flow Speed from Field Measurement | Estimated Free-Flow Speed | |
| | Base free-flow speed ⁴ , BFFS | 66.0 mi/h |
| Mean speed of sample ³ , S _{FM} | Adj. for lane and shoulder width,4 | f _{LS} (Exhibit 15-7) 0.0 mi/h |
| Total demand flow rate, both directions, v | Adj. for access points ⁴ , f _A (Exhibi | t 15-8) 4.0 mi/h |
| Free-flow speed, FFS=S _{FM} +0.00776(v/ f _{HV,ATS}) | Free-flow speed, FFS (FSS=BFF | S-f _{LS} -f _A) 62.0 mi/h |
| Adj. for no-passing zones, f _{np,ATS} (Exhibit 15-15) 0.7 mi/h | Average travel speed, ATS _d =FFS | '' |
| | V _{o,ATS}) - f _{np,ATS}
Percent free flow speed, PFFS | 79.3 % |
| Percent Time-Spent-Following | Toront mod not opoda, 1110 | 1 3.0 70 |
| | Analysis Direction (d) | Opposing Direction (o) |
| Passenger-car equivalents for trucks, E _T (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Passenger-car equivalents for RVs, E _R (Exhibit 15-18 or 15-19) | 1.0 | 1.0 |
| Heavy-vehicle adjustment factor, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1)) | 1.000 | 1.000 |
| Grade adjustment factor ¹ , f _{g,PTSF} (Exhibit 15-16 or Ex 15-17) | 1.00 | 1.00 |
| Directional flow rate ² , v _/ (pc/h) v _i =V _/ (PHF*f _{HV,PTSF} * f _{g,PTSF}) | 760 | 769 |
| Base percent time-spent-following ⁴ , BPTSF _d (%)=100(1-e ^{av} d ^b) | 67.5 | |
| Adj. for no-passing zone, f _{np,PTSF} (Exhibit 15-21) | 1. | 7.0 |
| Percent time-spent-following, $PTSF_d$ (%)= $BPTSF_d$ + $f_{np,PTSF}$ * $(v_{d,PTSF} / v_{d,PTSF} + v_{d,PTSF})$ | + 75.9 | |
| (o _{PTSF}) Level of Service and Other Performance Measures | | |
| Level of Service and Other Performance Measures Level of Service, LOS (Exhibit 15-3) | | D |
| /olume to capacity ratio, v/c | | 47 |

Directional Page 2 of 2

| Capacity, C _{d,ATS} (Equation 15-12) pc/h | 1659 |
|---|-------|
| Capacity, C _{d,PTSF} (Equation 15-13) pc/h | 1700 |
| Percent Free-Flow Speed PFFS _d (Equation 15-11 - Class III only) | 79.3 |
| Bicycle Level of Service | |
| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 760.5 |
| Effective width, Wv (Eq. 15-29) ft | 28.00 |
| Effective speed factor, S _f (Eq. 15-30) | 4.79 |
| Bicycle level of service score, BLOS (Eq. 15-31) | 12.67 |
| Bicycle level of service (Exhibit 15-4) | F |
| No. 4. | |

Notes

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^{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 downgrade segments are treated as level terrain.

^{2.} If $v_i(v_d \text{ or } v_o) >= 1,700 \text{ pc/h}$, terminate analysis--the LOS is F.

^{3.} For the analysis direction only and for v>200 veh/h.

For the analysis direction only
 Exhibit 15-20 provides coefficients a and b for Equation 15-10.
 Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.



Appendix 7

Projected Four-Lane Highway 2035 – Low Condition

Direction 1 = Northbound/Eastbound Direction

Direction 2 = Southbound/Westbound Direction

| AADT(veh/h) Peak-Hour Prop of AADT (veh/d) Peak-Hour Prop of Prop, D Deakt-Hour Direction Prop, D Doth/ (veh/h) Driver Type Adjustment 1.00 Calculate Flow Adjustments f p 1.00 E T 1.5 f HrV 0.889 Calc Speed Adj and FFS Lane Width, LW (ft) 12.0 Access Points, A (A/mi) Median Type, M FFS (measured) Base Free-Flow Speed, BFFS Coperations Coperations Design (N) Required Number of Lanes, N Flow Rate, v p (pc/h/ln) Design LOS Pesign LOS A Celicy Indian Access Pow Rate (pc/h/ln) Design LOS Design LOS Design LOS | MULTILANE HIGHWAYS WORKSHEET(Direction 1) | | | |
|---|---|---|---|--|
| Analyst | × | | | |
| Date Performed | | | Site Information | |
| Toper,(LOS) Toper, (N) Toper, (vp) | Date Performed
Analysis Time Period | DOWL HKM
5/1/2012
Peak Hour | From/To
Jurisdiction
Analysis Year | Glendive to Savage
Dawson/Richland County |
| Peak Hour Factor, PHF 0.81 | | | | |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | J i L | Pes. (N) | J Flan. (vp) |
| Calculate Flow Adjustments fp 1.00 E _R 1.2 E _T 1.5 f _{HV} 0.889 Speed Inputs Calc Speed Adj and FFS Lane Width, LW (ft) 12.0 f _{LW} (mi/h) Total Lateral Clearance, LC (ft) 12.0 f _{LC} (mi/h) Access Points, A (A/mi) 0 f _A (mi/h) Median Type, M FFS (measured) 60.0 FFS (measured) 60.0 f _M (mi/h) FFS (measured) 60.0 FFS (mi/h) 60.0 Operational (LOS) Clow Rate, v _p (pc/h/lin) 168 Flow Rate, v _p (pc/h) Speed, S (mi/h) 60.0 Max Service Flow Rate (pc/h/lin) Design LOS Design LOS | Volume, V (veh/h)
AADT(veh/h) |) | %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade Length (mi) Up/Down % | 25
0
Level
0.00
0.00 |
| ET 1.5 f _{HV} 0.889 Speed Inputs Calc Speed Adj and FFS Lane Width, LW (ft) 12.0 f _{LW} (mi/h) Total Lateral Clearance, LC (ft) 12.0 f _{LC} (mi/h) Access Points, A (A/mi) 0 f _A (mi/h) Median Type, M f _M (mi/h) FFS (measured) 60.0 Base Free-Flow Speed, BFFS FFS (mi/h) 60.0 Operations Design Opesign (N) Pelow Rate, v _p (pc/h/ln) 168 Flow Rate, v _p (pc/h) Speed, S (mi/h) 60.0 Max Service Flow Rate (pc/h/ln) Design LOS Design LOS | Calculate Flow Adjus | tments | | |
| Lane Width, LW (ft) 12.0 $f_{LW} (ml/h)$ Total Lateral Clearance, LC (ft) 12.0 $f_{LC} (mi/h)$ Access Points, A (A/mi) 0 $f_{A} (mi/h)$ Median Type, M FFS (measured) 60.0 $f_{M} (mi/h)$ FFS (mi/h) 60.0 Operations Design Design (N) Required Number of Lanes, N Flow Rate, v_p (pc/h/ln) 60.0 Operation 2.8 Operation 3.8 Operation 3.8 Operation 4.0 Operation 4.0 Operation 4.0 Operation 5.0 Operation 6.0 Operation 6. | f _p
E _T | | | |
| Total Lateral Clearance, LC (ft) 12.0 Access Points, A (A/mi) 0 Median Type, M FFS (measured) 60.0 Base Free-Flow Speed, BFFS Operations Design Design (N) Required Number of Lanes, N Flow Rate, v_p (pc/h/in) 60.0 Operation 2.8 LOS A | Speed Inputs | | Calc Speed Adj and I | FFS / |
| Operations Design Operational (LOS) Design (N) Flow Rate, v _p (pc/h/ln) 168 Speed, S (mi/h) 60.0 O (pc/mi/ln) 2.8 LOS A Design (N) Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M FFS (measured) Base Free-Flow Speed, BFFS | 12.0 | f _{LC} (mi/h)
f _A (mi/h)
f _M (mi/h) | 60.0 |
| Design (N) Flow Rate, v _p (pc/h/ln) Speed, S (mi/h) O (pc/mi/ln) 2.8 Design (N) Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design (N) Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | Operations | 100000000000000000000000000000000000000 | Design | |
| Bicycle Level of Service | Operational (LOS)
Flow Rate, v _p (pc/h/ln)
Speed, S (mi/h)
D (pc/mi/ln)
LOS | 60.0
2.8 | <u>Design (N)</u>
Required Number of Lanes, N
Flow Rate, v _p (pc/h)
Max Service Flow Rate (pc/h/ln) | |
| | Bicycle Level of Service | | | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 149.4 | |
|---|-------|--|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 13.91 | |
| Bicycle level of service (Exhibit 15-4) | F | |

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| MULTILANE HIGHWAYS WORKSHEET(Direction 2) | | | |
|---|---|--|---|
| | | | |
| × | | | |
| | | | |
| General Information | | Site Information | |
| Analyst Agency or Company Date Performed Analysis Time Period | David Stoner DOWL HKM 5/1/2012 Peak Hour IT 200 Glendive to Fairview Corrid | Highway/Direction to Travel
From/To
Jurisdiction
Analysis Year | MT 16
Glendive to Savage
Dawson/Richland County
2035 - Low |
| Project Beschpash Will 107 M | | Des. (N) | [Dlas () |
| Flow Inputs | J | Des. (II) | Plan. (vp) |
| Volume, V (veh/h) AADT(veh/h) Peak-Hour Prop of AADT (veh/o Peak-Hour Direction Prop, D DDHV (veh/h) Driver Type Adjustment | 249
f)
1.00 | Peak-Hour Factor, PHF
%Trucks and Buses, P _T
%RVs, P _R
General Terrain:
Grade Length (mi)
Up/Down % | 0.78
25
0
Level
0.00
0.00 |
| Calculate Flow Adjus | | Number of Lanes | 2 |
| f _p | 1.00 | E _R | 1.2 |
| E _T | 1.5 | -r
f _{HV} | 0.889 |
| Speed Inputs | | Calc Speed Adj and | |
| Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M FFS (measured) Base Free-Flow Speed, BFFS | 12.0
12.0
0
60.0 | f _{LW} (mi/h) f _{LC} (mi/h) f _A (mi/h) f _M (mi/h) FFS (mi/h) | 60.0 |
| Operations | | Design | |
| <u>Operational (LOS)</u>
Flow Rate, v _p (pc/h/ln)
Speed, S (mi/h)
D (pc/mi/ln)
LOS | 179
60.0
3.0
A | Design (N) Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | |
| Bicycle Level of Service | | | |
| | | | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 159.6 | |
|---|-------|--|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 13.95 | |
| Bicycle level of service (Exhibit 15-4) | F | |

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| MULTILANE HIGHWAYS WORKSHEET(Direction 1) | | | |
|---|------------------------------------|--|--------------------------------------|
| | | | |
| × | | | |
| | | | |
| | | | |
| General Information | | Site Information | |
| Analyst | David Stoner | Highway/Direction to Travel | MT 16 |
| Agency or Company | DOWL HKM | From/To | Savage to Crane |
| Date Performed | 5/1/2012 | Jurisdiction
Analysis Year | Dawson/Richland County
2035 - Low |
| Analysis Time Period | Peak Hour | | 2000 - LOW |
| 1 | T 200 Glendive to Fairview Corrido | ······································ | |
| C Oper.(LOS) | | Des. (N) | Plan. (vp) |
| Flow Inputs | | | |
| Volume, V (veh/h) | 253 | Peak-Hour Factor, PHF | 0.87 |
| AADT(veh/h) | | %Trucks and Buses, P _T | 23 |
| Peak-Hour Prop of AADT (veh/d |) | %RVs, P _R | 0 |
| Peak-Hour Direction Prop, D
DDHV (veh/h) | | General Terrain: Grade Length (mi) | Level
0.00 |
| Driver Type Adjustment | 1.00 | Up/Down % | 0.00 |
| | | Number of Lanes | 2 |
| Calculate Flow Adjus | tments | | |
| f _p | 1.00 | E _R | 1.2 |
| E _T | 1.5 | f _{HV} | 0.897 |
| Speed Inputs | | Calc Speed Adj and I | FFS |
| Lane Width, LW (ft) | 12.0 | f _{Lw} (mi/h) | |
| Total Lateral Clearance, LC (ft) | 12.0 | | |
| Access Points, A (A/mi) | 0 | f _{LC} (mi/h) | |
| Median Type, M | | f _A (mi/h) | |
| FFS (measured) | 60.0 | f _M (mi/h) | |
| Base Free-Flow Speed, BFFS | | FFS (mi/h) | 60.0 |
| Operations | | Design | |
| | | | |
| Operational (LOC) | | Design (N) | |
| Operational (LOS) | 400 | Required Number of Lanes, N | |
| Flow Rate, v _p (pc/h/ln) | 162 | Flow Rate, v _p (pc/h) | |
| Speed, S (mi/h) | 60.0 | Max Service Flow Rate (pc/h/ln) | |
| D (pc/mi/ln) | 2.7 | Design LOS | |
| LOS | Α | , and the second | |
| | | | |
| Bicycle Level of Service | | | |
| | | | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 145.4 | |
|---|-------|-------------|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 12.39 | |
| Bicycle level of service (Exhibit 15-4) | F | At Allillor |

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| MULTILANE HIGHWAYS WORKSHEET(Direction 2) | | | |
|---|---|---|--|
| × | | | , |
| General Information | | Site Information | |
| Analyst Agency or Company Date Performed Analysis Time Period Project Description MT 16 / M | David Stoner DOWL HKM 5/1/2012 Peak Hour T 200 Glendive to Fairview Corrido | Highway/Direction to Travel
From/To
Jurisdiction
Analysis Year | MT 16
Savage to Crane
Dawson/Richland County
2035 - Low |
| Project Description Wil 107 M | | Des. (N) | ————————————————————————————————————— |
| Flow Inputs | , | 503. (1 1) | i Franc (vp) |
| Volume, V (veh/h) AADT(veh/h) Peak-Hour Prop of AADT (veh/d Peak-Hour Direction Prop, D DDHV (veh/h) Driver Type Adjustment | 307
)
1.00 | Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade Length (mi) Up/Down % Number of Lanes | 0.84
25
0
Level
0.00
0.00 |
| Calculate Flow Adjus | tments | | |
| f _p
E _T | 1.00
1.5 | E _R
f _{HV} | 1.2
0.889 |
| Speed Inputs | | Calc Speed Adj and | FFS |
| Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M FFS (measured) Base Free-Flow Speed, BFFS | 12.0
12.0
0
60.0 | f _{LW} (mi/h) f _{LC} (mi/h) f _A (mi/h) f _M (mi/h) FFS (mi/h) | 60.0 |
| Operations | | Design | |
| Operational (LOS) Flow Rate, v _p (pc/h/ln) Speed, S (mi/h) D (pc/mi/ln) LOS | 205
60.0
3.4
A | Design (N) Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | |
| Bicycle Level of Service | | | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 182.7 | |
|---|-------|-----|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | (1) |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 14.02 | |
| Bicycle level of service (Exhibit 15-4) | F | |

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| MULTILANE HIGHWAYS WORKSHEET(Direction 1) | | | |
|---|--|---|--|
| × | | | |
| General Information | | Site Information | |
| Analyst Agency or Company Date Performed Analysis Time Period Project Description MT 16 / M | David Stoner DOWL HKM 5/1/2012 Peak Hour T 200 Glendive to Fairview Corrido | Highway/Direction to Travel
From/To
Jurisdiction
Analysis Year | MT 16
Crane to Sidney
Dawson/Richland County
2035 - Low |
| C Oper.(LOS) | | Des. (N) | ☐ Plan. (vp) |
| Flow Inputs | | . , | , 17 |
| Volume, V (veh/h) AADT(veh/h) Peak-Hour Prop of AADT (veh/d Peak-Hour Direction Prop, D DDHV (veh/h) Driver Type Adjustment | 271
)
1.00 | Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade Length (mi) Up/Down % | 0.80
19
0
Level
0.00
0.00 |
| Calculate Flow Adjus | | Number of Lanes | 2 |
| f _p
E _T | 1.00
1.5 | E _R
f _{HV} | 1.2
0.913 |
| Speed Inputs | | Calc Speed Adj and I | FFS |
| Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M FFS (measured) Base Free-Flow Speed, BFFS | 12.0
12.0
0
60.0 | f _{LW} (mi/h)
f _{LC} (mi/h)
f _A (mi/h)
f _M (mi/h)
FFS (mi/h) | 60.0 |
| Operations | | Design | |
| Operational (LOS) Flow Rate, v _p (pc/h/ln) Speed, S (mi/h) D (pc/mi/ln) LOS | 185
60.0
3.1
A | Design (N) Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | |
| Bicycle Level of Service | | | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 169.4 | |
|---|-------|--|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 9.73 | |
| Bicycle level of service (Exhibit 15-4) | F | |

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| MULTILANE HIGHWAYS WORKSHEET(Direction 2) | | | |
|--|---|--|--|
| | | | |
| × | | | |
| | | | |
| | | | |
| General Information | | Site Information | |
| Analyst Agency or Company Date Performed Analysis Time Period | David Stoner
DOWL HKM
5/1/2012
Peak Hour | Highway/Direction to Travel
From/To
Jurisdiction
Analysis Year | MT 16
Crane to Sidney
Dawson/Richland County
2035 - Low |
| Project Description MT 16 / M | T 200 Glendive to Fairview Corrido | r Planning Study | |
| ☐ Oper.(LOS) | | Des. (N) | Plan. (vp) |
| Flow Inputs | | S VIII S C C C C C C C C C C C C C C C C C | |
| Volume, V (veh/h)
AADT(veh/h) | 416 | Peak-Hour Factor, PHF
%Trucks and Buses, P _T | 0.87
19 |
| Peak-Hour Prop of AADT (veh/d
Peak-Hour Direction Prop, D
DDHV (veh/h)
Driver Type Adjustment | 1.00 | %RVs, P _R General Terrain: Grade Length (mi) Up/Down % | 0
Level
0.00
0.00 |
| | | Number of Lanes | 2 |
| Calculate Flow Adjus | tments | | |
| f _p | 1.00 | E _R | 1.2 |
| E _T | 1.5 | f_{HV} | 0.913 |
| Speed Inputs | | Calc Speed Adj and I | FFS |
| Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M | 12.0
12.0
0 | f _{LW} (mi/h)
f _{LC} (mi/h)
f _A (mi/h) | |
| FFS (measured) Base Free-Flow Speed, BFFS | 60.0 | f _M (mi/h)
FFS (mi/h) | 60.0 |
| Operations | | Design | |
| | | | |
| Operational (LOS)
Flow Rate, v _p (pc/h/ln)
Speed, S (mi/h)
D (pc/mi/ln) | 261
60.0
4.3 | Design (N) Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | |
| LOS Bicycle Level of Service | A | | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 239.1 | |
|---|-------|---|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | **** |
| Bicycle level of service score, BLOS (Eq. 15-31) | 9.91 | |
| Bicycle level of service (Exhibit 15-4) | F | *************************************** |

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| MULTILANE HIGHWAYS WORKSHEET(Direction 1) | | | |
|---|---|---|---|
| | | | |
| | | | |
| General Information | | Site Information | |
| Analyst Agency or Company Date Performed Analysis Time Period Project Description MT 16 / M | David Stoner DOWL HKM 5/1/2012 Peak Hour T 200 Glendive to Fairview Corrido | Highway/Direction to Travel
From/To
Jurisdiction
Analysis Year | MT 16
Sidney to Fairview
Dawson/Richland County
2035 - Low |
| ☐ Oper.(LOS) | | Des. (N) | Γ Plan. (vρ) |
| Flow Inputs | | X -1 | s com /th/ |
| Volume, V (veh/h) AADT(veh/h) Peak-Hour Prop of AADT (veh/d Peak-Hour Direction Prop, D DDHV (veh/h) | , | Peak-Hour Factor, PHF
%Trucks and Buses, P _T
%RVs, P _R
General Terrain:
Grade Length (mi) | 0.83
17
0
Level
0.00 |
| Driver Type Adjustment Calculate Flow Adjus | 1.00 | Up/Down %
Number of Lanes | 0.00 |
| fp | 1.00 | E _R | 1.2 |
| Ė _T | 1.5 | f _{HV} | 0.922 |
| Speed Inputs | | Calc Speed Adj and | FFS |
| Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M FFS (measured) Base Free-Flow Speed, BFFS | 12.0
12.0
0
60.0 | f _{LW} (mi/h) f _{LC} (mi/h) f _A (mi/h) f _M (mi/h) FFS (mi/h) | 60.0 |
| Operations | | Design | |
| <u>Operational (LOS)</u>
Flow Rate, v _p (pc/h/ln)
Speed, S (mi/h)
D (pc/mi/ln)
LOS | 345
60.0
5.8
A | Design (N) Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | |
| Bicycle Level of Service | | | |
| | | 1 | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 318.7 | |
|---|-------|--|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 8.82 | |
| Bicycle level of service (Exhibit 15-4) | F | |

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| MULTILANE HIGHWAYS WORKSHEET(Direction 2) | | | |
|---|------------------------------------|-----------------------------------|--------------------------------------|
| | | | |
| X | | | |
| | | | |
| | | | |
| General Information | | Site Information | |
| Analyst | David Stoner | Highway/Direction to Travel | MT 16 |
| Agency or Company | DOWL HKM | From/To
Jurisdiction | Sidney to Fairview |
| Date Performed Analysis Time Period | 5/1/2012
Peak Hour | Analysis Year | Dawson/Richland County
2035 - Low |
| | T 200 Glendive to Fairview Corrido | | |
| Coper.(LOS) | | Pes. (N) | |
| Flow Inputs | J | , (i) | τ τιαπ. (γμ) |
| Volume, V (veh/h) | 523 | Peak-Hour Factor, PHF | 0.86 |
| AADT(veh/h) | | %Trucks and Buses, P _T | 25 |
| Peak-Hour Prop of AADT (veh/d |) | %RVs, P _R | 0 |
| Peak-Hour Direction Prop, D | , | General Terrain: | Level |
| DDHV (veh/h) | | Grade Length (mi) | 0.00 |
| Driver Type Adjustment | 1.00 | Up/Down % Number of Lanes | 0.00 |
| Calculate Flow Adjus | tmonto | number of Lanes | 2 |
| | | <u> </u> | |
| f _p | 1.00 | E _R | 1.2 |
| E _T | 1.5 | f _{HV} | 0.889 |
| Speed Inputs | | Calc Speed Adj and I | FFS |
| Lane Width, LW (ft) | 12.0 | f _{LW} (mi/h) | |
| Total Lateral Clearance, LC (ft) | 12.0 | | |
| Access Points, A (A/mi) | 0 | f _{LC} (mi/h) | |
| Median Type, M | | f _A (mi/h) | |
| FFS (measured) | 60.0 | f _M (mi/h) | |
| Base Free-Flow Speed, BFFS | | FFS (mi/h) | 60.0 |
| Operations | | Design | |
| | | | |
| Operational (LOS) | | Design (N) | |
| Flow Rate, v _p (pc/h/ln) | 242 | Required Number of Lanes, N | |
| 1 | 342 | Flow Rate, v _p (pc/h) | |
| Speed, S (mi/h) | 60.0 | Max Service Flow Rate (pc/h/ln) | |
| D (pc/mi/ln) | 5.7 | Design LOS | |
| LOS | A | | |
| | | | |
| Bicycle Level of Service | | | |
| | | 1 | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 304.1 | |
|---|-------|--|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 14.27 | |
| Bicycle level of service (Exhibit 15-4) | F | |

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Appendix 7

Projected Four-Lane Highway 2035 – High Condition

Direction 1 = Northbound/Eastbound Direction

Direction 2 = Southbound/Westbound Direction

| MULTILANE HIGHWAYS WORKSHEET(Direction 1) | | | |
|---|------------------------------------|--|---------------------------------------|
| | | | |
| × | | | |
| | | | |
| General Information | | Site Information | |
| Analyst
Agency or Company | David Stoner
DOWL HKM | Highway/Direction to Travel From/To | MT 16
Glendive to Savage |
| Date Performed Analysis Time Period | 5/1/2012
Peak Hour | Jurisdiction
Analysis Year | Dawson/Richland County
2035 - High |
| | T 200 Glendive to Fairview Corrido | r Planning Study | |
| C Oper.(LOS) | Ĭ | Des. (N) | Plan. (vp) |
| Flow Inputs | 201 | | |
| Volume, V (veh/h) AADT(veh/h) | 321 | Peak-Hour Factor, PHF
%Trucks and Buses, P _T | 0.81
25 |
| Peak-Hour Prop of AADT (veh/d
Peak-Hour Direction Prop, D
DDHV (veh/h) | | %RVs, P _R General Terrain: Grade Length (mi) | 0
Level
0.00 |
| Driver Type Adjustment | 1.00 | Up/Down %
Number of Lanes | 0.00
2 |
| Calculate Flow Adjus | tments | | |
| f _p | 1.00 | E _R | 1.2 |
| E _T | 1.5 | f _{HV} | 0.889 |
| Speed Inputs | | Calc Speed Adj and I | FFS |
| Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M | 12.0
12.0
0 | f _{LW} (mi/h)
f _{LC} (mi/h)
f _A (mi/h) | |
| FFS (measured) Base Free-Flow Speed, BFFS | 60.0 | f _M (mi/h)
FFS (mi/h) | 60.0 |
| Operations | | Design | |
| | | | |
| Operational (LOS)
Flow Rate, v _p (pc/h/ln) | 222 | <u>Design (N)</u>
Required Number of Lanes, N
Flow Rate, v _o (pc/h) | |
| Speed, S (mi/h)
D (pc/mi/ln)
LOS | 60.0
3.7
A | Max Service Flow Rate (pc/h/ln) Design LOS | |
| Bicycle Level of Service | | | |
| | | | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 198.1 | |
|---|-------|--|
| Effective width, W _y (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _f (Eq. 15-30) | 5.19 | |
| Blcycle level of service score, BLOS (Eq. 15-31) | 14.06 | |
| Bicycle level of service (Exhibit 15-4) | F | |

HCS 2010TM Version 6.3

| MULTILANE HIGHWAYS WORKSHEET(Direction 2) | | | |
|---|--|---|--|
| | | | |
| General Information | | Site Information | |
| Analyst Agency or Company Date Performed Analysis Time Period Project Description MT 16 / M | David Stoner
DOWL HKM
5/1/2012
Peak Hour
T 200 Glendive to Fairview Corric | Highway/Direction to Travel
From/To
Jurisdiction
Analysis Year | MT 16
Glendive to Savage
Dawson/Richland County
2035 - High |
| ☐ Oper.(LOS) | | Des. (N) | ☐ Plan. (vp) |
| Flow Inputs | | | 11/ |
| Volume, V (veh/h) AADT(veh/h) Peak-Hour Prop of AADT (veh/d) Peak-Hour Direction Prop, D DDHV (veh/h) Driver Type Adjustment | 331
i)
1.00 | Peak-Hour Factor, PHF
%Trucks and Buses, P _T
%RVs, P _R
General Terrain:
Grade Length (mi)
Up/Down %
Number of Lanes | 0.78
25
0
Level
0.00
0.00 |
| Calculate Flow Adjus | stments | | |
| f _p
E _T | 1.00
1.5 | E _R | 1.2
0.889 |
| Speed Inputs | | Calc Speed Adj and | FFS |
| Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M FFS (measured) Base Free-Flow Speed, BFFS | 12.0
12.0
0
60.0 | f _{LW} (mi/h) f _{LC} (mi/h) f _A (mi/h) f _M (mi/h) FFS (mi/h) | 60.0 |
| Operations | 1/2/2/1 | Design | |
| <u>Operational (LOS)</u>
Flow Rate, v _p (pc/h/ln)
Speed, S (mi/h)
D (pc/mi/ln)
LOS | 238
60.0
4.0
A | Design (N) Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | |
| Bicycle Level of Service | | | |
| | | | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 212.2 | |
|---|-------|------|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | **** |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 14.09 | |
| Bicycle level of service (Exhibit 15-4) | F | |

HCS 2010TM Version 6.3

| MULTILANE HIGHWAYS WORKSHEET(Direction 1) | | | |
|---|--|---|---|
| [X] | | | |
| General Information | | Site Information | |
| Analyst Agency or Company Date Performed Analysis Time Period Project Description MT 16 / M | David Stoner DOWL HKM 5/1/2012 Peak Hour T 200 Glendive to Fairview Corridor | Highway/Direction to Travel
From/To
Jurisdiction
Analysis Year | MT 16
Savage to Crane
Dawson/Richland County
2035 - High |
| Project becomption with 10 7 km | | Pes. (N) | □ Plan. (vp) |
| Flow Inputs | | | · · · · · · · · · · · · · · · · · · · |
| Volume, V (veh/h) AADT(veh/h) Peak-Hour Prop of AADT (veh/d Peak-Hour Direction Prop, D DDHV (veh/h) Driver Type Adjustment | 336
)
1.00 | Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade Length (mi) Up/Down % Number of Lanes | 0.87
23
0
Level
0.00
0.00
2 |
| Calculate Flow Adjus | tments | Number of Calles | |
| f _p
E _T | 1.00
1.5 | E _R f _{hv} | 1.2
0.897 |
| Speed Inputs | | Calc Speed Adj and I | FFS |
| Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M FFS (measured) Base Free-Flow Speed, BFFS | 12.0
12.0
0
60.0 | f _{LW} (mi/h)
f _{LC} (mi/h)
f _A (mi/h)
f _M (mi/h)
FFS (mi/h) | 60.0 |
| Operations | | Design | |
| <u>Operational (LOS)</u>
Flow Rate, v _p (pc/h/ln)
Speed, S (mi/h)
D (pc/mi/ln)
LOS | 215
60.0
3.6
A | <u>Design (N)</u> Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | |
| Bicycle Level of Service | 1713 TO 1813 T | | |

| Directional demand flow rate in outside lane, $v_{ m OL}$ (Eq. 15-24) veh/h | 193.1 | |
|---|-------|--|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 12.54 | |
| Bicycle level of service (Exhibit 15-4) | F | |

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| MULTILANE HIGHWAYS WORKSHEET(Direction 2) | | | |
|---|---|---|---|
| × | | | |
| General Information | | Site Information | |
| Analyst
Agency or Company
Date Performed
Analysis Time Period | David Stoner
DOWL HKM
5/1/2012
Peak Hour | Highway/Direction to Travel
From/To
Jurisdiction
Analysis Year | MT 16
Savage to Crane
Dawson/Richland County
2035 - High |
| | T 200 Glendive to Fairview Corridor | | pun- |
| Flow Inputs | I : U | es. (N) | Plan. (vp) |
| Volume, V (veh/h) AADT(veh/h) Peak-Hour Prop of AADT (veh/d Peak-Hour Direction Prop, D DDHV (veh/h) Driver Type Adjustment | 407
)
1.00 | Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade Length (mi) Up/Down % Number of Lanes | 0.84
25
0
Level
0.00
0.00
2 |
| Calculate Flow Adjus | tments | Trumber of Calles | |
| f _ρ
E _τ
Speed Inputs | 1.00
1.5 | E _R f _{HV} Calc Speed Adj and F | 1.2
0.889 |
| Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M FFS (measured) Base Free-Flow Speed, BFFS | 12.0
12.0
0
60.0 | f _{LW} (mi/h) f _{LC} (mi/h) f _A (mi/h) f _M (mi/h) FFS (mi/h) | 60.0 |
| Operations | | Design | |
| <u>Operational (LOS)</u>
Flow Rate, v _p (pc/h/ln)
Speed, S (mi/h)
D (pc/mi/ln)
LOS | 272
60.0
4.5
A | <u>Design (N)</u> Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | |
| Bicycle Level of Service | | | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 242.3 | |
|---|-------|--|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S ₁ (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 14.16 | |
| Bicycle level of service (Exhibit 15-4) | F | |

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| MULTILANE HIGHWAYS WORKSHEET(Direction 1) | | | | |
|---|---|---|---|--|
| × | | | | |
| General Information Site Information | | | | |
| Analyst Agency or Company Date Performed Analysis Time Period | David Stoner
DOWL HKM
5/1/2012
Peak Hour | Highway/Direction to Travel
From/To
Jurisdiction
Analysis Year | MT 16
Crane to Sidney
Dawson/Richland County
2035 - High | |
| ll' | T 200 Glendive to Fairview Corrido | | | |
| Classification | | Des. (N) | Plan. (vp) | |
| Flow Inputs Volume, V (veh/h) AADT(veh/h) Peak-Hour Prop of AADT (veh/o Peak-Hour Direction Prop, D DDHV (veh/h) Driver Type Adjustment | 360
I)
1.00 | Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade Length (mi) Up/Down % Number of Lanes | 0.80
19
0
Level
0.00
0.00 | |
| Calculate Flow Adjus | stments | | | |
| ^f _ρ
E _τ
Speed Inputs | 1.00
1.5 | F _R | 1.2
0.913 | |
| Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M FFS (measured) Base Free-Flow Speed, BFFS | 12.0
12.0
0
60.0 | Calc Speed Adj and I f _{LW} (mi/h) f _{LC} (mi/h) f _A (mi/h) f _M (mi/h) FFS (mi/h) | 60.0 | |
| Operations | | Design | | |
| <u>Operational (LOS)</u>
Flow Rate, v _p (pc/h/ln)
Speed, S (mi/h)
D (pc/mi/ln)
LOS | 246
60.0
4.1
A | Design (N) Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | | |
| Bicycle Level of Service | | 1 | | |
| | | | | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 225.0 | |
|---|-------|--|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 9.88 | |
| Bicycle level of service (Exhibit 15-4) | F | |

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| MULTILANE HIGHWAYS WORKSHEET(Direction 2) | | | |
|---|--|---|---|
| × | | | |
| General Information | | Site Information | |
| Agency or Company
Date Performed
Analysis Time Period | David Stoner DOWL HKM 5/1/2012 Peak Hour | Highway/Direction to Travel
From/To
Jurisdiction
Analysis Year | MT 16
Crane to Sidney
Dawson/Richland County
2035 - High |
| Project Description MT 16 / MT | | | |
| Flow Inputs | Ι · υ | es. (N) | □ Plan. (vp) |
| Volume, V (veh/h) AADT(veh/h) Peak-Hour Prop of AADT (veh/d) Peak-Hour Direction Prop, D DDHV (veh/h) | 1.00 | Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade Length (mi) Up/Down % Number of Lanes | 0.87
19
0
Level
0.00
0.00 |
| Calculate Flow Adjust | ments | | |
| ۲ | 1.00
1.5 | E _R
f _{HV}
Calc Speed Adj and F | 1.2
0.913 |
| Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M | 12.0
12.0
0 | f _{LW} (mi/h) f _{LC} (mi/h) f _A (mi/h) f _M (mi/h) FFS (mi/h) | 60.0 |
| Operations | | Design | |
| <u>Operational (LOS)</u>
Flow Rate, v _p (pc/h/ln) 3
Speed, S (mi/h) 6 | 347
50.0
5.8
A | <u>Design (N)</u> Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | |
| Bicycle Level of Service | | | |

| Directional demand flow rate in outside lane, $v_{ m OL}$ (Eq. 15-24) veh/h | 317.2 | |
|---|-------|--------|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _I (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 10.05 | |
| Bicycle level of service (Exhibit 15-4) | F | A-WA-1 |

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| MULTILANE HIGHWAYS WORKSHEET(Direction 1) | | | | |
|--|------------------------------------|--|------------------------|--|
| | | | | |
| × | | | | |
| | | | | |
| General Information Site Information | | | | |
| Analyst | David Stoner | Highway/Direction to Travel | MT 16 | |
| Agency or Company | DOWL HKM | From/To | Sidney to Fairview | |
| Date Performed | 5/1/2012 | Jurisdiction | Dawson/Richland County | |
| Analysis Time Period | Peak Hour | Analysis Year | 2035 - High | |
| | T 200 Glendive to Fairview Corrido | | | |
| Oper.(LOS) | <u> </u> | Des. (N) | Plan. (vp) | |
| Flow Inputs | | | | |
| Volume, V (veh/h) | 661 | Peak-Hour Factor, PHF | 0.83 | |
| AADT(veh/h) | Λ. | %Trucks and Buses, P _T | 17 | |
| Peak-Hour Prop of AADT (veh/d
Peak-Hour Direction Prop, D | 1) | %RVs, P _R
General Terrain: | 0 | |
| DDHV (veh/h) | | Grade Length (mi) | Level
0.00 | |
| Driver Type Adjustment | 1.00 | Up/Down % | 0.00 | |
| | | Number of Lanes | 2 | |
| Calculate Flow Adjus | tments | | | |
| f _p | 1.00 | E _R | 1.2 | |
| E _T | 1.5 | f_{HV} | 0.922 | |
| Speed Inputs | | Calc Speed Adj and I | FFS | |
| Lane Width, LW (ft) | 12.0 | | | |
| Total Lateral Clearance, LC (ft) | 12.0 | f _{LW} (mi/h) | | |
| Access Points, A (A/mi) | 0 | f _{LC} (mi/h) | | |
| Median Type, M | | f _A (mi/h) | | |
| FFS (measured) | 60.0 | f _M (mi/h) | | |
| Base Free-Flow Speed, BFFS | | FFS (mi/h) | 60.0 | |
| Operations | | Design | | |
| | | | | |
| Operational (LOO) | | Design (N) | | |
| Operational (LOS) | 400 | Required Number of Lanes, N | | |
| Flow Rate, v _p (pc/h/ln) | 432 | Flow Rate, v _p (pc/h) | | |
| Speed, S (mi/h) | 60.0 | Max Service Flow Rate (pc/h/ln) | | |
| D (pc/mi/ln) | 7.2 | Design LOS | | |
| LOS | Α | - | | |
| | | | | |
| Bicycle Level of Service | | | | |
| | | I | | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 398.2 | |
|---|-------|--|
| Effective width, W _v (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 8.93 | |
| Bicycle level of service (Exhibit 15-4) | F | |

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| MULTILANE HIGHWAYS WORKSHEET(Direction 2) | | | |
|---|---|---|--|
| X | | | |
| General Information | | Site Information | |
| Analyst Agency or Company Date Performed Analysis Time Period | David Stoner
DOWL HKM
5/1/2012
Peak Hour | Highway/Direction to Travel
From/To
Jurisdiction
Analysis Year | MT 16
Sidney to Fairview
Dawson/Richland County
2035 - High |
| | T 200 Glendive to Fairview Corrido | | Potential Control of C |
| Flow Inputs | J : L | Pes. (N) | Plan. (vp) |
| Volume, V (veh/h) AADT(veh/h) Peak-Hour Prop of AADT (veh/d) Peak-Hour Direction Prop, D DDHV (veh/h) Driver Type Adjustment | 654
)
1.00 | Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade Length (mi) Up/Down % Number of Lanes | 0.86
25
0
Level
0.00
0.00 |
| Calculate Flow Adjus | tments | | |
| f _p
E _T | 1.00
1.5 | E _R | 1.2
0.889 |
| Speed Inputs | | Calc Speed Adj and I | FFS |
| Lane Width, LW (ft) Total Lateral Clearance, LC (ft) Access Points, A (A/mi) Median Type, M FFS (measured) Base Free-Flow Speed, BFFS | 12.0
12.0
0
60.0 | f _{LW} (mi/h) f _{LC} (mi/h) f _A (mi/h) f _M (mi/h) FFS (mi/h) | 60.0 |
| Operations | | Design | 11000 |
| <u>Operational (LOS)</u>
Flow Rate, v _p (pc/h/ln)
Speed, S (mi/h)
D (pc/mi/ln)
LOS | 427
60.0
7.1
A | <u>Design (N)</u> Required Number of Lanes, N Flow Rate, v _p (pc/h) Max Service Flow Rate (pc/h/ln) Design LOS | |
| Bicycle Level of Service | | | |

| Directional demand flow rate in outside lane, v _{OL} (Eq. 15-24) veh/h | 380.2 | |
|---|-------|--|
| Effective width, W _V (Eq. 15-29) ft | 24.00 | |
| Effective speed factor, S _t (Eq. 15-30) | 5.19 | |
| Bicycle level of service score, BLOS (Eq. 15-31) | 14.39 | |
| Bicycle level of service (Exhibit 15-4) | F | |

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